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Wireless Intercoms Devices and Applications Guide

How to Use Wireless Intercom Devices for Increased Productivity and Improved Customer Service.

There are times when installing a wired solution for a communication challenge is either impossible or prohibitively expensive. For instance, running wires in a building with historical significance or across paved outdoor areas may not be feasible.

In existing buildings, installing communication devices at entry points can be particularly challenging. Trenching for outdoor cabling and routing cables through walls and ceilings is both messy and costly.

Long-range wireless communication and security devices offer a much simpler and more affordable installation alternative. With these wireless devices, access issues can often be resolved in a single day. The installation process involves finding the right location for the device, mounting it on a pole or wall, and providing power via an electrical outlet, batteries, or solar power.

These wireless solutions include base station intercoms, handheld two-way radios, call boxes with remote gate opening and keypad capability, long-distance motion and vehicle proximity sensors, and wireless public address and remote switch monitoring devices. They can communicate over distances of up to a mile or more with external antennas. No FCC license is required, though many devices can be programmed to work with existing licensed two-way radios.

One of the key advantages of these products is that they eliminate the need for expensive wiring while providing mobility for monitoring personnel. Staff no longer need to be tied to a desk to receive calls and alerts, increasing their productivity.

While these wireless devices are not suitable for more complex requirements, such as networked proximity or biometric card readers, they are ideal for situations requiring simple, long-range two-way communication and remote gate or door opening with keypad entry.

MURS Radio Frequencies

Until recently, customers seeking long-range wireless solutions faced significant challenges. They had to use overcrowded, unlicensed radios plagued with interference or navigate the cumbersome process of obtaining an FCC license. For those without existing two-way radios or a desire to secure an FCC license, there is now a relatively new, license-free option available.

This option utilizes a set of frequencies known as MURS (Multi-Use Radio Service). Although the FCC released these frequencies in 2000, MURS radios remain relatively scarce, and their usage is light in most areas.

MURS radios offer substantial advantages, with range measured in miles rather than feet. They have four times the power of commonly available unlicensed radios. Additionally, users can enhance the range by adding a larger or external antenna, which can be mounted up to 60 feet high.

MURS provides five channels and 38 privacy codes, allowing users to filter out unwanted chatter and receive only communications using their specific privacy code.

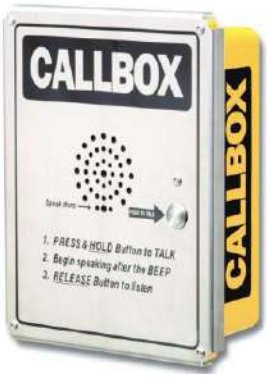
For customers with existing licensed two-way radios, many of the discussed devices are also available in licensed VHF and UHF frequencies.

Product Applications

Below are example applications where these products have been used.

Wireless Security Gate Intercom

A wireless security gate intercom offers long-range, two-way voice communication to a two-way radio or wireless intercom, enabling the remote opening of gates or doors. This allows monitoring personnel to move freely rather than being confined to a desk. These intercoms, also known as "wireless call boxes," are essentially long-range two-way radios housed in water- and vandal-resistant cases with added features. They operate without airtime or telephone service fees.



A wireless gate intercom allows for the quick implementation of a communication system without the need for costly and messy trenching. These gate-opening intercoms have a range of up to a mile, or even further with the use of external antennas.

These call boxes use either UHF or VHF frequencies for long-range communication. While most of these wireless frequencies require an FCC license, the MURS version supports unlicensed MURS frequencies. These call boxes can be programmed to be compatible with virtually any brand of VHF, or MURS business band radio.

For applications requiring the remote unlocking of a gate or door, a call box with a relay, controllable by pressing a button on a wireless intercom or two-way radio with the two-tone encode feature, is needed. A call box with an entry keypad is also available, allowing individuals to enter a code at the call box to open the gate or door. In addition to opening a gate or door, the call box relay can be used to activate a switch that turns on a light, sounds an alarm, or any other application requiring remote control of an on/off switch.

The callbox relay can be programmed to operate in several ways:

- **On/Off Code:** The switch will close when a preprogrammed code is received, and open when it is received again. The switch will also open by itself when the Callbox's preprogrammed Automatic Turn Off feature is activated.

- **Switch On When Called:** The switch closes when the callbox first receives the call and it remains on until its Talk button is pressed, or a programmable timer expires (1-255 seconds).
- **Switch On When Callbox In Use:** The switch will close when the Callbox first sends or receives a call and remains closed until a preprogrammed timer expires.
- **Switch On When Active Includes Turn-Off Code:** Switch closes when the Callbox sends or receives a call with the added ability to open the switch when the Callbox receives a preprogrammed code.
- **Momentary Close**: Switch will close for 1-255 seconds when a preprogrammed code is received.
- **Alternate Open and Close:** Switch will toggle between open and closed when it receives a preprogrammed code. The Callbox transmits a single beep when open and a double beep when closed.

