

GLOSSARY OF TWO-WAY RADIO TERMS

The following is a glossary of terms, abbreviations and acronyms which will prove helpful in conducting business.

Ac, ac	Alternating current changes polarity every half cycle. Current flow begins at a zero reference point, swings to its maximum level, then through zero, to its minimum level, and back to zero to complete one full cycle. (i.e., "household electricity")
Accelerated Life Testing	<p>The Accelerated Life Test (ALT) is a developmental process of rigorous laboratory testing that simulates years of field stress in a manner of months. These tests may include temperature extremes, humidity exposure, vibration survival, water saturation, and other environmental extremes pertinent to specific products.</p> <p>BENEFITS:</p> <p>The simulated tests ensure that the radio will have a long and useful life in various adverse conditions. When used during the design phase, ALT can detect potential problems, thus allowing for corrections prior to the initial production runs. This will ensure the reliability of new products that have this feature.</p>
amplifier	An electrical device used to increase power, voltage, or current.
amplitude modulation	Abbreviated as A.M. A system of radio transmission that modulates the carrier frequency (rf) by varying the amplitude above and below the normal values relative to audio frequency.
antenna	A device which permits radiation and reception of radio frequency into space.
antenna gain	The increase of the power radiated by and/or received by an antenna in a given direction compared to the power radiated in the same direction by a standard antenna.
attenuation	The reduction in strength or absorption of an electrical impulse.
audio	Currents or waves that correspond to audible sound waves, as well as devices that operate within this range.
audio distortion	<p>Audio distortion is an undesired change in speaker output that results in diminished voice message clarity. Distortion must be stated in conjunction with the rated power.</p> <p>In transmitters, this specification is always related to some specific degree of modulation or deviation at a given frequency, normally 1000 Hertz.</p> <p>In receivers, the distortion specification is always related to audio output power and is taken at full rated audio power output or at a specified power less than the maximum.</p>

audio distortion
(cont.)

UNIT OF MEASUREMENT: Percent (%)

TYPICAL RANGE: Between 2% (best) and 10% (worst)

QUANTIFIES:

Unfaithful reproduction of audio signals due to changes occurring in the wave form of the original signal somewhere in the course of its transmission, reception or amplification.

CUSTOMER BENEFIT:

Low audio distortion could mean better reception and fewer repeated messages to the radio user. Public safety and other performance oriented users will be looking for distortion figures of 5% or less for both transmitter and receiver. Heavily utilized dispatch systems, such as police or fire department, may not have sufficient air time available to repeat transmissions. Personal safety may depend upon crisp and clear communications.

audio output

Audio output is the amount of power used to drive the speaker. Generally, the higher the output, the more volume at the speaker. However, speaker efficiency should also be considered. Because speakers have poor efficiency, a small increase in efficiency can mean a substantial improvement in sound levels.
Unit of Measurement: Watts or Decibels, Sound Pressure Level (dB SPL)

TYPICAL RANGE: .250 Watts to .750 Watts - Portables
3 Watts to 12 Watts - Mobiles

SPL Standard = 85 dB SPL at a distance of 6" for Portables
and 24" for mobiles.

QUANTIFIES:

The number of watts the receiver will deliver to the voice coil of the loudspeaker.

Some radios are now being rated in "Sound Pressure Level (SPL)" which is the measure of how much audible energy is being delivered to your ears. SPL takes into account the efficiency of the loudspeaker and its distance from your ears.

EXAMPLE:

Mobile A has 3 watt audio output with an internal speaker. This will be adequate in a car with the windows rolled up. Using an externally mounted speaker will allow the same 3 watts to overcome the average traffic noise with the windows rolled down. Mobile B is a truck in a noisy environment. This vehicle needs 5 watt audio output from an external speaker to deliver the same degree of intelligibility to the user.

A Sound Pressure Level of 85 dB is equivalent to playing your car radio loud enough to override the noise of traffic. Most telephones have the ringer set for 85 dB.

audio output (cont.)	<p>CUSTOMER BENEFIT: The audio output necessary to an individual customer depends entirely on his/her environment. An objective for a salesperson may be to evaluate the customers ability to hear in relation to the amount of noise present in his/her environment.</p>
band	<p>Frequencies which are within two defined limits, and which are used for a specific purpose. For instance, in the business spectrum we refer to radios that operate in Low Band, High Band, UHF, VHF, 800 and 900 MHz "Bands" of frequencies.</p>
base station	<p>A transmitter/receiver unit located in a fixed location which can talk directly to mobiles or portables.</p>
battery	<p>One or more electrochemical storage cells connected together to serve as a DC voltage source.</p>
battery drain, typical	<p>Battery drain is the amount of energy that is drawn from the battery by the radio. Usually expressed in transmit, receive and standby categories.</p> <p>UNIT OF MEASUREMENT: Milliamp (mA)</p> <p>QUANTIFIES: The lower the battery drain the longer the battery life.</p> <p>EXAMPLE: Two portables have 5 watts transmit power each. The portable with less transmit battery drain will use less energy or battery power.</p> <p>CUSTOMER BENEFIT: For the portable user, battery drain would be crucial to the amount of battery life or length of service. The portable requires recharging unlike the mobile that recharges as the vehicle operates. For the mobile user, battery drain would be important for cases where transmit and receive were necessary when the vehicle engine was not operating. (i.e. accidents, emergencies, Public Safety applications).</p>
Battery Revert	<p>An option in fixed equipment utilizing AC power to "revert" to a battery backup in case of electrical outage.</p>
Battery Saver	<p>A circuit used in some radios to extend the life of a charged battery.</p>
bidirectional	<p>Coverage obtained by use of proper side-mounted omni-directional antenna.</p>
call sign	<p>FCC-assigned identifying letters and numbers for two-way radio stations.</p>
cardiod	<p>A 180° heart-shaped directional pattern of an antenna.</p>
carrier squelch	<p>A squelch system that responds to the presence of an RF carrier.</p>

