

## Unit 3

### Emergency Communications Technology

**3.1.0. Unit Goal:** Summarize Emergency Communications Technology systems used in Public Safety Emergency Communications (telephone, computer-aided dispatch, geographic information systems (GIS), radio, recorders, etc.). Review the history of 9-1-1 administration, legislation and system technology.

**3.1.1 Learning Objective:** Review the history of 9-1-1 administration in Texas.

- The three-digit telephone number "9-1-1" has been designated as the "Universal Emergency Number," for citizens throughout the United States to request emergency assistance. It is intended as a nationwide telephone number and gives the public fast and easy access to a Public Safety Answering Point (PSAP).

In 1967, the President's Commission on Law Enforcement and Administration of Justice recommended that a "single number should be established" nationwide for reporting emergency situations.

In November 1967, the FCC met with the American Telephone and Telegraph Company (AT&T) to find a means of establishing a universal emergency number that could be implemented quickly. In 1968, AT&T announced that it would establish the digits 9-1-1 (nine-one-one) as the emergency code throughout the United States.

Congress backed AT&T's proposal and passed legislation allowing the use of only the numbers 9-1-1 when creating a single emergency calling service, thereby making 9-1-1 a standard emergency number nationwide.

*NENA.9-1-1 Origin and History (2018, March 15)*

<https://www.nena.org/?page=911overviewfacts>

The First 9-1-1 Call. February 16, 1968: the first-ever 911 call is placed by Alabama Speaker of the House Rankin Fite from Haleyville City Hall to U.S. Rep. Tom Bevill (Dem.) at the city's police station. Bevill reportedly answered the phone with "Hello." The phone used to answer the first 911 call, a bright red model, is now in a museum in Haleyville, while a duplicate phone is still in use at the police station. The serving telephone company was then Alabama Telephone Company. This Haleyville 9-1-1 system is still in operation today.

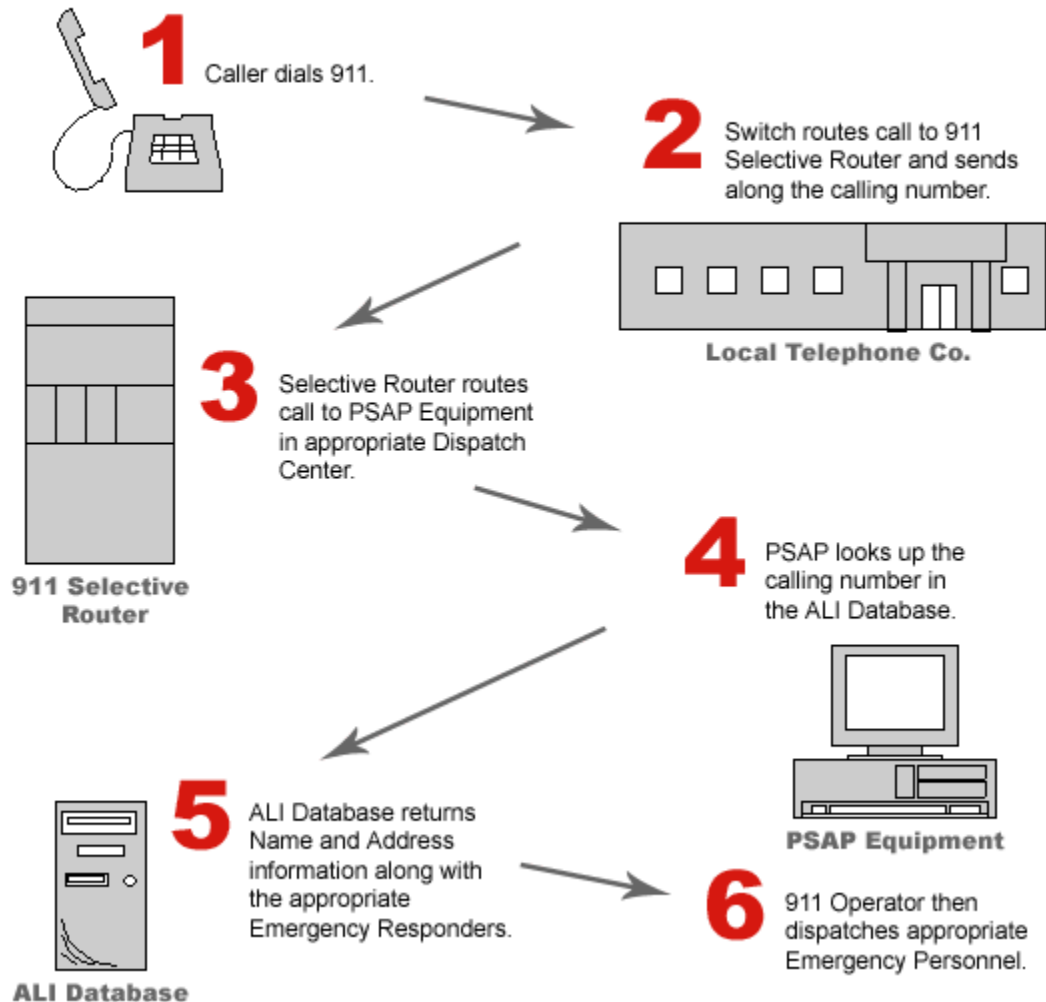
[https://www.countyofunion.org/site/cpage.asp?cpage\\_id=180009766&sec\\_id=180003667](https://www.countyofunion.org/site/cpage.asp?cpage_id=180009766&sec_id=180003667)

- In 1970, Odessa was the first city in Texas to have 9-1-1 installed.  
*Haleyville, where it all began. Dispatch Magazine online, History of 9-1-1. Retrieved 29, Jan. 2019.* [https://www.countyofunion.org/site/cpage.asp?cpage\\_id=180009766&sec\\_id=180003667](https://www.countyofunion.org/site/cpage.asp?cpage_id=180009766&sec_id=180003667)
- Regional Council or Council of Governments - A regional council (RC) or council of governments (COG) – these terms are generally interchangeable, and might also be called regional planning commissions, regional commissions, or planning districts – is a multi-service entity with state- and locally-defined boundaries that delivers a variety of federal, state, and local programs while carrying out its function as a planning organization, technical assistance provider, and “visionary” to its member local

governments. As such, COGs and RCs are accountable to local units of government and effective partners for state and federal governments.

**3.1.2 Learning Objective:** Describe the elements of the 9-1-1 network and call flow process.

### 911 Call Processing



*E9-1-1. Independent Emergency Services, 9-1-1 Call Processing. 2006 Graphic.*  
<http://www.ies911.com/911callprocess.html>

**3.1.3 Learning Objective:** Distinguish how different types of telephones affect a 9-1-1 call.

- Landline phone - a line of transportation or communication on land; especially: a telephone line that transmits signals from one station to another directly along a wire without the use of radio waves.

Merriam Webster. Landline. (Retrieved March 27, 2018) <https://www.merriam-webster.com/dictionary/landline>

- Cellular phones - The number of 9-1-1 calls placed by people using wireless phones has significantly increased in recent years. It is estimated that about 70 percent of 911 calls are placed from wireless phones, and that percentage is growing. For many Americans, the ability to call 911 for help in an emergency is one of the main reasons they own a wireless phone.
  - Unique challenges posed by wireless phones - While wireless phones can be an important public safety tool, they also create unique challenges for emergency response personnel and wireless service providers. Since wireless phones are mobile, they are not associated with one fixed location or address. While the location of the cell site closest to the 9-1-1 caller may provide a general indication of the caller's location, that information is not always specific enough for rescue personnel to deliver assistance to the caller quickly.

FCC. *Consumer Guide. 9-1-1 Wireless Service*, (2015, November 15), (2<sup>nd</sup> Paragraph). <https://transition.fcc.gov/cgb/consumerfacts/wireless911srv.pdf>

- VoIP and internet phone systems - Voice over Internet Protocol (VoIP), is a technology that allows you to make voice calls using a broadband Internet connection instead of a regular (or analog) phone line. Some VoIP services may only allow you to call other people using the same service, but others may allow you to call anyone who has a telephone number - including local, long distance, mobile, and international numbers. Also, while some VoIP services only work over your computer or a special VoIP phone, other services allow you to use a traditional phone connected to a VoIP adapter.

FCC. *Voice-Over-Internet Protocol (VoIP). IP-Enabled Services*. (2007, October 13) <https://www.fcc.gov/general/voice-over-internet-protocol-voip>

- Portable interconnected Voice over Internet Protocol (VoIP) services can be used from virtually any Internet connection anywhere, which raises challenges for the emergency services community in determining the location from which a 911 call has originated.

You should be aware that:

  - VoIP 911 calls may not connect to the PSAP or may improperly ring to the administrative line of the PSAP, which may not be staffed after hours, or by trained 911 operators.
  - VoIP 911 calls may correctly connect to the PSAP, but not automatically transmit the user's phone number and/or location information.
  - VoIP customers may need to provide location or other information to their VoIP providers and update this information if they change locations, for their VoIP 911 service to function properly.
  - VoIP service may not work during a power outage, or when the Internet connection fails or becomes overloaded.

FCC. *Voice-Over-Internet Protocol. Consumer Facts*. (2015, November 2) <https://transition.fcc.gov/cgb/consumerfacts/voip911.pdf>

- Text-to-911 is the ability to send a text message to reach 911 emergency call takers from your mobile phone or device. However, because text-to-911 is currently only

available in certain locations, you should always make a voice call to contact 911 during an emergency whenever possible. If you attempt to send a text to 911 where the service is not yet available, FCC rules require all wireless carriers and other text messaging providers to send an automatic "bounce-back" message that will advise you to contact emergency services by another means, such as making a voice call or using telecommunications relay service. Bounce-back messages are intended to minimize your risk of mistakenly believing that a text to 911 has been transmitted to an emergency call center when it has not.

*FCC. Consumer Guide, Text to 9-1-1-What you need to know. (2017, April 25)*

<https://transition.fcc.gov/cgb/consumerfacts/text-to-911-consumer-guide.pdf>

- Real-time Text (RTT) is a technology that allows text to be sent immediately as it is created through wireless handsets that use IP-based technology on networks that support RTT. With RTT, there is no need to press a "send" key as there generally is for SMS, chat, or other types of texting. A recipient can read a message while the sender types it. Instant text transmissions are similar to the instantaneous exchange of information in voice conversations over the phone and can be critical for emergency calls to 911.