There is a version of this callbox that also can store recorded messages. This callbox can play a message when someone presses its button. This could be a message that gives the caller specific instructions on what to do. These units can also send a second and different voice message alert to the monitoring central location or portable radios. This message could give the call boxes' location or it could be an emergency message of some type.

There can be a total of 5 event messages as follows:

- **Greeting Message:** This message plays when a user presses the Talk button on the Callbox. You can use it to record instructions for the user to follow such as "*Welcome to our facility. An attendant will be with you shortly.* "
- **Identification (ID) Message:** The ID message is transmitted automatically when the Talk button is first pressed. This message identifies which Callbox has been activated. A typical message might be, "*South delivery entrance*" or "*Main Gate*." The message will be retransmitted every time the Callbox is pressed until it is answered. If the Greeting Message is used, the ID message is transmitted after the greeting is played. The ID message can be periodically sent until the Callbox is answered. It is also sent ahead of a Sensor Detect or Low Battery/Power Fail messages.
- **Low Battery/Power Fail Message:** This message is automatically transmitted when low voltage is detected on the Callbox. The message may say something like "*Power failure*" or "Low Battery." The ID Message is sent immediately before this message.
- **Sensor Detect On Message:** This message is automatically transmitted when a switch attached to the Sensor Input is closed. A typical message may be something like, "*Door opened*," "*Motion detected*," or "*Vehicle present.*" The ID Message is sent immediately before this message. A typical message may be something like, "*Main Gate*," *Vehicle present.* "
- **Sensor Detect Off Message:** This message is automatically transmitted when a switch attached to the Sensor Input is opened. A typical message may be something like, "*Door opened*," "*Motion detected*," or "*Vehicle present.*" The ID Message is sent immediately before this message.

If no AC power is available at the gate, these call boxes can be powered by six D-cell batteries or a solar power system. A smaller version that uses three D-sized batteries is also available. When AC power is accessible, an optional AC to DC 12-volt transformer can be used.

For systems with multiple call boxes, a unique numeric identifier can be transmitted to a radio capable of decoding it, similar to a telephone with Caller ID. If fewer than five call boxes are needed and the five unlicensed MURS frequencies are being used, each call box can be assigned to a separate channel.

For wireless gate communications, a wireless security gate intercom like the Callbox XT Outdoor Wireless Intercom offers clear wireless voice communication and remote gate unlocking, quickly, without expensive trenching and monthly air-time fees.

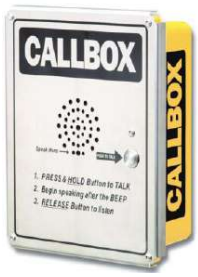
Delivery Door/Loading Dock Intercom System

Many industrial, retail, and other businesses have delivery doors or docks where delivery companies drop off packages, inventory, and supplies. These doors often have a doorbell to alert personnel of a delivery or remain unlocked to allow delivery personnel to enter.

The issue with relying on a doorbell, or nothing at all, is that staff may not always hear the ringing or knocking. By the time they respond, the impatient delivery person may have already left, causing the delivery to be delayed until another day.

Leaving delivery doors unlocked to avoid missed deliveries presents a significant security risk. Loading docks or delivery doors in businesses, hospitals, or colleges can become entry points for unauthorized individuals, exposing the organization to various security threats. Hiring security personnel to monitor these areas is costly and often impractical.

The solution to both problems is to keep delivery doors locked and install an intercom system for delivery personnel to use when making deliveries.



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With a ***Callbox XT Outdoor Intercom*** installed by a delivery door, and at least one of the staff carrying a two-way radio, the delivery door can be secured without missing deliveries. Base station intercoms could also be placed on several desktops allowing office personnel to monitor deliveries as well. Using these wireless intercoms, a business can still get important deliveries without compromising security.

The Callbox XT Outdoor Intercom is a robust metal and fiberglass unit equipped with two-way radio circuitry, allowing users to press a button to call for assistance. This enables two-way communication so personnel can inform the delivery person they are on their way to unlock the door. If the door needs to be unlocked remotely, a signal can be sent to the callbox to activate an electric door lock, allowing the delivery person to bring in packages without anyone needing to go to the door.

The advantage of a wireless callbox is the elimination of the high costs associated with running expensive cables. Additionally, there are no airtime or telephone service fees. Another benefit is that monitoring personnel can carry handheld radios to communicate with the callbox, providing them with the mobility to move freely.

