Understanding Your Radio Station License

More than just frequencies

CDE #36494

by Christine Phelps

Your agency has a radio station license, but for many telecommunicators, all they know is that the frequencies shown on the license are the ones they use on the radio. This article will help you understand the technical items on the license and the responsibilities your agency must meet in order to hold a license. The intent is to educate the users with what a radio station license looks like and what it all means.

Applicants who are eligible under the FCC's Part 90 rules must apply for a radio station license to transmit on frequencies for two-way communications. The license used here as an example is a reference copy from the FCC's Universal Licensing System (ULS) database. Your agency should have an official license, which must be posted at the base for identification and authorization.

The sample license shows the licensee name as Polk County School Board. The licensee name should be the highest governmental entity name. There are many different departments under a city, county or state agency that use frequencies to transmit on their radios. For instance, a city fire department may request a license under the city name and show "Fire Department" in the attention line.

Under the licensee name is the mailing address for the licensee. The attention line can include a department and/or title of a person in charge of the radio station license. It is not recommended to include a person's name with the title. These licenses are authorized for 10 years there's a good chance the same person will not be in that position for 10 years.

If your agency changes its mailing address at any time, you must notify the FCC as soon as possible. This also applies to changes in phone numbers, email addresses and any other administrative information. Failure to keep this information updated could be costly. If your agency is not notified properly due to an address change, you could miss required deadlines and other notifications.

To the right of the mailing address is the call sign (in this example, WQMC230), which is a combination of letters and numbers assigned by the FCC. To the right of the call sign is the file number. This would be kept blank.

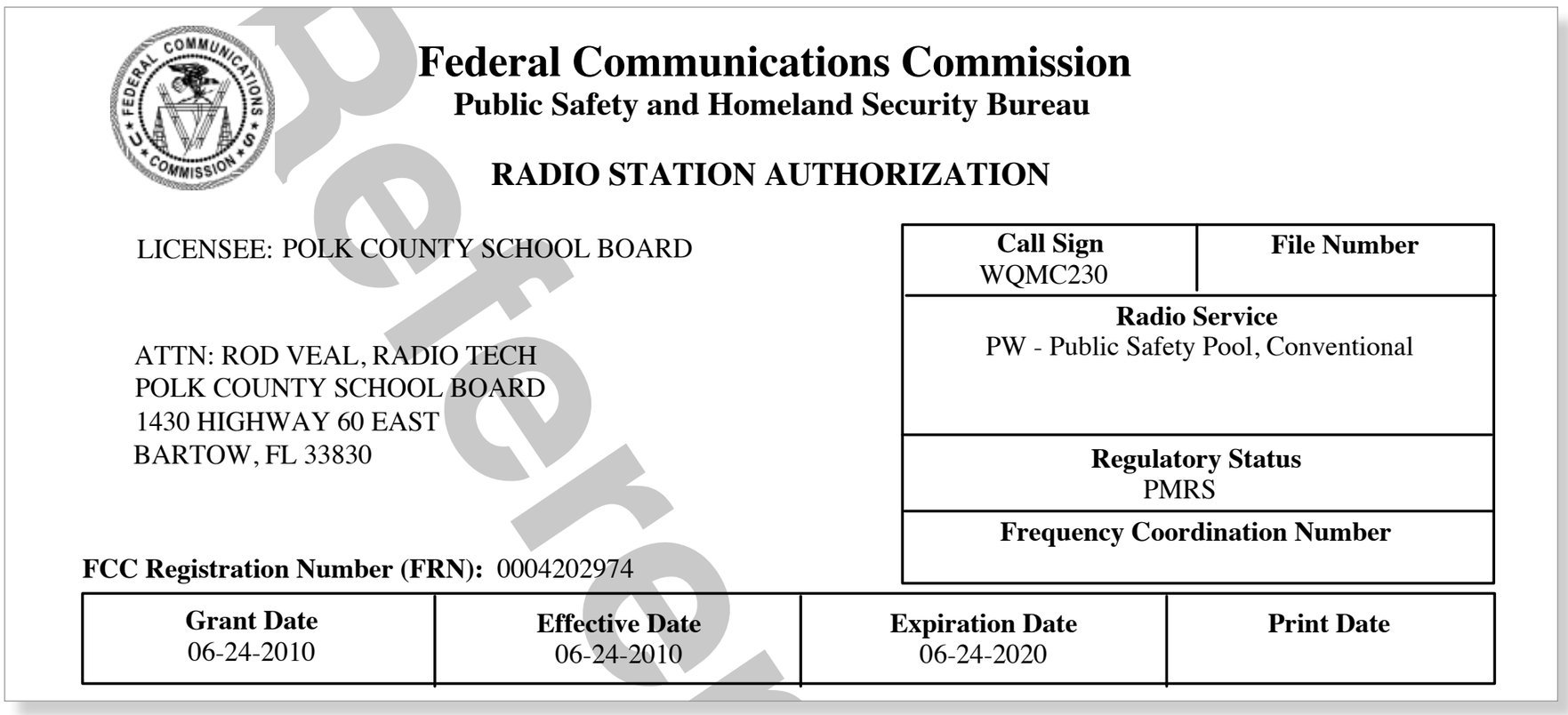
On this license, the radio service is "PW—Public Safety Pool, Conventional," meaning the licensee will be using frequencies under 800 MHz. The FCC radio service codes identify the frequency range and type of radio system that is licensed (conventional or trunked). The codes also tell us which radio service the licensee is eligible to apply under in the Part 90 rules. For instance, a conventional system under public safety radio service using frequencies below 800 MHz would have a code of PW, and a trunked system would have the code YW. The complete list of codes is available on the FCC's website under the FCC Form 601 instructions.