*FCC. Real-Time Text: Improving Accessible Telecommunications. Retrieved 29, January 2019. <https://www.fcc.gov/consumers/guides/real-time-text-improving-accessible-telecommunications>*

- Non-Service-Initialized phones - NSI phones are favorite tools of terrorists, pranksters, telephone hackers and decoy callers. They assume they cannot be located or identified – but in fact, neither is totally true. However, the vast majority of NSI 9-1-1 calls are "real" calls. Always assume a 9-1-1 call from an NSI phone is a bona fide request for emergency service until determined otherwise.
  - NSI calls are frequently confused with ANI failure calls. NSI calls ANI looks like: (911) ###-####. ANI Failure may look like: (###) 911-####. The last 7 digits of an NSI 911 call ANI match the last 7 digits of the phone's electronic serial number ("ESN"). So, if you are dealing with a "false" caller, the ANI record of the call has evidentiary value once the caller is apprehended.
  - NSI phones frequently have no carrier. They access the network via the nearest available tower face. Note that this is not always the closest tower in all situations – the closest tower could already be at full capacity or the signal path to it may be obstructed.
  - NSI phones often ARE locatable as Phase Two calls – and they frequently are received as Phase Two calls, with valid Lat/Longs for the location of the phone when the 911 call was completed. If the caller remains on the line, they can often be ALI re-bid for updated locations, assuming the call does not switch towers. If you are not a Phase Two PSAP, you might try transferring the NSI 911 caller (assuming they stay on the line) to a PSAP that IS Phase Two and have them attempt to perform an ALI re-bid on the call. That MIGHT generate a valid set of Lat/Longs for the caller.
  - Calls from NSI phones do not display or have a working call back number. You cannot call them back.

- Calls from NSI phones cannot usually be backtraced through the carrier – there often is no carrier.
- Keep in mind – there are currently millions of deactivated / no-account (or carrier) cellular telephones being retained by the public specifically for calling 911 in an emergency. These calls will ALL be received as NSI calls, and the vast majority will likely be bona fide, in-progress emergencies. Because the batteries may now be very old, talk time will likely be minimal. They may not even fully complete the call before dying out, so be especially careful of “hang up” NSI 911 calls.
- NSI calls can come from many different types of calling situations and phones:
  - Old phones with no account or carrier
  - Brand new phones when the registration process has not yet been completed
  - GSM Phones running without their SIM cards installed
  - Any phone where the 911 call was initiated while the phone was just turned on and hasn’t finished booting up – “cold start” calls
  - Donated, charity, battered women’s shelter phones, etc.
  - Some older emergency call box phones
  - An improperly registered phone which is now roaming
  - Pre-paid phones now out of minutes
  - In general, almost any cellular or PCS phone without a current wireless carrier
- The pre-paid phones now out of minutes are the favorite tool of the decoy caller or prankster harassing the 911 center. Stolen phones may also be employed.

*NSI. 9-1-1 Calls (“Non-Service Initialized”).*

[http://nd911.homestead.com/08\\_NSI\\_911\\_Calls.pdf](http://nd911.homestead.com/08_NSI_911_Calls.pdf) FCC. 9-1-1 Call-Forwarding Requirements for Non-Initialized Phones. (2015, April 1) 2.

[https://apps.fcc.gov/edocs\\_public/attachmatch/FCC-15-43A1\\_Rcd.pdf](https://apps.fcc.gov/edocs_public/attachmatch/FCC-15-43A1_Rcd.pdf)

### 3.1.4 **Learning Objective:** Identify the different 9-1-1 systems.

- Basic 9-1-1 System (B9-1-1) - Before the designation of 9-1-1 as the nationwide three-digit emergency call number, if someone had an emergency, s/he dialed “0” for an operator. This could be an incredibly stressful situation—and often ineffective—not only for the calling party but also for the telephone company operator who did not necessarily have the best tools to perform emergency call assistance services.

*9-1-1 Institute. History of 9-1-1. (2015, April 15), (Page 3-paragraph 1)*

[http://www.ng911institute.org/wp-content/uploads/2015/10/iCERT-9EF\\_Historyof911\\_WebVersion.pdf](http://www.ng911institute.org/wp-content/uploads/2015/10/iCERT-9EF_Historyof911_WebVersion.pdf)

- Enhanced 9-1-1 System - While B911 was a vast improvement on dialing the operator in the event of an emergency, there was an ever-growing need for faster, more accurate emergency response. As B911 service became more widely established across the country in the early 1970s, 9-1-1 call takers began to see the value of having automatic access to the name, address and

phone number of the emergency caller instead of relying on the caller, who was often not able to provide that information during the call. And as the 9-1-1 system expanded to include more PSAPs, the network needed a way to automatically route 911 calls to the appropriate agency. This led to the establishment of Enhanced 911 (E911) services in the mid-1970s that originally included 9-1-1 selective routing, automatic location information (ALI) and automatic number identification (ANI). E911 eventually evolved to include selective transfer, fixed transfer, alternate routing, default routing, PSAP evacuation (abandonment) routing and call detail record.

*9-1-1 Institute. History of 9-1-1. Enhanced 9-1-1 (2015, April 15), (Page 4)*

[http://www.ng911institute.org/wp-content/uploads/2015/10/iCERT-9EF\\_Historyof911\\_WebVersion.pdf](http://www.ng911institute.org/wp-content/uploads/2015/10/iCERT-9EF_Historyof911_WebVersion.pdf)

- NexGen (NG) 9-1-1 - USDOT views the NG 9-1-1 system as an evolutionary transition to enable the general public to make a 911 “call” 24 from any wired, wireless, or Internet Protocol (IP)-based device, and allow the emergency services community to take advantage of Enhanced 911 call delivery and other functions through new internetworking technologies based on open standards. By enabling the general public to access 911 services through virtually any communications device, the NextGen 911 system provides a more direct ability to request help or share critical data with emergency services providers from any location. In addition, call takers at the public safety answering point (PSAP) will be able to transfer emergency calls to another PSAP and forward the location and other critical data, such as text messages, images, video, with the call.

*9-1-1 Institute. History of 9-1-1. Enhanced 9-1-1 (2015, April 15), (Page 9)*

[http://www.ng911institute.org/wp-content/uploads/2015/10/iCERT-9EF\\_Historyof911\\_WebVersion.pdf](http://www.ng911institute.org/wp-content/uploads/2015/10/iCERT-9EF_Historyof911_WebVersion.pdf)

### **3.1.5 Learning Objective:** Identify Automatic Location Identification (ALI), Automatic Number Identification (ANI), and ANI/ALI Data Fields relevance to emergency telecommunications.

- Automatic Location Identification (ALI) - A feature corresponding to automatic number identification by which the number provided by the automatic number identification feature is matched with the address or location of the telephone from which the call is made and is presented to the public safety answering point along with the number in a computerized 9-1-1 system.

*Health and Safety Code Title 9, Safety Subtitle B, Emergencies. Chapter 772 Local Administration of Emergency Communications. Subchapter A. Sec. 772.001 (1).*

<http://www.statutes.legis.state.tx.us/Docs/HS/htm/HS.772.htm>

- Automatic Number Identification (ANI):  
A feature that enables a service supplier to identify the telephone number of a caller and that operates by forwarding the caller's telephone number to the public safety answering point, where the data is received by equipment that translates it into a visual display.

*Health and Safety Code Title 9, Safety Subtitle B, Emergencies. Chapter 772 Local Administration of Emergency Communications. Subchapter A. Sec. 772.001 (2).*

<http://www.statutes.legis.state.tx.us/Docs/HS/htm/HS.772.htm>

**3.1.6 Learning Objective:** Define the term Public Safety Answering Point (PSAP).

- Public safety answering point is a communications facility that is:
  - Operated continuously;
  - Assigned the responsibility to receive 9-1-1 calls and, as appropriate, to dispatch emergency response services directly or to transfer or relay emergency 9-1-1 calls to other public safety agencies;
  - The first point of reception by a public safety agency of a 9-1-1 call; and
  - Serves the jurisdictions in which it is located or other participating jurisdictions.

*Health and Safety Code Title 9, Safety Subtitle B, Emergencies. Chapter 772 Local Administration of Emergency Communications. Subchapter A. Sec. 772.001 (13).*

<http://www.statutes.legis.state.tx.us/Docs/HS/htm/HS.772.htm>

**3.1.7 Learning Objective:** Define the term Transfer Method.

- Transfer Method - the method of responding to a telephone request for emergency service by which a public safety answering point transfers the call directly to the appropriate public safety agency or another provider of emergency services for appropriate action.

*Health and Safety Code Title 9, Safety Subtitle B, Emergencies. Chapter 772 Local Administration of Emergency Communications. Subchapter A. Sec. 772.001 (18).*

<http://www.statutes.legis.state.tx.us/Docs/HS/htm/HS.772.htm>

- Transfer Protocol - When emergency calls need to be transferred to another PSAP, the telecommunicator will transfer the call without delay. The telecommunicator will advise the caller: "Please do not hang up; I am connecting you with (name of the agency)." The telecommunicator should stay on the line until the connection is complete and all pertinent information has been relayed to the answering PSAP.

Note: For those calls that are transferred to another telecommunicator for the dispatch of emergency services, it is important to ensure that the call has been transferred to the proper agency and that all necessary information has been relayed. If an emergency call must be handled by a secondary PSAP or dispatch authority, the call should be transferred rather than providing the caller with the telephone number of the secondary PSAP and advising them to call there instead.

*NENA. Call Answering Standard/Model Recommendation NENA 56-005.1, 2006, June 10) 3.7 Transferring Emergency Calls (page 9).*

[https://c.ymcdn.com/sites/www.nena.org/resource/resmgr/standards/NENA\\_56-005.1\\_Call\\_Answering.pdf](https://c.ymcdn.com/sites/www.nena.org/resource/resmgr/standards/NENA_56-005.1_Call_Answering.pdf)

- Transfer Liability – Blind Transfer: means failing to advise the calling party that the call is being transferred and failing to remain on the line until there is confirmation that the appropriate transfer has been made.

*State of New Jersey-Office of Emergency Telecommunications Services.*

*Subchapter 1-General Provision 17:24-1.2 Definitions-Blind Transfer (Retrieved*

*2018, March 27).* <http://www.nj.gov/911/resource/reg/index.html#2>

- Call answering - Standard for answering 9-1-1 Calls. Ninety percent (90%) of all 9-1-1 calls arriving at the Public Safety Answering Point (PSAP) shall be answered within ten (10) seconds during the busy hour (the hour each day with the greatest call volume, as defined in the NENA Master Glossary). Ninety-five (95%) of all 9-1-1 calls should be answered within twenty (20) seconds.

*NENA Call Answering Standard/Model Recommendation. NENA 56-005.1, (2006, June 10) page 8.*

[https://c.ymcdn.com/sites/www.nena.org/resource/resmgr/standards/NENA\\_56-005.1\\_Call\\_Answering.pdf](https://c.ymcdn.com/sites/www.nena.org/resource/resmgr/standards/NENA_56-005.1_Call_Answering.pdf)

- Refer to your department policies and procedures manual for more definitions.

## Unit 3.1 Emergency Communications Technology Resources

*E9-1-1. Independent Emergency Services, 9-1-1 Call Processing. 2006 Graphic.*  
<http://www.ies911.com/911callprocess.html>

### Glossary/Acronyms

ANI - (Automatic Number Identification): Telephone number associated with the access line from which a call originates.

ALI - (Automatic Location Identification): The automatic display at the PSAP of the caller's telephone number, the address/location of the telephone and supplementary emergency services information of the location from which a call originates.