The callbox has a range of up to a mile, which can be extended by adding an external antenna. If existing two-way radios are in use, these callboxes can be programmed to be compatible with virtually any brand of VHF or UHF business band radio.

By using a callbox at the delivery door, base station intercoms on desks, and handheld two-way radios for mobile personnel, businesses can ensure they never miss a delivery again.

Wireless Emergency Warning System

When an emergency occurs on a university or business campus, rapid communication can save lives. Many campuses have some form of warning system, but they often lack a critical component of an effective emergency notification system.

Campus emergency notification systems frequently send text or verbal messages to cell phones, but not everyone carries their phone, has it turned on, or is paying attention to it. Therefore, these devices cannot be solely relied upon.

Additionally, there is often a time lag between when a message is entered into the system and when the last person receives it. This delay can range from 20 to 40 minutes or more, especially if someone isn't checking their messages regularly. Delays can be even longer if an off-site hosted system is used.

Sirens are also commonly used to alert people of emergencies, but they cannot convey the nature of the emergency. Moreover, people are so accustomed to hearing sirens that they may have difficulty distinguishing a campus warning siren from those used by police, fire, ambulance, or even car alarms.

The missing element in many warning systems is a verbal announcement that clearly communicates the nature of the emergency and the appropriate response. The cost of

implementing such a system is often prohibitive due to the expense of running wires for installation.

This is where a wireless public address (PA) system, used in conjunction with existing two-way radios, can meet the need. A wireless PA system eliminates the need for expensive wiring and allows security personnel to make announcements from any location. They can be at the scene of an emergency and provide immediate updates.

A wireless PA system consists of a long-range receiver unit with an antenna that receives transmissions from a mobile or desktop two-way radio, amplifies them, and broadcasts them through attached PA horn speakers.

These systems are available in UHF and VHF frequencies and can be programmed to work with existing campus two-way radios.

Strategically placed units across a campus enable security personnel to quickly broadcast clear emergency messages and live updates. These real-time messages reduce the burden on emergency response personnel, who are often too busy to handle numerous calls from people seeking information.

For broadcast pre-recorded messages, the wireless PA system can be used with a Voice Notification Wireless Monitor device. This device is a wireless radio transmitter that reports changes in the status of connected switches. When a switch is closed, it transmits a user-recorded voice message to the PA system. It can be used for messages triggered by a device or activated manually with a button.

Whether dealing with a natural disaster like a tornado or a man-made threat such as a terrorist act, an inexpensive add-on wireless PA system provides an effective solution for immediate emergency response on a large scale.

OSHA Employee Emergency Evacuation System

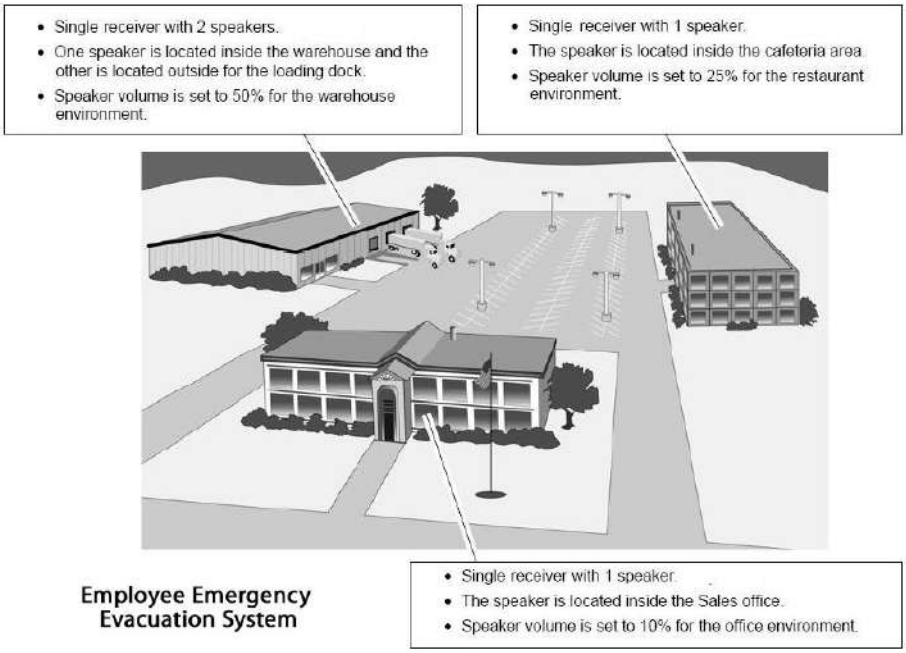
Implementing OSHA's Environmental Health & Safety (EH&S) requirements can be expensive, but there are ways to save tens of thousands of dollars on the employee emergency evacuation system, also known as an employee alarm system.

