



UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

MANUAL TRANSMITTAL SHEET

Release	1-1500
Date	9/30/87

Subject

1292 - RADIO COMMUNICATIONS

1. Explanation of Material Transmitted: This Manual Section contains the subject matter previously located in Manual Section 9122. Numerous changes and additional guidance for planning, implementing, and managing the Bureau's radio communication systems have been incorporated into Manual Section 1292. The numerical designation has been changed from 9122 to 1292 in order to coincide with the numerical designations used for other Information Resources Management functions.
2. Report Required: None.
3. Materials Superseded: None.
4. Filing Instructions: File as directed below.

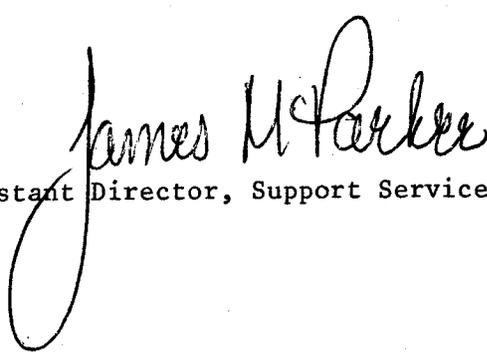
REMOVE:

None

INSERT:

1292

(Total: 15 Sheets)


Assistant Director, Support Services

1292 - RADIO COMMUNICATIONS

Table of Contents

- .01 Purpose
- .02 Objective
- .03 Authority
- .04 Responsibility
- .05 References
- .06 Policy
- .07 File and Records Maintenance
- .08 Radio Frequency Authorizations
- .09 System Improvements and Updating

- .1 Radio Communications Service Plan

- .2 Radio Communications Service Record
 - .21 Contents
 - A. State and Area Maps
 - B. System Drawing
 - C. Narrative

- .3 Operating Standards
 - .31 Posting and Filing Authorizations
 - .32 Operational Control
 - A. Operators
 - B. Priority of Emergency Communications
 - C. Multiple Remote Control Operating Positions
 - D. Call Signs
 - E. Radio Log
 - .33 Operating Procedures
 - A. Prevention of Interference
 - B. Profane Language
 - C. Use of Call Sign
 - D. The 10-Code
 - E. Phonetic Alphabet
 - F. The 24-Hour Clock
 - G. Operator Procedures

- .4 Equipment
 - .41 Minimum Technical Standard
 - .42 Procurement
 - A. Equipment Types
 - .43 Maintenance
 - A. Performance Testing
 - B. Maintenance Record
 - .44 Aircraft Installation
 - .45 Test Equipment

1292 - RADIO COMMUNICATIONS

.46 Replacement Guidelines

- A. Damaged
- B. Reliability
- C. Obsolete
- D. Optimum Age
- E. Maximum Age

.5 Facilities

.51 Design and Construction

- A. Land Use
- B. Antenna Structures
- C. Lightning Protection

.52 Maintenance

Glossary of Terms

Illustrations

- 1. Map Symbols
- 2. State Map
- 3. Drawing Symbols
- 4. System Drawing
- 5. Narrative

1292 - RADIO COMMUNICATIONS

.01 Purpose. This Manual Section provides the overall guidance for planning, implementing, and managing the Bureau's radio communications.

.02 Objective. The objective of the Bureau's radio communication services is to support Bureau offices and activities in accomplishing assigned responsibilities and missions by:

- A. Providing for public and employee safety.
- B. Supporting the National Interagency Incident Management System. (National emergencies, natural disasters, wildfire suppression, etc.)
- C. Increasing the effectiveness of personnel and equipment in support of land and resource management.

.03 Authority. (See BLM Manual Section 1290.03.)

.04 Responsibility. Radio communications is part of Telecommunications Services. (See BLM Manual Section 1290.04.)

.05 References. (See BLM Manual Sections 1290, 1291, 1511, and 2860.)

