

Amateur Radio Technician Class Training

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Based on the No-Nonsense Technician Class
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Updates by Rebecca Mercuri, Ph.D., K3RPM



AMATEUR RADIO DIGITAL COMMUNICATIONS

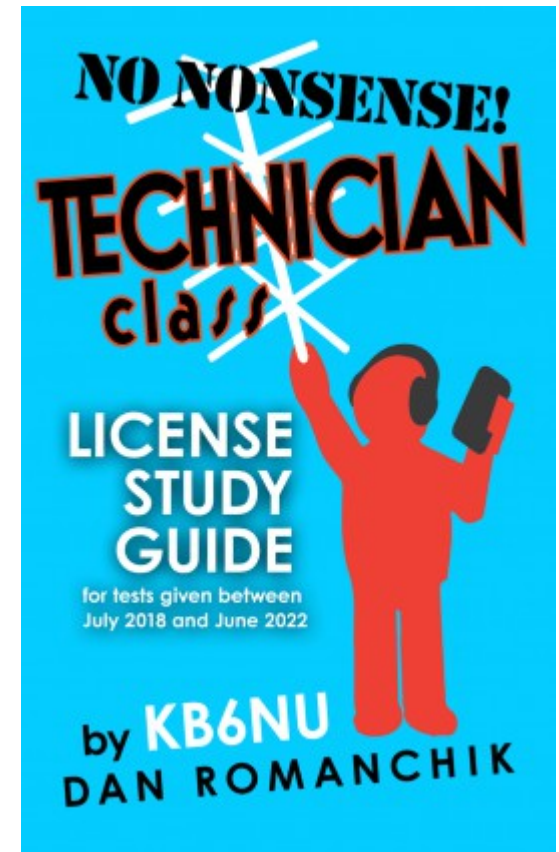


Welcome to Session 6

Any Questions Before We Start?

Agenda

- Introduction
- Radio Wave Characteristics (RWC)
- Electronic Components and Circuits (ECCD)
- Electrical Principles (EP)
- Antennas and Feed Lines (AFL)
- Amateur Radio Signals (ARS)
- Electrical Safety (ES)
- Radio Practices and Station Setup (RPSS)
- Station Equipment (SE)
- Operating Procedures (OP)
- **Rules and Regulations (RR)**



Rules & Regulations (RR)

- Amateur Radio Service
- Authorized Frequencies
- Licensing & Classes
- Authorized Transmissions
- Control Operator
- Station ID, 3rd Party Traffic, ...

Rules & Regulations

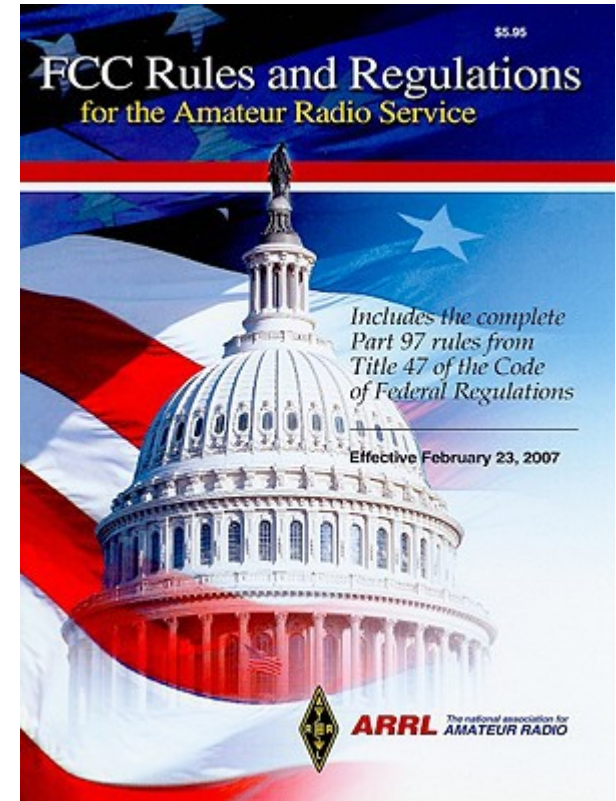
- **Amateur Radio Service**

- one purpose is: *Advancing skills in the technical communications phases of the radio art*

