Ham Radio License Course

Discovering the Excitement of Ham Radio

ARRL The national association for AMATEUR RADIO®

SCARS Tech License Course – Week 6

Operating Procedures

Lea Greenleaf W5HLG

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Technician License Course

Chapter 6

Lesson Plan Module – 6a

Contact Basics, Band Plans, Making Contacts and Using Repeaters

The Typical Telephone Conversation

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

The Typical Ham Contact (QSO)

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

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

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”

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"

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

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”

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

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

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

Making Contacts

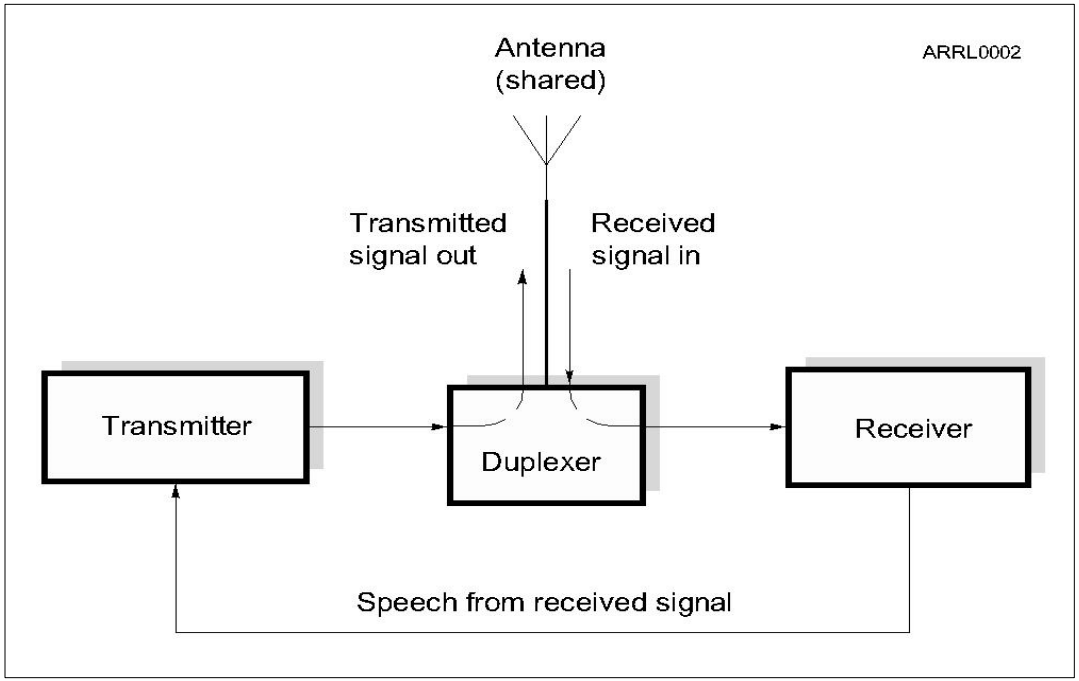
- Simplex FM

- 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

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.

Repeater Review – How They Work



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.

Things to Know to Use a Repeater

- Output frequency
- Frequency offset

- And therefore the input frequency

- Repeater access tones (if any)

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.

Repeater Output Frequency

- "How about the NARL repeater?"
  - Here the repeater is referenced by the sponsoring club name.

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

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)

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.

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

Repeater Control

- Courtesy beep or tone signals time-out timer reset
- May have an autopatch system for phone calls

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

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

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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Chapter 6

Lesson Plan Module – 6b

Nets, Emergency Communications, Special Modes and Techniques

Nets

- Net is short for “Network”
- Evolved over the years to share and exchange information in an organized and efficient way
- Social nets
- Traffic nets
- Emergency and public service nets

Traffic Nets

- *Traffic* refers to formal messages that are relayed via Amateur Radio
- Radiogram structured to ensure accuracy
- National Traffic System (NTS)
- Procedures
- Accountability

Emergency and Public Service Nets

- Public service nets – training for emergency nets
- Training for ham operators as well as emergency groups and managers supported by Amateur Radio
- Emergency nets