What is an employee alarm system? According to OSHA's Employee Alarm System standard 29 CFR 1910.165, "An employee alarm system can be any piece of equipment and/or device designed to inform employees that an emergency exists or to signal the presence of a hazard requiring urgent attention."

Typically, installing an emergency mass notification system to meet this OSHA standard requires running thousands of feet of wire. The labor costs alone for installing this wiring can significantly exceed the cost of the equipment.

This expense can be greatly reduced by installing a wireless notification system instead. Installation time can also be reduced to a day or two for a complete working system.

The core of the system is a wireless PA (public address) device placed at various locations throughout a building or property. This setup allows personnel to broadcast emergency messages without needing extensive wiring.



Employee Emergency Evacuation System

The PA system consists of a receiver unit with an antenna that receives transmissions, amplifies them, and sends them to the attached PA horn speakers. Each receiver location can be set to different volume levels depending on the environment.

There are two main options for activating this emergency notification system. First, a portable two-way radio, mobile vehicle radio, or base station intercom can be used to make live voice announcements from anywhere. These announcements can guide evacuations or instruct employees to take cover if severe weather is approaching.

The second option involves using a device called the MURS Voice Notification Wireless Monitor, which broadcasts a pre-recorded message when a button is pressed. Two messages can be recorded, with two separate buttons to activate them.

Another advantage of a wireless PA system is that handheld two-way radios can be used to make announcements, allowing emergency personnel to communicate from anywhere. Even if they are up to two miles away or more with the use of external antennas. For facilities with an existing wired PA system, a Wireless PA System Interface device is available to receive transmissions from radios and broadcast them over the wired system.

These wireless PA units are available in both UHF and VHF frequencies, making them compatible with existing two-way radios. The VHF model includes several frequencies that do not require an FCC license.

Additionally, the VHF MURS Wireless PA version can be programmed to receive automatic transmissions from NOAA Weather Radio, ensuring employees are instantly aware of approaching severe weather.

A leading chemical company implemented this system and saved a significant amount of money. They received a quote for about $70,000 to install a wired system, with over $40,000 of that cost attributed to labor. By choosing a wireless solution instead, they discovered the cost was less than $12,000, and they could install the system in just a day or two. By installing the system themselves, they saved over $50,000.

When an employee emergency evacuation system needs to be implemented, a wireless system can be quickly installed without the hassles and expense of a wired system.

Use Wireless Callboxes for ADA Compliance

The Americans with Disabilities Act (ADA) impacts businesses across all industries, with wheelchair accessibility being one of the more common requirements.

If your business has two public entrances, typically only one must be accessible. When one entrance is not accessible, a sign must provide directions to the accessible entrance, which must remain open during business hours.

If the accessible entrance remains locked for security reasons, there must be an accessible way for notifying staff to open the door. A wireless callbox is an effective solution for this, provided it is located on an accessible route and mounted at an accessible height (generally no more than 48 inches above the ground).

To assist businesses in complying with the ADA, the IRS offers tax incentives. Section 44 of the IRS Code provides a tax credit for small businesses, and Section 190 allows a tax deduction for all businesses. The tax credit is available to businesses with total revenues of $1,000,000 or less in the previous tax year or with 30 or fewer full-time employees. This credit can cover 50% of eligible access expenditures up to $10,250 (maximum credit of $5,000). It can be used for barrier removal, accessibility improvements, providing accessible formats (Braille, large print, audio), sign language interpreters, readers for customers or employees, and purchasing adaptive equipment. The tax deduction, available to all businesses, allows a maximum deduction of $15,000 per year for expenses related to barrier removal and alterations.

Purchasing wireless callbox equipment may be tax deductible, but it's advisable to consult a tax accountant for guidance.

A MURS Callbox Outdoor Intercom is an excellent choice for this application, as it does not require an FCC license and can communicate directly with two-way radios or base station intercoms.

Employee Safety in Parking Lots

While most businesses prioritize employee safety within their premises, parking lot safety is often overlooked despite being prone to accidents and incidents.

One effective way to enhance parking lot safety is by installing wireless callboxes. These callboxes enable employees to quickly call for assistance in various situations.