- Regulated and enforced by the **FCC**

- **Part 97** applies to Amateur Radio

Part 97 defines an amateur radio station as a station in an Amateur Radio Service consisting of the apparatus necessary for carrying on radio communications



More FCC Part 97 Definitions

- **Space Station**

An amateur station located
>**50km** above earth

- **Beacon**

Amateur station transmitting communications
for the purposes of observing propagation
or related experimental activities

- **Volunteer Frequency Coordinator**

Recommends transmit/receive channels and other
parameters for auxiliary and repeater stations

Selected by amateur operators in a local/regional area



Repeaters

- **Repeater**
 - Amateur station that simultaneously retransmits the signal of another amateur station on a different channel(s)
- **Auxiliary Station**
 - A station that transmits signals over the air from a remote receive site to a repeater for retransmission

Interference



- **Harmful Interference**

- ...that which seriously degrades, obstructs, or repeatedly interrupts a radio communication service operating in accordance with the Radio Regulations
- **NEVER** permitted!
- Intentionally causing interference is grounds for:
 - Revocation of license
 - Fines
 - Prison

The ITU

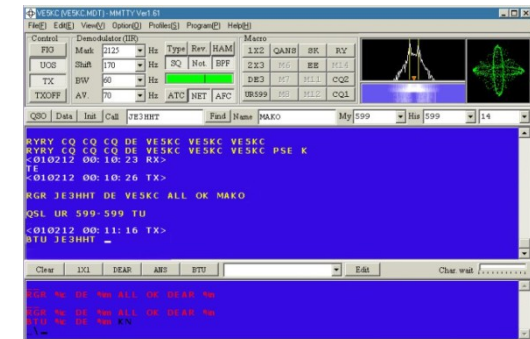
International Telecommunications Union



- ***ITU is a United Nations agency for information and communication technology issues***
- **Three ITU Regions**
 - North American radio stations are in **Region 2**
- ITU deals with worldwide amateur radio issues
- FCC deals with US only, within ITU framework

