

# Amateur Radio General License Training

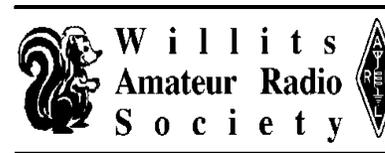
## Welcome

These presentations are sponsored by:

**Mendocino Auxiliary Communications Service (MACS)**

**Mendocino County Amateur Radio Communications Service (McARCS)**

**Willits Amateur Radio Society (WARS)**



# G2 Operating Procedures

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KN6UAW

Email: my call sign at arrl.net

# Question Topics

5 exam questions; 5 groups; 60 total questions

Topics:

- Good Practices
- Making Contacts
- Modes
- HF Receiving
- HF Transmitting
- Emergency Operations
- Volunteer Monitoring Program
- Packet-Based Modes and Systems
- Receiving and Transmitting Digital Modes
- Digital Operating Procedures

# Good Practices

General Class License Manual pages 2-1 – 2-4

- NATO phonetics are recommended and the most common.
- Listen first!
- Follow Part 97 frequency and mode restrictions as well as the band plan to stay within General license privileges. (Examples follow.)
- Unlike VHF, clear HF frequencies are rare/unusual. Find a frequency where you minimize interference, following recommended signal separation (CW: 150-500Hz; SSB 2-3kHz).
- Tune to a clear frequency and listen. On phone ask, “Is this frequency in use? This is AB1DEF” a couple times before starting a QSO.
- No amateur has priority access to any HF frequency except in an emergency, so be flexible.
- Split operation – RX on frequency 1, TX on frequency 2 (typically up or down 5kHz).

# US Amateur Radio Bands

**US AMATEUR POWER LIMITS — FCC 97.313** An amateur station must use the minimum transmitter power necessary to carry out the desired communications. (b) No station may transmit with a transmitter power exceeding 1.5 kW PEP.



**ARRL** The national association for **AMATEUR RADIO**

Amateurs wishing to operate on either 2,200 or 630 meters must first register with the Utilities Technology Council online at <https://utc.org/plc-database-amateur-notification-process/>. You need only register once for each band.

## 2,200 Meters (135 kHz)



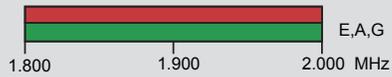
## 630 Meters (472 kHz)

5 W EIRP maximum, except in Alaska within 496 miles of Russia where the power limit is 1 W EIRP.

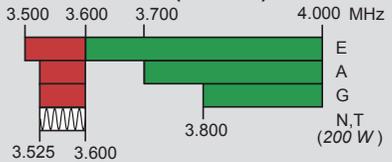


## 160 Meters (1.8 MHz)

Avoid interference to radiolocation operations from 1.900 to 2.000 MHz



## 80 Meters (3.5 MHz)

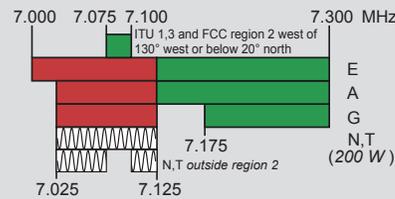


## 60 Meters (5.3 MHz)



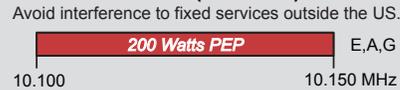
General, Advanced, and Amateur Extra licensees may operate on these five channels on a secondary basis with a maximum effective radiated power (ERP) of 100 W PEP relative to a half-wave dipole. Permitted operating modes include upper sideband voice (USB), CW, RTTY, PSK31 and other digital modes such as PACTOR III. Only one signal at a time is permitted on any channel.

## 40 Meters (7 MHz)

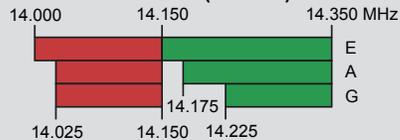


See Sections 97.305(c), 97.307(f)(11) and 97.301(e). These exemptions do not apply to stations in the continental US.