.06 Policy. It is Bureau policy that radio communications shall be developed and provided, utilizing commercially available equipment of minimal complexity, to ensure dependable, economical services. Radio communications shall be provided by the most efficient and effective methods of utilizing the radio frequency spectrum.

.07 File and Records Maintenance. Refer to Section .2 for a description of recordkeeping requirements. Refer to the Bureau Records Schedule for the authorized disposition of official records .

.08 Radio Frequency Authorization. (For frequency authorization and utilization, see BLM Manual Section 1291.)

.09 System Improvements and Updating. Systems shall be updated and improved through equipment replacement and modification. Proven new techniques and product designs that will enhance and improve the system's performance or its capability to economically meet requirements should be implemented. Equipment and system designs should not be allowed to become obsolete.

1292 - RADIO COMMUNICATIONS

.1 Radio Communication Services Plan. A Radio Communication Services Plan shall be provided as part of the Telecommunication Services Plan. (See BLM Manual Section 1290.1.)

1292 - RADIO COMMUNICATIONS

.2 Radio Communication Services Record. Descriptions of radio communication systems shall be incorporated as a section of the Telecommunication Services Record. (See BLM Manual Section 1290.2.)

.21 Contents. Descriptions of radio communication systems shall be included which clearly illustrate the capability and explain the operational logic for frequencies used in the systems.

A. State and Area Maps. A State map, using map symbols, shall be included which illustrates the general locations and operational relationship of all fixed sites (base stations, repeater stations, and control points and stations). (See Illustrations 1 and 2.) Maps of each district, area, or specific system (resource area, river program, aircraft operations, etc.) are optional.

B. System Drawing. A system drawing, using functional drawing symbols, shall be included which illustrates the operation of the system and the use and logic of any radio frequencies. All radio frequencies and tone frequencies must be listed. All fixed sites must be identified (separate enclosure as necessary) by name, coordinates, and elevation. (See Illustrations 3 and 4.)

C. Narrative. A brief narrative describing the system, the purpose, and basic operation shall be included for each system. (See Illustration 5.) Areas without proper coverage and the corrective actions needed to insure adequate communications should be identified.

1292 - RADIO COMMUNICATIONS

.3 Operating Standards. The Bureau is authorized to operate radio communication systems on specific radio frequencies under the Department of the Interior Radio Frequency Authorizations (RFA's). The operation of stations must be in compliance with 377 Departmental Manual and the Departmental Radio Communications Handbook.

.31 Filing Authorizations. Upon approval by the Frequency Assignment Subcommittee of the Interdepartment Radio Advisory Committee (IRAC), the National Telecommunications and Information Administration (NTIA) issues a computer generated RFA to the Department of the Interior. The Department issues the RFA to the Bureau/Office Radio Liaison. This is the official Department of the Interior RFA reflecting the assignment as it appears in the NTIA Government Master File of Radio Frequency Assignments. Copies of the form, when issued for control, base, repeater, or other fixed stations, shall be kept on file at the respective points of operation. A permanent file of all applicable RFA's shall be kept on hand by offices that maintain and operate Bureau radio communication systems. (See Departmental Radio Communications Handbook, Chapter 7.)

.32 Operational Control. The operation of a Bureau radio station must be under the control of a responsible Bureau employee. Systems should be monitored, as necessary, to ensure that operating standards are observed.

A. Operators. All operators of BLM radio stations shall be citizens of the United States and shall be either employees of the Bureau or shall be under the direct control of the Bureau on a contractual or cooperative-use agreement basis. All operators shall be under the supervision of an official of the Bureau who can insure that Bureau procedures regarding radio operations are met when operating a radio station authorized by the Department of the Interior. (See Departmental Radio Communications Handbook, Chapter 4.)