When applying for a license, eligibility must be determined first so that proper frequencies can be assigned to the system. There are specific frequencies listed under the public safety and business/industrial sections in Part 90 that can be considered for assignment. Some of these frequencies have limitations, which may include a limitation on the amount of power that can be requested, the bandwidth, antenna height and other specifications. FCC Certified Frequency Coordinators verify this information during the application process.

The regulatory status in this example is private land mobile radio service (PMRS), which is public safety. The frequency coordination number (FAC number) might be entered if the FCC finds it necessary to identify the issuance of the particular license with a FAC number; most of the time it is blank.

The FCC registration number (FRN) will always be on correspondence from the FCC, and should be used by applicants or licensees when corresponding with the FCC. The FRN is a unique entity identifier for everyone doing business with the commission. The FCC will use the FRN to determine if all of a registrant's fees have been paid to the federal government before proceeding with an application request.

Applicants must register their taxpayer identification number (TIN) with the FCC on the ULS system to obtain an FRN. During the registration process, the program will ask the applicant to create a password. The FRN will be immediately assigned after the registration is completed. The FRN and password must be kept on file by the applicant for future correspondence with the FCC. If your agency misplaces the password, you can contact the FCC at (877) 480-3201 to have it reset.



Federal Communications Commission
Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: POLK COUNTY SCHOOL BOARD

ATTN: ROD VEAL, RADIO TECH
POLK COUNTY SCHOOL BOARD
1430 HIGHWAY 60 EAST
BARTOW, FL 33830

Call Sign	File Number
WQMC230	

Radio Service
PW - Public Safety Pool, Conventional

Regulatory Status
PMRS

Frequency Coordination Number

FCC Registration Number (FRN): 0004202974

Grant Date	Effective Date	Expiration Date	Print Date
06-24-2010	06-24-2010	06-24-2020	

The grant date listed is the date the FCC originally granted the license on the frequencies/sites shown. The effective date is the date the FCC last granted a change to the license. The expiration date is the date the license will expire (most licenses are valid for 10 years). Next to the expiration date is the print date, which will be left blank.

Breaking Down the Details

The next section of the license, "Fixed Location Address or Mobile Area of Operation," describes

STATION TECHNICAL SPECIFICATIONS

Fixed Location Address or Mobile Area of Operation

Loc. 1 **Address:** 600 6TH STREET SE
City: WINTER HAVEN **County:** POLK **State:** FL
Lat (NAD83): 28-00-49.6 N **Long (NAD83):** 081-43-02.1 W **ASR No.:** **Ground Elev:** 51.1

Loc. 2 **Area of operation**
Operating within a 10.0 km radius around fixed location 1

where the fixed locations for the antennas are located and the area to be served by the mobiles.