channel	A narrow band of frequencies (including the assigned carrier frequency) within which a radio system must operate in order to prevent interference with stations on adjacent channels.
channel element	A temperature-compensated crystal oscillator circuit; a frequency-determining device for certain radio equipment.
channel scan	See Scan with/without priority.
chassis	The framework on which parts of radio or other electronic circuits are mounted.
cloning	The ability to transfer a radio's unique data stored "personality" i.e. frequency assignment, squelch codes, and other characteristics to another radio. On some radios this is done via cloning cable which plugs into the radio being cloned. The radio which is correctly programmed is called the "Master" and the other radio is referred to as the "Slave". The two radios being cloned must be in the same band i.e. UHF or VHF, and the same frequency split i.e. 146-174.

BENEFITS:

This feature allows two independent work groups operating on different frequencies to use radios interchangeably since cloning is fast and simple.

EXAMPLE:

Three or more fire departments are called to a forest fire, each having portables operating on different frequencies. If all radios are clonable, they can be cloned to operate together, thus allowing all of the firemen to communicate with each other.

This application could be used on job sites where different work teams are interacting to complete a specific task.

coded squelch	With Continuous Tone Coded Squelch System a sub-audible tone is attached to the carrier signal. With Digital Coded Squelch, a digital code is attached to the signal. A receiver, which is equipped to accept a certain tone or code, will not unmute unless the proper code is presented with the RF signal. Additional circuitry is required to accomplish this in both the transmitter and receiver.
---------------	---

Multiple Tone Coded Squelch/Multiple Digital Coded Squelch: Similar to above except the radio will be able to encode or decode multiple tones or codes on the same or different channels.

BENEFITS:

CTCSS/DCSS-Operators will hear only those calls that have specific system tones or codes. This will minimize missed or misunderstood messages as well as reduce operator fatigue. (Because the operator does not have to listen to other co-channel people) Provides a degree of security and privacy by encoding the signal.

coded squelch (cont.)	The user will also be able to contact select persons in a fleet who have the same tones or codes.				
	<p>TERMINOLOGY:</p> <table border="0"> <tr> <td data-bbox="456 304 847 412">Motorola-Private Line/DPL G.E.-Channel Guard/DCG Channel</td> <td data-bbox="935 293 1517 367">Uniden-CTCSS/Digital Coded Squelch Standard-CTCSS/Digital Private</td> </tr> <tr> <td data-bbox="456 416 791 524">E.F.J.-Call Guard/DCG Regency-CTCSS Squelch</td> <td data-bbox="943 412 1469 479">Maxon-CTCSS Midland-CTCSS/Digital Controlled Squelch</td> </tr> </table>	Motorola-Private Line/DPL G.E.-Channel Guard/DCG Channel	Uniden-CTCSS/Digital Coded Squelch Standard-CTCSS/Digital Private	E.F.J.-Call Guard/DCG Regency-CTCSS Squelch	Maxon-CTCSS Midland-CTCSS/Digital Controlled Squelch
Motorola-Private Line/DPL G.E.-Channel Guard/DCG Channel	Uniden-CTCSS/Digital Coded Squelch Standard-CTCSS/Digital Private				
E.F.J.-Call Guard/DCG Regency-CTCSS Squelch	Maxon-CTCSS Midland-CTCSS/Digital Controlled Squelch				
community repeater	A local system able to be leased and shared by multiple businesses, each with a different PL code. Similar to a "Party line" phone system; one conversation at a time. Maximum of 16 customers permitted on each repeater system.				
console	A cabinet that houses equipment and controls for a communications center or station.				
continuous duty	The ability for a transmitter to operate at full rated power when keyed continuously for 24 hours at room temperature. Applies mainly to base stations.				
	<p>BENEFITS:</p> <p>Best accomodates customers who have a need for stations which can operate continuously without a loss in power such as public safety (police), public services (utility), and dispatch systems (taxis). Intermittent duty stations can work at full rated power for only one minute at a time and then must rest for 4 minutes. Customers who buy stations which have continuous duty are assured of 24 hour operation, no degradation of performance or decrease in reliability, and minimum maintenance. Radios with this feature are best used in systems with demanding usage needs.</p>				
control, extended local	The extended location of controls wired to a base or control station of up to 100 feet from the base station.				
control head	A device, generally mounted in a vehicle, from which control of the radio unit is accessed.				
control, remote	The control of a system where all functions are performed from more than 1000 feet from the base station; DC or tone.				
control station	A fixed station used to talk through repeater systems to mobiles and portables.				
converter	A device which changes the condition of energy within the same type of energy. Eg. positive to negative ground converter.				
corner reflector antenna	A type of directional antenna often used for (UHF) directional transmitting and receiving. Recommended for use in icy areas.				