B. Priority of Emergency Communications. Emergency communications shall assume the highest priority on Bureau radio communication systems. Utilization of a radio communications system for an emergency should be managed by a responsible person involved in the emergency. Use of the system shall be relinquished when the emergency terminates. (See BLM Manual Section 1291.22D.)

C. Multiple Remote Control Operating Positions. Bureau radio communications facilities with multiple remote control operating positions must establish a main control position with the capability to switch or transfer control of the radio transmitter to the other operating positions. The main control position must be manned by a responsible Bureau operator. (See .32A above.)

1292 - RADIO COMMUNICATIONS

D. Call Signs. An international call sign is assigned to stations in accordance with the provisions of the Departmental Radio Communications Handbook, Chapter 3.

1. Posting. The international call signs of all associated stations must be displayed prominently at, or near, the operating position.

E. Radio Log. A radio log must be maintained for each station or system. (See Departmental Radio Communications Handbook, Chapter 4.6.)

1. Recording Instruments. Recording instruments may be used to record communications at a station, but not to the exclusion of the radio log. The radio log shall include a statement that all transmissions and receptions are being recorded. All recordings shall be identified as to date, period of recording, and location.

.33 Operating Procedures. Radio communications shall be restricted to official business and shall be kept as brief and to the point as possible. Line managers are responsible for compliance with proper operating procedures on radio systems under their control.

A. Prevention of Interference. The channel shall be monitored for traffic prior to any transmission. Do not transmit on a busy channel, except in an emergency. (See Departmental Radio Communications Handbook, Chapter 4.3.)

B. Profane Language. Profanity or obscene language is forbidden. (See Departmental Radio Communications Handbook, Chapter 4.5.)

C. Use of Call Signs. The international call sign shall be transmitted during normal operations to identify the station when signing off at the close of a series of transmissions or at least once every half hour during extended periods of operation. (See Departmental Radio Communications Handbook, Chapter 4.4.)

D. The 10-Code. Use of a code is not recommended in situations where emergency actions must be taken by personnel that have not received semiannual training on proper usage. Some user groups, particularly in the public safety and fire sector, have adopted a standard group of code signals known as the "10-Code." Use of such a code is effective only when fully understood by all users of a radio system. Where use of code signals is desirable, the Associated Public-Safety Communications Officers' (APCO) code shall be employed. Use of all or any part of the APCO 10-Code is optional, but the meaning of any APCO 10-Code must not be changed.

1292 - RADIO COMMUNICATIONS

1. The APCO 10-Code:

10-1	Signal Weak	10-21	Call (_____) by Phone
10-2	Signal Good	10-22	Disregard
10-3	Stop Transmitting	10-23	Arrived at Scene
10-4	Affirmative (OK)	10-24	Assignment Completed
10-5	Relay (To)	10-25	Report to (Meet)
10-6	Busy	10-26	Estimated Arrival Time
10-7	Out of Service	10-27	License/Permit Information
10-8	In Service	10-28	Ownership Information
10-9	Say Again	10-29	Records Check
10-10	Negative	10-30	Danger/Caution
10-11	_____ on Duty	10-31	Pick Up
10-12	Stand by (Stop)	10-32	_____ Units Needed (Specify)
10-13	Existing Conditions	10-33	Help Me Quick
10-14	Message/Information	10-34	Time
10-15	Message Delivered	10-35	---Reserved---
10-16	Reply to Message	10-36	---Reserved---
10-17	En route	10-37	---Reserved---
10-18	Urgent	10-38	---Reserved---
10-19	(In) Contact	10-39	---Reserved---
10-20	Location		

E. Phonetic Alphabet. The international phonetic alphabet is the recommended method used to spell out those parts of messages where the received signals are marginal and there is chance for error. These phonetics were chosen because they give maximum readability under maximum noise conditions and wide ranges of lingual accents.