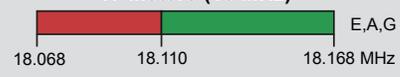
## 30 Meters (10.1 MHz)



## 20 Meters (14 MHz)



## 17 Meters (18 MHz)



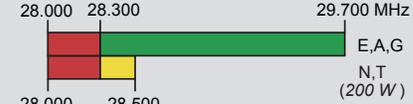
## 15 Meters (21 MHz)



## 12 Meters (24 MHz)



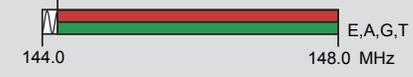
## 10 Meters (28 MHz)



## 6 Meters (50 MHz)



## 2 Meters (144 MHz)



## 1.25 Meters (222 MHz)



\*Geographical and power restrictions may apply to all bands above 420 MHz. See *The ARRL Operating Manual* for information about your area.

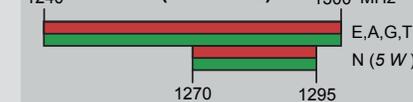
## 70 cm (420 MHz)\*



## 33 cm (902 MHz)\*



## 23 cm (1240 MHz)\*



All licensees except Novices are authorized all modes on the following frequencies:

2300-2310 MHz	10.0-10.5 GHz ‡	122.25-123.0 GHz
2390-2450 MHz	24.0-24.25 GHz	134-141 GHz
3300-3500 MHz	47.0-47.2 GHz	241-250 GHz
5650-5925 MHz	76.0-81.0 GHz	All above 275 GHz

‡ No pulse emissions

### KEY

**Note:** CW operation is permitted throughout all amateur bands.

**MCW** is authorized above 50.1 MHz, except for 144.0-144.1 and 219-220 MHz.

**Test** transmissions are authorized above 51 MHz, except for 219-220 MHz

- = RTTY and data
- = phone and image
- = CW *only*
- = SSB phone
- = USB phone, CW, RTTY, and data
- = Fixed digital message forwarding systems *only*

- E** = Amateur Extra
- A** = Advanced
- G** = General
- T** = Technician
- N** = Novice

See *ARRLWeb* at [www.arrl.org](http://www.arrl.org) for detailed band plans.

## ARRL We're At Your Service

ARRL Headquarters:  
860-594-0200 (Fax 860-594-0259)  
email: [hq@arrl.org](mailto:hq@arrl.org)

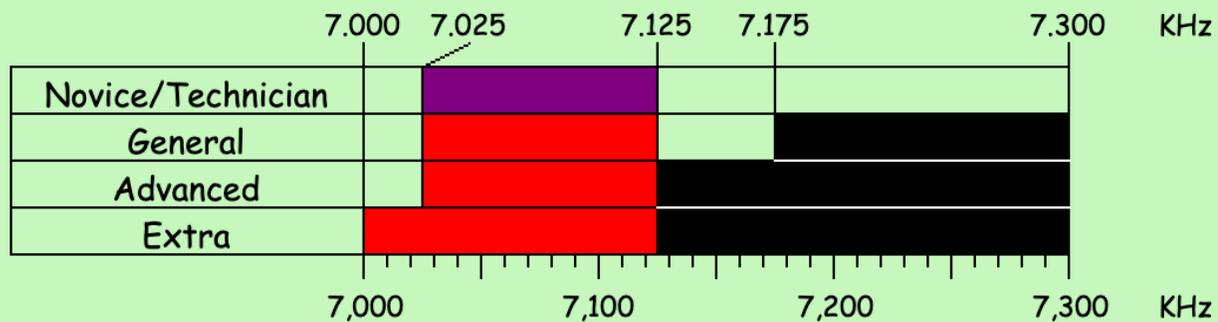
Publication Orders:  
[www.arrl.org/shop](http://www.arrl.org/shop)  
Toll-Free 1-888-277-5289 (860-594-0355)  
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email: [membership@arrl.org](mailto:membership@arrl.org)

Getting Started in Amateur Radio:  
Toll-Free 1-800-326-3942 (860-594-0355)  
email: [newham@arrl.org](mailto:newham@arrl.org)

Exams: 860-594-0300 email: [vec@arrl.org](mailto:vec@arrl.org)

## 40 Meters (7,000 - 7,300 KHz)



- = CW (US: Novice/Technician 200 watts PEP only)
- = CW, RTTY and data (US: < 1 KHz Bandwidth)
- = CW, phone and image

