Technician License Course
Chapter 6

Lesson Plan Module 13 –

Contacting Other Hams – Part 1

Contact Basics, Band Plans, Making Contacts and Using Repeaters

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The Typical Telephone Conversation

- Greeting
- Identify who is participating
- Exchange information, generally taking turns
- Salutations
- End the conversation

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The Typical Ham Contact (QSO)

- Greeting
- Identify who is participating
- Exchange information, generally taking turns
- Salutations
- End the conversation

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Radio Manners

- Speak clearly and distinctly
  - Remember – you can't see the other person talking!
  - Use phonetics when needed
- Assume all communications are public – choose topics accordingly

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Radio Manners

- Before transmitting, be sure the frequency is clear and you are authorized to use it!
- Station identification (10-minute rule)
- Frequencies are shared
  - No one has a prior claim to a frequency
  - Schedules, nets, pre-planned events
  - Be flexible, always have a “Plan B”

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Radio Manners

- Signal reports
- Power level
  - Avoid excess power
- Location (QTH)
  - Grid locators

- RST
  - **R**eadability (1–5)
  - **S**trength (1–9)
  - **T**one (CW only 1–9)
  - "Your signal is 58"

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Radio Manners

- Advice and assistance
  - Radio and antenna tests or checks
- Ham radio is self-regulated
  - ARRL Official Observers
- Logging contacts – on paper or computer
- QSLs and award programs

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Band Plans

- A band plan is a formal plan for organizing types of operation on a band
  - Informal agreement – not a regulation
  - Intended for normal circumstances
  - Be flexible in times of heavy band use (contests, special events, DXpeditions)
  - Always have a “Plan B”

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Making Contacts

- Repeater operation
  - Listen to see how the regulars operate
  - To announce your presence, just say your call
  - Respond to a call with the station's call followed by your own call
  - Often used by a club or group as a regional intercom

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Making Contacts

- Repeater signal reports (examples)
  - Full-quieting: signal is strong enough that no noise is heard
  - Scratchy: occasional noise with your signal
  - Flutter: multi-path from a mobile station
  - In and out: occasionally copyable but mostly inaudible

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Making Contacts

- HF on CW or SSB
  - “CQ” means “I am calling anyone”
  - To answer give the station’s call followed by your call once or twice
  - Use of phonetics is common

Making Contacts

- Taking turns
  - Nets
  - Roundtables
  - Shared contacts
- Breaking in
  - Wait for a pause
  - Give your call

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Making Contacts

- Simplex FM
  - Each user takes turns to transmit
  - Works for stations close to each other
  - If you can hear the other station on the repeater input frequency, try simplex
  - 2 meters: 146.52 MHz
  - 70 cm: 446.00 MHz

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Repeater Review

- Specialized transmitter/receiver interconnected by a controller.
- Generally located at a high place.
- Receives and simultaneously retransmits your signal on a different frequency.
- Dramatically extends line-of-sight range.