Basic 9-1-1 (B 9-1-1) - Basic 9-1-1 means that when the three-digit number is dialed, a call taker/dispatcher in the local public safety answering point (PSAP), or 9-1-1 call center, answers the call. Voice (or TTY) communicates the emergency and its location between the caller and the call taker.

Enhanced 9-1-1 (E 9-1-1) - In areas serviced by enhanced 9-1-1, the call is selectively routed to the proper PSAP for the caller's location, and the PSAP has equipment and database information that displays the caller's phone number and address to the call taker.

Next Generation 9-1-1 (NG 9-1-1) - NG911 is an Internet Protocol (IP)-based system that allows digital information (e.g., voice, photos, videos, text messages) to flow seamlessly from the public, through the 911 network, and on to emergency responders.

Public Safety Answering Point (PSAP) - An entity responsible for receiving 9-1-1 calls and processing those calls according to a specific operational policy.

Transfer method - means the method of responding to a telephone request for emergency service by which a public safety answering point transfers the call directly to the appropriate public safety agency or another provider of emergency services for appropriate action.

VoIP (Voice over Internet Protocol) - Technology that permits delivery of voice calls and other real-time multimedia sessions over IP networks.

**3.2.0 Unit Goal:** Summarize the legislation, systems, and technology that provides an equal level of service to citizens who are Deaf or Hard of Hearing or speech impaired.

**3.2.1 Learning Objective:** Identify the requirements of the American with Disabilities Act (ADA) involving public safety Telecommunicators.

- The ADA requires that all Public Safety Answering Points (PSAPs) provide direct and equal access to their services for people with disabilities who use teletypewriters (TTYs).
  - “Direct access” means that PSAPs must directly receive TTY calls without relying on an outside relay service or third-party services.
  - “Equal access” means that the telephone emergency services provided for TTY users are as effective as those provided for people who make voice calls. Access must be equal in terms of:
    - response time;
    - response quality;
    - hours of operation; and
    - all other features offered (e.g., automatic number identification, automatic location identification, automatic call distribution).
  - All basic emergency services provided by public safety agencies are covered, including police, fire, and ambulance services. Direct, equal access must be provided to all services included in the system. An example of another emergency service covered is an emergency poison control information service.
  - Some emergency communications services use a two-tiered system to dispatch services. In these situations, a primary PSAP is the initial 9-1-1 answering point. It transfers calls to secondary PSAPs, such as fire or emergency medical services. In those transfer situations, PSAPs must understand how to correctly transfer TTY calls. Secondary PSAPs have the same responsibilities under the ADA as do primary PSAPs. They must be able to receive transferred TTY calls as efficiently and effectively as voice calls.

*Department of Justice Nondiscrimination on the Basis of State and Local Government Services Regulations, 28 C.F.R. Part 35, § 35.162 (2005). See [www.ada.gov/reg2.htm](http://www.ada.gov/reg2.htm) for the complete text of 28 C.F.R. Part 35.*

- A Teletypewriter (TTY) - TTY is a device that is used with a telephone to communicate with persons with hearing disabilities or speech disabilities. To communicate by TTY, a person types his or her conversation, which is then read on a TTY display or a computer display by the person who receives the call. Both parties must have a TTY or a computer with a TTY modem and related software to communicate. The computer equipment must be compatible with the code used by TTYs and capable of translating between the TTY code and the computer code.
  - Most TTY devices transmit the information typed through the telephone line in an electronic code called Baudot. When it reaches the receiving TTY, the code is translated back to characters. Computers with TTY modems generally operate in American Standard Code for Information Interexchange (ASCII), an electronic “language.” Thus, computers must have an ASCII/Baudot modem and related software in order to translate Baudot sent from TTYs.

- 9-1-1 is a universal emergency number, but it may not be the number used in your area. If your locality has emergency communications services but uses different emergency numbers, such as a seven-digit number, you are still required to comply with requirements under Title II of the ADA for emergency communications.
- The only real difference is the options for TTY users. Localities that use 9-1-1 are prohibited from requiring TTY users to call a different number. However, entities that do not use 9-1-1 may have a separate line for TTY users. If a separate line is used, access must be as direct and as equal to access for voice callers. Wherever the emergency numbers are listed, the TTY number must be listed as prominently as the voice number.

*Department of Justice Americans with Disabilities Act Title II Technical Assistance Manual II - 7.300 (1993). See [www.ada.gov/taman2.html](http://www.ada.gov/taman2.html) for the text of the Technical Assistance Manual.*

- When a standard TTY is used, communications can only occur in one direction at a time. In other words, the two people involved in the conversation must take turns sending and receiving. A person sending a communication by TTY indicates that he or she has finished transmitting by typing the letters “GA,” which stand for “go ahead.”
- Baudot Format is a type of TTY code. Title II requires that telephone emergency service systems be compatible with all codes used for TTY communications. Currently, telephone emergency services must only be compatible with Baudot format.
  - Some TTYs emit a recorded spoken announcement to the call taker that a TTY call is being received. For example, the announcement may state: “HEARING IMPAIRED CALLER. USE TTY.”
  - TTY callers may press TTY keys to emit audible tones and more quickly notify the call taker that a TTY call is being placed.
- You may not know you have a TTY call unless you query the line with a TTY. Often, the TTY call will be perceived by the call taker as a silent, open line call. This is because the caller’s equipment does not recognize that the call has been answered until the call taker sends a TTY response.
  - Historically, many people who used TTYs have not had confidence in the accessibility of emergency communications services. Silent, open lines have commonly been treated as hang-ups even though silence may indicate there is a TTY caller on the line. The number of TTY calls each PSAP receives may increase over time because the ADA is making 9-1-1 and other emergency services more accessible to people who use TTYs.
- PSAPs must provide direct and equal access to emergency communications services for people who use TTYs.
  - In order to provide equal access to TTY users, every call-taking position within the PSAP must have its own TTY or TTY-compatible equipment. PSAPs must have systems that enable call takers to handle TTY calls as properly, promptly, and reliably as voice calls.
- Every call-taking position must have its own TTY or TTY-compatible equipment to give TTY users equal access to emergency call services. Experience has shown that:

- With TTY or TTY-compatible equipment at each call-taking position, call takers can handle TTY calls as effectively as voice calls.
- Call takers at PSAPs that have only one TTY have significant difficulties handling TTY calls as quickly as voice calls.
- Sharing a TTY among several call takers may result in undue delay in obtaining the TTY and connecting it to the answering position.
- Transferring a TTY call from a non-TTY capable answering position to a TTY-dedicated position may result in the call being disconnected or undue delay in answering the call. In some cases, transfers may result in the loss of enhanced features, such as automatic number identification and automatic location identification information.
- Each call taker needs to query every silent, open line as a potential TTY call. Because most PSAPs receive many silent, open line calls, often more than one at a time, each call taker must have his or her own TTY equipment to be able to query all of those calls with a TTY.
- Automatic Identification Features:
  - Many PSAPs have equipment with advanced features that facilitate quicker responses to callers. For example, many have automatic number identification (ANI) and automatic location identification (ALI). These features automatically tell the call taker the phone number and address from which a call originates.
  - If your area's emergency service provider has these features, you must ensure that TTY calls have the same access as voice calls to such enhanced features whenever feasible. Such features are currently available for TTY calls placed using traditional TTY hook-ups to standard telephone lines. Emergency service providers need to stay current with changing technology to ensure that equal access and services are provided to TTY callers relying on newer technologies when they become available.
  - TTY calls may not simply be transferred to a third line to get this information because transfers often result in the loss of the automatic phone number and address information.
- Automatic Call Distribution (ACD):
  - Another feature employed by PSAPs is automatic call distribution (ACD). ACD places incoming calls into a queue, sends out a programmed message to callers to let them know that their calls have been received, and distributes calls to the next available call taker. This feature, if offered, must also be accessible for TTY calls. For TTY callers transferred to a queue using ACD, there must be a programmed TTY message providing the same information that other callers receive.
- Switching between Voice Mode and TTY Mode - All call takers must have the capability to switch back and forth easily from TTY mode to voice mode during the same call. This is especially necessary for silent calls because it allows the call taker to first query the line by voice and then quickly switch to query the line by TTY.
- Voice Carryover and Hearing Carryover:
  - Voice carryover (VCO) is a communication hybrid of TTY and voice. With VCO, a person with hearing loss can speak directly to the call taker and read the response that is typed back.

- Hearing Carryover (HCO) allows a TTY user to type words on the TTY and hear call takers' spoken responses through the handset.
- Having equipment that can switch back and forth between voice mode and TTY mode is also necessary for VCO and HCO. These types of communication can shorten the length of calls that would otherwise be conducted exclusively by typing.
- Both of these types of communication can be accomplished using standalone TTY equipment and alternating between speaking into the handset and placing the handset in the TTY when the caller (HCO) or call taker (VCO) types a response.
- VCO (Voice Carryover) is often used by persons who become deaf or hard of hearing later in life and prefer to speak instead of type.
- HCO (hearing carryover) is often used by persons who are not deaf or hard of hearing but have speech disabilities.
- Maintenance and Back-up of TTY Equipment:
  - The ADA regulation contains a specific provision requiring that covered entities maintain their accessible features and equipment in operable working condition. To comply with this regulation, PSAPs must implement procedures for maintenance and backup capability for TTY equipment that is equally effective as the procedures for maintenance and backup capability provided for voice telephone equipment. For example, TTY equipment must be maintained and tested as often as voice equipment to ensure that it is working properly.
  - If a PSAP has a plan for backup equipment in case some of its equipment malfunctions, the telephone lines malfunction, or there is a power failure, the plan must provide for TTY calls and equipment. For instance, PSAPs should keep extra TTY equipment on hand, in case primary equipment fails, if they have backup voice telephone equipment for such a situation.
- Training Call Takers to Respond Effectively to TTY Calls:
  - PSAPs should train their call takers to effectively recognize and process TTY calls. Providing appropriate equipment is only as effective as your staff training.
  - The ADA does not specify how call takers should be trained. But the Department of Justice believes that the following are essential for proper training:
    - a. Training should be mandatory for all personnel who may have contact with individuals from the public who have hearing or speech disabilities.
    - b. PSAPs should require or offer a refresher training at least as often as they require or offer training for voice calls, but at a minimum, every six months.
    - c. The checklist included with this chapter has additional information about what should be included in a comprehensive training program. You should use this checklist to assess your current training program for emergency call services, policies and procedures, and testing program.
- Common TTY Abbreviations:

- GA: go ahead, your turn to talk
- GA or SK: go ahead, or goodbye or stop keying
- SKSK: stop keying, end of the conversation
- U: you
- UR: your
- R: are
- TMW: tomorrow
- XXXX: error, erase
- ASAP: as soon as possible
- CD or CLD: could
- SHD: should
- HD or HLD: hold, please
- MSG: message
- NBR or NU: number
- PLS: please
- Q or QQ: question mark
- VCO: (Voice Carryover) TTY user will use his/her voice during a call
- HCO: (Hearing Carryover) TTY user will use his/her hearing during the call
- TTY: teletypewriter
- Testing to Ensure Direct, Equal Access:
  - Frequent testing is essential to ensure direct, equal access to emergency communications services. The best way to test is to implement an internal testing program. The goal of these tests is to determine whether TTY equipment functions properly and whether personnel have been adequately trained to handle TTY calls correctly.
  - Include these steps in your testing:
    - Conduct two types of test calls: silent, open line calls in which no tones are emitted, and calls in which the caller introduces the call by transmitting TTY tones. These tests should be unannounced and should cover each call taker and each position.
    - Keep records of the results of all test calls. Include, at a minimum, the date and time of each test call; the identification of the call taker and the call taking position; whether each call was silent or transmitted tones; whether the caller received a TTY response and the content of the TTY response; the time elapsed and the number of rings from the initiation of the TTY call until the call taker responded by TTY; and whether the call was processed according to the PSAP's standard operating procedures.
- Beyond TTYs: Providing 9-1-1 and Emergency Services Via New Communication Technologies:
  - Some people who have hearing disabilities do not have access to TTYs. This is becoming more and more the case as people who are deaf, just like people in general, communicate using the internet and other relatively new technologies. Because of these advances in communication technology, some deaf people and people with speech disabilities no longer have TTYs in their homes and rely instead on instant messaging, text messaging, email, or the video communication features of computers.