- |   |   |
|---|---|
| <p><b>7,028</b> - FISTS CW Calling</p> <p><b>7,030</b> - QRP DX CW Calling</p> <p><b>7,035.150</b> - CW QRP Calling</p> <p><b>7,040</b> - QRP CW Calling</p> <p><b>7,040</b> - DX Data/RTTY</p> <p><b>7,047.5</b> - ARRL Code</p> <p><b>7,055</b> - SKCC CW Calling (Primary)</p> <p><b>7,058</b> - FISTS CW Calling</p> <p><b>7,070.150</b> - US PSK</p> | <p><b>7,080 - 7,125</b> - Data/RTTY</p> <p><b>7,080.150</b> - PSK</p> <p><b>7,095</b> - ARRL RTTY</p> <p><b>7,100 - 7,105</b> - Packet</p> <p><b>7,120</b> - SKCC CW Calling</p> <p><b>7,171</b> - SSTV</p> <p><b>7,285</b> - QRP Calling</p> <p><b>7,290</b> - AM Calling</p> <p><b>7,290</b> - ARRL Voice</p> |
|---|---|

# Good Practices

G2B01 [97.101(b), (c)]: Which of the following is true concerning access to frequencies?

- A. Nets have priority
- B. QSOs in progress have priority
- C. Except during emergencies, no amateur station has priority access to any frequency
- D. Contest operations should yield to non-contest use of frequencies

# Good Practices

G2B03: What is good amateur practice if propagation changes during a contact creating interference from other stations using the frequency?

- A. Advise the interfering stations that you are on the frequency and that you have priority
- B. Decrease power and continue to transmit
- C. Attempt to resolve the interference problem with the other stations in a mutually acceptable manner
- D. Switch to the opposite sideband

# Good Practices

G2B04: When selecting a CW transmitting frequency, what minimum separation from other stations should be used to minimize interference to stations on adjacent frequencies?

- A. 5 Hz to 50 Hz
- B. 150 Hz to 500 Hz
- C. 1 kHz to 3 kHz
- D. 3 kHz to 6 kHz

## Good Practices

G2B05: When selecting an SSB transmitting frequency, what minimum separation should be used to minimize interference to stations on adjacent frequencies?

- A. 5 Hz to 50 Hz
- B. 150 Hz to 500 Hz
- C. 2 kHz to 3 kHz
- D. Approximately 6 kHz

# Good Practices

G2B06: How can you avoid harmful interference on an apparently clear frequency before calling CQ on CW or phone?

- A. Send “QRL?” on CW, followed by your call sign; or, if using phone, ask if the frequency is in use, followed by your call sign
- B. Listen for 2 minutes before calling CQ
- C. Send the letter “V” in Morse code several times and listen for a response, or say “test” several times and listen for a response
- D. Send “QSY” on CW or if using phone, announce “the frequency is in use,” then give your call sign and listen for a response

## Good Practices

G2B07: Which of the following complies with commonly accepted amateur practice when choosing a frequency on which to initiate a call?

- A. Listen on the frequency for at least two minutes to be sure it is clear
- B. Identify your station by transmitting your call sign at least 3 times
- C. Follow the voluntary band plan
- D. All these choices are correct

# Good Practices

G2D07: Which of the following are examples of the NATO Phonetic Alphabet?

- A. Able, Baker, Charlie, Dog
- B. Adam, Boy, Charles, David
- C. America, Boston, Canada, Denmark
- D. Alpha, Bravo, Charlie, Delta

# Making Contacts

General Class License Manual pages 2-5 – 2-8

- Listen first, then check that the frequency is not in use.
- CQ, CQ, CQ, this is AB1CDE. AB1CDE, AB1CDE calling CQ.
- CQ DX is seeking a contact outside the lower 48 states.
- Break into a QSO with your call sign (once).
- 6m band plan calls for DX between 50.1 and 50.125 MHz.
- Log your contacts to answer FCC information requests.
- Keep a record of your antenna gain.

# Making Contacts

G2A08: What is the recommended way to break into a phone contact?

- A. Say “QRZ” several times, followed by your call sign
- B. Say your call sign once
- C. Say “Breaker Breaker”
- D. Say “CQ” followed by the call sign of either station

# Making Contacts

G2A11: Generally, who should respond to a station in the contiguous 48 states calling “CQ DX”?