Fixed locations will show the street address or geographical description of where the structure for the antenna is located with the city, county and state information. It will also include the coordinates in degrees, minutes and seconds in North American Datum 1983 (NAD83) format.

If FAA clearance is not required for the structure, the antenna structure registration (ASR) number will be blank on the license. However, if the structure requires FAA clearance/approval, the ASR number would appear next to the coordinates. To determine if FAA clearance is required, the applicant can use the TOWAIR tool on the FCC's ULS website at wireless.fcc.gov/uls. If the results show that registration is required, or that the antenna fails slope to the nearest airport, the applicant must file with the FAA for clearance. Once a final determination notification is received from the FAA, the information must be registered on the FCC's website to obtain an ASR number, which is assigned immediately after registration is completed.

The ground elevation, which is measured from sea level, is in meters and is shown to the right of the coordinates and ASR number.

The mobile area of operation (AOP) is the area that the mobiles will cover. It is best described with a radius in kilometers around either coordinates for a fixed site on the application, referencing the location number, or a radius in kilometers around a set of reference coordinates. The FCC Certified Frequency Coordinators prefer the AOP with coordinates for search purposes. However, there are many other ways to describe the AOP (see figure below).

The next section after location information (pictured to the right) shows technical information for the radios. The left column will reference the location number and the antenna number. If the application is for one antenna on a particular structure, the antenna number would be "1." If the application is for two different antennas on the same structure, but each at different heights, the second antenna would be shown as antenna 2 at the fixed location.

The frequencies (in MHz) are listed in the third column. In most cases, frequencies are assigned by an FCC Certified Frequency Coordinator for public safety. APCO is one of four public safety coordinators. We are the largest and process the highest volume of applications.

When an agency plans to purchase equipment for a radio system, it must first obtain a radio station license. The agency will need to submit a completed FCC Form 601 to a frequency coordinator. The coordinator will run searches, using specialized programs, to find new frequencies for assignment or check requested specific frequencies to determine if they are assignable. The coordinator may also run routine engineering to support the assignment.

Area of Operation Codes & Required Data Values

Code Description	Additional Schedule D Data
A: KMRA* around a fixed location (option not available to maritime or aviation services)	Fixed location number, temporary fixed or mobile radius
P: KMRA* around a center point	Latitude, longitude, city, state, county, temporary fixed or mobile
R: Rectangular area of operation	Latitude, longitude, maximum latitude, maximum longitude
N: Nationwide, including Hawaii Alaska & U.S. territories	
U: Continental U.S.	
C: Countywide area of operation	State, county
S: Statewide area of operation	State
O: Other	Description (should include state)
X: Land-mobile control station meeting the 6.1 meter rule	State

*Kilometers radius

The assignment of frequencies may also have certain limitations on technical parameters that the applicant must comply with, according to FCC rules and regulations. During the coordination process, additional documents may be required to be included with the application for the FCC to consider granting the license. The coordinator is familiar with the procedures and will notify the applicant if any additional documents or information is required to complete the process before submitting the application to the FCC for review and grant consideration.

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.
1	1	000156.21750000	FB2
2	1	000153.97250000	MO
2	1	000156.21750000	MO

The next column is the station class, which describes the use of the frequency by code. Please refer to the figure to the right for a list of station classes used in public safety.

Station Class Descriptions

When referring to the FCC licenses and the figure to the right, it's helpful to have a clear understanding of what the different codes mean. What follows is a list of the different codes, how they are defined according to the FCC and how they are utilized by public safety agencies.

FB Station Class—Fixed Base Station

A fixed base would be a unit that does not move from one location to another, and is often seen on a desk or table. The fixed base transmits to mobiles out in the field and receives transmissions from the mobile units all on the same frequency. Hence, two-way radio communications. A fixed base can also transmit to paging units, but the pagers do not talk back to the fixed base. This type of communications is called simplex operations.

FB2 Station Class—Repeater/Mobile Relay

Repeaters, or mobile relay stations, are base stations authorized to retransmit automatically on a mobile service frequency when communications originate on the transmitting frequency of the mobile station. Repeaters are often used to increase the coverage of the mobile units.