1. The international phonetic alphabet:

A - Alpha	N - November
B - Bravo (brah'voe)	O - Oscar
C - Charlie	P - Papa (pa-pah')
D - Delta	Q - Quebec (kay'beck)
E - Echo	R - Romeo
F - Foxtrot	S - Sierra
G - Golf	T - Tango
H - Hotel	U - Uniform
I - India	V - Victor
J - Juliett (joollee-yet')	W - Whiskey
K - Kilo (kee-lo)	X - X-ray
L - Lima (lee-mah)	Y - Yankee
M - Mike	Z - Zulu

F. The 24-Hour Clock. All "times" spoken and recorded shall be based upon the 24-hour clock, using local time.

1292 - RADIO COMMUNICATIONS

G. Operator Procedure. Bureau radio stations shall be operated in an efficient and professional manner. The following is an example of correct radio communications procedure: (Geographic names, names of individuals, or a numeric/alphanumeric system may be used to identify personnel, offices, or units.)

1. Smith in a mobile is calling the Example District Office through the Sample Peak repeater: "Example - Smith - Sample Peak."

NOTE: Parenthetical words are implied. The full verbiage would be: Example (District Office) (this is) Smith (calling through the) Sample Peak (repeater, over). (Use of the word "over" at the end of a single transmission is not necessary, but may be used when communication conditions are poor.)

2. Example District Office answers: "Smith - Example."

3. Smith clears the radio channel after the message is completed: "Smith."

4. Example District Office base station clears the radio channel with international call sign: "Example KOD424."

1292 - RADIO COMMUNICATIONS

.4 Equipment. Radio communications equipment shall be purchased, installed, and maintained to provide cost-effective communications meeting appropriate Bureau service requirements and specifications.

.41 Minimum Technical Standards. All radio communications equipment shall meet or exceed the technical standards specified in the Electronic Industries Association minimum standards and the NTIA standards. (See NTIA Manual Chapter 5.)

.42 Procurement. Radio communications equipment shall be procured in accordance with Bureau purchasing regulations and the procedures set forth in Bureau Manual Section 1511.

A. Equipment Type. Every effort shall be made to utilize standard, commercially available (off-the-shelf) equipment to meet radio communications equipment requirements.

.43 Maintenance. All radio communications equipment shall be maintained to the original equipment manufacturer's performance specifications.

A. Performance Testing. Performance testing of all Bureau radio communications equipment shall be conducted as required to ensure that the equipment is operating properly and ready for use. As a minimum, transmitter frequency, power, and modulation and receiver frequency and sensitivity shall be tested annually for compliance with the equipment manufacturer's performance specifications.

B. Maintenance Record. A maintenance record shall be maintained for all radio communications equipment to provide a permanent historical record of each item. The maintenance record shall identify the equipment and its location, the date, a brief description and cost of all repairs, and performance testing results.

C. Maintenance Support. Unless prior written agreements have been established, maintenance of radios used to support efforts in another State shall be performed by the requesting State, returned configured as initially received, and comply with the original equipment manufacturer's performance specifications. This does not apply to the Boise Interagency Fire Center National Radio Support Cache.

.44 Aircraft Installations. Installation of radio communications equipment in BLM-owned, contracted, chartered, or rented aircraft requiring modification or alteration to the aircraft wiring or structure shall only be performed by an Federal Aviation Administration (FAA) certified technician in compliance with applicable FAA regulations. Bureau radios used in aircraft shall be limited to 10 watts of transmitter power.

1292 - RADIO COMMUNICATIONS

.45 Test Equipment. All test equipment shall be maintained to the accuracy necessary to maintain the radio communications equipment performance within the manufacturer's specifications. Test equipment shall be calibrated as necessary to assure compliance with the manufacturer's specifications. All calibrations shall be traceable to the National Bureau of Standards.