- A. Any caller is welcome to respond
- B. Only stations in Germany
- C. Any stations outside the lower 48 states
- D. Only contest stations

## Making Contacts

G2B08: What is the voluntary band plan restriction for US stations transmitting within the 48 contiguous states in the 50.1 MHz to 50.125 MHz band segment?

- A. Only contacts with stations not within the 48 contiguous states
- B. Only contacts with other stations within the 48 contiguous states
- C. Only digital contacts
- D. Only SSTV contacts

# Making Contacts

G2B10: Which of the following is good amateur practice for net management?

- A. Always use multiple sets of phonetics during check-in
- B. Have a backup frequency in case of interference or poor conditions
- C. Transmit the full net roster at the beginning of every session
- D. All these choices are correct

# Making Contacts

G2D05: Which of the following indicates that you are looking for an HF contact with any station?

A. Sign your call sign once, followed by the words “listening for a call” -- if no answer, change frequency and repeat

B. Say “QTC” followed by “this is” and your call sign -- if no answer, change frequency and repeat

C. Repeat “CQ” a few times, followed by “this is,” then your call sign a few times, then pause to listen, repeat as necessary

D. Transmit an unmodulated carrier for approximately 10 seconds, followed by “this is” and your call sign, and pause to listen -- repeat as necessary

# Making Contacts

G2D08: Why do many amateurs keep a station log?

- A. The FCC requires a log of all international contacts
- B. The FCC requires a log of all international third-party traffic
- C. The log provides evidence of operation needed to renew a license without retest
- D. To help with a reply if the FCC requests information about your station

# Making Contacts

G2D09: Which of the following is required when participating in a contest on HF frequencies?

- A. Submit a log to the contest sponsor
- B. Send a QSL card to the stations worked, or QSL via Logbook of The World
- C. Identify your station according to normal FCC regulations
- D. All these choices are correct

# Modes

General Class License Manual pages 2-9 – 2-10

- CW (continuous wave) aka Morse code; usually in the band areas reserved for CW (although anywhere in band is allowed).
- SSB (single sideband) most common phone signal. SSB is AM with both the carrier and one sideband suppressed, resulting in a 3kHz wide signal.
- Good amateur practice is to use USB (upper sideband) on 20m and above and LSB (lower sideband) on 40m and below. (60m band is special and uses USB.)
- Other modes include digital voice, various digital data modes and image modes.

# Modes

G2A01: Which mode is most commonly used for voice communications on frequencies of 14 MHz or higher?

- A. Upper sideband
- B. Lower sideband
- C. Suppressed sideband
- D. Double sideband

# Modes

G2A02: Which mode is most commonly used for voice communications on the 160-, 75-, and 40-meter bands?

- A. Upper sideband
- B. Lower sideband
- C. Suppressed sideband
- D. Double sideband

# Modes

G2A03: Which mode is most commonly used for SSB voice communications in the VHF and UHF bands?

- A. Upper sideband
- B. Lower sideband
- C. Suppressed sideband
- D. Double sideband

# Modes

G2A04: Which mode is most commonly used for voice communications on the 17- and 12-meter bands?

- A. Upper sideband
- B. Lower sideband
- C. Suppressed sideband
- D. Double sideband

# Modes

G2A05: Which mode of voice communication is most commonly used on the HF amateur bands?

- A. Frequency modulation
- B. Double sideband
- C. Single sideband
- D. Single phase modulation

# Modes

G2A06: Which of the following is an advantage of using single sideband, as compared to other analog voice modes on the HF amateur bands?

- A. Very high-fidelity voice modulation
- B. Less subject to interference from atmospheric static crashes
- C. Ease of tuning on receive and immunity to impulse noise
- D. Less bandwidth used and greater power efficiency

# Modes

G2A07: Which of the following statements is true of single sideband (SSB)?

- A. Only one sideband and the carrier are transmitted; the other sideband is suppressed
- B. Only one sideband is transmitted; the other sideband and carrier are suppressed
- C. SSB is the only voice mode authorized on the 20-, 15-, and 10-meter amateur bands
- D. SSB is the only voice mode authorized on the 160-, 75-, and 40-meter amateur bands

# Modes

G2A09: Why do most amateur stations use lower sideband on the 160-, 75-, and 40-meter bands?

