

# **Appendix J**

## **Glossary of Terms and Abbreviations**

## Glossary of Terms and Abbreviations

3DES	Triple DES (see DES)
3G	Next generation multimedia wireless PCS (cellular) technology, 2 GHz band, minimum data rates: 144 kbps mobile, 384 kbps walking, 2 Mbps fixed.
802.11	Wireless local area networking standards developed by the IEEE
802.11a	802.11 version that provides up to 54 Mbps throughput in the unlicensed 5 GHz band, 8 channels, the higher frequency band limits its range to about 60 feet, not compatible with 802.11b or 802.11g; also known as Wi-Fi5.
802.11b	802.11 version that provides up to 11 Mbps throughput in the unlicensed 2.4 GHz band and is backward-compatible with 802.11, the original specification, 3 channels, effective range of about 300 feet, interoperable with 802.11g; also known as Wi-Fi.
802.11g	Most recently approved version of 802.11, provides 54 Mbps throughput in the unlicensed 2.4 GHz band, and is interoperable with 802.11b, effective range of about 300 feet.
access fee	User fee for connecting to a network, usually monthly
AES	Advanced Encryption Standard (successor of DES) will be a new Federal Information Processing Standard (FIPS) Publication that will specify a cryptographic algorithm for use by U.S. Government organizations to protect sensitive (unclassified) information. NIST also anticipates that the AES will be widely used on a voluntary basis by organizations, institutions, and individuals outside of the U.S. Government (see FIPS 140-1).
AFB	United States Air Force Base
agency	Term that applies generically to any local, state, federal entity or organization, such as; a department, division, city/town, or bureau. Includes: government, quasi-government, and private groups.
AM	Amplitude modulation, whereby transmission continuously changes the signal strength to match the voice being transmitted, susceptible to man-made (car ignition, motors, etc.) and natural (lightning storms)

and other atmospheric disturbances) interference sources. Not used for PS communications since the late 1940's.

AMSL	Above Mean Sea Level
analog	Radio signal that uses continuous changes in the amplitude or frequency of a radio transmission to convey information.
ANSI	American National Standards Institute
APCO	Association of Public-Safety Communications Officials-International, Inc.
AVL	Automatic Vehicle Location
AWG	American Wire Gauge -a U.S. standard set of non-ferrous wire conductor sizes. The "gauge" means the diameter. Non-ferrous includes copper and also aluminum and other materials, but is most frequently applied to copper household electrical wiring and telephone wiring.
bandwidth	The capacity of a telecom line or channel to carry signals. The necessary bandwidth is the amount of spectrum required to transmit the signal without distortion or loss of information. FCC rules require suppression of the signal outside the band to prevent interference.
base station	A fixed, land station in the land mobile service (e.g., the radio located at a fire or police station that either communicates directly or through a repeater to field subscriber units).
BEMS	Bureau of Emergency Medical Services
BER	Bit Error Rate, method to determine quality of digital transmissions.
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
blocked call	Whenever there are insufficient channels to grant a communication request, usually indicated by a fast busy signal
Bluetooth	A short-range wireless communications protocol for connecting PDAs, computers, mobile phones, and accessories without cables. Range is slightly more than 30 feet and data is transmitted at 1 Mbps.

Bluetooth includes device-registration and security capabilities that, for example, make sure your wireless headset works with your phone only, even if other Bluetooth phones are close by.

bps	Bits per second
CAD	Computer-Aided Dispatch, computer system to help dispatch personnel and vehicles
CALEA	Commission on Accreditation for Law Enforcement Agencies, Inc.
CDP	Concept Demonstration Project
CDPD	Cellular Digital Packet Data, original cellular data system, being replaced by faster technologies on all digital cellular systems.
cellular	Mobile/wireless telephone communications is geographically broken into relatively small cells.
channel	A connection between initiating and terminating nodes of a circuit. A single path provided by a transmission medium via an electrical separation, such as by frequency or frequency pairs.
Circuit Merit (CM)	Measurement of predicted voice quality performance. CM requires a large sample of recorded voice transmissions with concurrent measurements of the local mean of received signal power and that the radio receivers used are of the same technology with known and calibrated performance specifications. All testing and analysis should be done by the system operator, with test equipment and calibration services provided by the equipment manufacturer. (see DAQ)

Voice quality classifications:

CM-5 Speech completely clear and understandable. No warble or audio gaps.