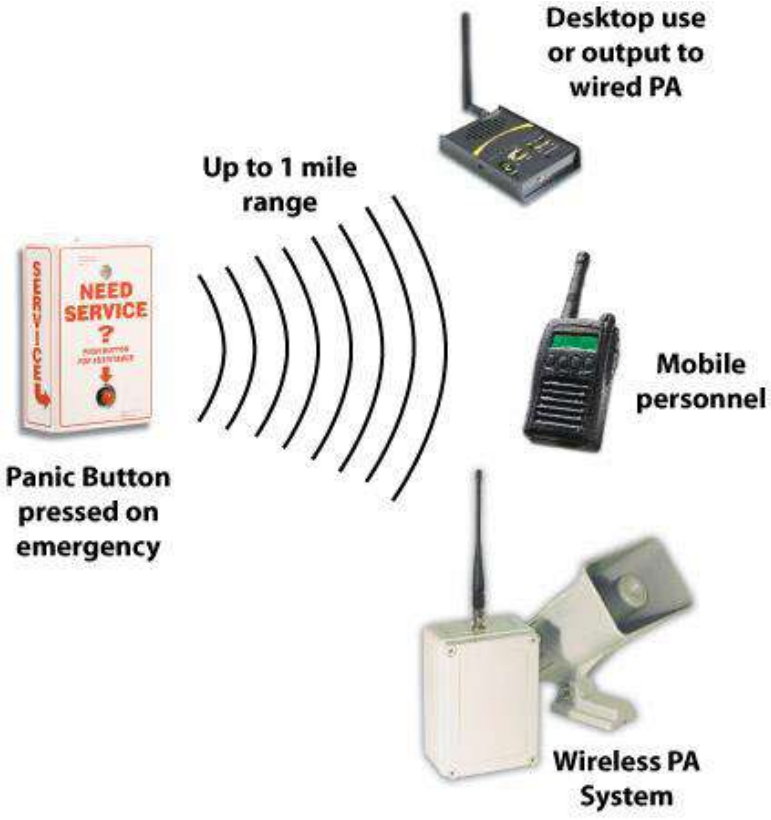
For instance, if an employee's car fails to start, they can use the callbox to request a jumpstart. In cases where a woman feels uneasy about a suspicious van nearby (commonly used by predators), she can use the callbox to request an escort. Additionally, in the event of an accident, employees can promptly call for help.

The MURS Callbox Outdoor Intercom is well-suited for this purpose. It can be powered by batteries, solar energy, or AC power. With a simple push of a button, an employee can contact security personnel who are equipped with two-way radios or base station intercoms.

These callboxes play a crucial role beyond mere convenience. They enhance safety by enabling immediate responses to emergencies or suspicious situations, such as vehicle issues, potential threats, or accidents. Employees can feel reassured knowing they have direct access to support, whether it's for a mechanical problem with their vehicle or concerns about personal safety.

Emergency Notification Call Button

There are critical situations where making a phone call to alert an emergency response team is not fast or reliable enough. What's needed is an emergency notification system that activates with the simple press of a button to alert all necessary parties immediately.



A chemical manufacturing facility provides a prime example of such a need. In the event of a chemical spill, there's no time to waste on multiple phone calls. Immediate assistance from multiple personnel is crucial.

The MURS Indoor Customer Service Callbox serves as an effective panic button in this scenario. When pressed, it sends a pre-recorded message to two-way radios, base-station intercoms, or a wireless/wired public address system. This message can be

a voice alert or even a siren sound, ensuring swift notification of the emergency. If multiple panic buttons are installed across different areas, distinguishing between their recordings ensures that help is dispatched to the correct location.

Alternatively, the MURS Voice Notification Wireless Monitor offers another panic button option. It triggers a pre-recorded message when a button is pressed, with two separate buttons available for different messages.

For locations without an existing PA system, the MURS Wireless PA System can receive calls from the callbox without the need for costly cabling installation. If a PA system is already in place, the Two-Way Radio MURS Wireless PA Interface can integrate seamlessly to receive wireless transmissions from these devices.

Regardless of the industry, this system guarantees rapid emergency response in critical situations, ensuring the safety and prompt assistance of personnel when emergencies arise.

How Far Can Wireless Radios Communicate?

If you're considering purchasing long-range wireless products, it's important to grasp the basics of wireless frequencies and communication distances, which we'll cover here.

One of the most common queries when shopping for a two-way radio or wireless intercom is about their communication range. However, answering this question is akin to asking, "How far is up?" It's not straightforward due to numerous variables at play. Understanding radio signal transmission is key to navigating this complexity.

If you recall the days of AM radio, you might remember tuning into stations hundreds of miles away. These frequencies, typically below 2 Megahertz (MHz), exploit atmospheric reflection to follow the Earth's curvature. In low-noise environments, AM radio signals can reach radios hundreds of miles away, even beyond the horizon.

