Amateur Radio Technician Exam Preparation

ARRL
The National Association for Amateur Radio®

Amateur Radio Technician Exam Prep Course

Module 6

Communicating With Other Hams

6.1 Band Plans
6.2 Making Contacts
6.3 Using Repeaters
6.4 Nets
6.5 Communications for Public Service
6.6 Satellite Operating

Band Plans

- Band plans are *voluntary agreements* designed for normal conditions (not regulations)
- Amateur Radio is the only service that can tune freely and use multiple modes within their allocations
- Amateur Radio Band Plan:
  - www.arrl.org/band-plan
- See 2 meter band plan on following slide (Table 6.1)

Table 6.1: 2 meter (144-148 MHz) Band Plan

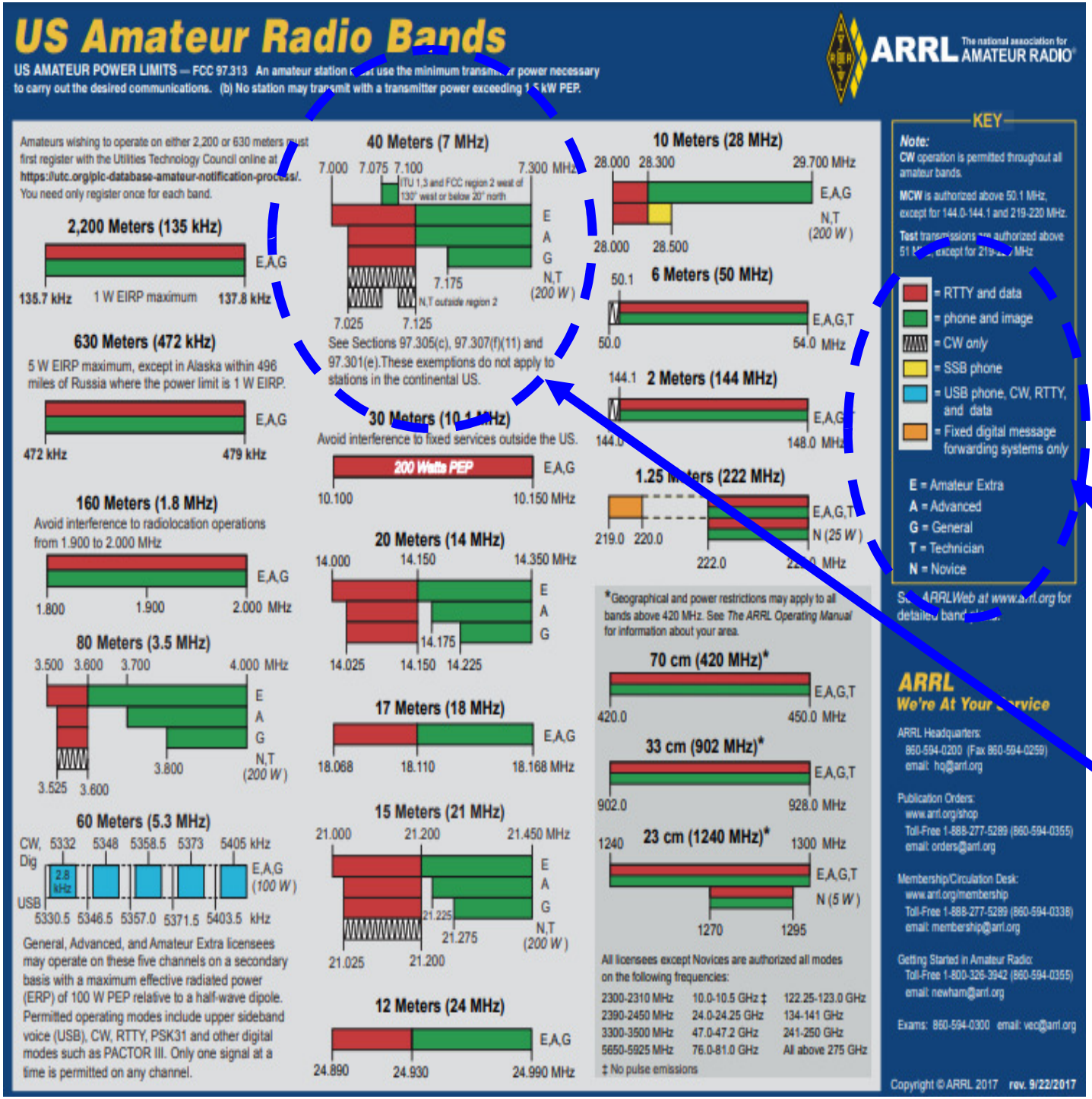
2 meter and 70 cm bands are where many Technician licensees begin operating