CM-4 Speech easily understandable. Some warble, but not of the oscillating or squealy kind. No audio gaps.

CM-3 Speech understandable with some effort, but occasional repetitions required. Persistent warble, sometimes oscillating or squealy. Occasional short audio gaps of no more than a few syllables.

CM-2 Speech understandable with considerable effort, but frequent repetitions required. Constant oscillating or squealy warble. Frequent audio gaps of up to several words.

CM-1 Speech is not understandable. Warble, squeal, and audio gaps completely mask useful intelligibility.

co-channel interference	Interference resulting from two or more simultaneous transmissions on the same channel.
collocation	Placement of multiple antennas or radio equipment at a common physical site or building.
communications	Information transfer among or between users.
control channel	Logic channel that carries network information rather than actual voice or data messages, most trunked networks have a control channel - therefore if you want four voice/data channels the system will need five channels.
conventional	Radio system with dedicated, single-purpose channels (can be shared between several users with different operational needs; <i>i.e.</i> , fire and police), user must select the specific channel to be used.
cross-band repeater	A repeater that receives in one frequency band and retransmits in a second frequency band; (see repeater)
DAQ	Delivered Audio Quality, reference similar to Circuit Merit with additional definitions for digitized voice and a static SINAD equivalent intelligibility when subjected to multipath fading, levels described in TIA/EIA TSB-88-A. (see Circuit Merit)
	<u>DAQ definitions:</u>
	DAQ 1 Unusable. Speech present but not understandable.
	DAQ 2 Understandable with considerable effort. Frequent repetition due to Noise/ Distortion.
	DAQ 3 Speech understandable with slight effort. Occasional repetition due to Noise/ Distortion.
	DAQ 3.4 Speech understandable with repetition only rarely required. Some Noise/ Distortion.
	DAQ 4 Speech easily understood. Occasional Noise/ Distortion.
	DAQ 4.5 Speech easily understood. Infrequent Noise/ Distortion.
	DAQ 5 Speech easily understood.
dB	Decibel

dBm	Decibel referenced to one milliwatt. Zero dBm equals one milliwatt.
dBw	Decibel referenced to one watt. Zero dBw equals one watt.
DCI	Department of Criminal Investigation
DEA	Drug Enforcement Agency
dead spot	Geographic area within the normal coverage envelope where signals are below specification for minimal quality.
DEQ	Department of Environmental Quality
DES	Data Encryption Standard is a widely-used method of data encryption using a private (secret) key. There are 72,000,000,000,000,000 (72 quadrillion) or more possible encryption keys that can be used. For each given message, the key is chosen at random from among this enormous number of keys. Like other private key cryptographic methods, both the sender and the receiver must know and use the same private key. DES applies a 56-bit key to each 64-bit block of data. The process can run in several modes and involves 16 rounds or operations. Although this is considered "strong" encryption, many companies use "triple DES", which applies three keys in succession. DES originated at IBM in 1977 and was adopted by the U.S. Department of Defense. Since there is some concern that the encryption algorithm will remain relatively unbreakable, NIST has indicated DES will not be recertified as a standard and submissions for its replacement are being accepted. The next standard will be known as the Advanced Encryption Standard (AES).
digital	Radio transmission method, replacing analog FM systems, that transmits binary 1's and 0's much like a computer. Generally digital signals can travel greater distances (better coverage), however once the signal levels are below minimum no communications are possible. As data is normally digital, data transmissions are very compatible with digital radios. Digital radios are generally small and consume significantly less power (longer battery life) than FM radios.
DOC	Department of Corrections
DOD	Department of Defense
DOE	Department of Energy