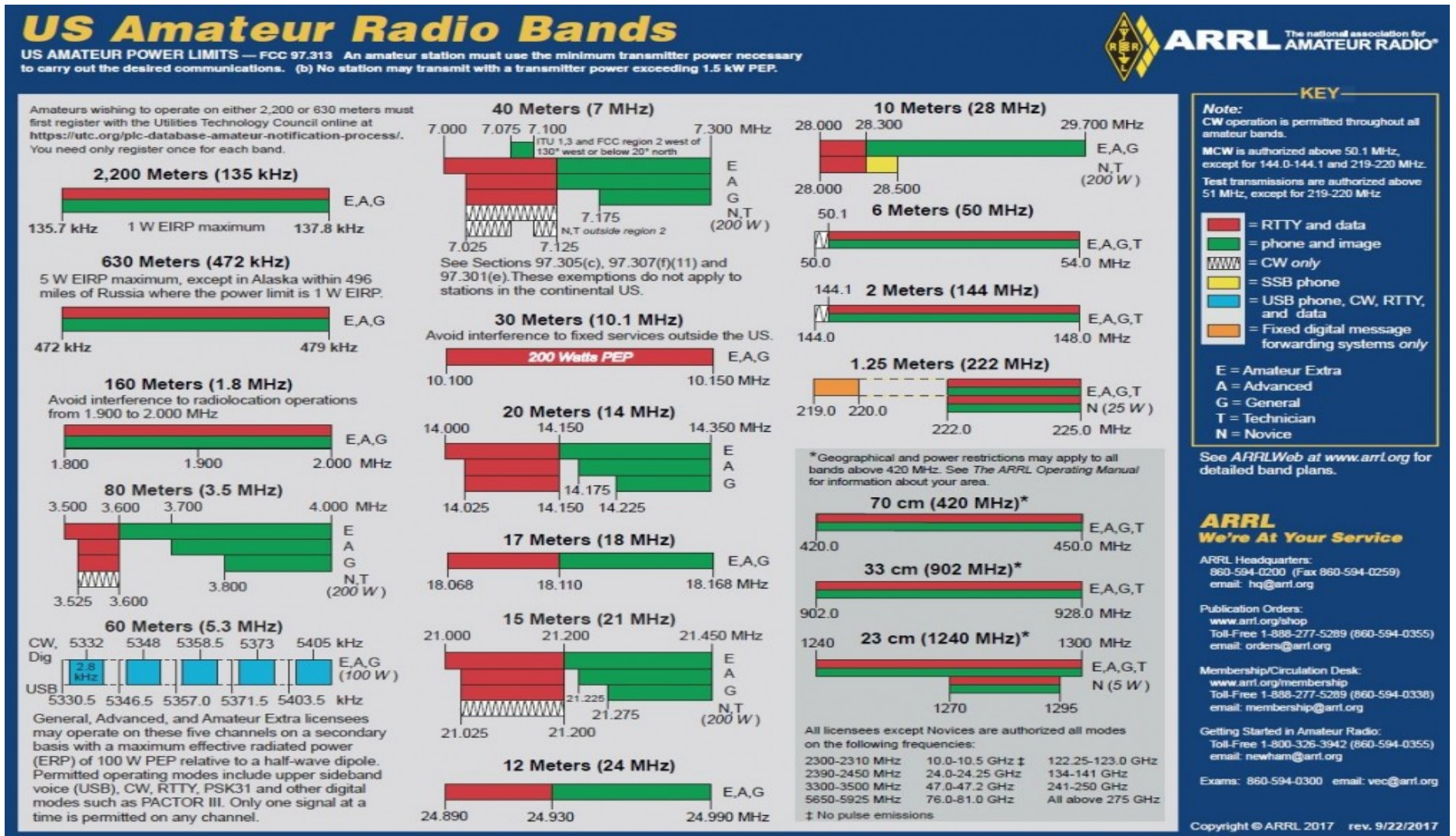
Some Frequency / Mode Allocations

| Band | Frequencies (In MHz) | Modes You Can Use |
|--------------|------------------------------------|--|
| 80 meters | 3.525 – 3.600 | CW |
| 40 meters | 7.025 – 7.125 | CW |
| 15 meters | 21.025 – 21.200 | CW |
| 10 meters | 28.000 – 28.300 28.300 – 28.500 | CW, RTTY/data, 200 watts PEP maximum power CW, phone, 200 watts PEP maximum power |
| Above 50 MHz | All amateur privileges | |



CW = Morse code; PEP = peak envelope power; RTTY = radioteletype.

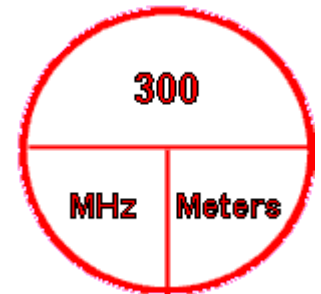
Full Band Plan Chart



This band plan chart from the ARRL can be downloaded at:
<http://www.arrl.org/graphical-frequency-allocations> Rules & Regulations 7 of 26

Questions on Frequencies & Bands

Memorize These Facts!



- **52.525 MHz** is within the 6 meter band
- The **2 meter band** is what you're using when your station is transmitting on 146.52 MHz
- **443.350 MHz** is in the 70 cm band, authorized for use by Technicians in ITU Region 2
- **1296 MHz** is a 23 cm frequency that Techs can use
- The **1.25 meter band** is what you're using when your station is transmitting on 223.50 MHz.
- Technicians have **HF phone** & **RTTY** privileges on **10m** only
- Permitted operating **Power for Technicians:**
 - *200W on assigned portions of HF*
 - *1500W above 30MHz*