FB8 Station Class—Trunked Centralized Repeater

This station class is used only in frequency bands below 512 MHz. It is essentially the same as repeaters/mobile relay stations, except that it operates in trunked system mode and is used when the system is centralized and does not monitor the frequencies for co-channel users. Instead, it arbitrates the operation of a frequency when another licensee is using it.

FB4 Station Class—Community Repeater

This type of system would be the same as a repeater/mobile relay station, but it is used by several agencies within a fairly small area. The agencies may be small communities that do not necessarily have enough users to manage their own system. Needless to say, the cost of a system may also not be in their budget. These agencies/communities will sign mutual agreements and one would be designated to manage the radio system.

Common Stations Classes Used in Public Safety:

Base	FB
Mobile Relay (Repeater)	FB2
Trunked Repeater with Dispatcher	FB8
Community Repeater	FB4
Control Station	FX1*
Fixed Relay (Link System)	FX2
Operational Fixed (Telemetry)	FXO
Mobile	MO
Mobile/Vehicular Repeater	MO3
Mobile which goes with FB8	MO8
Primary Permanent Fixed Stations (4.9 GHz only)	FXB

* Station associated with a mobile relay (repeater) that employs the same frequency as the associated mobile station for control purposes.

Where appropriate, follow each code with any of the following that apply:

T =	Temporary (Ex: FBT, FB2T, FXOT, etc.)
S =	Stand-by (Ex: FBS, FB2S, etc.)
I =	Itinerant (Ex: FBI, FB2I, etc.)
C =	Interconnect (Ex: FBC, FB2C, etc.)
J =	Temporary Interconnect (Ex: FBI, FB2I, etc.)
K =	Stand-by Interconnect (Ex: FBK, FB2K, etc.)
L =	Itinerant Interconnect (Ex: FBL, FB2L, etc.)

FX1 Station Class—Control Station

The transmissions of an operational fixed station are used to automatically control the emissions or operation of another radio station at a specific location. Control stations are used with repeaters/mobile relay stations when the base might be too far away from where the mobiles operate. The base would transmit on one frequency through the control station and the control station would retransmit to the mobiles on a different frequency, and the same the other way around. Control stations are also used for links for systems requiring retransmission of frequencies to cover areas affected by terrain or distance.

The "20 foot rule" applies to control stations that work with repeaters only. If the control station antenna is 20 ft. (6.1 meters) or less, it can be shown on a license as "6.1" with an "X" for area of operation and the state in which it operates. This does not mean that these control stations can operate throughout the state. Control stations are authorized to operate within the mobile area of operation. The FCC only needs to know what state it is operating in. Also, UHF T-Band control stations and control stations north of Line A, or in Alaska, east of Line C (Canadian Regions) must be shown as fixed locations, rather than 6.1. The FCC requires all applicable site information be provided, as if adding a base. Wireline control stations do not need to be licensed as they do not use frequencies. All fixed bases, repeaters, etc. must be shown on a license with all applicable site information, whether the antenna is above or below 20 ft. tall.

Control stations should not be confused with *control points*. Control points are locations where a transmitter's functions may be controlled, such as a dispatch location. All licenses are required to have at least one control point.

FX2 Station Class—Fixed Relay

A fixed relay is a station at a specific site used to communicate with another station at another specific site. A relay is a device that receives a signal from a low-power or distant transmitter and retransmits it on the same or different frequency in order to increase the coverage area. For example, the signal from a base situated in a valley would only propagate within that valley. A relay site at the top of a nearby mountain would rebroadcast the original signal to a wider area.

FXO Station Class—Operational Fixed Station

This is a fixed station, not open to public correspondence, operated by and for the sole use of those agencies operating their own radio communication facilities in public safety and other services. This station class is often used for telemetry systems transmitting non-voice signals for the purpose of automatically indicating or recording measurements at a distance from the measuring instrument. Telemetry systems may include water monitoring at wastewater treatment plants or monitoring runways at airports for specific conditions.