DOI	Federal Department of the Interior
DOT	Department of Transportation
dropped call	Radio call that is unintentionally discounted due to a system problem, lack of channel availability, or dead spot in coverage.
DS-0	Digital Signal level 0, 64/56 kbps, one uncompressed voice or data channel.
DS-1	Digital Signal level 1, 1.544 Mbps in North America, capacity of 24 DS-0s (non-compressed voice circuits), also incorrectly referred to as T1
DS-3	Digital Signal level 3, 44.736 Mbps, capacity of 28 DS-1s, 672 64-kbps voice channels
DTMF	Dual-Tone Multi-Frequency (telephone keypad signally)
dual band	Radio equipment that operates on two frequency bands.
dual mode	Radio equipment that operates on both analog and digital networks.
EDACS	Enhanced Digital Access Communications System, digital trunked radio originally developed by General Electric (M/A-Com). (see P25 and TETRA)
EDX	An advanced, comprehensive, general-purpose software package offering a complete set of planning tools for wireless networks.
EIA	Electronic Industries Alliance (was Association), publisher of standards
EMA	Emergency Management Agency
EMP	Electro-Magnetic Pulse
EMS	Emergency Medical Service
encryption	Encoding (and decoding) “scrambling” of transmissions to provide secure/private communications that can only be unlocked by the intended/authorized recipient(s).
EOC	Emergency Operations Center

ETSI	European Telecommunications Standardization Institute
FAA	Federal Aviation Authority
FBI	Federal Bureau of Investigation
FCC	Federal Communications Commission
FDMA	Frequency Division Multiple Access
<b>FE</b>	Federal Engineering, Inc., the consultant on the Wyoming PSMC project.
<b>FEClientNet</b>	Federal Engineering's Internet web-based customer interactive URL
FEMA	Federal Emergency Management Agency
FERN	Fire Emergency Radio Network
Five 9's	A degree of reliability that equates to 99.999% available, or less than 5 minutes, 15 seconds outage time in one year.
FIPS 140-1	Federal Information Processing Standard, U.S. government standard for implementations of cryptographic modules, that is, hardware or software that encrypts and decrypts data or performs other cryptographic operations (such as creating or verifying digital signatures). The FIPS 140-1 standard was created by the National Institute of Standards and Technology (NIST); it specifies requirements for the proper design and implementation of products that do cryptography.
FM	Frequency modulation, whereby the transmission is constant in signal strength, but the center frequency varies in proportion to the voice being transmitted, eliminates most interference sources. Used for PS communications since 1940's replacing AM - now being replaced by digital modulation. Note FM gradually fades away as signal strength is reduced by distance from the transmitter.
frequency reuse	Ability of channels/frequencies assigned to one location to be used again in another area with enough distance between them to prevent interference from affecting service quality.
full duplex	Mode of operation where the equipment is simultaneously transmitting and receiving, as in conventional or cellular phones. Requires two

frequencies to create one channel. Generally not used in LMR systems.

GHz	Gigahertz (1,000,000,000 Hz)
GIS	Geographical Information System
GPS	Global Positioning System, a U.S. satellite system that lets persons/ systems determine their position with extreme accuracy using GPS receivers, used by AVL technologies
GUI	Graphical User Interface
half duplex	Mode of operation where the equipment transmits then receives over a single frequency allowing two-way communication, as in PSMC repeaters, base stations, mobile and portable units.
handoff	Process that automatically switches a user from the original tower site to an adjacent site with better signal quality.
HAZMAT	Hazardous materials
HP	Highway Patrol
HVAC	Heating, ventilation, and air conditioning
Hz	Hertz (same as cycles per second)
ICS	Incident Command System, combination of facilities equipment, personnel, procedures, and communications operating with a common organizational structure, with responsibility for the management of assigned resources to effectively accomplish stated objectives pertaining to an incident.
in-building repeater	A special low-power repeater, that amplifies signals to/from portable radios within a building to/from a base station or mountaintop repeater, thus giving portable coverage inside the building equal to outside the building. Can be use in tunnels.
in-vehicle repeater	A special mobile repeater, usually cross-band, that communicates with a user's portable radio and relays the signals to/from a base station or mountaintop repeater, thus giving portable coverage equal to the mobile coverage.