Modern two-way radios and intercoms, on the other hand, operate within the 150MHz to 900MHz frequency range. Unlike AM radio waves, these frequencies travel in straight lines and are generally limited by line-of-sight and obstacles like buildings or terrain features.

However, there are exceptions to these general rules. Despite operating on line-of-sight principles, radio waves can penetrate non-metallic objects and be reflected off surfaces, sometimes extending their effective range beyond direct line-of-sight paths.

Understanding that radio waves travel in straight lines helps in determining their maximum range for two-way radios. The Earth's curvature dictates that after passing the horizon, radio waves will continue straight into space. Therefore, the distance to the horizon is technically the maximum communication range, but this is influenced by antenna height as well.

In summary, while the range of two-way radios depends largely on line-of-sight principles and the Earth's curvature, real-world factors such as obstacles and reflections can influence

actual performance. grasping these concepts is crucial when evaluating the potential range of wireless communication devices.

To find the line of site distance to the horizon for a given antenna height we can use this formula: horizon in kilometers = 3.569 times the square root of the antenna height in meters. Figure 1 illustrates this formula.

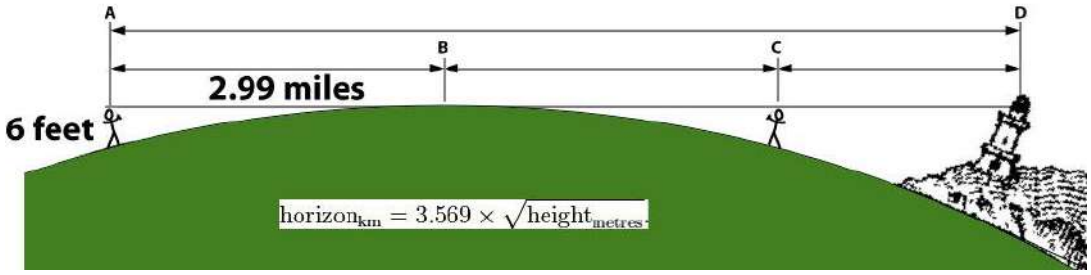


Figure 1

So, if the antenna height of a radio is at 6 feet, or 1.82880 meters tall, the horizon is 4.83 kilometers, or 2.99 miles away, which is Point B in the illustration. Of course, this calculation assumes the receiving antenna is laying directly on the ground so raising the height of it would extend line-of-site.

Point C in the illustration shows another radio with the antenna at 6 foot so theoretically you should be able to communicate almost 6 miles. So realistically, for two people carrying a handheld two-way radio, the maximum communication distance on flat ground with no obstructions is around 4 to 6 miles.

So, you might be wondering why some radios claim ranges of 25 miles or more. Technically, they can achieve such distances. Point D on Figure 1 illustrates a scenario where a tower is positioned atop a mountain. Standing at the top of this tower significantly elevates your antenna height, allowing communication over longer distances by overcoming much of the Earth's curvature.

Other factors also influence the range of a two-way radio, such as weather conditions, the specific frequency used, and physical obstructions in the environment. Additionally, the radio's power output plays a significant role in determining its effective range.

Radio Power

Another important factor in the distance a two-way radio will communicate is its power output. This power output is measured in “watts.” You’ve likely heard an FM radio station say they are broadcasting at 50,000 or 100,000 watts. Well, a handheld business-type two-way radio usually broadcasts at 1-5 watts. A vehicle mobile radio may broadcast anywhere from 5 to 100 watts. The more watts a radio has, the farther it can transmit.

Why is this? When water moves through a pipe it loses pressure along the way. When electricity flows along a wire it loses current. When an object is rolling, it will eventually stop

rolling due to friction. Radio waves operate by the same laws of physics as everything else so there will be signal loss along the way. But if you apply more water pressure, more electrical current, or get the rolling object moving faster, you'll get more distance out of all of them. The same is true for radio signals. Increasing the power in watts at the source helps overcome any "resistance" along the way.

Keep in mind that for battery-powered handheld radios more watts is not always a good thing. The higher the wattage, the quicker your batteries run down.

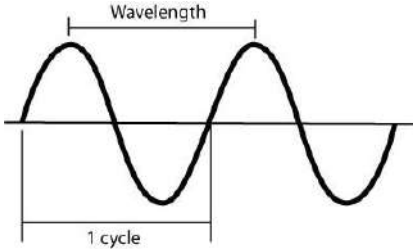
Radio Frequencies

One more factor in determining how far a two-way radio will communicate is the frequency it uses and the environment that frequency is used in.

There are two major formats for most two-way radios. They are Ultra High Frequency (UHF) radio and Very High Frequency (VHF) radio. Neither frequency band is inherently better than the other. They each have their pluses and minuses. Both formats are effective ways to communicate with another person so deciding on the right radio for you depends on your application.