coverage	An expression of statistical probability relating to a customer's useable radio area and time; 90% of the area 90% of the time.
cross-banding	Transmitting and receiving on different frequency bands within the same piece of equipment.
crystal	A thin slab of natural or man-made quartz which, when subjected to the proper electrical excitation, will vibrate or oscillate at a specific frequency.
current	The movement of electrons through a conductor. Current is measured in amperes.
cycle	One complete reversal of an alternating current, including a rise to the maximum level in one direction, the return to zero, a rise to the maximum in the other direction, and a return to zero. The number of cycles occurring in one second is the frequency of the current. The word "Hertz" is used to signify one cycle per second.
dB	Abbreviation for decibel. See decibel.
DC control	A type of remote control using tones for coding purpose. Good for customer-owned dedicated lines over 100 feet; not for telephone leased lines.
decibel	A unit of relative voltage or power. One-tenth of a Bel; roughly the smallest change that the human ear can detect.
decoder	A device that "receives" and translates coded intelligence into a usable form.
desk set	Includes a microphone, speaker, frequency selector and code selector; looks like a telephone wired to a base or control station.
deviation	The frequency or change of a carrier frequency as the result of modulation. A variation from normal.
digital	Data in the form of pulses.
dipole antenna	A straight ungrounded antenna separated in the center by an insulator, using a conductor one-half wavelength long at a specified frequency.
direct current	Abbreviated as DC. An electrical current that flows in one direction only, usually associated with a battery or other power source.
directional antenna	Any antenna which picks up or radiates signals better in one direction than another.
dispatch point	FCC terminology. A position from which a radio system is used other than the official licensed control point.
DPL	Abbreviation for Digital Private Line. A type of coded squelch using databursts; up to 80 coded possible.

DTMF	Abbreviation for Dual Tone Multi Frequency. A generic term for Touch Tone, as in phones.
duplexer	A device used in trunked/repeater/base systems which allows one antenna to be used to transmit and receive radio signals of different frequencies at the same time.
duplex interconnect	A feature allowing interconnect to a phone system while the unit transmits and receives at the same time.
duty cycle	Duty cycle is often encountered when referring to handheld equipment, however, the specification may also be indicated for base stations and mobiles.

The duty cycle, for portables, is given as three numbers referring to percentage of transmit time, receive time, and silent time (standby) with power turned on.

Base station duty cycle is referred to as continuous or intermittent duty. Continuous duty is the ability for a transmitter to operate at full rated power when keyed continuously for 24 hours at room temperature. Intermittent duty stations can work at full rated power using cycle of one minute on and four minutes off for a period of eight hours followed by three continuous test cycles of five minutes on, separated by two fifteen minute off intervals.

The duty cycle for mobiles is one minute transmit and four minutes receive without any standby. The mobile is not concerned with battery life, but with head constraints for the transmitter.

UNIT OF MEASUREMENT: Percent (%) or Minutes

TYPICAL RANGE:

5-5-90% (marginal) to 10-10-80% (best) - Portables

1 minute (transmit) 4 minutes (receive) no standby - Mobiles

100% Continuous Duty Transmit (no standby) - Base Stations

QUANTIFIES:

The duty cycle percentages or minutes have meaning only when related to a specific time duration.

EXAMPLE:

A portable radio with a 5-5-90%, 8 hour duty cycle provides 24 minutes transmit time, 24 minutes receive time and 432 minutes standby time in a given 8 hour shift. The radio with 10-10-80%, 8 hour duty cycle provides 48 minutes transmit time, 48 minutes receive time and 384 minutes standby time in a given 8 hour shift.

CUSTOMER BENEFIT:

The handheld with a higher duty cycle will have a better battery capacity for a longer period of time. Many portable users do not like the additional weight and inconvenience of carrying an extra battery. During their

duty cycle (cont.) work shifts, some users do not have time to recharge a battery or may not have the availability of a charger. Higher wattage portables can also consume battery power more rapidly than lower wattage radios. Continuous duty base stations will work continuously without loss of power. The customer is assured of 24 hour operation with no degradation in performance or decrease in reliability.

EEPROM Electrically Erasable Programmable Read-Only Memory.

EIA specs Electronics Industries Association specifications for a radio's environmental durability.

electromagnetic spectrum The total range of frequencies of electromagnetic radiation extending from the longest radio wave to the shortest known cosmic ray.

extender/noise blanker This feature employs blanking gate in the radio which silences the receiver in the presence of certain types of noises.