interoperability	Ability of public safety personnel to communicate by radio with staff from other agencies, on demand and in real time.
IP	Internet Protocol
ITS	Intelligent Transportation System
kbps	Kilobits per second
kHz	Kilohertz (1000 Hz)
kW	Kilowatts
LAN	Local Area Network
land mobile service	A public or private radio service providing two-way communication, paging and radio signaling on land.
land line service	Traditional wired phone service.
LARC	Laramie/Albany County Records and Communications Center
LE	Law Enforcement
LMR	Land Mobile Radio
LPG	Liquid Petroleum Gas
LTR	Logical Trunked Radio, M/A-Com term, describes their trunked radio system.
LULC	Land Use Land Clutter
MA	Mutual Aid
Mbps	Megabits per second
MDC	Mobile Data Computer
MDT	Mobile Data Terminal
MHz	Megahertz (1,000,000 Hz)

modular interconnect system	Generic name for baseband cross-connect systems (similar to the ACU-1000), a.k.a. Intelligent Interconnect Systems
MOST	Management and Oversight of Strategic Technologies
MOU	Memorandum of Understanding
MTTR	Mean-Time-To-Repair
MW	Megawatt
multipath distortion	Occurs when a transmitter signal arrives at a receiver from two or more paths (direct and reflections off buildings, mountains, etc.).
NAD	North American Datum - a mathematical model of the earth used to calculate the coordinates on a map, chart, or survey system. Datums in use include WGS-1984 and NAD-1983.
narrowband	In LMR systems, the FCC has specified reducing channel bandwidth to 12.5 kHz, thereby doubling the number of available channels. Note narrowband operation will be mandatory by January 1, 2018, when all public safety users must cease operation of wideband equipment on or before that date. (see refarming).
NASTD	National Association of State Telecommunications Directors
NCIC	National Crime Information Center, national database of crime and criminal information operated by the FBI.
NIJ	National Institute of Justice, part of NLECTC
NIST	National Institute of Standards and Technology
NLECTC	National Law Enforcement and Corrections Technology Center, works with public safety radio spectrum and interoperability issues.
NOC	Network Operations Center

NPS	National Park Service
NPSPAC	National Public Safety Planning Advisory Committee
NPSPAC channels	Special 800 MHz channels for public safety only use
NSA	National Security Agency
NTIA	National Telecommunications and Information Administration, part of Department of Commerce, coordinates use of the federal government frequency spectrum.
NTSB	National Transportation Safety Board
OTAP	Over-the-air-programming, the ability to add new types of services to a subscriber device by using the wireless network instead of requiring the customer to bring in the phone for reprogramming.
OTAR	Over-The-Air-Rekeying, changing traffic encryption key or transmission security key in subscriber equipment by sending the new key directly to the subscriber equipment over the communication path it secures.
P25	APCO Project 25, digital radio interoperability standard (developed primarily by Motorola), adopted by Federal government agencies, many law enforcement/public safety agencies, and all users of the 700 MHz band. After a slow start, now followed by most LMR manufacturers. Still developing with some incompatibility issues (especially between TDMA and FDMA transmission methods and channel bandwidths). The Phase I standard has been complete since October 1995, Phase II will extend Phase I standards into 6.25 kHz channels and TDMA transmission. Goals of Project 25: interoperability (greater safety and productivity with enhanced mutual aid), choices (suppliers), longevity (of technology/equipment), flexibility (to expand as resources and needs require), and economy (towards competitive sources) – something that the LMR industry has lacked since the introduction of trunked and digital systems. (see EDACS and TETRA).
paging system	Usually a one-way mobile radio system or service whereby a user carries a small, lightweight miniature radio receiver capable of responding to coded signals. These devices, called "pagers," emit an

audible signal, vibrate, or display text messages when activated by an incoming signal. Two-way pagers are also available that allow the user to respond with a simple acknowledgment or send text messages.

path	In communications systems a route between any two points. In radio communications, the route that (a) lies between a transmitter and a receiver and (b) may consist of two or more concatenated links. Note: Examples of paths are line-of-sight paths and ionospheric paths.
PBX	Private Branch eXchange, a small telephone or voice switch that routes or interconnects voice traffic between consoles, repeaters, base stations and/or telephone lines.
PCS	Personal Communications Service, any of several types of wireless, voice and/or data communications systems, typically incorporating digital technology, uses the 1900 MHz band. PCS licenses are most often used to provide services similar to advanced cellular mobile or paging services. However, PCS can also be used to provide other wireless communications services, including services that allow people to place and receive communications while away from their home or office, as well as wireless communications to homes, office buildings and other fixed locations.
PD	Police Department
PL	Private-Line <sup>®</sup> Motorola, subaudible tones transmitted with voice to open or identify a channel.
PLMR	Private Land Mobile Radio
priority service	Method to prioritize users for unequal access.
PS	Public Safety
PSAP	Public Safety Answering Point, usually a 9-1-1 call center
PS spectrum	Specific bands of frequencies set aside by the FCC for use by public safety agencies. They are: Low Band (25-50 MHz), VHF High Band (150-174 MHz), 220 Band (220-222 MHz), UHF Band (450-470 MHz), 700 Band (764-776 and 794-806 MHz), 800 Band (806-824 and 851-869 MHz) and 4.9 GHz Band.
PSMC	Public Safety Mobile Communications