Two-way radios communicate with each other through use of radio waves. Radio waves have different frequencies, and by tuning a radio receiver to a specific frequency you can pick up a specific signal.

Radio waves are transmitted as a series of cycles, one after the other. You will always see the “Hz” abbreviation used to indicate the frequency of a radio. Hertz is equal to one cycle per second.

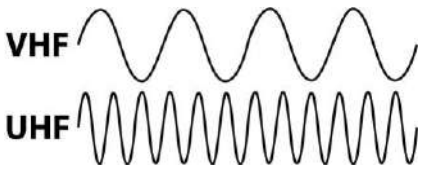


Radio waves are measured by kilohertz (kHz), which is equal to 1000 cycles per second, or megahertz (MHz), which is equal to 1,000,000 cycles per second--or 1000 kHz. The relationship between these units is like this: 1,000,000 Hertz = 1000 kilohertz = 1 megahertz.

You may also hear the term “wavelength” when you hear about radio waves. This term is from the early days of radio when frequencies were measured in terms of the distance between the peaks of two consecutive cycles of a radio wave instead of the number of cycles per second. Lower frequencies produce a longer wavelength (the width of each cycle gets bigger on lower frequencies).

What is significant about wavelength for two-way radios is that it affects transmission range under certain conditions. A longer wavelength, which corresponds to a lower frequency, as a general rule lets a radio signal travel a greater distance.

Lower frequencies or longer wavelengths also have greater penetrating power. That’s one of the reasons they are used for communicating with submarines. VLF (Very Low Frequency) radio waves (3–30 kHz) are used to penetrate



sea water to a depth of approximately 20 meters. So a submarine at shallow depth can use these frequencies.

So, from what you read above you may think VHF is always the better choice for a two-way radio no matter where you are using it since it has a lower frequency than UHF and the signal can travel a greater distance. That's not necessarily true. Even though VHF has better penetrating capabilities and can travel farther, that doesn't necessarily make it the better choice for use in buildings. Remember the conversation about wavelength above? Wavelength has a big impact on transmission distance.

To explain this let's assume we are communicating from one side of a metal commercial building to the other. In between these two points is a metal wall with a three-foot doorway. Metal is an enemy to radio waves, and they typically don't pass through it.

For our example let's assume that the UHF wavelength the radio uses is about a foot and a half wide and a similar VHF radio is around five feet wide. These are in the ballpark of their normal wavelengths.

When the UHF radio transmits its signal the foot and a half wide wave will pass through the door since the door is wider than the wavelength. The VHF signal will be totally reflected since it is wider than the opening to the door.

Your microwave oven provides an example of this. The glass front door has a metal mesh with very small holes. Microwaves, being extremely high frequency, have wavelengths that are only several inches long. The mesh keeps the microwaves trapped in the oven, but it allows you to see inside because light waves have a microscopic wavelength.

Just imagine walking through the building carrying a five-foot-wide pole. You will encounter the same challenges a VHF signal encounters. Now imagine walking through the building with a pole that's only a foot and a half wide like a UHF wave. There are lots fewer doorways you couldn't get through.

The one caveat is that wireless signals will penetrate through drywall, masonry, human bodies, furniture, wall paneling, and other solid objects. All these objects will reduce the signal strength though. The denser the object, the more it reduces the signal. VHF will penetrate these obstacles better than UHF, but that doesn't necessarily mean that VHF is better for indoor applications as we continue to discuss the reasons why in the UHF section below.

In our example above we assumed you had a metal wall with an opening. If you reverse this and you have a three-foot metal object in front of the transmitting radio, then VHF would win. Since the object is three feet wide it will totally block the UHF signal whereas the VHF signal will get around it. Lower frequencies such as VHF diffract around large smooth obstacles more easily, and they also travel more easily through brick and stone.

For most applications, lower radio frequencies are better for longer range. A broadcasting TV station illustrates this. A typical VHF station operates at about 100,000 watts and has a

coverage radius range of about 60 miles. A UHF station with a 60-mile coverage radius requires transmission at 3,000,000 watts.

So, there is no clear choice for which is better, VHF or UHF. There is a lot of “black magic” to radio technology so it’s not always easy to tell which will work better for your application. To help you decide on the best technology for you, more detail about each one is included below.

UHF Radio

The UHF radio band for commercial radios is between 400 to 512 MHz. Until recently, it wasn’t widely used. Now, the UHF radio frequency is used for two-way radios, GPS, Bluetooth, cordless phones, and WiFi.