Note the variety of activity in just one band

144.00-144.05	EME (CW)
144.05-144.10	General CW and weak signals
144.10-144.20	EME and weak-signal SSB
144.200	SSB calling frequency
144.200-144.275	General SSB operation
144.275-144.300	Propagation beacons
144.30-144.50	OSCAR subband
144.50-144.60	Linear translator inputs
144.60-144.90	FM repeater inputs
144.90-145.10	Weak signal and FM simplex (145.01, 03, 05, 07,09 are widely used for packet radio)
145.10-145.20	Linear translator outputs
145.20-145.50	FM repeater outputs
145.50-145.80	Miscellaneous and experimental modes
145.80-146.00	OSCAR subband
146.01-146.37	Repeater inputs
146.40-146.58	Simplex
146.52	National Simplex Calling Frequency
146.61-147.39	Repeater outputs
147.42-147.57	Simplex
147.60-147.99	Repeater inputs

Band Plans (cont.)

- HF band plans tend to be simpler than VHF and UHF because there are no repeaters
- Other common uses listed in band plans …
  - Beacons — Automated transmissions for listeners to tell when the band is “open” to the beacon’s location
  - Weak signal — Modes that work better at lower signal strengths (CW, SSB, and some digital modes). Every amateur band from 50 MHz on up has frequencies available for CW and SSB operation.
  - Satellite uplinks and downlinks —Segments of bands where signals are sent to (*uplink*) and received from (*downlink*) satellites
  - Simplex — Transmitting and receiving on the same frequency
  - Repeater inputs and outputs
  - Control links

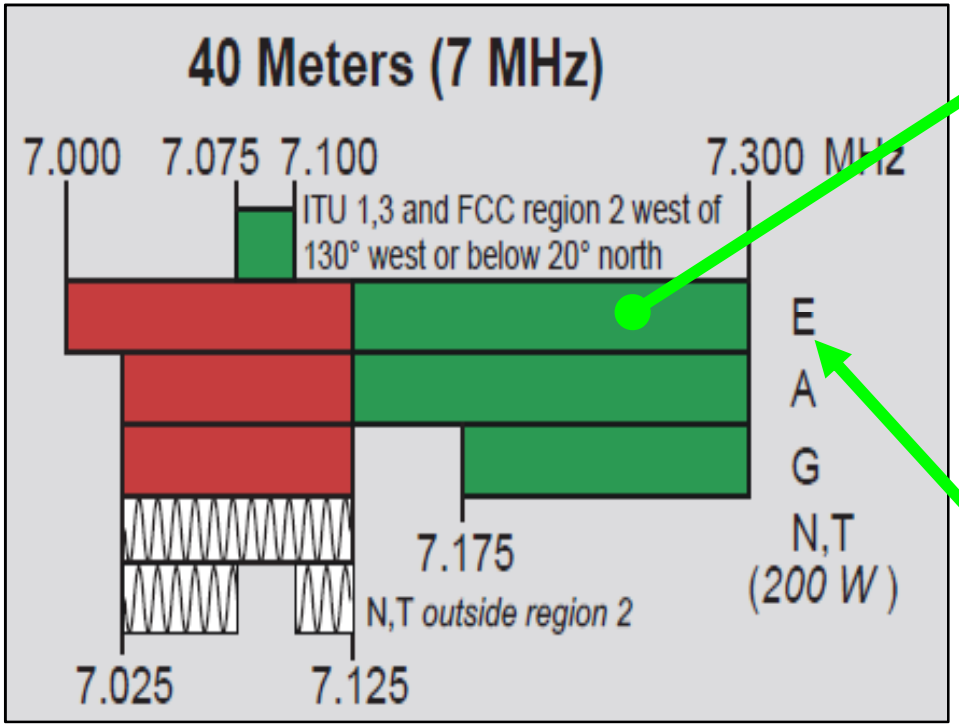


Frequency Bands Chart from arrl.org

See slide **INTERPRETING THE BAND PLAN**

Interpreting the Band Plan

Band (frequency)



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

Use(s)

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

License privilege(s)

An EXTRA may use the 40 meter band for phone or image from 7.125 to 7.300 MHz.