.46 Replacement Guidelines. Equipment replacement guidelines are provided to assist in determining when equipment should be replaced. These guidelines do not preclude replacement for reasons other than those given nor for continuing equipment in service if determined appropriate. In all cases, discretion must be exercised in determining when equipment should be replaced. Equipment should be replaced when one or more of the following conditions exist:

A. Damaged. Equipment is damaged beyond economical repair. Economical repair is determined by the the following equation:

R is greater than $C(0.775 - 0.625 A/P)$

Where: R = Estimated cost of repair
 C = Cost of replacement
 A = Age of equipment (years)
 P = Optimum replacement age (years)

NOTE: If R (estimated cost of repair) is greater than the resultant calculations $[C(0.775 - 0.625A/P)]$, the cost of repair is not economical and the equipment should be replaced.

B. Reliability. The equipment is not providing the required dependable service. The equipment (not associated hardware and installation) is out of service more than 20 percent of the time during a season because of breakdown requiring repair.

C. Obsolete. The equipment does not comply with minimum technical standards or system improvements and modifications are not economical. Economical modifications are determined by the following formula:

M is greater than $C(0.775 - 0.625 A/P)$

Where: M = Estimated cost of modification
 C = Cost of replacement
 A = Age of equipment (years)
 P = Optimum replacement age (years)

NOTE: If M (estimated cost of modification) is greater than the resultant calculations $[C(0.775 - 0.625 A/P)]$, the cost of modification is not economical and the equipment should be replaced.

1292 - RADIO COMMUNICATIONS

D. Optimum Age. The reliability of equipment decreases and the cost of ownership increases with equipment years of service. The approximate optimum radio communications equipment replacement age is:

1. Land Mobile Radios.
 - a. Fixed stations - 10 years.
 - b. Mobiles - 7 years.
 - c. Portables - 7 years.
2. Low Density Microwave Radio.
 - a. Transceivers - 10 years.
 - b. Multiplex equipment - 7 years.

E. Maximum Age. Equipment should be removed from service when the following equipment age is exceeded:

1. Land Mobile Radios.
 - a. Fixed stations - 15 years.
 - b. Mobiles - 10 years.
 - c. Portables - 10 years.
2. Low Density Microwave Radio.
 - a. Transceivers - 15 years.
 - b. Multiplex equipment - 10 years.

1292 - RADIO COMMUNICATIONS

.5 Facilities. Radio communications facility design, construction, and maintenance shall be consistent with system needs and provide for equipment service and protection. All facilities shall be maintained in a manner consistent with accepted professional radio communications practices. (See BLM Manual Section 2860.)

.51 Design and Construction. The radio communications technical and functional requirements shall be provided for in the facility design. All designs and construction shall follow and adhere to Bureau regulations, standards, and policies.

A. Land Use. Radio communication facilities located on Bureau managed land shall be authorized and coordinated following applicable procedures and policies for land use and environmental impact.

B. Antenna Structures. Antenna structures shall, as a minimum, comply with the Structural Standard for Steel Antenna Towers and Antenna Supporting Structures, Electronic Industries Association Standard RS-222-D.

1. Obstruction Marking and Lighting. Obstruction marking and lighting shall be consistent with FAA regulations. (See Departmental Radio Communications Handbook, Chapter 5.)

2. Proposed Construction or Alteration. The FAA Regional Office shall be notified of any proposed construction or alteration of objects that may affect the navigable airspace. (See Departmental Radio Communications Handbook, Chapter 5.)

C. Lightning Protection. All radio communications facilities shall be protected against the effects of lightning strikes to the extent practicable using current, generally accepted techniques.

1. Grounding. Towers and equipment shall be properly grounded using interconnected, multiple grounding schemes.

2. Impulse Protection. Impulse protectors or suppressors shall be used on antenna coaxial cables, power lines, and telephone lines.

.52 Maintenance. All radio communications facilities shall be maintained to standards sufficient to ensure dependable service.

1292 - RADIO COMMUNICATIONS

Glossary of Terms

-R-

radio communications: telecommunications by means of radio waves (FM, AM, single sideband, microwave, meteor burst, satellite, etc.).