Primary and Secondary Users

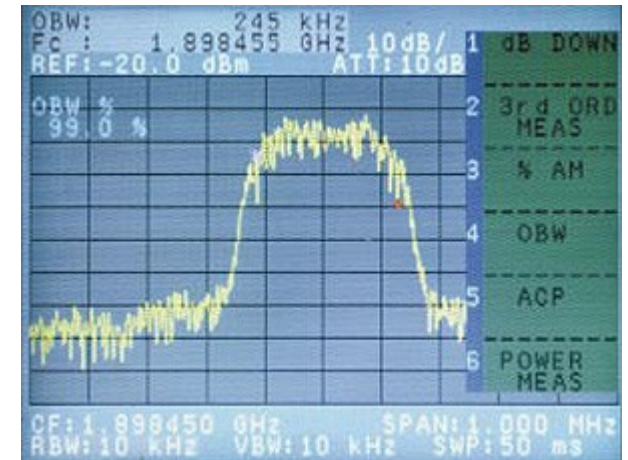
- Amateur radio shares some bands with other international radio services
 - Sometimes we're the primary users, i.e. 70 cm band
 - Sometimes we're the secondary users, i.e. 23 cm band
- Secondary users of a band...
 - **...must not cause harmful interference to primary users**
 - Example: *If you learn that your 23 cm operation is interfering with a radiolocation service outside the US, you must **stop operating** or **take actions** to eliminate the interference*

Sub-bands

- **FCC** defines sub-bands for specific operating modes
 - **CW only** is allowed in these mode-restricted sub-bands:
 - **50.0 to 50.1 MHz**
 - **144.0 to 144.1 MHz**
- **Mode-restricted** sub-bands for the Technician are found on...
 - **6 meters**
 - **2 meters**
 - **1.25 meters**

Frequency Selection

- Don't operate right at the band or sub-band edge!
- **Reasons why:**
 - To allow for calibration error of the transmitter frequency display
 - So that modulation sidebands do not extend beyond the band edge
 - To allow for transmitter frequency drift



Licenses & Operating



Call Signs in the USA

- Consist of one or two letters, followed by a single number, followed by one, two or three letters
 - 1x2, 2x1, 1x3, 2x2, 2x3
 - Vanity call sign requested by a licensed amateur must match the allowed format for their class
- **Technician, General & Extra** – use different formats
- **Special event** call signs are typically **1x1**
 - W8C is an example of a special event call sign
- **Clubs** can apply for a call sign
 - *must have **at least four members***



W-1-A-W
The Hiram Percy Maxim
Memorial Station at ARRL

Records and Operating

- Contact logging is no longer required, but many Hams still do it
- You **must** keep your mailing address current
 - *Failure to do so can result in suspension or revocation!*
 - *FCC will take action if correspondence is returned due to incorrect address*



When Am I Eligible to Operate??

- You can begin to operate **as soon as your name and call sign appear in FCC's ULS database**
- License good for **10 years**
- Renewal grace period is **2 years**
- **If your license is expired, you can't transmit until renewal** shows in the database



Operating Outside of the USA

- Allowed **if the foreign country allows it**
 - *Some countries have reciprocal agreements*
 - *Ex: Germany, operate as DL/W2AEW*
 - *Check local restrictions*
- International waters
 - Any vessel **documented or registered in US is OK**



Authorized & Prohibited

- Prohibited Transmissions
 - **Obscene** or **indecent** words or language
 - **Music**
 - *Except when incidental to an authorized retransmission of staffed spaceflight communications*
 - Unpublished **codes** or **ciphers**
 - *Except when transmitting control commands to space stations or radio controlled crafts*



Other Prohibitions



- No communications with **any country whose administration has notified the ITU that it objects to such communications**
- Can not use station to make money or be compensated, except
 - Operation in **incidental to classroom** instruction
 - Occasional notification of **equipment for sale**
- **No broadcasting**
 - *No transmissions intended for reception by general public*
 - *Exception: only where such communications directly relate to the immediate safety of human life or protection of property*
 - *Exception: when transmitting code practice, information bulletins, or transmissions necessary for emergency communications*

What is Allowed?