- A. Lower sideband is more efficient than upper sideband at these frequencies
- B. Lower sideband is the only sideband legal on these frequency bands
- C. Because it is fully compatible with an AM detector
- D. It is commonly accepted amateur practice

# HF Receiving

General Class License Manual pages 2-11 – 2-12

- QRN – noise or static; caused by storms and other natural atmospheric processes; exists on all HF bands.
- Most HF contacts exchange a signal report so adjustments can be made if necessary to accommodate conditions.
- RST signal reports – readability, strength and tone.
  - Readability 1-5; 5 best
  - Strength 1-9; 9 best
  - Tone 1-9; 9 best; typically only when using CW and digital
  - A "C" is added to tone on CW when the signal is chirpy or unstable
  - A typical exchange might be I hear you 57 (great readability, good strength) and you hear me 44 (good readability, acceptable strength)

## HF Receiving

G2C07: When sending CW, what does a “C” mean when added to the RST report?

- A. Chirpy or unstable signal
- B. Report was read from an S meter rather than estimated
- C. 100 percent copy
- D. Key clicks

# HF Receiving

G2C10: What does the Q signal “QRN” mean?

- A. Send more slowly
- B. Stop sending
- C. Zero beat my signal
- D. I am troubled by static

# HF Receiving

G2D11: Why are signal reports typically exchanged at the beginning of an HF contact?

- A. To allow each station to operate according to conditions
- B. To be sure the contact will count for award programs
- C. To follow standard radiogram structure
- D. To allow each station to calibrate their frequency display

# HF Transmitting

General Class License Manual pages 2-13 – 2-16

## CW Procedures:

- CW transmissions can be configured as semi break-in where the transceiver switches back to receive after the VOX delay expires or full break-in where the radio switches between transmit and receive within a few microseconds.
- Full break-in enables hearing incoming signals between transmitted code characters.
- Prosigns are two letter abbreviations used for CW.
  - “AR” indicates end of message.
  - “KN” tells others you’re only interested in hearing from the specific station you’re contacting.

# HF Transmitting

## CW Procedures (continued):

- Respond to a CW CQ at the fastest speed you're comfortable with, but no faster than the speed of the sending station.
- Match your transmitting frequency to the received signal to achieve "zero-beat".

Q-signals are additional abbreviations used for both CW and phone.

- "QRS" tells the sender to send slower.
- "QRV" indicates you're ready to receive
- "QSL" tells the sender you have received and understood their message
- "QRL" are you busy/is this frequency in use?

Be sure to give your call sign every 10 minutes and at the end of a transmission for both phone and CW transmissions.

# HF Transmitting

G2C04: What does the Q signal “QRL?” mean?

- A. “Will you keep the frequency clear?”
- B. “Are you operating full break-in?” or “Can you operate full break-in?”
- C. “Are you listening only for a specific station?”
- D. “Are you busy?” or “Is this frequency in use?”

# HF Transmitting

G2A10: Which of the following statements is true of VOX operation versus PTT operation?

- A. The received signal is more natural sounding
- B. It allows “hands free” operation
- C. It occupies less bandwidth
- D. It provides more power output

# HF Transmitting

G2C01: Which of the following describes full break-in CW operation (QSK)?

- A. Breaking stations send the Morse code prosign “BK”
- B. Automatic keyers, instead of hand keys, are used to send Morse code
- C. An operator must activate a manual send/receive switch before and after every transmission
- D. Transmitting stations can receive between code characters and elements

# HF Transmitting

G2C02: What should you do if a CW station sends “QRS?”

- A. Send slower
- B. Change frequency
- C. Increase your power
- D. Repeat everything twice

# HF Transmitting

G2C03: What does it mean when a CW operator sends “KN” at the end of a transmission?

- A. No US stations should call
- B. Operating full break-in
- C. Listening only for a specific station or stations
- D. Closing station now

# HF Transmitting

G2C05: What is the best speed to use when answering a CQ in Morse code?

- A. The fastest speed at which you are comfortable copying, but no slower than the CQ
- B. The fastest speed at which you are comfortable copying, but no faster than the CQ
- C. At the standard calling speed of 10 wpm
- D. At the standard calling speed of 5 wpm

# HF Transmitting

G2C06: What does the term “zero beat” mean in CW operation?

- A. Matching the speed of the transmitting station
- B. Operating split to avoid interference on frequency
- C. Sending without error
- D. Matching the transmit frequency to the frequency of a received signal

# HF Transmitting

G2C08: What prosign is sent to indicate the end of a formal message when using CW?