1292 - RADIO COMMUNICATIONS

System Functional Description - Map Symbols

RADIO NET

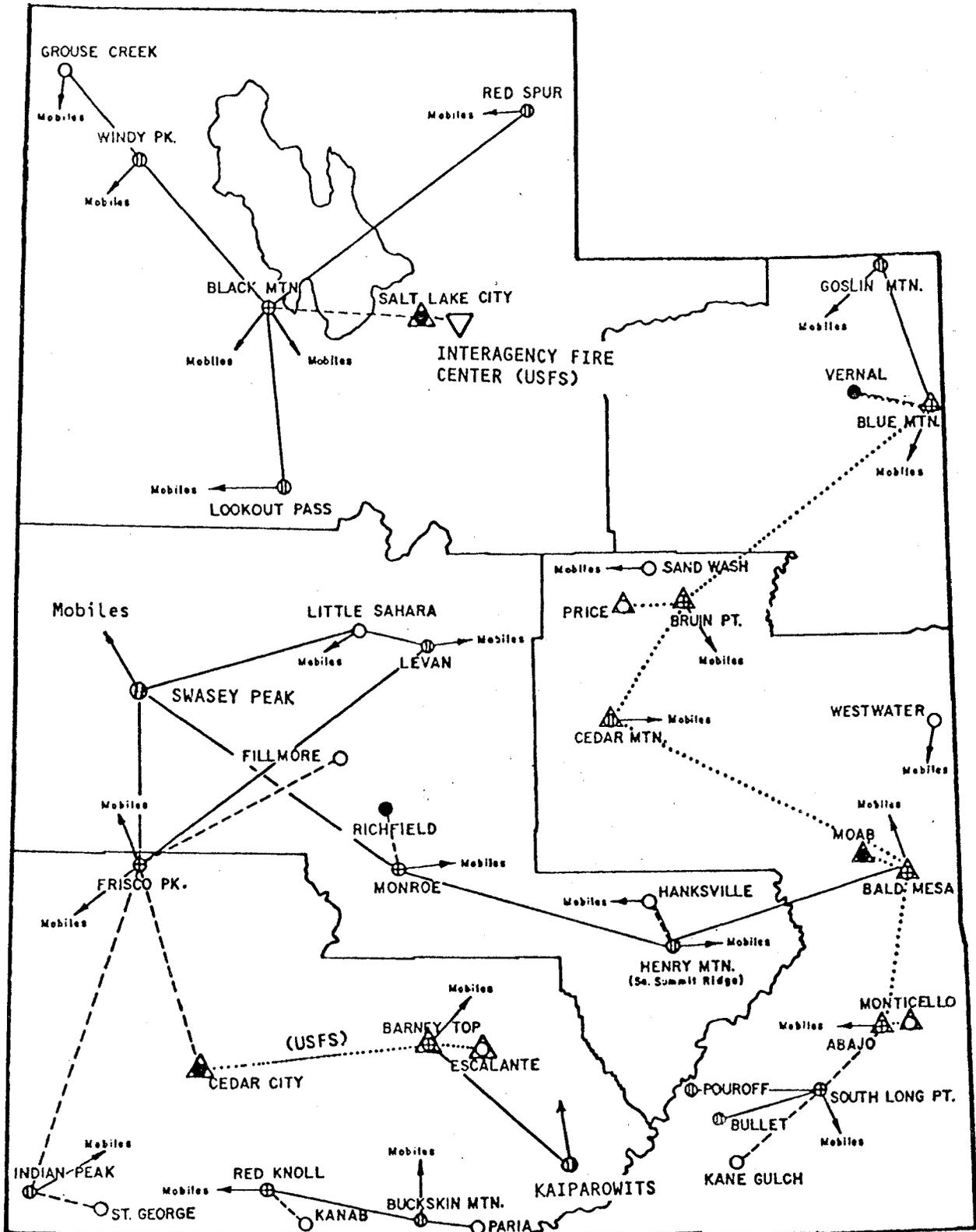
○	LOCAL BASE STATION
⊕	REMOTE BASE STATION
⊖	REPEATER STATION
△	MICROWAVE STATION
—	INTENDED "RADIO" PATH
.....	MICROWAVE PATH