BENEFITS:

This feature will dramatically improve communication intelligibility in low signal, high noise environments (usually only available in low band). This feature can also increase the user's talk-out range ability. This feature is effective in suppressing automobile noise problems such as ignition noise. It is not very effective with noise problems attributed to lightning or to power lines.

external alarm Alerting a mobile user who is out of his or her vehicle that a message is being received or that they are needed on the radio. The alarm function can be accomplished through honking the horn and/or flashing the lights of the vehicle.

BENEFITS:

When a person is out of his or her vehicle, he can still be informed that there is a need to return to the vehicle and use the radio.

EXAMPLE:

On a noisy construction site, a supervisor is out of his truck while conversing with the foreman and is needed by the owner of the company. If his mobile radio has external alarm, the truck's lights would flash to signal that there is a call on the radio.

Factory Mutual Approval Products and accessories to products, that are approved by Factory Mutual may be used in various hazardous environments based on the following criteria:

Intrinsically Safe Class 1 - Locations include Groups A,B,C & D. These are flammable gas or vapor locations. i.e. Natural Gas Co.

Intrinsically Safe Class 2 - Locations include Groups E,F & G. These are combustible dust locations. i.e. Grain Elevators.

Non-Incendive Class 1 - Locations include Groups A,B,C & G. These are

Factory Mutual
Approval (cont.)

flammable gas or vapor locations. i.e. Chemical or Gas Plants.

Division 1 - Locations where the particular hazardous materials are present in the air in potentially flammable concentrations continuously, frequently, or intermittently under normal operating conditions. Division 1 equipment can be used in Division 2 locations.

Division 2 - Locations which might become hazardous in the event of a mechanical breakdown, accidental failure, or the abnormal operation of equipment.

When using radios approved in various classes, it is imperative all accessories are likewise approved. If they are not approved, the radio is no longer approved.

Insurance companies many times require the use of "FM" approved equipment by detailing specific classifications in various hazardous environments.

BENEFITS:

This feature allows use of the radio, in specific areas, without causing a risk to the user or others. This is important when working in environments that may be highly explosive, or susceptible to fire from electrical products. Customers may be able to reduce insurance premiums by substantiating compliance with FM approved equipment.

ADDITIONAL INFORMATION:

The National Electric Code - Article 500 (available at most State Marshall offices and from Industrial Insurance Underwriter)

FCC Federal Communications Commission. A board of commissioners appointed by the President having the power to regulate domestic communications systems other than Federal systems.

Field Reprogrammable A product feature enabling radio reprogramming of frequencies and features at a service shop rather than at the factory.

frequency The number of complete cycles per second of alternating current or radio waves, usually measured in Hertz.

Frequency Modulation Abbreviated as FM. A method of modulating a carrier frequency by causing the frequency to vary above and below the carrier frequency proportional to the amplitude of the sound being transmitted.

Frequency Separation/
Bandsread/
Bandwidth Frequency separation is the maximum allowable difference between channel frequencies in the same radio. It is the amount by which a transmitter or receiver's frequency can be changed without seriously affecting the transmitter power or receiver sensitivity specifications. This specification is usually not the same for transmitters and receivers.

UNIT OF MEASUREMENT: Megahertz (MHz)

Frequency
Separation/
Bandspread/
Bandwidth
(cont.)

TYPICAL RANGE: 1 MHz (worst) to 20 MHz (best)

This specification will normally be given in terms of number of megahertz separation between highest and lowest operating frequency for a transmitter or receiver that will permit operation with no degradation of power or sensitivity.

QUANTIFIES:

How far apart two channels can be placed in the frequency spectrum when in the same radio. Some manufacturers may also specify the overall bandspread that may be obtained with a certain degree of degradation in performance.

CUSTOMER BENEFIT:

Since all channels within a radio must be assigned within the available frequency separation specification, narrow separation can sometimes cause a problem in finding available frequencies. The wider the frequency separation, the easier it is to find available frequencies. In Police and Fire Systems for example, a wide separation is usually imperative where multiple agency communication is required.

CONSIDERATION:

Refer to the FCC Rules and Regulations to determine the maximum frequency span for licensing, by band, for an individual radio service. The "Business Radio Service" for VHF runs from 151.8 to 173.4 MHz, yet most frequencies fall between 151.8 to 158.5 MHz. Some users, with special authorization, may have requirements to operate on channels within more than one radio service.

fringe area

An area or locality at such a distance from the transmitter that the signals received are weak.

gain

The increase of voltage, current, or power as measured against established standard.

gain antenna

An antenna designed to increase its normal field range through a more directional profile. A signal pushed along the horizon, compressed from the top; elliptical. The increase is measured in decibels.

GIGA HERT(GHz)

One hundred million times per second.

ground

A connection (intentional or accidental) between an electrical circuit and the earth, or its equivalent.

guy wire

A wire used to steady or brace a tower.

handset

A device similar to a telephone handset used in place of a hand microphone.

Hertz

A unit of frequency measurement equal to one cycle per second.