- Communications incidental to the purposes of the amateur service and remarks of a personal nature
- Brief transmissions for the purposes of making adjustments
- You may receive a letter from the FCC or other agencies if you are reported for violations – be sure to respond as instructed



Control Operator & Types

- Station is **NEVER** operated without a Control Operator
- **Who** can be a Control Operator?
 - Only a person for whom an amateur operator/primary station license grant appears in the FCC database or who is authorized for alien reciprocal operation
 - Is usually the **station licensee**
- License *class* of the *Control Operator* determines the transmitting privileges
 - Ex: Technician can't be control operator in Extra
 - class portion of band



Guest operating
under supervision

Control Operator & Control Point

- Required **only** for **transmitting**
- **Designated** by Station Licensee
- **BOTH** *control operator* and *station licensee* are equally responsible for proper operation
- Operator or originating station responsible when using repeater
- **Control Point:** location at which the control operator function is performed



Amateur Radio Operator Yvette Cendes
KB3HTS, at Station W8EDU, 2005

Control Type

- **Local Control**

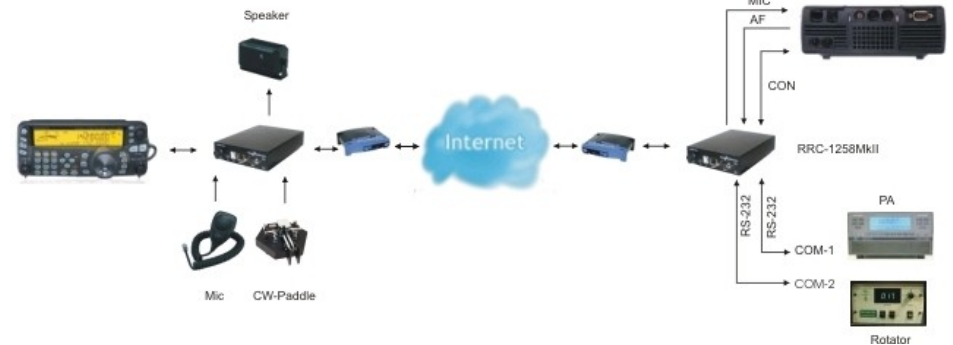
- Such as transmitting using a handheld radio

- **Remote Control**

- Control operator is not at the station location but can indirectly manipulate the operating adjustments of a station – such as operating a station over the internet
- A control operator is *required* and *must be present at the (remote) control point, indirectly manipulates the controls of the station (which is located elsewhere)*

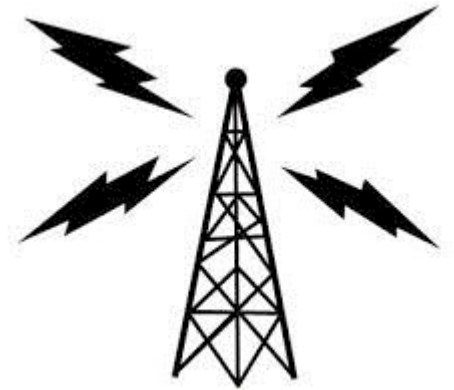
- **Automatic Control**

- Repeater when the control operator is not present at a control point
- Only type permissible for the control operator to be at a location other than the control point



Station Identification

- Every *10 minutes & at end of contact*
- Using English
- Voice (phone) or CW (Morse) emission
- Phonetic alphabet encouraged
- *Exception* : when transmitting signals to control a model craft
- Tactical call, like "Race Operator" OK
 - *But must still ID with call sign every 10 minutes*