- State and local governments are responsible under Title II of the ADA for providing effective communication and equal access to 9-1-1 and other emergency services. To achieve effective communication, access to 9-1-1 services should be made available, when feasible, to people with hearing and speech disabilities who use communication technologies other than standard telephones or TTYs, such as personal digital assistants (PDAs) or other wireless technologies.
- Stay informed about emerging communication technologies as well as the technical abilities of telecommunications equipment and service providers. Meet with members of your community who are deaf, hard-of-hearing, or who have speech disabilities to learn what technologies are available in their homes and elsewhere when emergency assistance is needed. Find out about strategies that other emergency communications services are using to provide effective communications to people with hearing and speech disabilities who do not have TTYs. Train PSAP personnel frequently (at least every six months) and update the training as necessary. Finally, use the checklist included in this chapter to determine if your emergency communications service is providing effective communication as required by Title II of the ADA.

*ADA Best Practices Tool Kit for State and Local Governments Chapter 4(A), (C-6) and 9-1-1, Emergency Communications-7. Training Call Takers to Respond Effectively to TTY Calls*  
<https://www.ada.gov/pcatoolkit/chap4toolkit.htm>

- TTYs & Telephone Relay Services - Telephone relay services are provided by States, as required by Title IV of the ADA, and are regulated by the Federal Communications Commission. Relay services involve a communications assistant who uses both a standard telephone and a TTY to type voice communication to a TTY user and read a TTY user's typed communication to a voice telephone user. Telephone relay services are not as effective for emergencies, because they are far more time-consuming than calls between two TTYs.

*Americans with Disabilities Act: Access for 9-1-1 Telephone Emergency Services, I. Introduction (Page 3.).* <https://www.ada.gov/911ta.pdf>

- Title II Checklist:
  - Do you have a TTY or TTY compatible equipment at every emergency communications services call-taking position?
  - Do you have procedures for maintaining TTYs and TTY compatible equipment that is as effective as the maintenance procedures for voice telephone equipment?
  - If you have a plan for backup equipment in case of equipment malfunctions, telephone line malfunctions, or power failure, does that plan cover TTY calls and equipment?
  - Is the response time of the telephone emergency services provided for TTY users equal to the response time of the services provided to others?
  - Is the response quality of the telephone emergency services provided for TTY users equal to the response quality of the services provided to others?
  - Are the hours of operation of the telephone emergency services provided for TTY users equal to the hours of operation of the services provided to others?
  - If the telephone emergency services provided additional features (such as automatic number identification, automatic location identification, automatic call distribution), are the features provided to TTY users equal to the features

provided to others, whenever feasible? (Feasibility should be determined based on the availability of technology in the marketplace to perform the function for communications received from TTY users.)

- Do call takers respond to each silent, open line call by querying the line with a TTY?
- Can all call takers easily switch back and forth between TTY mode and voice mode during a call?
- Is TTY training mandatory for all emergency communications services personnel who may have contact with individuals from the public who have hearing or speech disabilities?
- Do telephone emergency services require or offer refresher training for TTYs at least as often as they require or offer training for voice calls, and at least every six months?
- Do you test your telephone emergency services to ensure direct, equal access for people using TTYs?

*Chapter 4 Addendum: Title II Checklist (9-1-1 and Emergency Communications Services)*

[https://ada.gov/pcatoolkit/ch4\\_chklist.pdf](https://ada.gov/pcatoolkit/ch4_chklist.pdf)

**3.2.2 Learning Objective:** Explain the different technologies and systems used to provide Deaf and Hard of Hearing citizen's access to emergency services and basic operating functions.

- **Telecommunications Relay Service:** Telecommunications Relay Service (TRS) is a telephone service that allows persons with hearing or speech disabilities to place and receive telephone calls. TRS is available in all 50 states, the District of Columbia, Puerto Rico and the U.S. territories for local and/or long-distance calls. TRS providers – generally telephone companies – are compensated for the costs of providing TRS from either a state or a federal fund. There is no cost to the TRS user.
  - How TRS works - TRS uses operators, called communications assistants (CAs), to facilitate telephone calls between people with hearing and speech disabilities and other individuals. A TRS call may be initiated by either a person with a hearing or speech disability or a person without such disability. When a person with a hearing or speech disability initiates a TRS call, the person uses a teletypewriter (TTY) or other text input device to call the TRS relay center and gives a CA the number of the party that he or she wants to call. The CA places an outbound traditional voice call to that person, then serves as a link for the call, relaying the text of the calling party in voice to the called party, and converting to text what the called party voices back to the calling party.
  - Forms of TRS available: There are several forms of TRS, depending on the particular needs of the user and the equipment available:
    - Text-to-Voice TTY-based TRS is a "traditional" TRS service using a TTY to call the CA at the relay center. TTYs have a keyboard and allow people to type their telephone conversations. The text is read on a display screen and/or a paper printout. A TTY user calls a TRS relay center and types the number of the person he or she wishes to call. The CA at the relay center then makes a voice telephone call to the other party to the call and relays the callback and forth between the parties by speaking what a text user types and typing what a voice telephone user speaks.

- Voice Carry Over allows a person with a hearing disability, but who wants to use his or her own voice, to speak directly to the called party and receive responses in text from the CA. No typing is required by the calling party. This service is particularly useful to senior citizens who have lost their hearing, but who can still speak.
- Hearing Carry Over allows a person with a speech disability, but who wants to use his/her own hearing, to listen to the called party and type his/her part of the conversation on a TTY. The CA reads these words to the called party, and the caller hears responses directly from the called party.
- Speech-to-Speech Relay Service is used by a person with a speech disability. A CA (who is specially trained in understanding a variety of speech disorders) repeats what the caller says in a manner that makes the caller's words clear and understandable to the called party. No special telephone is needed.
- Shared Non-English Language Relay Services - Due to a large number of Spanish speakers in the United States, the FCC requires interstate TRS providers to offer Spanish-to-Spanish traditional TRS. Although Spanish language relay is not required for intrastate (within a state) TRS, many states (including Texas) with large numbers of Spanish speakers offer this service on a voluntary basis. The FCC also allows TRS providers who voluntarily offer other shared non-English language interstate TRS, such as French-to-French, to be compensated from the federal TRS fund.
- Captioned Telephone Service is used by persons with a hearing disability but some residual hearing. It uses a special telephone that has a text screen to display captions of what the other party is saying (Federal Communications Commission · Consumer and Governmental Affairs Bureau, 445 12 St. SW. Washington, DC 20554 1-888-CALL-FCC (1-888-225-5322) TTY: 1-888-TELL-FCC (1-888-835-5322)). A captioned telephone allows the user, on one line, to speak to the called party and to simultaneously listen to the other party and read captions of what the other party is saying. There is a “two-line” version of captioned telephone service that offers additional features, such as call-waiting, \*69, call forwarding, and direct dialing for 911 emergency service. Unlike traditional TRS (where the CA types what the called party says), the CA repeats or re-voices what the called party says. Speech recognition technology automatically transcribes the CA’s voice into text, which is then transmitted directly to the user’s captioned telephone text display.
- IP Captioned Telephone Service combines elements of captioned telephone service and IP Relay. IP captioned telephone service can be provided in a variety of ways but uses the Internet – rather than the telephone network – to provide the link and captions between the caller with a hearing disability and the CA. It allows the user to simultaneously both listen to, and read the text of, what the other party in a telephone conversation is saying. IP captioned telephone service can be used with an existing voice telephone and a computer or other Web-enabled device without requiring any specialized equipment. For more information regarding IP captioned telephone service, visit <https://consumercomplaints.fcc.gov/hc/enus/articles/203515890-IP-Relay-Service>.

- Internet Protocol Relay Service is a text-based form of TRS that uses the Internet, rather than traditional telephone lines, for the leg of the call between the person with a hearing or speech disability and the CA. Otherwise, the call is generally handled just like a TTY-based TRS call. The user may use a computer or other web-enabled device to communicate with the CA. IP Relay is not required by the FCC but is offered by several TRS providers. For more information regarding IP Relay visit <https://consumercomplaints.fcc.gov/hc/en-us/articles/203515890-IP-Relay-Service>.

*Telecommunications Relay Services (TRS) Federal Communications Commission (FCC)*  
<https://www.fcc.gov/consumers/guides/telecommunications-relay-service-trs>

- Video Relay Service (VRS) – This Internet-based form of TRS allows persons whose primary language is American Sign Language to communicate with the CA in ASL using video conferencing equipment. The CA speaks what is signed to the called party and signs the called party's response back to the caller. VRS is not required by the FCC but is offered by several TRS providers. VRS allows conversations to flow in near real time and in a faster and more natural manner than text-based TRS. Beginning January 1, 2006, TRS providers that offer VRS must provide it 24 hours a day, seven days a week, and must answer incoming calls within a specific period of time so that VRS users do not have to wait for a long time. For more information regarding VRS visit [www.fcc.gov/guides/video-relay-services](http://www.fcc.gov/guides/video-relay-services).