10 ignition noise

Interference produced by high voltage ignition discharge in a vehicle.

integrated circuit (IC)	A solid state device which may contain the equivalent of hundreds or thousands of transistors, diodes, resistors, and capacitors on a tiny "chip" of silicon.
interconnect	The ability to transmit a message that originated in radio frequency through the telephone system.
Intermodulation	<p>Intermodulation (IM) is the undesirable mixing of signals from radio transmitters. A powerful interfacing signal created by intermodulation occurs on a frequency close to the assigned frequency, producing an undesirable and overriding interference on the receiver's tuned frequency.</p> <p>UNIT OF MEASUREMENT: Decibels (dB)</p> <p>TYPICAL RANGE: -60 dB (worst) to -85 dB (best)</p> <p>QUANTIFIES: IM is the product of two radio waves beating together and producing a third frequency that interferes with the reception of a desired signal.</p> <p>CUSTOMER BENEFIT: IM is most likely to occur and is most troublesome in urban areas which are heavily congested with mobile systems, TV stations and commercial radio stations. Signals from all these other sources can mix together in the receiver forming new frequencies which may be on-channel and interfere with the desired on-channel signals. A receiver with excellent IM will have less of this interference problem than a receiver with poorer specs.</p> <p>The intermodulation specification has become extremely important to public safety and military users who often need to operate their equipment in close proximity to sometimes very powerful transmitters operating on a variety of frequencies.</p>
jamming	Transmission of disturbing radio signals or noise in such a way as to interfere with the reception of signals from another radio station.
keypad	A matrix of numeric touchtone keys enabling a user to dial phone numbers, etc.
kilohertz	One thousand cycles. Abbreviated KHz. Equal to one thousand cycles per second.
LED	Abbreviation for light emitting diode; an indicator light.
lightning arrester	A protective device which helps to protect an antenna or transmitter from lightning damage.
local control	Control of a base or control station that is possible when the station is physically located on the dispatcher's desk.

MDC 1200	A signaling scheme permitting the transfer of data communications at the rate of 1200 bits per second.
megahertz	Abbreviated as MHz. One million times per second.
microprocessor	A small Central Processing Unit on an integrated circuit chip.
microwave	That portion of the frequency spectrum above 1000 MHz.
MIL 810 Specs	U.S. Military specifications for pressure, temperature, solar radiation, shock, vibration, dust, immersion, humidity, salt fog, and rain.
mobile	Equipment designed for vehicular installation.
modem	An interface device usually connected between a computer and telephone lines or radio.
modulate	To vary the amplitude, frequency rate or phase of a radio signal, in order to transmit intelligence.
Modulation acceptance	<p>Modulation acceptance is the measure of a receiver's ability to respond to slightly off-frequency or over-deviated signals.</p> <p>UNIT OF MEASUREMENT: kilohertz (kHz)</p> <p>TYPICAL RANGE: 6.5 kHz (worst) to 7.5 (best)</p> <p>QUANTIFIES:</p> <p>Modulation acceptance is the characteristic of a receiver that allows it to accept only a narrow band of modulated RF. When the FCC authorizes a specific operating frequency, in reality, you are receiving a very narrow-band within the radio spectrum.</p> <p>CUSTOMER BENEFIT:</p> <p>The customer with higher modulation acceptance will experience better reception and less distortion of voice signal. This is not generally considered to be a critical performance specification.</p>
negative ground	The condition where the vehicle's electrical system is grounded to earth from the negative polarity of the power source. In vehicles this is especially important to note since most mobile radios are negatively grounded. It is necessary that both the vehicle and the radio have the same type of grounding system.
NICAD	Nickel Cadmium battery.
offsets	Frequencies allocated by the FCC with power and antenna height limitations, allowing radio transmissions in a small designated area; sometimes referred to as splinter frequencies.
omni-directional	An antenna that radiates or receives signals from all directions equally.

paging	A one-way communication system in which an intended receiver is alerted to receive a message.
paging dial interconnect	An option enabling an individual to page another individual from a phone; often used in hospitals.
PL	Abbreviation for Private Line; continuous tone-coded squelch; 29 codes; not compatible with DPL; common among all radio manufacturers.
point-to-point communications	Radio communications between two fixed location stations.
power amplifier	An audio or radio frequency amplifier designed to increase and deliver a larger amount of output energy (power). Abbreviated as PA.
Power-Up Alert tones	A feature of a receiver that permits the user to hear the start up of the device.
Printed circuit	Abbreviated as PC. A circuit manufactured so that many or all of the components are attached to a non-conductive circuit board with copper strips on one or both sides to replace wires.
propagation	The radiation of electromagnetic waves.
push-to-talk	The user must push a button on the transceiver in order to talk. Abbreviated P-T-T.
quarter wave antenna	An antenna electrically equal to one-fourth of the wavelength of the signal to be transmitted or received. Unity gain or "0" gain.
quartz crystal	A thin slice of quartz which, when precision-ground and smoothed will vibrate at a frequency determined by its thickness and its position in the natural quartz structure.
Quick Call II ®	A Motorola trademark for its system of selective calling and alerting functions using two sequential tones.
Radio Common Carrier	Abbreviated as RCC. Licensed independent radiopaging and mobile telephone companies that provide FCC authorized communications services solely through the use of radio signals.
radiate	To send out or transmit electromagnetic energy into space.
radio frequency	That part of the general frequency spectrum between the audio and infrared light regions (about 10 kHz to 10,000,000 MHz); abbreviated as "rf".
radio spectrum	The entire range of useful radio waves as classified into seven bands by the Federal Communications Commission.
radio wave	A combination of electric and magnetic fields varying at a radio frequency, and capable of traveling through space at the speed of light. 13