Making Contacts on Repeaters

- Before you transmit, be sure you are authorized to use that frequency and mode
- Typical repeater "manners" …
  - Listen so that you are aware of someone using the repeater
  - Keep transmissions short
  - Identify your station legally
- Easiest way to attract listeners … *give your call sign followed by "monitoring" … KØILP monitoring*
- Responding to a station looking for a contact … *say the other station's call sign once, followed by "this is" or "from," then give your call sign … KX4IU this is KØILP*

Making Contacts on Repeaters (cont.)

- If you accidentally interrupt someone … *just say "Sorry, KØILP clear" and wait for their contact to end or tune to a different repeater*
- What if you receive a report that your signal's audio is strong, but distorted?
  - You're slightly off-frequency (radio control knob got bumped)
  - Speaking too loudly into the microphone
  - Transmitting from a bad location

Making Contacts on Simplex Channels

- Simplex channels are conveniently located between bands of repeater input and output channels
- It's often quite easy to make contact directly, without use of a repeater … avoids occupying or "tying up" a repeater
- Many radios have a *reverse* split function that swaps transmit and receive frequencies, enabling you to listen for the other station on the repeater's input frequency

Making Contacts: SSB, CW, and DIGITAL

- Starting contacts is different on these modes than on repeaters that use fixed channels … *call must be long enough to attract attention*
- Done by calling *CQ* (means "I am calling any station.")
  - The station calling CQ sends or says "CQ" several times followed by their call sign … *CQ CQ CQ, this is KØILP Kilo Zero India Lima Papa calling CQ and standing by*
  - On CW or Digital: *CQ CQ CQ DE KØILP KØILP KØILP K*

Q-Signals

- Q-signals are a system of radio shorthand (abbreviations for common information) developed from old telegraphy codes
- Although developed for use by Morse operators, their use is also common on phone/voice
- Table 6.2 lists the most common Q-signals

Table 6.2: Q-Signals

Take the form of a question only when followed by a question mark.

QRG	Your exact frequency (or that of _____) is _____kHz. Will you tell me my exact frequency (or that of _____)?
QRL	I am busy (or I am busy with _____). Are you busy? Usually used to see if a frequency is busy.
QRM	Your transmission is being interfered with _____ (1. Nil; 2. Slightly; 3. Moderately; 4. Severely; 5. Extremely.) Is my transmission being interfered with?
QRN	I am troubled by static _____. (1 to 5 as under QRM.) Are you troubled by static?
QRO	Increase power. Shall I increase power?
QRP	Decrease power. Shall I decrease power?
QRQ	Send faster (_____wpm). Shall I send faster?
QRS	Send more slowly (_____wpm). Shall I send more slowly?
QRT	Stop sending. Shall I stop sending?
QRU	I have nothing for you. Have you anything for me?
QRV	I am ready. Are you ready?
QRX	I will call you again at _____hours (on _____kHz). When will you call me again? Minutes are usually implied rather than hours.
QRZ	You are being called by _____ (on _____kHz). Who is calling me?
QSB	Your signals are fading. Are my signals fading?
QSK	I can hear you between signals; break in on my transmission. Can you hear me between your signals and if so can I break in on your transmission?
QSL	I am acknowledging receipt. Can you acknowledge receipt (of a message or transmission)?
QSO	I can communicate with _____ direct (or relay through _____). Can you communicate with _____ direct or by relay?
QSP	I will relay to _____. Will you relay to _____?
QST	General call preceding a message addressed to all amateurs and ARRL members. This is in effect "CQ ARRL."
QSX	I am listening to _____ on _____kHz. Will you listen to _____on _____kHz?
QSY	Change to transmission on another frequency (or on _____kHz). Shall I change to transmission on another frequency (or on _____kHz)?
QTC	I have _____messages for you (or for _____). How many messages have you to send?
QTH	My location is _____. What is your location?
QTR	The time is _____. What is the correct time?

DXing and Contesting

- DX stands for *distant station*
  - Means thousands of miles on HF (and occasionally 6 meters)
  - Beyond the radio horizon on VHF/UHF
- Best done on SSB or CW because of the efficiency of those modes
- Radio contests are held in which the competitors try to make as many short contacts as possible in a fixed period of time
- During contesting send only the minimum

Popular DXing Event

ARRL Field Day — The Biggest Amateur Event of All!

Every year on the fourth full weekend of June, North American hams head for the hills…and the fields and the parks and the backyards. It's Field Day! This is the annual emergency preparedness exercise in which more hams participate than any other. The basic idea — set up a portable station (or several) and try to make as many contacts with other ham groups as possible on as many amateur bands as possible. If you think the bands are busy on weekends, wait until you hear them during ARRL Field Day!