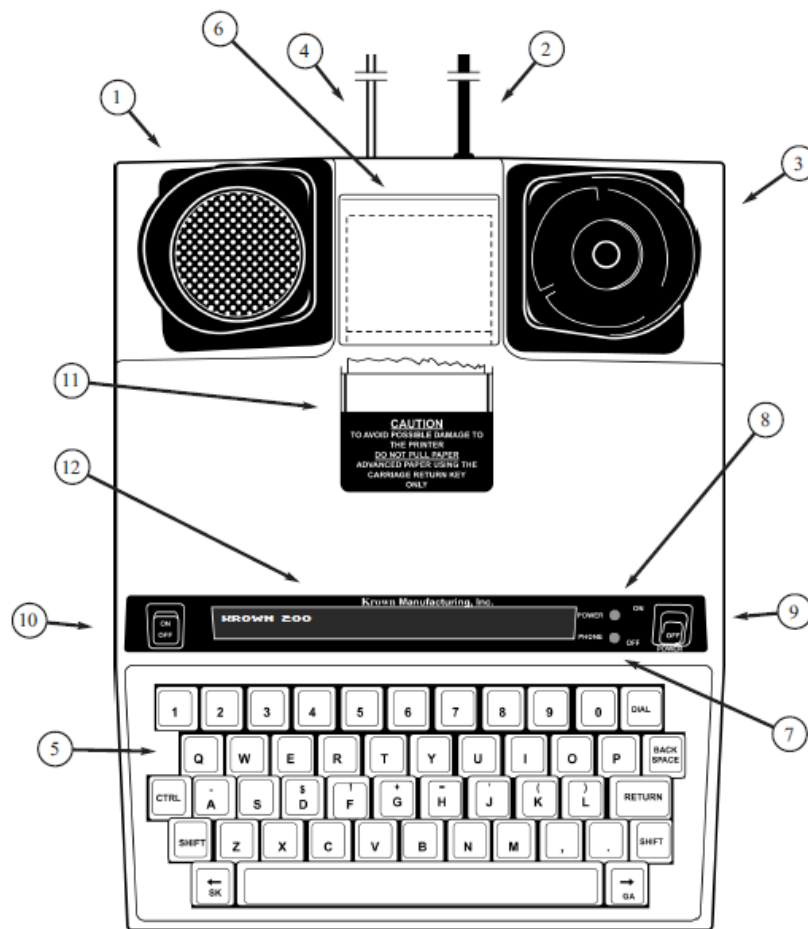
*Video Relay Services (VRS) Federal Communications Commission (FCC) Video Relay Service (VRS)* <https://www.fcc.gov/consumers/guides/telecommunications-relay-service-trs>

- 711 Access to TRS - Just as you can call 411 for information, you can dial 711 to connect to certain forms of TRS anywhere in the United States. Dialing 711 makes it easier for travelers to use TRS because they do not have to remember TRS numbers in every state. Because of technological limitations, however, 711 access is not available for the Internet-based forms of TRS (VRS and IP Relay).

*711 for Telecommunications Relay Service. FCC (Retrieved May 2, 2018)*  
[www.fcc.gov/guides/711-telecommunications-relay-service](http://www.fcc.gov/guides/711-telecommunications-relay-service)

### 3.2.3 **Learning Objective:** Identify the components of a TTY.

- In order to afford equal access to TTY users, every call-taking position within PSAP must have its own TTY or TTY-compatible equipment.
- Printer, acoustic coupler, on/off switch, keyboard, message display, and space bar.
  - Printer – receives characters printed in ALL CAPITAL LETTERS and transmits characters printed in lowercase letters.
  - Acoustic Coupler – holds the handset, the audio to the right and the speaker to the left.
  - On/Off Switch – Press for on, press for off, maybe a toggle switch (most standard models).
  - Keyboard – Conversation, dialing and shortcut components function from the keyboard.
  - Message Display – usually lighted upper-case letters will appear on the display.
  - Space Bar – Moves the cursor one space forward.
  - Components of a TTY:



|                     |                |                     |
|---------------------|----------------|---------------------|
| 1. Acoustic Coupler | 5. Keyboard    | 9. Power Switch     |
| 2. AC Power Jack    | 6. Paper Cover | 10. Printer Switch  |
| 3. Battery Pack     | 7. Phone Light | 11. Thermal Printer |
| 4. Dual Phone Jacks | 8. Power Light | 12. Visual Display  |

Krown. Krown Manufacturing Inc., Instruction Manual Krown 200 (Model: Krown200).

(Retrieved 2018, April 11). Page 6-13. <http://krownmfg.com/wp-content/uploads/2014/06/krown200.pdf>

Federal Communications Commission (FCC) Access for 9-1-1 and Telephone Emergency Services, B. Equipment and C. Other Requirements for TTY Equipment

<https://www.fcc.gov/general/access-9-1-1-and-telephone-emergency-services>

### 3.2.4 **Learning Objective:** Review the methods for handling a TDD call.

- Possible methods include but are not limited to Customer Premise Equipment and Standalone equipment. Procedures for Handling TTY Calls:
  - In addition to proper equipment, direct, equal access for TTY calls requires that PSAPs use effective procedures for recognizing and responding to TTY calls.
  - Recognizing TTY Calls/Treating Silent, Open Lines as Potential TTY Calls.
  - All call takers must be able to recognize and handle TTY calls properly. There are three types of TTY calls a call taker may receive. Some TTYs emit a recorded spoken announcement to the call taker that a TTY call is being placed, such as

"HEARING IMPAIRED CALLER. USE TTY." Other times, TTY callers may press TTY keys to emit audible tones and more quickly notify the call taker that a TTY call is being placed. Most often, however, a person using a TTY will make a call that is perceived by the call taker as a silent, open line call. This is because the caller's equipment does not recognize that the call has been answered until the call taker sends a TTY response.

- The only way for PSAPs to properly identify all TTY calls is for call takers to recognize TTY tones and to query every silent, open line call with a TTY to determine if it is a TTY call after it has been queried by voice.
- Requiring Callers Using TTYs to Press a Key:
  - In the past, some PSAPs have required callers using TTYs to press the space bar or other keys after they call, to emit tones and notify call takers that it is a TTY call. This requirement violates the ADA. Requiring TTY callers to press keys repeatedly until recognized is unfamiliar to most TTY callers, and callers cannot be relied on to perform such unfamiliar tasks, especially in emergency situations. Further, in many emergency situations, there may not be time or opportunity to press keys repeatedly until recognized.
  - ILLUSTRATION: A 9-1-1 call taker answers a call, responds with a standard spoken greeting, and expects to hear a spoken response. If the call taker receives a silent, open line, the call taker should query the line verbally a second time, and then query the line using a TTY to determine if the call is from a TTY user.

*Federal Communications Commission (FCC) Access for 9-1-1 and Telephone Emergency Services, D. Procedures for Handling TTY Calls, E. Training, and F. Testing*  
<https://www.fcc.gov/general/access-9-1-1-and-telephone-emergency-services>

## Unit 3.2 Emergency Communications Technology Resources

- Relay Texas Instructional Videos: Relay Texas TTY, Published on August 1, 2013, Retrieved January 19, 2018; Relay Texas VCO Published August 6, 2013, Retrieved January 19, 2018; Relay Texas HCO, Published on August 13, 2013, Retrieved on January 19, 2018, <http://relaytexas.com/support/videos/instructional-videos/>
- NENA Video Relay Service & IP Relay Service PSAP Interaction Information Document NENA-INF-013.2-2015 (originally 52-502) June 27, 2015, [http://c.ymcdn.com/sites/www.nena.org/resource/resmgr/Standards/NENA-INF-013\\_2-2015\\_origina.pdf](http://c.ymcdn.com/sites/www.nena.org/resource/resmgr/Standards/NENA-INF-013_2-2015_origina.pdf)
- APCO/NENA ANS 3.105.1-2015 Minimum Training Standards for TTY/TDD Use in the Public Safety Communications Center February 24, 2015, <https://www.apcointl.org/doc/911-resources/apco-standards/594-31051-2015-tty-tdd-training/file.html>
- Krown. Krown Manufacturing Inc., *Instruction Manual Krown 200 (Model: Krown200)*. (Retrieved 2018, April 11). Page 6-13. <http://krownmfg.com/wp-content/uploads/2014/06/krown200.pdf>

### Glossary/Acronyms

Telecommunications Relay Service (TRS) - Telephone transmission services that provide the ability for individuals who are Deaf, Hard of Hearing or have speech disability to engage in communication by wire or radio with one or more individuals, in a manner that is functionally equivalent to the ability of a hearing individual who does not have a disability to communicate using voice communication services by wire or radio. TRS includes services that enable two-way communication between an individual who uses a text telephone or other nonvoice terminal device and an individual who does not use speech-to-speech services, video relay services and non-English relay services.

Telecommunications Device for the Deaf (TDD) – A telecommunications device for the deaf (TDD) is a teleprinter, an electronic device for text communication over a telephone line, that is designed for use by persons with hearing or speech difficulties.

Teletypewriter (TTY) - A teletypewriter/teleprinter is an electromechanical typewriter that can be used to send and receive typed messages through various communications channels, in both point-to-point and point-to-multipoint configurations.

Video Relay Service (VRS) - A telecommunications relay service that allows people with hearing or speech disabilities who use sign language to communicate with voice telephone users through video equipment. The video link allows the CA to view and interpret the party's signed conversation and verbally relay the conversation back and forth with a voice caller.

**3.3.0 Unit Goal:** Summarize systems and functionality used in public safety emergency communications Computer-Aided Dispatch (CAD) systems.

**3.3.1 Learning Objective:** Define the purpose of a Computer Aided Dispatch (CAD) system and describe the basic functions and design.

- CAD system is the principal application used by public safety agencies to manage law enforcement, fire, and EMS incidents from the initial time an incident is reported to the conclusion of the incident. CAD is also used to track the status and location of resources, and for post-incident analysis of the response.

*APCO ANS 1.110.1-2015. Multi-Functional Multi-Discipline, Computer Aided Dispatch (CAD) Minimum Functional Requirements (page 13, 1.1)*

<https://www.apcointl.org/download/apco-ans-1-101-1-2015-multi-functional-multi-discipline-cad/?wpdmdl=5951&ind=0>

- CAD basic functions:
  - Receive calls for service
  - Automatic prioritizing of calls
  - Unit recommendations
  - Dispatch and clear calls
  - Unit status
  - Location history
  - Location information/warning or cautions
  - Send and retrieve messages
  - Emergency message communications
  - Store and retrieve data
  - Recording and playback (if available)
  - 10. Other if applicable: \_\_\_\_\_

*APCO ANS 1.110.1-2015. Multi-Functional Multi-Discipline, Computer Aided Dispatch (CAD) Minimum Functional Requirements (page 13, 1.1)*

<https://www.apcointl.org/download/apco-ans-1-101-1-2015-multi-functional-multi-discipline-cad/?wpdmdl=5951&ind=0>

- The CAD system is one of the most important tools utilized by a Public Safety Answering Point (PSAP). All reported incidents are entered, dispatched, managed, and tracked via the CAD system, making it a mission-critical system. The lives of citizens and public safety personnel heavily depend on the CAD system consistently performing at its maximum operational effectiveness and reliability.
  - Although a CAD system is just one of many systems that public safety departments utilize it is often considered the heart of public safety operations. Following are a few of many reasons for this:
    - Virtually all law enforcement, fire, and EMS incidents flow through the CAD system.
    - Many public safety technology systems, such as 9-1-1, Geographic Information System.
    - (GIS)/Mapping, Automatic Vehicle Location (AVL), MDCs, Records Management Systems (RMS), and data mining applications are either an integrated part of, or are interfaced with, the CAD system.