radio wave (cont.)	It is produced by feeding the output of a radio transmitter to a transmitting antenna.
range	The extent of coverage or effectiveness. A measure of distance.
radio receiver	A device which amplifies radio frequency signals, separates the audio signal from the rf carrier, amplifies it, and converts it back to the original sound waves (voice heard through the speaker).
remote mount	Generally used to describe a mobile installation in which the bulk of the radio equipment is mounted somewhere other than the cab of the vehicle. The microphone, speaker, and control head only are mounted near the driver.
repeater	Radio stations that automatically rebroadcast radio signals that are received.
RF, rf	Abbreviation for radio frequency.
Scan without priority	<p>Scan will cycle through two or more channels, monitoring each in the carrier squelch mode for a short scan interval, starting at channel one and continuing to the last channel and then starting over. When finding a valid signal, channel scan stops scanning until traffic on that channel ceases. It then resumes scanning the next channel in sequence. If the user wishes to reply, he takes the mic off-hook and the radio reverts to the originally selected frequency. If necessary, he must select the appropriate channel for that frequency. Some radios offer channel scan that will not stop scanning or unmute the speaker, unless the correct CTCSS or DCSS tone is recognized.</p> <p>BENEFITS: Allows radio user to monitor some or all channels "hands free". Users will miss fewer messages.</p> <p>Less fatigue by not having to manually check each channel for an RF signal.</p>
Scan with priority	<p>PRIORITY - Scan will cycle through two or more channels, monitoring each for an RF signal. The priority channel is sampled between each non-priority sampling. The presence of an RF carrier on the priority channel will override a non-priority locked channel. The priority channel may be pre-programmed or operator selectable.</p> <p>DUAL PRIORITY - Two channels are selected for priority. Of these two, one will have priority over the other. Scan will sample both priority channels between each non-priority channel. Activity on the priority channel will override a lock on the secondary priority channel.</p> <p>BENEFITS: Prevents missing important messages if the user is talking on a non-priority channel. Less fatigue by not having to manually check each channel for an RF</p>

Scan with priority
cont.)

signal.
Advantageous for customers who require different levels of message importance.

Selectivity

Selectivity is the ability to reject signals on adjacent or nearby channels while satisfactorily receiving a signal on the desired channel.

UNIT OF MEASUREMENT: Decibels (dB)

TYPICAL RANGE: -50 dB (worst) to -90 dB (best)

QUANTIFIES:

The sensitivity of a receiver to an unwanted signal as compared to the desired channel's sensitivity. Sometimes the negative sign is omitted from the number.

EXAMPLE:

There are two congested UHF systems located on the same tower with identical power outputs of 60 watts. Two portables are receiving signals from the tower. Portable A has -55 dB selectivity and Portable B has -70 dB selectivity. Which portable can operate closest to the tower without interference?

NOTE: Theoretical example only.

Portable B can theoretically operate as close as 4.8 miles to the tower before interference will effect the unit. Portable A, however, will need to be 25 miles away from the tower to prevent interference from affecting the unit. Actual range can be subject to a number of other factors.

CUSTOMER BENEFIT:

A radio with a higher selectivity spec can operate more efficiently in congested urban areas where there are many systems operating on adjacent channels. A radio with better selectivity specs will hear the desired signal better in the presence of other systems in the area. The radio with poorer selectivity specs will receive more interference and will result in difficult to impossible communications in an area where other radio systems are operating.

Sensitivity

The characteristic of a radio receiver which determines the minimum input signal strength required to provide a useable signal.

UNIT OF MEASUREMENT: Microvolt (μ V)

TYPICAL RANGE: 0.50 μ V (worst) to 0.15 (best)

A lower rating indicates a more sensitive receiver; a 0.35 microvolt rating is more sensitive than one with a 0.50 rating.

QUANTIFIES:

Sensitivity is expressed in terms of microvolts of signal strength and refers to the receiver's ability to detect and amplify weak signals so they can be heard.

Sensitivity (cont.)

EXAMPLE:

A portable with 0.25 microvolts sensitivity will receive a usable signal one mile away from a 1 watt transmitter. A portable with 0.50 microvolts sensitivity will receive one-half mile away from a 1 watt transmitter. This is a hypothetical situation in open terrain.

CUSTOMER BENEFIT:

The higher the sensitivity in a radio, the greater the receiving range.

A system incorporating higher sensitivity radios could potentially be designed with lower output power and/or antenna height, than a comparable system with lower sensitivity radios. Lower power and/or reduced antenna height may translate into less costly equipment and/or installation expense.