Some groups focus on the emergency preparedness aspect, others get into the competitive aspect trying for the most points, and some just treat it as the annual club picnic plus radio operating. Whatever your organization prefers, Field Day is a great way to see a lot of ham radio all in one spot and all at the same time. For more information, browse to ARRL Field Day web page, read the Field Day announcement in the May issue of *QST* magazine, or enjoy the Field Day summary and results that usually appear in the December issue. CQ, Field Day!

www.arrl.org/field-day

Fox Hunting & Direction Finding

- A different and more physical type of contest is known as *foxhunting*
- Involves hiding and finding hidden transmitters
- Trains hams to find downed aircraft, lost hikers, and sources of interference or jamming
- You can get started with a portable radio with a signal strength indicator and a handheld or portable directional antenna

Video

- Two primary means of exchanging pictures or video in real-time
  - Amateur television (ATV) on the UHF bands at 430 MHz and higher
  - Fast-scan color television signals (NTSC … National Television System Committee)
    - Slow-scan television (SSTV) sends *still* signals
- More info on amateur radio imaging at:
  - www.arrl.org/atv-fast-scan-amateur-television
  - www.hamuniverse.com/atvfastscantv.html

PRACTICE QUESTIONS

Where may SSB phone be used in amateur bands above 50 MHz?

A. Only in sub-bands allocated to General class or higher licensees
B. Only on repeaters
C. In at least some segment of all these bands
D. On any band if the power is limited to 25 watts

T1B10 C 97.305(c) 6-1

What is a band plan, beyond the privileges established by the FCC?

A. A voluntary guideline for using different modes or activities within an amateur band
B. A list of operating schedules
C. A list of available net frequencies
D. A plan devised by a club to indicate frequency band usage

T2A10 A 6-1

What term describes an amateur station that is transmitting and receiving on the same frequency?

A. Full duplex
B. Diplex
C. Simplex
D. Multiplex

T2A11 C 6-1

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

T2A04 B 6-4

Which of the following indicates that a station is listening on a repeater and looking for a contact?

A. “CQ CQ” followed by the repeater’s call sign
B. The station’s call sign followed by the word “monitoring”
C. The repeater call sign followed by the station’s call sign
D. “QSY” followed by your call sign

T2A09 B 6-4

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

A. Your transmitter is slightly off frequency
B. Your batteries are running low
C. You are in a bad location
D. All these choices are correct

T7B10 D 6-4

What is the national calling frequency for FM simplex operations in the 2 meter band?

A. 146.520 MHz
B. 145.000 MHz
C. 432.100 MHz
D. 446.000 MHz

T2A02 A 6-6

How is a VHF/UHF transceiver's "reverse" function used?

A. To reduce power output
B. To increase power output
C. To listen on a repeater's input frequency
D. To listen on a repeater's output frequency

T2B01 C 6-6

Why are simplex channels designated in the VHF/UHF band plans?

A. So stations within range of each other can communicate without tying up a repeater
B. For contest operation
C. For working DX only
D. So stations with simple transmitters can access the repeater without automated offset

T2B09 A 6-6

How should you respond to a station calling CQ?

A. Transmit “CQ” followed by the other station’s call sign
B. Transmit your 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 C 6-6

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

A. Call on the quarter hour
B. Test transmission, no reply expected
C. Only the called station should transmit
D. Calling any station

T2A08 D 6-6

What should you do before 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 authorized to use that frequency
D. All these choices are correct

T2A12 D 6-6

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

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

T2B10 A 6-7

Which Q signal indicates that you are changing frequency?

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

T2B11 B 6-7

What operating activity involves contacting as many stations as possible during a specified period?

A. Simulated emergency exercises
B. Net operations
C. Public service events
D. Contesting

T8C03 D 6-7

Which of the following is good procedure when contacting another station in a contest?

A. Sign only the last two letters of your call if there are many other stations calling
B. Contact the station twice to be sure that you are in his log
C. Send only the minimum information needed for proper identification and the contest exchange
D. All these choices are correct

T8C04 C 6-7

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 A 6-8

What type of transmission is indicated by the term "NTSC?"

A. A Normal Transmission mode in Static Circuit
B. A special mode for satellite uplink
C. An analog fast-scan color TV signal
D. A frame compression scheme for TV signals

T8D04 C 6-9

Which of the following methods is used to locate sources of noise interference or jamming?

A. Echolocation
B. Doppler radar
C. Radio direction finding
D. Phase locking

T8C01 C 6-10

Which of these items would be useful for a hidden transmitter hunt?

A. Calibrated SWR meter
B. A directional antenna
C. A calibrated noise bridge
D. All these choices are correct

T8C02 B 6-10