- The CAD system is often the primary connection CAD users have to external systems, including neighboring and remote CAD systems, regional RMS, and state and federal criminal databases such as the Department of Motor Vehicles (DMV), Nlets (The International Justice & Public Safety Network), the Federal Bureau of Investigation National Crime Information Center (FBI NCIC), and the FBI's National Data Exchange (N---DEx).
- The CAD system is the primary tool used for public safety resource management.

APCO ANS 1.110.1-2015. *Multi-Functional Multi-Discipline, Computer Aided Dispatch (CAD) Minimum Functional Requirements* (page 48). <https://www.apcointl.org/doc/911-resources/apco-standards/584-11011-2015-multi-functional-multi-discipline-cad/file.html>

**3.3.2 Learning Objective:** Define the purpose of a Mobile Data Terminal, describe the basic functions and design, and list other common named systems in use such as Mobile Data Browser, Mobile Data System, Mobile Data Computer, etc.

- A Mobile Data System is a computerized device used in a vehicle to exchange information between an end user and a communications center.

*Mobile Data Terminal. NENA Master Glossary of 9-1-1 Terminology NENA-ADM-000.22-2018, 04/13/2018, page 130*

[https://c.ymcdn.com/sites/www.nena.org/resource/resmgr/standards/NENA-ADM-000.22-2018\\_FINAL\\_2.pdf](https://c.ymcdn.com/sites/www.nena.org/resource/resmgr/standards/NENA-ADM-000.22-2018_FINAL_2.pdf)

- Benefits of Mobile Computing - The degree of benefit a department achieves from mobile computing technology depends considerably on which hardware, software, and accompanying technologies are implemented:
  - Reduced Radio Congestion
  - Lighter Dispatch Workload
  - Easier Resource Management, Allocation, and Supervision
- Other benefits include improved intradepartmental communications, support for community-based policing, less expense when a report changes, lower training costs, increased officer confidence and improved professional image for the department.
- MDT basic functions:
  - View and receive calls for service
  - Unit capability to change own status
  - View all units and their status
  - Location history
  - Location information/warning
  - Send and retrieve messages
  - Emergency message communications
  - Store and retrieve data
  - Report writing
  - MDT design interfaces include TLETS/TCIC/NCIC Interface, RMS Interface, Bar Code Reader, etc.

*Mobile Computing Technologies. IACP/COPS Technology Technical Assistance. Program*  
<https://www.coursehero.com/file/28889428/MobileComputingpdf/>

## Unit 3.3 Emergency Communications Technology Resources

### Glossary/Acronyms

AVL – Automatic Vehicle Location: A means for determining the geographic location of a vehicle and transmitting this information to a point where it can be used.

CAD – Computer Aided Dispatch: A computer-based system, which aids PSAP

Telecommunicators by automating selected dispatching and record keeping activities.

GIS – Geographical Information System: A system for capturing, storing, displaying, analyzing and managing data and associated attributes which are spatially referenced.

MDT – Mobile Data Terminal: A Mobile Data System is a computerized device used in a vehicle to exchange information between an end user and a communications center.

RMS – Records Management System: The management of records for an organization throughout the records-life cycle. The activities in this management include the systematic and efficient control of the creation, maintenance, and destruction of the records along with the business transactions associated with them. Considered a key component of operational efficiency, record management adds more value to an organization's information assets.

**3.4.0 Unit Goal:** Summarize systems and technology used in public safety emergency communications maps and recorders.

**3.4.1 Learning Objective:** Identify various types of mapping tools utilized in a communications department/center.

- Mapping equipment and systems, including, but not limited to:
  - Printed maps - a representation usually on a flat surface of the whole or a part of an area.

*Merriam-Webster. Map. 2018, April 20. 1. a. <https://www.merriam-webster.com/dictionary/map>*

- AVL Maps - Automatic vehicle location (AVL) systems present to the dispatcher of emergency response units (e.g., police cars, ambulances) the estimated real-time locations of units within his/her service area.

*Larson, Richard. Science Direct, Evaluating dispatching consequences of automatic vehicle location in emergency services. Volume 5, Issue 1, 1978 Pages 11-30.*

<https://www.sciencedirect.com/science/article/pii/030505487890014X>

- Building Blueprints (malls, apartments, schools, and business) - A blueprint is a map of a building. It ties the concept of design to the details required to erect a structure. Blueprints, otherwise known as architectural drawing sets, have been used since the 19th century and are a guide through the construction process. They are most commonly used by contractors to apply for building permits from the municipality within which the construction is taking place. Once the blueprints have been filed by the contractor with the municipality building department, these building plans are public records and technically attainable by anyone wanting to view them.

*Andreescu, Laura. America Building Record (ABR). How to find Blueprints of a Building.*

2017, December 15. <https://www.buildingrecords.us/blog/how-to-find-blueprints-of-a-building>

- USNG-United States National Grid - The Federal Geographic Data Committee's U.S. National Grid (USNG) standard provides a nationally consistent language of location that has been optimized for local applications.
  - All street maps use a standard set of street names and addresses to locate places. The USNG does not replace this practice; it supplements it. The USNG expands the utility of street, and other, maps by adding several powerful features: It provides a grid reference system that is seamless across jurisdictional boundaries; it provides the foundation for a universal map index; it describes point-locations on appropriately gridded paper and digital maps; it allows geopositioning using Global Positioning System (GPS) receivers; and it supports Worldwide Web map portals that link digital maps and GPS data.
  - USNG may be the only unambiguous way to describe locations when the end-user is operating either in an area away from an established road network or in an area impacted by a natural disaster where road signs have been destroyed.
  - Private Citizens, public agencies, and commercial enterprises can use USNG. It has obvious applications in navigation, public safety response (e.g., police,

fire, rescue, National Guard), and web-enabled directions to businesses and other public/private facilities.

- USNG is a Presentation Standard. It does not replace data storage formats for either Geographic Information Systems (GIS) or the State Plane Coordinate System (SPCS) for engineering and survey applications.

USNG. *U.S. National Grid Supporting Public Safety, Commerce, and the General Public.*

2006, April 20. [https://www.fgdc.gov/usng/educational-resources/USNG\\_ExecSumV060420.pdf](https://www.fgdc.gov/usng/educational-resources/USNG_ExecSumV060420.pdf)

- Digital and online map tools (XY Coordinates, Keymap) - The digital map is an electronic map, which operation is based on a combination of graphic elements assigned to it in the form of electronic information. It is based on naturally harvested and processed into digital cartographic data. Advantages of digital maps compared with paper maps are visible at first glance: digital maps can include any area, they're scalable - we can freely zoom them in and out, they're more accurate (there are no printed maps on such a scale as the greatest closer of digital maps), they are more up-to-date (can be remotely updated at a much lower cost, and labor), they may contain a lot of different information, and layered architecture that allows you to group data and turning them on and off doesn't disrupt their visibility, they are interactive (answer to the selected user actions - e.g. Click), they take up a lot less space and may be always with you.

*Digital Maps. EMAPA. New era of cartography. Retrieved May 2, 2018.*

<http://emapa.pl/gb/digital-maps/digital-maps-1>

Morse, Steven. *Converting Addresses to/from Latitude/Longitude/Altitude in One Step.* (Retrieved May 3, 2018)

<http://stevemorse.org/jcal/latlon.php?cookie=&hidden=&doextra=&time=1280176794609&addr2latlon=1&address=20781+Warwick+Dr&city=Humble%2C&state=TX&zip=&country=US&latlon2addr=0&latitude=30.00843&longitude=-95.27702>

- Agency-specific maps (local boundaries, Mapsco (MapQuest) box maps, beat maps, etc.) – Agency-Specific Maps include local boundaries, beats/districts, jurisdictions etc.
- ANI/ALI - Automatic number identification (ANI) and automatic location identifier (ALI) is an application designed to complement a recorder system in specific applications. The E911 ANI/ALI Tagging System appends call records with location and number information, which can be used for search and replay.

*E911 ANI/ALI Tagging System. CRM Marketplace. NICE Systems, (Retrieved May 3, 2018).*

<https://www.crmmarketplace.com/doc/e911-aniali-tagging-system-0001>

- Refer to your department's policies and procedures.

**3.4.2 Learning Objective:** Complete practical scenarios/exercises to demonstrate the ability to utilize mapping tools.

**Instructor Note:** Design scenario and exercises to complete this objective. Utilization of real life situations in your area would be helpful to student involvement.

**3.4.3 Learning Objective:** Identify different types of recording equipment utilized in a communications center.

- Logging Recorder - A device that records, stores and is capable of playing back all communication media within the domain to which it is assigned. Media can include but is not limited to voice, radio, text and network elements involved with routing a 9-1-1 call. Logging recorders should have the capability to simultaneously record from several sources.

*NENA Master Glossary of 9-1-1 Terminology. NENA-ADM-000.22-2018, page 125.*

[http://c.ymcdn.com/sites/www.nena.org/resource/resmgr/standards/NENA-ADM-000.22-2018\\_FINAL\\_2.pdf](http://c.ymcdn.com/sites/www.nena.org/resource/resmgr/standards/NENA-ADM-000.22-2018_FINAL_2.pdf)

- Logging and Recall Recorder system requirements - As a minimum, each emergency telephone line or each emergency answering position must be recorded on a logging recorder. It is desirable that the logging recorder is equipped with dual decks/drives such that the failure or unavailability of one deck/drive will cause the other deck/drive to automatically take over the recording function. It is desirable that the recall recorder has the ability to play and record simultaneously such that an operator may listen to a previous call while recording a current call. It is desirable that both logging and recall recorders be synchronized with the Master Clock. Per FCC docket # 20840, federal law grants specific exemption of warning tones on calls made to telephone numbers published for emergency services.

*NENA. Recommended Generic Standards for E9-1-1 PSAP Equipment, 3.5.1.2 Logging and Recall Recorder Requirements (Page 26). 2000, August 23.*

[https://c.ymcdn.com/sites/www.nena.org/resource/collection/6EE32917-37BD-4FA0-838C-026931F702A6/NENA\\_04-001-v2\\_E9-1-1\\_PSAP\\_Equipment.pdf](https://c.ymcdn.com/sites/www.nena.org/resource/collection/6EE32917-37BD-4FA0-838C-026931F702A6/NENA_04-001-v2_E9-1-1_PSAP_Equipment.pdf)

- Instant retrieval systems (phone and radio) – Allows conversation playback after a call has been released. The recording may be controlled manually or automatically, depending on how the feature is configured.

*Positron Power 9-1-1. Version 5.5 User Guide. 2.1.6 Recording Conversations, 2013.*

[ftp://ftp.ocfl.net/divisions/911/pub/Intrado-Positron/Positron-D10045-E\\_Rev06\\_Power911\\_5.5\\_User\\_Guide.pdf](ftp://ftp.ocfl.net/divisions/911/pub/Intrado-Positron/Positron-D10045-E_Rev06_Power911_5.5_User_Guide.pdf)

- Automatic Vehicle Locators – A means for determining the geographic location of a vehicle and transmitting this information to a point where it can be used.