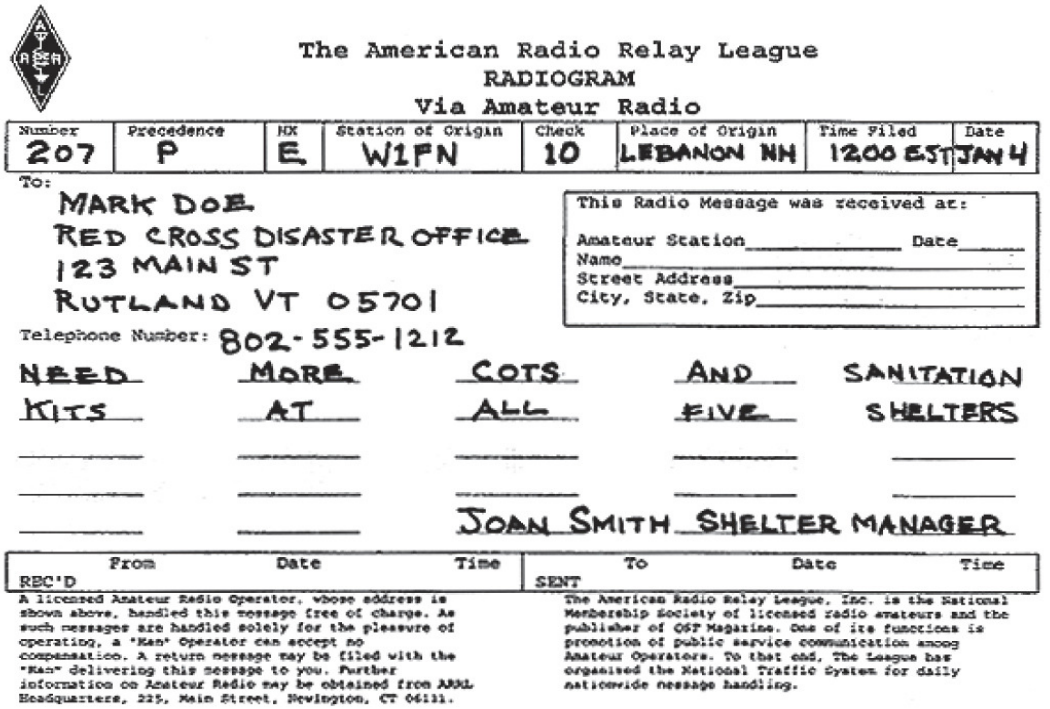
Net Structure

- Net Control Station (NCS)
  - Traffic cop who controls the flow of information
- Check-in and check-out procedures
  - Priority/Emergency access to Net Control
- Communications discipline vital
  - Learn and follow procedures

Net Structure

- Speak only when directed, and only to whom directed
- Follow through with your commitments

The Radiogram



The American Radio Relay League
RADIOGRAM
Via Amateur Radio

Number	Precedence	HX	Station of Origin	Check	Place of Origin	Time Filed	Date
207	P	E	W1FN	10	LEBANON NH	1200 EST	JAN 4

To:
MARK DOE
RED CROSS DISASTER OFFICE
123 MAIN ST
RUTLAND VT 05701

Telephone Number: 802-555-1212

This Radio Message was received at:
Amateur Station _____ Date _____
Name _____
Street Address _____
City, State, Zip _____

NEED MORE COTS AND SANITATION
KITS AT ALL FIVE SHELTERS

JOAN SMITH SHELTER MANAGER

From	Date	Time	To	Date	Time
REC'D			SENT		

A licensed Amateur Radio Operator, whose address is shown above, handled this message free of charge. As such messages are handled solely for the pleasure of operating, a "Ham" Operator can accept no compensation. A return message may be filed with the "Ham" delivering this message to you. Further information on Amateur Radio may be obtained from ARRL Headquarters, 225, Main Street, Newington, CT 06111.

The American Radio Relay League, Inc. is the National Membership Society of licensed radio amateurs and the publisher of QST Magazine. One of its functions is promotion of public service communication among Amateur Operators. To that end, The League has organized the National Traffic System for daily nationwide message handling.

Supporting Emergency Operations

- One of the most important reasons for the existence of Amateur Radio.
- Get involved and use what you have learned.
- Know where you fit in the overall emergency management team.