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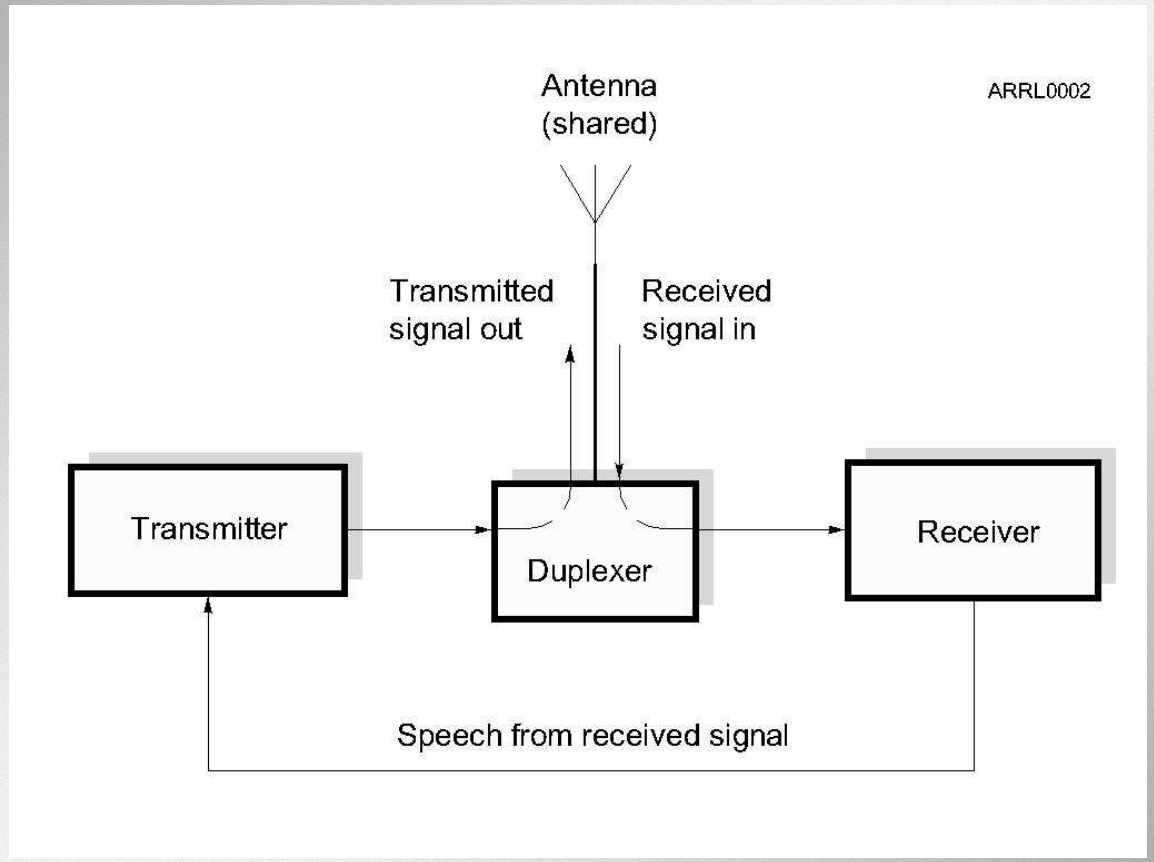
Repeater Review – How They Work



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Duplex Communication

- Transmitting on one frequency while simultaneously listening on a different frequency.
- Repeaters use duplex communications.
- **Output frequency** – the frequency the repeater transmits on and you listen to.
- **Input frequency** – the frequency the repeater listens to and you transmit on.

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Things to Know to Use a Repeater

- Output frequency
- Frequency offset
  - And therefore the input frequency
- Repeater access tones (if any)

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Repeater Output Frequency

- Repeaters are frequently identified by their output frequency.
  - "Meet you on the 443.50 machine."
    - Here the specific frequency is used.
  - "Let's go to 94."
    - Here an abbreviation for a standard repeater channel is used, meaning 146.94 MHz.
  - "How about the NARL repeater?"
    - Here the repeater is referenced by the sponsoring club name.

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Repeater Frequency Offset

- The offset frequencies (shifts or splits) are standardized to help facilitate repeater use.
- There are + and – offsets depending on the plan.
- Different bands have different standardized amounts of offset.

Standard Repeater Offsets by Band

Band	*Offset*
10 Meters	–100 kHz
6 Meters	Varies by region: –500 kHz, –1 MHz, –1.7 MHz
2 Meters	+ or -600 kHz
1.25 Meters	–1.6 MHz
70 cm	+ or -5 MHz
902 MHz	12 MHz
1296 MHz	12 MHz

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Repeater Access Tones

- Prevents accessing multiple repeaters at once.
- Subaudible low-frequency tone must be present before the repeater transmitter will turn on.
- Tones have various names (depending on equipment manufacturer).
  - CTCSS (continuous tone coded squelch system)
  - PL (a Motorola trade name for CTCSS)
  - Privacy codes or tones
  - DCS (digital coded squelch)

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Repeater Access Tones

- Access tones are usually published along with repeater frequencies.
- Could also be announced when the repeater identifies.
  - "PL is 123.0" meaning 123.0 Hz
- Tones are generally programmed into the radio along with frequency and offset.