Simplex/Half
Duplex/Duplex

Simplex- Operation of a radio system in only one direction at a time i.e. transmit or receive. Most common with conventional radio use.

Half Duplex- The ability of the radio operator to interrupt a telephone user while he is transmitting. However, while the radio user's microphone is keyed he cannot hear transmissions by the telephone user. Applies mainly to telephone interconnect.

Full Duplex- The ability to transmit (talk) and receive (listen) at the same time without interruption as in the standard telephone system. Applies mainly to telephone interconnect.

BENEFITS:

Half duplex provides the user with a more accurate conversation than does simplex. Each time the radio user completes transmitting, the telephone user will hear a beep indicating that he may now transmit. The radio user also has the ability to interrupt the telephone user to transmit a message, thus making the conversation more continuous.

Full duplex allows both persons to talk and listen simultaneously. There is perfect continuity in the conversation with little or no loss in message clarity.

skip

The distance at which radio waves of a specified frequency will be reflected from the ionosphere back to earth. In typical lowband systems "skip" can range from a few hundred to a thousand miles or more.

SMRS

Specialized Mobile Radio Service. This term is used to describe a shared system using 800 MHz trunking.

Splinter frequency

Also known as "offset frequency" or "business offset"; frequencies set halfway between the customary frequency spacing.

Spurious & Har-
monic Emission

Spurious and harmonic emissions are the unwanted signals emitted from a transmitter.

All transmitters generate spurs and harmonics from a transmitter. All transmitters generate spurs and harmonics internally. These emissions

Spurious &
Harmonic
Emission (cont.)

cause interference on other nearby systems.

UNIT OF MEASUREMENT: Decibels (dB)

TYPICAL RANGE: -45 dB (worst) to -100 dB (best)

QUANTIFIES:

Any undesired radiation from a radio transmitter at frequencies other than the operating frequency. Sometimes the negative sign is omitted from the number.

EXAMPLE:

A portable A is a VHF 2 watt unit with a spurious and harmonic spec of -46 dB. The distance from another receiver where Portable B is a VHF 2.5 watt unit with a spurious and harmonic spec of -71 dB. The distance from another receiver where Portable B may be heard is 0.5 miles. Note: Theoretical example only.

CUSTOMER BENEFIT:

The radio with the higher absolute value of spurious and harmonic specification will cause less interference to nearby systems. The result of this undesirable operation is not experienced by the operator of the spurious or harmonic transmitter, but other users hear the transmissions via their receivers. This could result in others eavesdropping on the customer's business conversation regarding interference to the FCC. The customer with multiple radio systems might want to incorporate a spec into their radios to alleviate possible system interference.

Spurious & Image
Rejection

Spurious and image rejection are the signals to which a receiver may respond that have no relationship to the actual operating frequency.

UNIT OF MEASUREMENT: Decibels (dB)

TYPICAL RANGE: -45 dB (worst) to -100 dB (best)

QUANTIFIES:

The receiver's ability to discriminate between the desired input frequency and an undesired signal at any other frequency to which it is also responsive. Sometimes the negative sign is omitted from the number.

EXAMPLE:

The prospect wants to operate via an SMR located on a particular tower (or building). Other 2-way systems are also located on this tower and one of these other 2-way systems is transmitting on a frequency which causes a spurious and/or image response in the prospect's mobiles. How close can the mobile drive to the interference? NOTE: Theoretical example only.

Mobile A has a spurious and image rejection spec of -70. The distance from the tower at which interference will effect Mobile A's receiver is 2.2 miles. Mobile B has a spurious and image rejection spec of -80. The distance from the tower at which interference will effect Mobile B's

Spurious & Image Rejection (cont.)

receiver is 0.7 miles. NOTE: Actual range is subject to a number of other factors.

CUSTOMER BENEFIT:

The radio with the higher absolute value of spurious and image rejection will reject the unwanted signals better than the radio with the lower specification. This could mean less interference and noise levels thus better reception for the radio.

static

Noise heard in a receiver due to changes in electrical charges in the atmosphere caused by lightning, man-made causes such as engine ignition, electric motors, neon lights, etc.

surge protector

An optional feature that protects equipment from power surges.

synthesized

Recent radio technology outdating crystal-based radios; permits radios to be reprogrammed without expensive or time-consuming changing of crystals.

talkaround

The ability of a radio user to communicate directly with another radio without transmitting through a repeater. Both radios have a second transmit channel which is on the same frequency as the receive channel of the other radio. There is no need for a second receive channel.

BENEFITS:

If the repeater fails, a user may still communicate if he or she is in the range of the other radios.

If two radios are out of range of the repeater and have this feature, they will be able to communicate if they are within range of one another. This effectively increases the usage range of the radios.

EXAMPLE:

Two farmers each have mobiles in their tractors and communicate through a community repeater. If this repeater fails and the farmers have talkaround, they could continue to communicate.

talkback scan

During scanning if a channel receives an RF signal the operator has three seconds to "talk back" (key up the microphone) and have the transmission go out on the last frequency received instead of reverting to the originally selected channel.