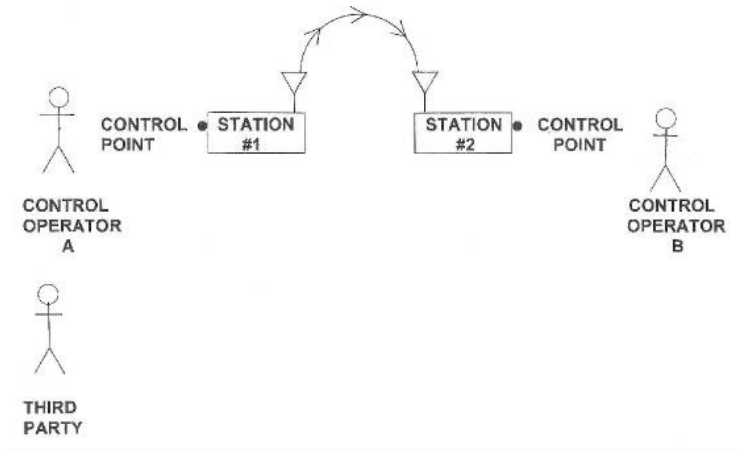
More Station Identification

- Self-assigned Identifiers
 - Examples: “/3”, “mobile”, “QRP”
 - All of these are correct
 - W2AEW stroke W3
 - W2AEW slant W3
 - W2AEW slash W3
 - May add call district if transmitting outside of your licensed district
 - Must not conflict with other FCC identifiers or foreign country call sign prefixes



Third Party Communications

- Transmitted on behalf of or to someone other than licensee
 - Example: Radiograms used in traffic handling
- Legal in US
 - May have restrictions communicating outside of US – must have 3rd party agreement with US
 - Authorized by FCC with any station whose government permits such communications



| THE AMERICAN RADIO RELAY LEAGUE | | | | | | | |
|---|------------|------|-------------------|---|-----------------|------------------------------------|--------|
| RADIOGRAM | | | | | | | |
| VIA AMATEUR RADIO | | | | | | | |
| NUMBER | PRECEDENCE | HR | STATION OF ORIGIN | CHECK | PLACE OF ORIGIN | TIME FILED | DATE |
| 1 | R | G | K4IWW | 12 | CARY NC | | DEC 20 |
| TO | | | | | | THIS RADIO MESSAGE WAS RECEIVED AT | |
| JOHN Q PUBLIC | | | | | | AMATEUR STATION _____ PHONE _____ | |
| 1234 MAPLE AVE | | | | | | NAME _____ | |
| ANYTOWN NC 27000 | | | | | | STREET ADDRESS _____ | |
| | | | | | | CITY AND STATE _____ | |
| TELEPHONE NUMBER 919 555 1234 | | | | | | | |
| ARRIVE | 7PM | DEC | 24 | X | | | |
| LOOKING | FORWARD | TO | SEEING | YOU | | | |
| X | LOVE | | | | | | |
| BETTY M PUBLIC | | | | | | | |
| REC'D | FROM | DATE | TIME | SENT | TO | DATE | TIME |
| THIS MESSAGE WAS RECEIVED AT THE STATION OF ORIGIN ON THE DATE AND TIME INDICATED ABOVE. THE STATION OPERATOR IS NOT RESPONSIBLE FOR THE DELIVERY OF THIS MESSAGE TO THE DESTINATION. THE DESTINATION OPERATOR IS RESPONSIBLE FOR THE DELIVERY OF THIS MESSAGE TO THE DESTINATION. THE DESTINATION OPERATOR IS RESPONSIBLE FOR THE DELIVERY OF THIS MESSAGE TO THE DESTINATION. | | | | THIS MESSAGE WAS RECEIVED AT THE STATION OF ORIGIN ON THE DATE AND TIME INDICATED ABOVE. THE STATION OPERATOR IS NOT RESPONSIBLE FOR THE DELIVERY OF THIS MESSAGE TO THE DESTINATION. THE DESTINATION OPERATOR IS RESPONSIBLE FOR THE DELIVERY OF THIS MESSAGE TO THE DESTINATION. THE DESTINATION OPERATOR IS RESPONSIBLE FOR THE DELIVERY OF THIS MESSAGE TO THE DESTINATION. | | | |

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Station Records

- Station records must be made available for inspection by FCC representative at any time
- These records include your RF emission tests, equipment manuals, and specifications



Rules & Regulations
Chapter End

CONGRATULATIONS!!!

**You've finished the Technician
License Study Materials!**

Questions?

What topics are fuzzy to you?

Let's Practice for the Exam!