STATION CONTROL

●	CONTROL POINT OF STATION
-----	CONTROL CIRCUIT "RADIO"
+++++	CONTROL CIRCUIT "LAND LINE"

1292 - RADIO COMMUNICATIONS

System Functional Description - Example State Map



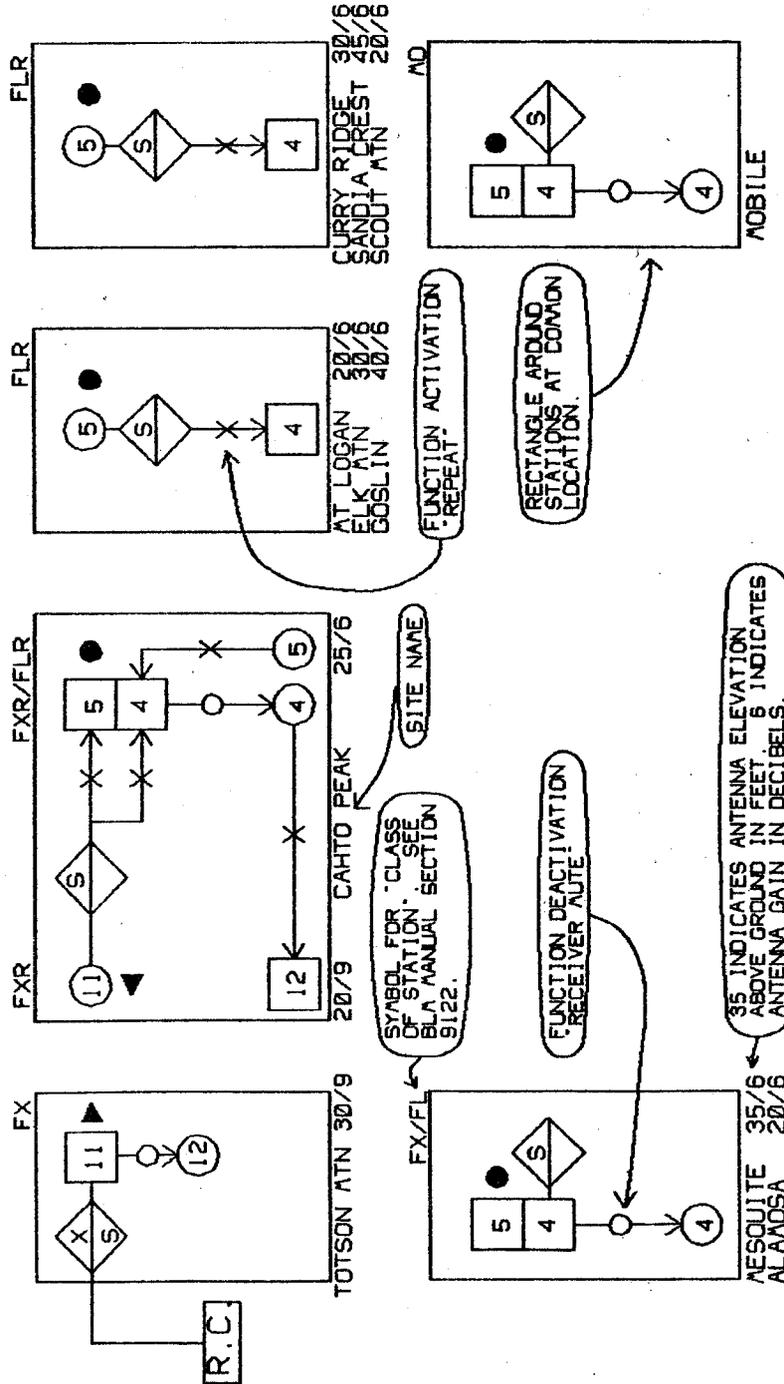
1292 - RADIO COMMUNICATIONS

System Functional Description - Drawing Symbols

- ① RECEIVER (OPERATING ON FREQUENCY 1)
- ② TRANSMITTER (OPERATING ON FREQUENCY 2)
- RC REMOTE CONTROL UNIT
- ↔ WIRE LINE OR COMMERCIAL CIRCUIT
- ⬠
E
A TONE CONTROL ENCODER (OPERATING ON TONE
FREQUENCY-A)
- ⬠
D
B TONE CONTROL DECODER (OPERATING ON TONE
FREQUENCY-B)
- ✕→ FUNCTION ACTIVATION
- FUNCTION DEACTIVATION
- ⬠
D
A ✕→
○→ TONE DECODER WITH FUNCTION OUTPUTS
(ILLUSTRATED FUNCTIONS OCCUR WITH DECODER
OPERATION)
- ▶ DIRECTIONAL ANTENNA
- OMNIDIRECTIONAL ANTENNA
- 20/6 20 INDICATES ANTENNA ELEVATION ABOVE
GROUND IN FEET. 6 INDICATES ANTENNA
GAIN IN DECIBELS. (NORMALLY NOTED BY
STATION NAME)

1292 - RADIO COMMUNICATIONS

System Functional Description - Example System Drawing



FREQUENCIES (MHz)	TONES
4 - 166.375	S - CTSS Group A
5 - 166.975	T - DTAF
11 - 406.425	X - SINGLE TONE
12 - 411.625	

SITE	LAT.	LONG.	ELEV.
CAHTOPEK	384112N	1233442W	4234
TOTSON ATN	400712N	1234130W	3692
SANDIA CREST	3633950N	1221122W	3057
AT LOGAN	405230N	1234355W	4951
SCOUT ATN	400701N	1240512W	0080
CURRY RIDGE	3920552N	1234930W	0049
GOSLIN	390632N	1231215W	0615
ELK ATN	3706335N	1163045W	3040
RESQUITE	3650555N	1203657W	4125
ALAMOSA	412739N	1215530W	0350

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