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Repeater Control

- Repeater identification (Morse code or synthesized voice)
  - Same ID requirements as you have
- Time-out protection
  - Protects against continuous transmission in the event of a stuck PTT or long-winded speaker
  - Usually three minutes
- Courtesy beep or tone signals time-out timer reset
- May have an autopatch system for phone calls

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Common Problems

- Off frequency: causes audio distortion
- Low batteries: weak signal, audio distortion
- Poor location: hear repeater OK, can’t make or maintain contact
- Access tone off or wrong: repeater is strong but can’t access it
- Repeater drops in and out of your receiver: squelch setting too high

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Digital Repeater Systems

- Repeaters linked by the Internet
- Use digital audio – Voice Over Internet Protocol (VOIP)
  - Similar to Skype
- Allows communication world-wide
- Internet Linking Relay Project (IRLP)
- Echolink
- Access codes on system websites

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D-STAR

- Both a repeater linking system and a digital voice protocol
- DV: Digital Voice mode (voice + 1200 baud data)
- DD: Digital Data mode (128 kbps data)
- Repeaters linked together worldwide
- Call user-to-user based on call sign
- Currently an ICOM system
- Yaesu and Kenwood also building digital systems

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Practice Questions

What is the most common repeater frequency offset in the 2 meter band?

A. Plus 500 kHz

B. Plus or minus 600 kHz

C. Minus 500 kHz

D. Only plus 600 kHz

T2A01 HRLM (6-16)

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What is the most common repeater frequency offset in the 2 meter band?

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T2A01 HRLM (6-16)

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What is the national calling frequency for FM simplex operations in the 70 cm band?

A. 146.520 MHz

B. 145.000 MHz

C. 432.100 MHz

D. 446.000 MHz

T2A02 HRLM (6-14)

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What is the national calling frequency for FM simplex operations in the 70 cm band?

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T2A02 HRLM (6-14)

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What is a common repeater frequency offset in the 70 cm band?

A. Plus or minus 5 MHz

B. Plus or minus 600 kHz

C. Minus 600 kHz

D. Plus 600 kHz

T2A03 HRLM (6-16)

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What is a common repeater frequency offset in the 70 cm band?

A. Plus or minus 5 MHz

B. Plus or minus 600 kHz

C. Minus 600 kHz

D. Plus 600 kHz

T2A03 HRLM (6-16)

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What is an appropriate way to call another station on a repeater if you know the other station's call sign?

A. Say "break, break" then say the station's call sign

B. Say the station's call sign then identify with your call sign

C. Say "CQ" three times then the other station's call sign

D. Wait for the station to call "CQ" then answer it

T2A04 HRLM (6-12)

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What is an appropriate way to call another station on a repeater if you know the other station's call sign?

A. Say "break, break" then say the station's call sign

B. Say the station's call sign then identify with your call sign

C. Say "CQ" three times then the other station's call sign

D. Wait for the station to call "CQ" then answer it

T2A04 HRLM (6-12)

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How should you respond to a station calling CQ?

A. Transmit CQ followed by the other station's call sign

B. Transmit our call sign followed by the other station's call sign

C. Transmit the other station's call sign followed by your call sign

D. Transmit a signal report followed by your call sign

T2A05 HRLM (6-13)

ARRL The national association for AMATEUR RADIO

How should you respond to a station calling CQ?

A. Transmit CQ followed by the other station's call sign

B. Transmit our call sign followed by the other station's call sign

C. Transmit the other station's call sign followed by your call sign

D. Transmit a signal report followed by your call sign

T2A05 HRLM (6-13)

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What is the meaning of the procedural signal "CQ"?

A. Call on the quarter hour

B. A new antenna is being tested (no station should answer)

C. Only the called station should transmit

D. Calling any station

T2A08 HRLM (6-13)

ARRL The national association for AMATEUR RADIO

What is the meaning of the procedural signal "CQ"?

A. Call on the quarter hour

B. A new antenna is being tested (no station should answer)

C. Only the called station should transmit

D. Calling any station

T2A08 HRLM (6-13)

What brief statement is often used in place of "CQ" to indicate that you are listening on a repeater?

A. The words "Hello test" followed by your call sign

B. Your call sign

C. The repeater call sign followed by your call sign

D. The letters "QSY" followed by your call sign

T2A09 HRLM (6-9)

What brief statement is often used in place of "CQ" to indicate that you are listening on a repeater?