*NENA Master Glossary of 9-1-1 Terminology. NENA-ADM-000.22-2018, Page 31.*

[http://c.ymcdn.com/sites/www.nena.org/resource/resmgr/standards/NENA-ADM-000.22-2018\\_FINAL\\_2.pdf](http://c.ymcdn.com/sites/www.nena.org/resource/resmgr/standards/NENA-ADM-000.22-2018_FINAL_2.pdf)

- Refer to your department's policies and procedures for agency-specific recording activations before answering, after answering and while on hold.

### Unit 3.4 Emergency Communications Technology Resources

- Video: Automatic Vehicle Locator (AVL). Niagara Sheriff. 2017, March 16.  
<https://www.youtube.com/watch?v=r7wiEkk6T00>

#### Glossary/Acronyms

Automatic Vehicle Location (AVL) - Automatic vehicle location (AVL) systems present to the dispatcher of emergency response units (e.g., police cars, ambulances) the estimated real-time locations of units within his/her service area.

Automatic Vehicle Locators – A means for determining the geographic location of a vehicle and transmitting this information to a point where it can be used.

Digital Map - The digital map is an electronic map, which operation is based on a combination of graphic elements assigned to it in the form of electronic information.

Instant Retrieval System – Allows conversation playback after a call has been released. The recording may be controlled manually or automatically, depending on how the feature is configured.

Logging Equipment - A device that records, stores and is capable of playing back all communication media within the domain to which it is assigned. Media can include but is not limited to voice, radio, text and network elements involved with routing a 9-1-1 call.

Printed Map - a representation usually on a flat surface of the whole or a part of an area.

United States National Grid (NSNG) - The Federal Geographic Data Committee's U.S. National Grid (USNG) standard provides a nationally consistent language of location that has been optimized for local applications.

### 3.5.0 **Unit Goal:** Summarize Emergency Communications Radio Technology systems used in Public Safety Emergency Communications.

#### 3.5.1 **Learning Objective:** Identify various radio systems used in public safety communications.

- Handheld or portable radio - Portable radios are small, lightweight, handheld, wireless communication units that contain both a transmitter and a receiver, a self-contained microphone and speaker, an attached power supply (typically a rechargeable battery), and antenna. Portable transceivers (such as a walkie-talkie) have relatively low-powered transmitters (1 W to 5 W), need to have their batteries periodically recharged or replaced, and may be combined in a wireless radio communication system with other portable, mobile, and base station radios. There are also very low-powered transceivers, available with power outputs of 0.1 W, which are generally linked to portable repeaters for extended range and interoperability with higher-powered radio systems.

NCJRS. *Overview of Communications Systems. Portable Radio 2.2.1, page 7.* (Retrieve May 3, 2018) <https://www.ncjrs.gov/pdffiles1/nij/191160-b.pdf>

- Trunking Systems - Trunked radio systems typically allocate 20 or more talk groups (logical channels) to a particular radio frequency channel. A radio system's computer assigns a user and the user group to a frequency when the push-to-talk (PTT) button is pressed. A user is an officer or member assigned to the precinct or Fire Company, and a user group is a police precinct or fire company. This results in a single conversation occurring over several channels, eliminating the need for the users to manually change frequencies, thus maximizing the system efficiency. In addition, the channel capacity increases because other users can use the time between transmissions for their communications without the need to wait for a "clear channel." Because the computer selects the channel and monitors the repeater before transmitting, the trunked radio system is more technically complex than the conventional system. Since it appears to be simpler and faster to use, it may be considered more efficient. Another apparent advantage to a trunked system is the increased difficulty in eavesdropping on conversations that may switch channels with every transmission. However, scanners that can follow talk groups on a trunked radio system are widely available to the general public, whereby digital spread spectrum radios may provide user security from such methods of eavesdropping.

NCJRS. *Overview of Communications Systems. Trunked Radio System 2.1.1.1, page 5.* (Retrieved May 3, 2018) <https://www.ncjrs.gov/pdffiles1/nij/191160-b.pdf>

- Conventional Radio - the Conventional system is the most basic radio communications system. Conventional, as its name implies, refers to a "traditional" method of frequency utilization. Conventional radios operate on fixed channels and each user group is permanently assigned a fixed frequency or a set of frequencies.
  - In the case of radios with multiple channels, they operate on one channel at a time. The proper channel is selected by a user. Typically, the user operates a channel selector or buttons on the radio control panel to select the channel.
  - In multi-channel systems, channels are used to separate purposes. A channel may be reserved for a specific function or for a geographic area. In a functional channel system, one channel may allow road repair crews to talk to the road maintenance office. A second channel may allow road repair crews to

communicate with state highway department crews. In a geographic system, a taxi company may use one channel to communicate in a northern area and a second channel when taxis are in a southern area.

- One key basic principle to remember when using radio is that only one radio can use one frequency (RF channel) at any one time. If two radios attempt to transmit in the same frequency at the same time, the signal collision will happen and cause interferences. Thus, it is important for radio user to be disciplined when using radio to:
  - Check that no one is talking on that particular frequency or channel
  - If the channel is occupied, wait until it is free.
- In a congested area with limited frequency, multiple groups share the same frequency which can cause interferences if users are not disciplined.

*Sandor, Kyle. Impact, Conventional Radio System, Two-Way Radio Explained Part 5. 2015, January 15. <http://blog.impactcomms.com/2015/01/conventional-radio/>*

- Base/Fixed Station - A base (or fixed) station radio also contains a transmitter and a receiver. The radio is powered by an external electrical system (typically 110 V ac) and is connected to an antenna located tens to hundreds of feet away, typically on top of a building or on a tower. Because the base station radio uses an external electrical system (i.e., commercial power mains), compared with portable and mobile radios, they have the most powerful transmitters (5 W to hundreds of watts) and the most sensitive receivers. Microphones can either be handheld or desktop models, and the speaker can either be external or internal to the radio.

*NCJRS. Overview of Communications Systems. Base Station, 2.2.3, page 7. (Retrieve May 3, 2018) <https://www.ncjrs.gov/pdffiles1/nij/191160-b.pdf>*

- Mobile Radio - Mobile radios are larger than portable radios and are designed to be mounted in a fixed location inside a vehicle (police cruiser, fire truck, etc.). Like the portable radios, mobile radios contain both a transmitter and a receiver and may contain an internal speaker. However, mobile radios connect to the vehicle's power supply, which enables them to have a higher transmitter output power (typically 5 W to 50 W) and an external antenna. The microphone is usually handheld, and the speaker may be externally located to the radio. Because of the higher transmitter power and external antenna, the effective communication range is greater than that of a portable radio, especially if a repeater is not used. The receivers in mobile radios are generally more sensitive than the receivers found in portable radios, as physical space for components in mobile radios is not as critical as in portable radios. Personnel who do not need to communicate with others when away from the vehicle typically use mobile radios. As with portable radios, mobile radios may be combined into a radio communication system with other portable, mobile, and base station radios.

*NCJRS. Overview of Communications Systems. Mobile Radio 2.2.2, page 7. (Retrieve May 3, 2018) <https://www.ncjrs.gov/pdffiles1/nij/191160-b.pdf>*

- Repeater System - A repeater is a specialized radio that contains both a receiver and a transmitter. Repeaters are used to increase the effective communications coverage area for portable, mobile, or base station radios that otherwise might not be able to communicate with one another. The repeater's receiver is tuned to the frequency used by a portable, mobile, or base station transmitter for

incoming signals, and the repeater's transmitter is tuned to the frequency used by a portable, mobile, or base station receiver. The incoming signal is rebroadcast back to the radio network on a different frequency, usually with higher power and from a better location (tall buildings, mountaintops, and/or towers).

*NCJRS. Overview of Communications Systems. Repeater, 2.2.4, page 7. (Retrieve May 3, 2018) <https://www.ncjrs.gov/pdffiles1/nij/191160-b.pdf>*

- Console radio (Backup) – Low-cost mid-power control station system for a wireless dispatch solution. Used as an emergency backup station when infrastructure is off-line or for wireless access to different system types for increased interoperability between agencies.
- Radio over Internet Protocol (RoIP) - Radio over Internet Protocol (RoIP) is a methodology of transmitting and receiving radio communications via Internet Protocol (IP), a data communications standard used to power the Internet as well as home, business and government computer networks.
  - If you understand the concept of Voice over IP (VoIP), Radio-over-IP is basically the same thing with an added command layer to control basic radio functions such as push-to-talk (PTT), frequency change, etc.
  - VoIP was originally used to enable voice communications over data networks using the TCP/IP protocol, i.e. LAN, WAN, and the Internet. VoIP has virtually put some telco's out of business, negating the need for separate lines for telephone (voice) and Internet (data). Now a single data connection can provide voice, data, video and other services. Cable TV vendors have capitalized on this technology, becoming your Internet Service Provider (ISP) as well as your phone company, offering the convenience and cost savings of a single provider of all three services.
  - Land mobile radio (LMR) vendors soon recognized this opportunity and began utilizing VoIP channels to carry radio traffic to remote sites, effectively hitching a free ride on existing data links without the expense of additional copper leased-lines or radio/microwave links.
  - Computer-aided dispatch (CAD) systems historically used EIA tone remote control to operate radios installed at different locations. The connection was normally made with twisted-pair telephone lines, 2 or 4 wires per radio. As is usually the case with analog systems, the distance may be limited by cable length, quality and signal loss. This method is still very widely used today, but new systems typically use RoIP, thus a single Ethernet cable can carry multiple radio links as well as other voice & data services.

*Radio-over-IP (RoIP) explained. ComTekk. What is Radio over IP? (Retrieved May 3, 2018) <http://comtekk.us/roip.htm>*

- Interoperability and Networking - The basic premise and definitions of interoperability and the three objectives to attain radio network interoperability are:
  - a. compatible communications equipment,
  - b. adequate signal coverage, and
  - c. network scaling. More importantly, interoperability is more a function of the human factors involved in establishing the operational parameters of the network than on the technical issues themselves.

FCC. Network Level Interoperability. Retrieved May 3, 2018) Paragraph 1.

<https://www.fcc.gov/general/network-level-interoperability>

APCO International. Comm Center & 9-1-1, Telematics. Retrieved May 3, 2018.

<https://apcointl.org/resources/telematics.html>

- Radio headsets – Wired or wireless, lightweight adaptable for phones and radio.
- Refer to Departmental Policies and Procedures.

### 3.5.2 **Learning Objective:** Define key terms used in radio technology today.

- Frequency- Wireless systems (radios) transmit data and voice information using a specific radio frequency (RF) to other radios tuned to the same frequency. Common radio messages are transmitted over the RF band between 0.05 MHz and 900 MHz. Most public safety communications radios (portable, mobile, base station, and repeaters) transmit frequencies between 30 MHz and 900 MHz which are dedicated to public service use. Cell phones and systems, such as global positioning receivers, call boxes, electronic signs, irrigation systems, and mobile command units, that transmit information from remote locations, transmit in the microwave band between 1 GHz and 20 GHz.