Emergency Communications Organizations

- Radio Amateur Civil Emergency Service (RACES).
  - Supports civil emergencies
  - National in scope
- Amateur Radio Emergency Service® (ARES®).
  - Local and regional in scope
  - Supports non-governmental agencies

Emergency Communication Tips

- Don’t become part of the problem.
- You are a communicator, not a decision or policy maker.
- Don’t give out unauthorized information.
- Know your abilities and limitations — keep yourself safe.
- Follow radio discipline and net procedures.
- Protect personal information — Amateur Radio communications is public.

Emergency Declarations

- FCC may declare a Temporary State of Communications Emergency.
  - Includes details of conditions and rules to be followed.
  - Specifics communicated through web sites and ARRL bulletins, the NTS, and on-the-air.
  - Avoid operating on restricted frequencies unless engaged in relief efforts.

Making and Answering Distress Calls

- Rule number one – speak in plain language!
- Mayday (voice); SOS (Morse code)
- Identify
- Give location
- State the situation
- Describe assistance required
- Provide other important information

Tactical Communications

- Tactical Identifiers
  - Facilitate communications
  - Location- or function-specific
  - Transcends operator changes
- FCC ID rules still apply
  - Give your FCC call sign every 10 minutes and when changing operators

Emergency Equipment

- "Go-kits"
  - Portable Amateur Radio equipment
  - Emergency power sources
  - Personal survival supplies and equipment

Emergency Communications Training

- If you are going to participate, get training.
- Actively participate in training and drill activities.
  - Nets
  - Public service activities
  - Attend community meetings and get involved in your community.

Emergency Communications Training

- Take emergency communication courses.
  - ARRL courses
  - FEMA courses on NIMS and other topics
    - May be required for your participation

Awards, DXing, Contests

- On-the-air activities provide incentive to get on the radio.
- Learn about propagation as you search for specific stations on various bands.
- Improve operating skills.
- Fun!

Awards

- WAC
  - Contacting all six inhabited continents
- WAS
  - Contacting 50 states
- VUCC
  - Contacting 100 grid squares on VHF/UHF

DXing

- Contacting stations far away – a tradition since the first days of radio.
- On HF, usually means contacting stations in other countries.
- On VHF/UHF, means contacting stations outside your normal coverage area.

Contests

- ARRL Rookie Roundup
- North American QSO Parties (ncjweb.com)
- State QSO Parties
- VHF/UHF Contests
- CQ World Wide DX Contest (a big one!)
- Contest Calendars

Field Day

- Emergency communications training with a competitive spirit.
- Set up portable station and antenna (in the field, mobile, anywhere!) and make as many contacts as possible.
- Get started with your local club or group – great way to get involved.

Special Events

- Special Event stations are set up to commemorate some significant local event.
- Usually stations are demonstration stations set up for public display.
- Commemorative certificates are awarded for contacting the stations.

Radio Direction Finding

- Useful for locating interference or noise sources.
- Works best with a directional antenna.
- “Fox hunting” competitions offer a fun opportunity to learn and practice.
- Good training for search and rescue.

Amateur Satellites

- OSCAR
  - **O**rbiting **S**atellites **C**arrying **A**mateur **R**adio
- Modes
  - FM
  - Analog (SSB and CW)
  - Digital
- International Space Station

Satellite Terms

- Uplink – Earth stations transmit to satellite
- Downlink – Satellite transmits to stations on Earth
- Beacon – Signal from satellite with information about satellite operating conditions
- Doppler Shift – Shift in frequency due to relative motion between satellite and Earth station
- LEO – Low Earth Orbit

Satellite Terms

- Spin fading – caused by rotation of satellite
- Pacsat – packet radio satellite
- Tracking software – gives beam heading and times when satellite is in view
- Mode – bands satellite is using for uplink and downlink (eg Mode U/V = 70 cm uplink, 2 meters downlink)

Other Special Modes

- Slow Scan TV (SSTV)
  - Sending snap-shot pictures
  - One frame every few seconds
- Amateur TV (ATV)
  - Similar to commercial TV imagery
  - Uses analog TV format (NTSC)

Other Special Modes

- Radio Control (RC)
  - Telecommand
  - 50 MHz band

End of Week 6

https://w5nor.org/tech