- A. SK
- B. BK
- C. AR
- D. KN

# HF Transmitting

G2C09: What does the Q signal “QSL” mean?

- A. Send slower
- B. We have already confirmed the contact
- C. I have received and understood
- D. We have worked before

# HF Transmitting

G2C11: What does the Q signal “QRV” mean?

- A. You are sending too fast
- B. There is interference on the frequency
- C. I am quitting for the day
- D. I am ready to receive

# HF Transmitting

G2D10: What is QRP operation?

- A. Remote piloted model control
- B. Low-power transmit operation
- C. Transmission using Quick Response Protocol
- D. Traffic relay procedure net operation

# Emergency Operations

General Class License Manual pages 2-16 – 2-18

## RACES:

- Radio Amateur civil emergency service.
- Sponsored by government agencies.
- Specifically for civil defense.
- FCC-licensed amateur with certification from a civil defense organization.
- RACES drills may not exceed 1 hour per week.

## ARES:

- Amateur radio emergency service.
- Sponsored and organized by the ARRL.
- Provides communications assistance to local and regional government and relief agencies.

# Emergency Operations

## Distress Calls:

- Suspend any existing contact.
- Immediately acknowledge to the station calling for help that you hear them.
- Stand by to receive the location of the emergency and the nature of the assistance required.
- Relay the information to the proper authorities and stay on frequency for further information or until help arrives.
- A station requesting emergency help can use any means of radio communication available. Any frequency, mode and/or power level even outside your normal privileges.

# Emergency Operations

G2B11 [97.407(d)(4)]: How often may RACES training drills and tests be routinely conducted without special authorization?

- A. No more than 1 hour per month
- B. No more than 2 hours per month
- C. No more than 1 hour per week
- D. No more than 2 hours per week

# Emergency Operations

G2B02: What is the first thing you should do if you are communicating with another amateur station and hear a station in distress break in?

- A. Inform your local emergency coordinator
- B. Acknowledge the station in distress and determine what assistance may be needed
- C. Immediately decrease power to avoid interfering with the station in distress
- D. Immediately cease all transmissions

# Emergency Operations

G2B09 [97.407(a)]: Who may be the control operator of an amateur station transmitting in RACES to assist relief operations during a disaster?

- A. Only a person holding an FCC-issued amateur operator license
- B. Only a RACES net control operator
- C. A person holding an FCC-issued amateur operator license or an appropriate government official
- D. Any control operator when normal communication systems are operational

# Volunteer Monitoring Program

General Class License Manual page 3-3

- The amateur service is largely self-policing.
- The volunteer monitoring program's goal is to encourage self-regulation and rules compliance.
- Amateur volunteers are formally enlisted to monitor the airwaves for rules violations.
- Volunteer monitors may compare repeater beam heading (similar to a fox hunt) to triangulate the location of a violating stations.

# Volunteer Monitoring Program

G2D01: What is the Volunteer Monitor Program?

- A. Amateur volunteers who are formally enlisted to monitor the airwaves for rules violations
- B. Amateur volunteers who conduct amateur licensing examinations
- C. Amateur volunteers who conduct frequency coordination for amateur VHF repeaters
- D. Amateur volunteers who use their station equipment to help civil defense organizations in times of emergency

# Volunteer Monitoring Program

G2D02: Which of the following are objectives of the Volunteer Monitor Program?

- A. To conduct efficient and orderly amateur licensing examinations
- B. To provide emergency and public safety communications
- C. To coordinate repeaters for efficient and orderly spectrum usage
- D. To encourage amateur radio operators to self-regulate and comply with the rules

# Volunteer Monitoring Program

G2D03: What procedure may be used by Volunteer Monitors to localize a station whose continuous carrier is holding a repeater on in their area?

- A. Compare vertical and horizontal signal strengths on the input frequency
- B. Compare beam headings on the repeater input from their home locations with that of other Volunteer Monitors
- C. Compare signal strengths between the input and output of the repeater
- D. All these choices are correct

# Packet-Based Modes and Systems

General Class License Manual pages pages 6-6 – 6-11

- Packet-based = structured modes.
- Derived from teletype over radio and computer-computer networking modes.
- Packet-based modes require computer control of your transceiver.
- Several modes (JT65 and FT8) require precise timing, necessitating keeping your computer synchronized to within 1 second of standard time.
- Packets are structured groups of information or “frames”.
  - Header provides synchronization information for the receiver.
  - Data is the information being exchanged.
  - Trailer provides additional control and/or status and error detection.