A. The words "Hello test" followed by your call sign

B. Your call sign

C. The repeater call sign followed by your call sign

D. The letters "QSY" followed by your call sign

T2A09 HRLM (6-9)

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Which of the following is a guideline to use when choosing an operating frequency for calling CQ?

A. Listen first to be sure that no one else is using the frequency

B. Ask if the frequency is in use

C. Make sure you are in your assigned band

D. All of these choices are correct

T2A12 HRLM (6-13)

ARRL The national association for AMATEUR RADIO

Which of the following is a guideline to use when choosing an operating frequency for calling CQ?

A. Listen first to be sure that no one else is using the frequency

B. Ask if the frequency is in use

C. Make sure you are in your assigned band

D. All of these choices are correct

T2A12 HRLM (6-13)

ARRL The national association for AMATEUR RADIO

What is the term used to describe an amateur station that is transmitting and receiving on the same frequency?

A. Full duplex communication

B. Diplex communication

C. Simplex communication

D. Multiplex

T2B01 HRLM (6-9)

ARRL The national association for AMATEUR RADIO

What is the term used to describe an amateur station that is transmitting and receiving on the same frequency?

A. Full duplex communication

B. Diplex communication

C. Simplex communication

D. Multiplex

T2B01 HRLM (6-9)

ARRL The national association for AMATEUR RADIO

What is the term used to describe the use of a sub-audible tone transmitted with normal voice audio to open the squelch of a receiver?

A. Carrier squelch

B. Tone burst

C. DTMF

D. CTCSS

T2B02 HRLM (6-16)

What is the term used to describe the use of a sub-audible tone transmitted with normal voice audio to open the squelch of a receiver?

A. Carrier squelch

B. Tone burst

C. DTMF

D. CTCSS

T2B02 HRLM (6-16)

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Which of the following common problems might cause you to be able to hear but not access a repeater even when transmitting with the proper offset?

A. The repeater receiver may require an audio tone burst for access

B. The repeater receiver may require a CTCSS tone for access

C. The repeater receiver may require a DCS tone sequence for access

D. All of these choices are correct

T2B04 HRLM (6-17)

ARRL The national association for AMATEUR RADIO

Which of the following common problems might cause you to be able to hear but not access a repeater even when transmitting with the proper offset?

A. The repeater receiver may require an audio tone burst for access

B. The repeater receiver may require a CTCSS tone for access

C. The repeater receiver may require a DCS tone sequence for access

D. All of these choices are correct

T2B04 HRLM (6-17)

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Which "Q" signal indicates that you are receiving interference from other stations?

A. QRM
B. QRN
C. QTH
D. QSB

T2B10 HRLM (6-5)

Which "Q" signal indicates that you are receiving interference from other stations?

A. QRM

B. QRN

C. QTH

D. QSB

T2B10 HRLM (6-5)

Which "Q" signal indicates that you are changing frequency?

A. QRU
B. QSY
C. QSL
D. QRZ

T2B11 HRLM (6-5)

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Which "Q" signal indicates that you are changing frequency?

A. QRU

B. QSY

C. QSL

D. QRZ

T2B11 HRLM (6-5)

Under what circumstances should you consider communicating via simplex rather than a repeater?

A. When the stations can communicate directly without using a repeater

B. Only when you have an endorsement for simplex operation on your license

C. Only when third party traffic is not being passed

D. Only if you have simplex modulation capability

T2B12 HRLM (6-14)

ARRL The national association for AMATEUR RADIO

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T2B12 HRLM (6-14)

ARRL The national association for AMATEUR RADIO

What should be done to insure that voice message traffic containing proper names and unusual words are copied correctly by the receiving station?

A. The entire message should be repeated at least four times

B. Such messages must be limited to no more than 10 words

C. Such words and terms should be spelled out using a standard phonetic alphabet

D. All of these choices are correct

T2C03 HRLM (6-22)

ARRL The national association for AMATEUR RADIO

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T2C03 HRLM (6-22)

ARRL The national association for AMATEUR RADIO

Which of the following describes the common meaning of the term “repeater offset”?