NCJRS. Overview of Communications Systems. Portable Radio 2.2.1, page 3. (Retrieve May 3, 2018) <https://www.ncjrs.gov/pdffiles1/nij/191160-b.pdf>

- Radio Channel- An assigned band of frequencies sufficient for radio communication.
  - The bandwidth of a radio channel depends upon the type of transmission and the frequency tolerance.
  - A channel is usually assigned for a specified radio service to be provided by a specified transmitter.

Radio Channel. Definition, Retrieved May 4, 2018. <https://www.its.bldrdoc.gov/fs-1037/dir-030/4363.htm>

- Talk Group- "talk group" is a generic term that refers to virtual radio channels created for/by a Trunked Radio Systems (TRS). While not actually a group, a Talkgroup ID (TGID) is the digitally assigned (DEC or HEX (a decimal)) virtual channel; in non-scanner speak it could be called a digitally assigned "user-group" channel, or a signal agency's digital channel identification number. Inherently in most System's operations, a group of people (users/subscribers) utilizes one single TGID for voice communications, hence Talkgroup.

Talkgroup. Radio Reference.com. Retrieved May 4, 2018.

<http://wiki.radioreference.com/index.php/Talkgroup>

- Citizens Band (CB) - The Citizens Band Radio Service (CBRS) is a private, two-way, short-distance voice communications service for personal or business activities of the general public. It also may be used for voice paging. It is authorized 40 channels between 26.965 MHz and 27.405 MHz.

Citizens Band Radio Service (CBRS). Federal Communications Commission. 2017, April 13.

<https://www.fcc.gov/wireless/bureau-divisions/mobility-division/citizens-band-radio-service-cbrs>

- Channel- A path between two nodes in a network. It may refer to the physical cable, the signal transmitted within the cable, or to a subchannel within a carrier frequency. In radio and TV, it refers to the assigned carrier frequency.

*Transmission Channel. Your Dictionary. Retrieved May 4, 2018.*

<http://www.yourdictionary.com/transmission-channel>

- Noise- an unwanted signal or a disturbance (such as static or a variation of voltage) in an electronic device or instrument (such as radio or television); broadly: a disturbance interfering with the operation of a usually mechanical device or system.

*Noise. Merriam Webster. Retrieved May 4, 2018, c.*

<https://www.merriam-webster.com/dictionary/noise>

- Receiver- a device for converting signals (such as electromagnetic waves) into audio or visual form:
  - such as a device in a telephone for converting electric impulses or varying current into sound
  - a radio receiver with a tuner and amplifier on one chassis

*Receiver. Merriam Webster. Retrieved May 4, 2018, d.* <https://www.merriam-webster.com/dictionary/receiver>

- Transmitter-an apparatus for transmitting radio or television signals.

*Transmitter. Merriam Webster. Retrieved May 4, 2018, a.* <https://www.merriam-webster.com/dictionary/transmitter>

**3.5.3 Learning Objective:** Explain the function of a radio system by way of interoperability, intercity, and interagency.

- The Federal Communications Commission has adopted the following definition of interoperability. Interoperability is defined in Section 90.7 of the Commission's rules as "[a]n essential communications link within public safety and public service wireless communications systems which permits units from two or more different entities to interact with one another and to exchange information according to a prescribed method in order to achieve predictable results."

*Interoperability. Federal Communication Commission. Retrieved May 4, 2018.*

<https://www.fcc.gov/general/interoperability>

- Mobile to Mobile
- Mobile to Base
- Base to Mobile
- Hamm Radio
- Citizen Band (CB) Radio.

**3.5.4 Learning Objective:** Identify the Federal Communications Commission (FCC) requirements for emergency communications (FCC 47 90.405).

- Permissible Communications:
  - Stations licensed under this part may transmit only the following types of communication:
    - Any communication related directly to the imminent safety-of-life or property;
    - Communications directly related and necessary to those activities which make the licensee eligible for the station license held under this part. In addition, when communication service is provided under the cooperative sharing provisions of § 90.179, the licensee providing such service may transmit

communications related to the activities for which the parties receiving the service would be eligible to be licensed.

- Communications for testing purposes required for the proper station and system maintenance. However, each licensee shall keep such tests to a minimum and shall employ every measure to avoid harmful interference.
- The provisions contained in the paragraph: of this section do not apply where a single base station licensee has been authorized to use a channel above 470 MHz on an exclusive basis, or to stations licensed under this part that are classified as CMRS providers under part 20 of this chapter. [50 FR 6182, Feb. 14, 1985, as amended at 59 FR 59965, Nov. 21, 1994]

*Permissible Communications. Federal Communications Commission. 2011, October 1. 47 CFR Ch. 1, 90.405. Page 403. <https://www.gpo.gov/fdsys/pkg/CFR-2011-title47-vol5/pdf/CFR-2011-title47-vol5-part90.pdf>*

- FCC rules that govern Public Safety Communications radio systems:
  - Licensees of radio stations in the private land mobile radio services shall be directly responsible for the proper operation and use of each transmitter for which they are licensed. In this connection, licensees shall exercise such direction and control as is necessary to assure that all authorized facilities are employed:
    - Only for permissible purposes;
    - Only in a permissible manner; and
    - Only by persons with authority to use and operate such equipment.
  - In carrying out their responsibilities under § 90.403(a), licensees shall be bound by the provisions of the Communications Act of 1934, as amended, and by the rules and regulations of the Commission governing the radio service in which their facilities are licensed; and licensees may not, through written or oral agreements or otherwise, relieve themselves of any duty or obligation imposed upon them, by law, as licensees.
  - Except for stations that have been granted exclusive channels under this part and that are classified as commercial mobile radio service providers pursuant to part 20 of this chapter, each licensee must restrict all transmissions to the minimum practical transmission time and must employ an efficient operating procedure designed to maximize the utilization of the spectrum.
  - Communications involving the imminent safety-of-life or property are to be afforded priority by all licensees.
  - Licensees shall take reasonable precautions to avoid causing harmful interference. This includes monitoring the transmitting frequency for communications in progress and such other measures as may be necessary to minimize the potential for causing interference.
  - Stations licensed in this part shall not continuously radiate an unmodulated carrier except where required for tests as permitted in § 90.405, except where specifically permitted by this part, where specifically authorized in the station authorization, or on an as-needed basis in the Radiolocation Radio Service.
  - The radiations of the transmitter shall be suspended immediately upon detection or notification of a deviation from the technical requirements of the station authorization and until such deviation is corrected. For transmissions concerning the imminent safety-of-life or property, the transmissions shall be suspended as soon as the emergency is terminated.

*General Operating Requirements. Federal Communications Commission. 2011, October 1. 47 CFR Ch. 1, 90.403. Page 402. <https://www.gpo.gov/fdsys/pkg/CFR-2011-title47-vol5/pdf/CFR-2011-title47-vol5-part90.pdf>*

- FCC Emergency Communications - The licensee of any station authorized under this part may, during a period of emergency in which the normal communication facilities are disrupted as a result of hurricane, flood, earthquake or similar disaster, utilize such station for emergency communications in a manner other than that specified in the station authorization or in the rules and regulations governing the operation of such stations. The Commission may at any time order the discontinuance of such special use of the authorized facilities.

*Emergency Communications. Federal Communications Commission. 2011, October 1. 47 CFR Ch. 1, 90.407. Page 403. <https://www.gpo.gov/fdsys/pkg/CFR-2011-title47-vol5/pdf/CFR-2011-title47-vol5-part90.pdf>*

- Refer to Departmental Policies and Procedures.

## Unit 3.5 Emergency Communications Technology Resources

- Radio over Internet Protocol Basics – YouTube, 2016, October 30.  
<https://www.youtube.com/watch?v=AuRiP-vBzCQ>

### Glossary/Acronyms

Analog signal - An analog signal is a continuous signal that contains time-varying quantities.

Antenna - An antenna is a transducer that converts radio frequency (RF) fields into alternating current or vice versa.

Base/Fixed Station - A base (or fixed) station radio also contains a transmitter and a receiver.

Citizens Band (CB) - The Citizens Band Radio Service (CBRS) is a private, two-way, short-distance voice communications service for personal or business activities of the general public.

Channel - A path between two nodes in a network. It may refer to the physical cable, the signal transmitted within the cable or to a subchannel within a carrier frequency.

Computer-aided dispatch (CAD) systems - historically used EIA tone remote control to operate radios installed at different locations.

Consolette radio (Backup) – Low-cost mid-power control station system for a wireless dispatch solution.

Digital - composed of data in the form of especially binary digits ·digital images/photos, a digital readout, a digital broadcast.

Frequency - Wireless systems (radios) transmit data and voice information using a specific radio frequency (RF) to other radios tuned to the same frequency.

Full-Duplex - In this mode, transmitters operate on one frequency, receivers on another but the user can listen and talk simultaneously.

Half-Duplex - This is a mode where transmitters operate on one frequency, receivers on another.

Mobile Radio - Mobile radios are larger than portable radios and are designed to be mounted in a fixed location inside a vehicle (police cruiser, fire truck, etc.).

Noise - an unwanted signal or a disturbance (such as static or a variation of voltage) in an electronic device or instrument (such as radio or television); broadly: a disturbance interfering with the operation of a usually mechanical device or system.

Receiver - a device for converting signals (such as electromagnetic waves) into audio or visual form.

Radio Channel - An assigned band of frequencies sufficient for radio communication.

Radio Over Internet Protocol (ROIP) - Radio over Internet Protocol (RoIP) is a methodology of transmitting and receiving radio communications via Internet Protocol (IP), a data communications standard used to power the Internet as well as home, business and government computer networks.

Repeater System - A repeater is a specialized radio that contains both a receiver and a transmitter.

Simplex - This is a mode where both transmitter and receiver operate on the same frequency.

Skip Distance - The skip distance is the distance over the Earth's surface between the point where a radio signal is transmitted, and the point where it is received having traveled to the ionosphere and been refracted back by the ionosphere.

Skip Zone - The skip zone, which may also be called a silent zone or dead zone, is a region where a radio transmission cannot be received.

Talk Group –“ talk group” is a generic term that refers to virtual radio channels created for/by a Trunked Radio Systems (TRS).

Telematics – The mechanisms that support the acquisition of telemetry data and action based upon it.

Transmitter -an apparatus for transmitting radio or television signals.

Tropospheric Ducting - The speed of a radio wave in the atmosphere is determined by the dielectric property of the air.

UHF-Ultra High Frequency - Radio frequencies often used to broadcast television signals. Mobile phones and satellite radio also use UHF signals.

VHF-Very High Frequency - Very high frequency (VHF) refers to the radio frequency electromagnetic waves ranging from 30 to 300 MHz with corresponding wavelengths ranging from 1 m to tens of meters.

Vu-Meter - VU meters measure the volume (intensity) of analog audio signals.