# Packet-Based Modes and Systems

- Error detection and correction is accomplished by including redundant information with the data being transmitted.
- ARQ is a mode where the receiver sends a NAK (not acknowledged) message when a mismatch is detected. PACTOR and packet radio both use ARQ.
- ARQ-based communications are point to point and cannot be broken into like CW or phone.

## Winlink:

- Enables transferring email and digital files using digital modes on HF bands.
- Winlink is a worldwide communication system now and can facilitate email exchanges between amateur radio operators without Internet access.
- Winlink also uses the Internet to connect its system of email servers with gateway and mailbox stations around the world to communicate with non-hams.
- Winlink uses several modes; on HF, PACTOR and VARA are common.

# Packet-Based Modes and Systems

## FT8 and WSPR:

- These are digital modes supported by the WSJT-X software suite.
- Both use precisely timed sequences, 8-tone FSK modulation and sophisticated error decoding and correction techniques.
- Both operate in very low signal-to-noise environments.
- Limited information can be exchanged with FT8 – call signs, grid locators and signal reports.
- FT8 signal reports provide the signal-to-noise level; a report of +3 means 3Db above the noise floor.

## AREDN:

- Amateur radio emergency data network.
- Uses commercially available routers, replacing the firmware.
- Provides a peer-to-peer, self-discovering network.
- Typically used during emergencies and for supporting large community events.

# Packet-Based Modes and Systems

G2E02: What is VARA?

- A. A low signal-to-noise digital mode used for EME (moonbounce)
- B. A digital protocol used with Winlink
- C. A radio direction finding system used on VHF and UHF
- D. A DX spotting system using a network of software defined radios

# Packet-Based Modes and Systems

G2E04: Which of the following is good practice when choosing a transmitting frequency to answer a station calling CQ using FT8?

- A. Always call on the station's frequency
- B. Call on any frequency in the waterfall except the station's frequency
- C. Find a clear frequency during the same time slot as the calling station
- D. Find a clear frequency during the alternate time slot to the calling station

# Packet-Based Modes and Systems

G2E07: Which of the following is required when using FT8?

- A. A special hardware modem
- B. Computer time accurate to within approximately 1 second
- C. Receiver attenuator set to -12 dB
- D. A vertically polarized antenna

# Packet-Based Modes and Systems

G2E09: How do you join a contact between two stations using the PACTOR protocol?

- A. Send broadcast packets containing your call sign while in MONITOR mode
- B. Transmit a steady carrier until the PACTOR protocol times out and disconnects
- C. Joining an existing contact is not possible, PACTOR connections are limited to two stations
- D. Send a NAK code

# Packet-Based Modes and Systems

G2E11: What is the primary purpose of an Amateur Radio Emergency Data Network (AREDN) mesh network?

- A. To provide FM repeater coverage in remote areas
- B. To provide real time propagation data by monitoring amateur radio transmissions worldwide
- C. To provide high-speed data services during an emergency or community event
- D. To provide DX spotting reports to aid contesters and DXers

# Packet-Based Modes and Systems

G2E12: Which of the following describes Winlink?

- A. An amateur radio wireless network to send and receive email on the internet
- B. A form of Packet Radio
- C. A wireless network capable of both VHF and HF band operation
- D. All of the above

# Packet-Based Modes and Systems

G2E13: What is another name for a Winlink Remote Message Server?

- A. Terminal Node Controller
- B. Gateway
- C. RJ-45
- D. Printer/Server

# Packet-Based Modes and Systems

G2E15: Which of the following is a common location for FT8?

- A. Anywhere in the voice portion of the band
- B. Anywhere in the CW portion of the band
- C. Approximately 14.074 MHz to 14.077 MHz
- D. Approximately 14.110 MHz to 14.113 MHz

# Receiving and Transmitting Digital Modes

General Class License Manual page 6-11

- Most digital modes on HF are transmitted as USB signals (except RTTY which uses LSB).
- Your modem must be configured for the correct baud rate and tone frequencies.
- Using the wrong SSB mode will invert the tone relationship, losing the ability to decode the digital data.