A. The distance between the repeater’s transmit and receive antennas

B. The time delay before the repeater timer resets

C. The difference between the repeater’s transmit and receive frequencies

D. Matching the antenna impedance to the feed line impedance

T4B11 HRLM (6-16)

ARRL The national association for AMATEUR RADIO

Which of the following describes the common meaning of the term “repeater offset”?

A. The distance between the repeater’s transmit and receive antennas

B. The time delay before the repeater timer resets

C. The difference between the repeater’s transmit and receive frequencies

D. Matching the antenna impedance to the feed line impedance

T4B11 HRLM (6-16)

ARRL The national association for AMATEUR RADIO

What might be the problem if you receive a report that your audio signal through the repeater is distorted or unintelligible?

A. Your transmitter may be slightly off frequency

B. Your batteries may be running low

C. You could be in a bad location

D. All of these choices are correct

T7B10 HRLM (6-12)

ARRL The national association for AMATEUR RADIO

What might be the problem if you receive a report that your audio signal through the repeater is distorted or unintelligible?

A. Your transmitter may be slightly off frequency

B. Your batteries may be running low

C. You could be in a bad location

D. All of these choices are correct

T7B10 HRLM (6-12)

ARRL The national association for AMATEUR RADIO

What is a grid locator?

A. A letter-number designator assigned to a geographic location

B. A letter-number designator assigned to an azimuth and elevation

C. An instrument for neutralizing a final amplifier

D. An instrument for radio direction finding

T8C05 HRLM (6-4)

ARRL The national association for AMATEUR RADIO

What is a grid locator?

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C. An instrument for neutralizing a final amplifier

D. An instrument for radio direction finding

T8C05 HRLM (6-4)

ARRL The national association for AMATEUR RADIO

How is access to an IRLP node accomplished?

A. By obtaining a password which is sent via voice to the node

B. By using DTMF signals

C. By entering the proper Internet password

D. By using CTCSS tone codes

T8C06 HRLM (6-19)

How is access to an IRLP node accomplished?

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B. By using DTMF signals

C. By entering the proper Internet password

D. By using CTCSS tone codes

T8C06 HRLM (6-19)

ARRL The national association for AMATEUR RADIO

How might you obtain a list of active nodes that use VoIP?

A. From the FCC Rulebook

B. From your local emergency coordinator

C. From a repeater directory

D. From the local repeater frequency coordinator

T8C09 HRLM (6-19)

How might you obtain a list of active nodes that use VoIP?

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C. From a repeater directory

D. From the local repeater frequency coordinator

T8C09 HRLM (6-19)

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How do you select a specific IRLP node when using a portable transceiver?

A. Choose a specific CTCSS tone

B. Choose the correct DSC tone

C. Access the repeater autopatch

D. Use the keypad to transmit the IRLP node ID

T8C10 HRLM (6-19)

ARRL The national association for AMATEUR RADIO

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T8C10 HRLM (6-19)

ARRL The national association for AMATEUR RADIO

What is meant by Voice Over Internet Protocol (VoIP) as used in amateur radio?

A. A set of rules specifying how to identify your station when linked over the Internet to another station

B. A set of guidelines for working DX during contests using Internet access

C. A technique for measuring the modulation quality of a transmitter using remote sites monitored via the Internet

D. A method of delivering voice communications over the Internet using digital techniques

T8C12 HRLM (6-19)

ARRL The national association for AMATEUR RADIO

What is meant by Voice Over Internet Protocol (VoIP) as used in amateur radio?

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D. A method of delivering voice communications over the Internet using digital techniques

T8C12 HRLM (6-19)

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What is the Internet Radio Linking Project (IRLP)?

A. A technique to connect amateur radio systems, such as repeaters, via the Internet using a Voice Over Internet Protocol

B. A system for providing access to websites via amateur radio

C. A system for informing amateurs real time of the frequency of active DX stations

D. A technique for measuring signal strength of an amateur transmitter via the Internet

T8C13 HRLM (6-18)

ARRL The national association for AMATEUR RADIO

What is the Internet Radio Linking Project (IRLP)?

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T8C13 HRLM (6-18)

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