XRC - CALUKTIAH
NRA - CALUKTIAH
Date: 7/85 Sheet 1 of 1
Revised 9/86

1292 - RADIO COMMUNICATIONS

System Functional Description - Example Narrative

EXAMPLE DISTRICT RADIO SYSTEM NARRATIVE

The Example District Radio System is a VHF High-Band system consisting of a remote base station on Sample Peak that is controlled from the Example District Office and tone selectable repeaters at Illustration Hill and Demo Mountain.

The base station provides radio coverage of the Far-Out Resource Area and the high recreational use area of the Red River Valley. The repeaters provide wide area car-to-car communications and extend system coverage to the western and northeastern areas of the District.

The purpose of the system is to provide general communications for District activities and management. The Illustration Hill repeater was provided primarily for recreation management of the Way-Out Campground.

The repeaters are CTCSS tone selectable to prevent simultaneous operation. CTCSS tone "a" (103.5 Hz) selects the Illustration Hill repeater and CTCSS tone "b" (110.9 Hz) selects the Demo Mountain repeater.

All mobiles have CTCSS tone encoders for repeater selection. The base station is remote controlled via land line and UHF radio. Transmit Channel 2 and CTCSS tones are selected via Burst-tones from the remote control unit. Burst-tone "A" (2000 Hz) selects CTCSS tone "a" and Channel 2. Burst-tone "B" (2150 Hz) selects CTCSS tone "b" and Channel 2. Transmit Channel 1 operates when no Burst-tone is present.