# Receiving and Transmitting Digital Modes

G2E01: Which mode is normally used when sending RTTY signals via AFSK with an SSB transmitter?

- A. USB
- B. DSB
- C. CW
- D. LSB

# Receiving and Transmitting Digital Modes

G2E05: What is the standard sideband for JT65, JT9, FT4, or FT8 digital signal when using AFSK?

- A. LSB
- B. USB
- C. DSB
- D. SSB

# Receiving and Transmitting Digital Modes

G2E14: What could be wrong if you cannot decode an RTTY or other FSK signal even though it is apparently tuned in properly?

- A. The mark and space frequencies may be reversed
- B. You may have selected the wrong baud rate
- C. You may be listening on the wrong sideband
- D. All these choices are correct

# Digital Operating Procedures

General Class License Manual pages pages 6-14 – 6-16

- Unmanned gateway and mailbox stations monitor a fixed frequency waiting for another station to connect.
- Connection establishment is protocol-specific, but the contact always starts with a connect message.
- These are point to point communications and cannot be broken into by another station.
- ARQ modes such as PACTOR and VARA do their best to automatically recover from reception difficulties. However, interference can cause:
  - Failure to connect.
  - Frequent retries or transmission delays.
  - Timeouts or dropped connections.

# Digital Operating Procedures

G2E03: What symptoms may result from other signals interfering with a PACTOR or VARA transmission?

- A. Frequent retries or timeouts
- B. Long pauses in message transmission
- C. Failure to establish a connection between stations
- D. All these choices are correct

# Digital Operating Procedures

G2E10: Which of the following is a way to establish contact with a digital messaging system gateway station?

- A. Send an email to the system control operator
- B. Send QRL in Morse code
- C. Respond when the station broadcasts its SSID
- D. Transmit a connect message on the station's published frequency

# Miscellaneous

- Digital signal band plan.
- RTTY frequency shift (mark -> space) is 170Hz.
- ALC is typically adjusted via the microphone gain or transmit audio control.
- An azimuthal projection map shows true bearings and distances from a specific location.
- The long path is 180 degrees from the station's short path (looking backward instead of forward).

# Digital Signal Band Plan

Band (meters)	Frequency (MHz)
160	1.800 – 1.810; FT8 on 1.840
80	3.570 – 3.600
60	5332.0, 5348.0, 5358.5, 5373, 5405 kHz
40	7.070 – 7.125
30	10.130 – 10.150; RTTY DX calling 7.040
20	14.070 – 14.0995; 14.105 – 14.112; PSK31 calling 14.070
17	18.100 – 18.110
15	21.070 – 21.110
12	24.920 - 24.930
10	28.070 – 28.189

## Miscellaneous

G2E08: In what segment of the 20-meter band are most digital mode operations commonly found?

- A. At the bottom of the slow-scan TV segment, near 14.230 MHz
- B. At the top of the SSB phone segment, near 14.325 MHz
- C. In the middle of the CW segment, near 14.100 MHz
- D. Between 14.070 MHz and 14.100 MHz

# Miscellaneous

G2E06: What is the most common frequency shift for RTTY emissions in the amateur HF bands?

- A. 85 Hz
- B. 170 Hz
- C. 425 Hz
- D. 850 Hz

## Miscellaneous

G2A12: What control is typically adjusted for proper ALC setting on a single sideband transceiver?

- A. RF clipping level
- B. Transmit audio or microphone gain
- C. Antenna inductance or capacitance
- D. Attenuator level

## Miscellaneous

G2D04: Which of the following describes an azimuthal projection map?

- A. A map that shows accurate land masses
- B. A map that shows true bearings and distances from a specific location
- C. A map that shows the angle at which an amateur satellite crosses the equator
- D. A map that shows the number of degrees longitude that an amateur satellite appears to move westward at the equator with each orbit

## Miscellaneous

G2D06: How is a directional antenna pointed when making a “long-path” contact with another station?

- A. Toward the rising sun
- B. Along the gray line
- C. 180 degrees from the station’s short-path heading
- D. Toward the north

# Resources

ARRL General Class License Manual (10<sup>th</sup> edition)

[HamExam.org](http://HamExam.org)