There are more available channels with UHF so in more populated areas UHF may be less likely to have interference from other systems. The range of UHF is also not as far as VHF under most conditions, but this reduced range may be a positive in some cases. Since UHF has lower range, there is less chance of distant radios interfering with your signal.

While VHF may be better at penetrating physical barriers like walls, that doesn’t mean it will give you greater coverage in a building. The shorter wavelength of UHF means that it can find its way through more spaces in your building as we discussed above. In the walking around with a pole example we gave you, the UHF signal has fewer obstacles that totally block it.

To highlight the differences in indoor range, below is an excerpt from a brochure of a leading two-way radio maker on the predicted range of one of their lines of handheld VHF and UHF two-way radios:

> “Coverage estimates: At full power, line-of-sight, no obstructions the range is approximately 4+ miles. Indoor coverage at VHF is approximately 270,000 sq ft and 300,000 sq ft at UHF. Expect about 20 floors vertical coverage at VHF and up to 30 floors at UHF. Note: Range and coverage are estimates and are not guaranteed.”

The greater wavelength of VHF makes it more difficult for it to bounce its way through walls, buildings and rugged landscape. Therefore, range will be reduced for VHF radios in these environments. That may not necessarily be a problem if the range needed is only a few hundred feet. You can also add an external antenna to an indoor VHF base station that will reduce or eliminate some of the problems encountered.

One of the downsides to UHF is that the FCC requires you to get a license to operate in these frequencies, although many frequencies in the VHF business band also require a license too. If you choose a radio in the VHF MURS frequencies, you can operate it without a license (discussed below).

One other advantage of the short wavelength that is produced by the higher UHF frequency is that the antenna on the radio can be shorter than an equivalent VHF radio. That can make

it more convenient to carry around as a portable radio, although most manufacturers find a way to make the antennas shorter on their VHF portable radios.

VHF Radio

FM radio, two-way radios, and television broadcasts operate using VHF. The VHF radio band specifically for commercial radios is between 130 – 174 MHz.

Both UHF and VHF radios are prone to line-of-sight factors, but VHF a little more so. The waves make it through trees and rugged landscapes, but not always as well as UHF frequencies do. However, if a VHF wave and a UHF wave were transmitted over an area without barriers, the VHF wave would travel almost twice as far. This makes VHF easier to broadcast over a long range.

If you are working mostly outdoors, a VHF radio is probably the best choice, especially if you are using a base station radio indoors and you add the external antenna. The higher you can place the antenna, the further you can transmit and receive. One exception to using a VHF radio outdoors is if you are using it in a heavily wooded area. Under these conditions a UHF radio may be able to transmit better though the trees.

VHF radios also have a smaller number of available frequencies. Interference with other radios could be more likely to be a problem. However, the FCC recently made this less of a problem when they opened a two-way radio spectrum called the MURS service. MURS stands for Multi-Use Radio Service. This service is for use in the United States and some countries that follow FCC regulations. It is a low power, short range service in the VHF 150 MHz radio spectrum. There are 5 channels in the MURS frequencies with 38 privacy codes under each one that enable you to only pick up conversations from radios transmitting your code. The FCC does not require users of products for MURS to be licensed.

With MURS you can add a larger or external antenna to improve range. If you want to put an antenna on top of your building or a tower, you can do it with MURS. Some antenna manufacturers claim an external antenna can increase the effective radiated power of a transmitter by a factor of 4. These MURS intercoms can transmit up to several miles, and perhaps more with an external antenna depending on the terrain and height of an antenna (can be up to 60 feet above the ground).

One benefit of VHF wireless radios is that battery life is almost always better than for similar UHF units. For handheld radios this is a plus.

In summary, if you are planning on using your two-way radios mainly inside buildings, then UHF is likely the best solution for you, but it in lots of applications VHF could still work fine since it doesn't have to transmit far. If you are mainly using your two-way radios for communication outside, then VHF would be a good choice, unless the area you are covering is heavily wooded or there are lots of buildings in the way of the radio signal.

Either radio technology can work for you if you don’t really have a long range to cover. There are also repeaters you can install that relay a UHF signal, but this is usually very complex to do. You may be able to find a repeater service in your city that will do this for you for a

monthly fee. For most applications a repeater is not necessary and VHF or UHF radios by themselves will do the trick.

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IntercomsOnline.com solves communication problems in homes and businesses. Their ecommerce store specializes in intercoms, wireless intercom systems, two way radios, wireless call boxes, and other communication devices. Through almost 40 years of product expertise in communication systems, they have been able to simplify the ordering of otherwise complex assemblies. Their site has ample product information needed to make an informed buying decision. Go to http://www.intercomsonline.com for more information. To join their dealer program, click here: IntercomsOnline.com Dealer Program

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