PSMR	Public Safety Mobile Radio
PSTN	Public Switched Telephone Network
PSWN	Public Safety Wireless Network program, a joint initiative of the Federal Departments of Justice and Treasury to foster interoperability among local, state, and federal public safety agencies.
PTT	Push-to-talk (see VOX)
QoS	Quality of Service
R56	Motorola Standards and Guidelines for Communication Sites
refarming	FCC term to promote more efficient use of PLMR services that requires reduced channel bandwidth (from 25 kHz to 12.5 kHz) to create additional communications paths or channels on frequencies below 512 MHz. After much delay, the mandatory date is now set for January 1, 2018 to operate <b>only</b> narrowband equipment. The FCC is also considering a second bandwidth reduction (to 6.25 kHz), the date is uncertain at this point.
repeater	Special receiver/transmitter combination that receives a signal on one frequency and retransmits a new signal on another frequency, usually within the same frequency band, sometimes referred to as a relay station.
RF	Radio Frequency
RFI	Radio Frequency Interference (or Request For Information)
RFP	Request For Proposal
roaming	Use of a wireless phone or PSMC equipment outside of the "home" service area defined by a service provider or system. Allows a user to travel statewide and communicate as if they were still in within their local area.
SALECS	State Agency Law Enforcement Communications System
SAR	Search and Rescue
satellite	Radio relay station (repeater) that orbits the earth. A complete satellite communications system also includes earth stations (and

portables/mobiles) that communicate with each other via the satellite. The satellite receives a signal transmitted by an originating earth station and retransmits that signal to the destination earth station(s)/receiver(s). Satellites are used to transmit telephone, television and data signals originated by common carriers, broadcasters, distributors of cable TV program material and for PSMC use into areas of coverage dead spots.

satellite phone	Wireless phone that uses mobile satellite services to communicate where PSMC or cellular coverage is poor.
satellite receiver	(see voting receiver)
SCADA	Supervisory Control and Data Acquisition, a category of software application program for process control, the gathering of data in real time from remote locations in order to control equipment and conditions
SCAN	Statewide Communications Alliance of Nebraska
scanner	Radio receiver (and sometimes transmitter) that moves across a wide range of radio frequencies and allows users to listen (and then transmit) on any of the licensed/authorized frequency.
SIEC	Statewide Interoperability Executive Committee
simplex	One-way communications ( <i>i.e.</i> , public address or broadcast systems).
simulcast	Signaling technique that transmits the same signal from multiple sites.
SINAD	Abbreviation for signal-plus-noise-plus-distortion to noise-plus-distortion ratio, a measure of received signal quality in analog systems.
SMR	Specialized Mobile Radio, a dispatch radio and interconnect service for business, using 220 MHz, 800 MHz, and 900 MHz bands.
SOP	Standard Operating Procedure
spectrum	The range of electromagnetic radio frequencies used in the transmission of sound, data and television.
spectrum allocation	Federal government designation of a range of frequencies (frequency bands) for a category of use(s). For example, the FCC allocated the 1900 MHz band for PCS. Spectrum demand and new technologies

can shift existing allocations. The UHF-T and 700 MHz bands were created by removing broadcast television from these frequencies.