After the mobile operator releases the P-T-T switch of his microphone, a three second timer is started, during which time no scanning takes place. During this period, called the "hangtime", the receive frequency that is paired with the last transmit frequency has exclusive priority.

BENEFITS:

The operator need not manually select a channel, he simply needs to key up his microphone within the three second time period. This will avoid missing messages through not selecting the correct channel in time to hear the message.

talkback scan
(cont.)

The three second drop time allows the radio users to have a continuous uninterrupted conversation.

NOTE: The times stated above apply to Motorola equipment. Other manufacturers may have slightly different time constraints.

Temperature
range

The temperature range denotes the range of ambient temperature over which a transmitter and/or receiver will operate with no more than a specified maximum amount of degradation in overall performance.

The temperature range is a direct reflection of the radio's frequency stability or the measure of the equipment's ability to remain set to a given channel frequency over a temperature range of -30 to +60 degrees centigrade. (See also frequency stability) High and low temperature extremes also effect a receivers sensitivity and a transmitters power output as well as effecting other performance specifications of a particular product.

UNIT OF MEASUREMENT: Celsius (C)

TYPICAL RANGE: -30 C to +60 C

QUANTIFIES:

The temperature range in which a radio can operate successfully under standard test conditions.

CUSTOMER BENEFITS:

Radios that meet this standard requirement would be able to operate in climates with extreme temperature variations. This could be desirable for equipment operating at remote sites (i.e. repeaters) or where sudden drastic temperature changes may be encountered. (i.e. mountain tops)

EXAMPLES:

High temperatures: foundries, steel mills and certain geographic locations such as Arizona and Texas.

Low temperatures: ski resorts, refrigerated packing plants and geographic locations such as Alaska and Minnesota.

Time-out-timer

This feature shuts off transmissions after the transmission exceeds a specified period of time. The transmitter automatically reverts to standby and an audible alert tone may sound to signal this condition so that the radio may be keyed up for the next transmission. The period of time before transmission is ended may typically be programmable for 30, 60, or 120 seconds.

BENEFITS:

Prevents lockup of the repeater or the typing up of channels due to prolonged keying of the transmitter.

Provides more air time for other users on the system by freeing up those channels where radios have been keyed up longer than a specified period of time.

Time-out-timer (cont.) Prevents potential damage to the repeater or base station by not allowing it to be in the transmit mode indefinitely. Averts the need to manually locate radios which have been inadvertently left in the transmit mode.

EXAMPLE:

A mobile operator leaves the microphone on the seat and it is jammed in the push-to-talk mode thus tying up the repeater or base station and the channels on which they operate. After a specified period of time, the radio will automatically shut off transmission. This will free the channel for others to use.

tone remote control Control of a base or control station from more than 100' with the use of a non-continuous leased line.

transmission line A set of conductors used to transfer signal energy from one location to another. Most common application is the coaxial cable used to connect a station to an antenna.

transmission loss A term used to denote a decrease in power during the transmission of energy from one point to another.

transmitter The equipment that is used for generating and amplifying an rf carrier signal, modulating this carrier signal with intelligence, and then radiating the modulated signal into space.

trunking A system in which many users can share multiple repeater equipment with relative privacy.

unidirectional antenna An antenna designed to radiate with maximum strength or receive with maximum sensitivity in a particular direction, and with minimum radiation or reception in the opposite direction.

Universal capability A portable radio that has the capability of having a remote speaker/microphone or headset connected to it. The same feature is required for operation with a vehicle Converta-Com console. Converta-Com console allows the portable to operate as a mobile. The portable is connected to a mobile microphone, speaker, and antenna. This is accomplished through a plug-in socket on the portable radio.

BENEFITS:

Remote speaker/microphones are convenient for customers who do not wish to take their portable out of its carrying case when they want to talk or listen, or who prefer a mobile operation when in a vehicle.

EXAMPLE:

Many public safety personnel prefer to keep the radio close to their ears so as to minimize missed messages while at the same time reducing casual eavesdropping by people in their vicinity.

Maintenance personnel in particularly high noise areas (mines, airports, etc.) benefit by placing the audio close to their ears.

Allows the portable radio the flexibility of converting from portable to

Universal capability (cont.)	mobile operation (with hand microphone, high output speaker, and external antenna).
variable time-out-timer	A timer on a transmitter that can be set at varying intervals to turn the transmitter off.
vehicular repeater	A piece of equipment in a vehicle that receives the low power transmissions from the unit outside the vehicle and retransmits the signal at its higher power, thus increasing the range of the signal; allows a portable, effectively, to have the range of a mobile while retaining the flexibility of a portable; made only in UHF and VHF; requires crossbanding.
voice paging	One way communications of a message utilizing voice transmissions.
watt	The basic unit of power equal to the voltage multiplied by the current in amperes; a radio's power output rating.
wavelength	The distance traveled by a wave in the time of one cycle. Electromagnetic waves include both light and radio waves and travel in space at approximately 300,000,000 meters per second. To determine the exact length of a wave, the above number is divided by the frequency.
Yagi antenna	A particular form of high gain end-fire antenna array having maximum radiation in one direction.