spread spectrum	Jam resistant technology that “spreads” information over a wider bandwidth than is necessary that provides interference tolerance, originally devised for military use.
STARS	Virginia’s Statewide Agencies Radio System
subscriber	User, customer on a network
subscriber unit	User’s equipment (usually a mobile or portable radio)
T1	Digital circuit at 1.544 Mbps, capable of 24 DS-0s (non-compressed voice channels), data, video, or any combination (see DS-1).
talk-in	Communication path from the subscriber unit to a repeater (or base station).
talk-out	Communication path from the repeater (or base station) to a subscriber unit.
talk group	Users assigned to a specific group that normally communicate with each other. Primarily preprogrammed into a trunk system, but can be assigned on-the-fly to add other users to interoperate with the group, during emergencies or joint operations.
TCP/IP	Transmission Control Protocol/Internet Protocol, a suite of protocols (standards) for digital transmissions, originally developed by DOD. Used on most networks e.g., email and web browsing are two of the more common uses.
TDMA	Time Division Multiple Access
TEK	Traffic Encryption Key, a key used to encrypt plain text or voice and/or to decrypt text or voice.
terminal unit	User’s equipment (usually a mobile or portable radio)
TETRA	Terrestrial Trunked Radio, an open digital trunked radio standard defined by ETSI. (see P25 and EDACS)
TIA	Telecommunications Industry Association, part of ANSI, standards developing trade group representing manufacturers and suppliers of

communications and information technology products.

TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance
Tier 1	Subscriber units with basic entry level features
Tier 2	Subscriber units with Tier 1 features and advance public safety features ( <i>i.e.</i> , encryption, AVL, panic button, user ID, etc.)
Tier 3	Subscriber units with Tier 2 features and equipped with DTMF keypad
traffic peak	Period in a day or year where communications traffic typically reaches its maximum level.
transceiver	Combination transmitter and receiver, PSMC base stations, mobiles and portables are examples.
tri-band	Radio equipment that operates on three frequency bands.
tri-mode	Radio designed to operate on three different non-compatible modes.
trunked	Radio system with a group of channels available and assigned as needed to specific “groups” or uses, all channels are automatically system assigned while in-use, then released for other users. Maximizes traffic in a minimum number of channels. FCC preferred method of operation (especially for new systems).
turnkey	Entire system with hardware and software assembled and installed by a vendor and sold as a package.
UCAN	Utah Communications Agency Network
UHF	Ultra High Frequency, the part of the radio spectrum from 300 to 3000 MHz, which includes broadcast TV Channels 14 and higher, lower frequency microwave and some marine, aviation and land mobile services.
UHF PS Band	Frequencies between 450 and 470 MHz
ULS	Universal Licensing System, new Wireless Telecommunications Bureau program for electronic filing of license applications and reporting changes in a common database that can accessed remotely through the Internet.

UPS	Uninterruptible Power Supply
USF&WS	United States Fish and Wildlife Service
USFS	United States Forest Service
USGS	United States Geological Survey
USPS	United States Park Service
VHF	Very High Frequency, the part of the radio spectrum from 30 to 300 MHz, which includes broadcast TV Channels 2-13, the FM broadcast band and some marine, aviation and land mobile services.
VHF Hi Band	Frequencies between 150 and 174 MHz
VHF Lo Band	Frequencies between 25 and 50 MHz, also known as Low Band.
Vocoder	A device that breaks speech patterns into components, allowing them to be re-transmitted efficiently over a narrow bandwidth.
VoIP	Voice over Internet Protocol
voting receiver	Multiple remote receivers tied together through a comparator device at a transmitter site to improve portable coverage, signal strength is compared from each receiver, the best receiver becomes the receiver during a specific transmission. Also called a satellite receiver.
VOX	Voice Operated Transmit, no push-to-talk necessary to transmit
VSWR	Voltage Standing-Wave Ratio
WANG	Wyoming Air National Guard
WEMA	Wyoming Emergency Management Agency, now merged with the Wyoming Office of Homeland Security
WHP	Wyoming Highway Patrol
Wi-Fi	Wireless Fidelity, common name for IEEE 802.11b wireless LAN standard using 2.4 GHz frequencies
Wi-Fi5	Wireless Fidelity 5, common name for IEEE 802.11a wireless LAN standard using 5 GHz frequencies, not compatible with Wi-Fi.

wideband	In LMR systems, most channels are of 25 kHz bandwidth for voice communications.
WSFD	Wyoming State Forestry Division
WTB	Wireless Telecommunications Bureau, part of the FCC
WY	Wyoming
WYDOT	Wyoming Department of Transportation (also WyDOT)