No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
1		11K2F3E	25.000	48.000	8.0	19.5	06-24-2011
60		11K2F3E	5.000	5.000			06-24-2011
60		11K2F3E	5.000	5.000			06-24-2011

MO Station Class—Mobile

Mobiles are considered by the FCC to be units intended to be used in motion, such as vehicular, portable, handheld, aircraft and marine units. Mobiles transmit to a base station or other mobile units.

MO3 Station Class—Mobile or Vehicular Repeater

A mobile station authorized to retransmit automatically on a mobile service frequency, communications to or from hand-carried transmitters. A typical system would be a mobile repeater unit in a vehicle, which allows transmissions to portables and handhelds in the field that may be too far away from their base repeater/mobile relay.

MO8 Station Class—Trunked Centralized Mobiles

This station class is used only in frequency bands below 512 MHz, operates the same as regular mobiles in trunked system mode and is centralized. The system does not monitor the frequencies for co-channel users and arbitrate the operation of a frequency when another licensee is using it.

FXB Station Class—Primary Permanent Fixed Stations

This station class is used for frequencies in the 4.9 GHz band under the PA radio service code. This station class code is to be used for permanent fixed stations or links that meet the requirements for primary status. Secondary permanent fixed stations or links must use the existing station class code of FXO. The 4.9 GHz frequencies are used to deliver broadband service, such as a fixed video surveillance link used to monitor a high-risk target or environment.

RF Specs

As we come back to the second half of the license, we get into some of the more technical terminology found in frequency coordination.

The column pictured to the left labeled "No. Units" shows some of the following:

- Number of base stations, repeaters, control stations with antennas taller than 6.1 meters (20 ft.) or shown as fixed that you have on a specific frequency at a specific site and antenna;
- Total number of control stations on a specific frequency with antennas shorter than 6.1 meters (20 ft.); and
- Total number of mobile units (the FCC considers "mobiles" to be vehicular, portables, handhelds, aircraft and marine, and accepts a total number, with the highest power shown on the license).

The column labeled "No. Pagers" shows the total number of pagers on the base/repeater frequency line.

The next column shows the emission designator(s). An emission designator consists of numbers and letters that describe the technology that is being used. The actual emission that should be added to the license application is the emission designation as listed on the equipment's type acceptance. This information should be available in the technical specifications for your radios as listed by the manufacturer**.** Some common emission designators can be found on the APCO Spectrum Management website at www.apcointl.org/spectrum-management/resources/licensing-links/emission-designators.

The next column on the license shows the output power, also called transmitter power output (TPO). This is the actual amount of power in watts that a transmitter produces. The "ERP (watts)" column shows the effective radiated power (ERP). ERP is measured in watts, and is determined by subtracting system losses and adding system gains. ERP takes into consideration transmitter output power, transmission line attenuation (electrical resistance, and RF resistance and RF radiation), RF connector insertion losses and antenna directivity, but not height above average terrain (HAAT). ERP is typically applied to antenna systems.

The column labeled "Ant. Ht/Tp" is the antenna height to tip measured from ground level to the tip of the antenna in meters. The next column, "Ant. AAT," is the height above average terrain (aka, HAAT). There is a specific calculation using the coordinates, ground elevation, structure height and overall height that provides the HAAT value. This calculation is built-in to APCO's engineering program, which is used by all AFC staff members and is calculated as a courtesy to our applicants.

The last column on this sample license is the Construct Deadline Date. The FCC allows a one-year period for the licensee to become fully constructed and operational on frequencies/sites granted on a license. The licensee must notify the FCC within one year that they are fully operational by submitting a Schedule K on the FCC's ULS system online. Some licensees are able to report that they are fully operational soon after the license is granted. The licensee should then submit the notification to the FCC. Other licensees may take a while constructing their frequencies/sites. As long as they can notify the FCC within one year that they are fully constructed and operational, they are within the guidelines of the FCC rules and regulations. If the licensee finds that they need additional time to construct, they can request an extension of their buildout deadline by submitting a Schedule L with a letter of justification before the deadline date. If the licensee does not respond to their buildout status within one year, the FCC will terminate the license or the part of the license that is affected.

Licensee Name: POLK COUNTY SCHOOL BOARD

Call Sign: WQMC230 **File Number:** **Print Date:**

Control Points
Control Pt. No. 1
Address: 600 6TH STREET SE
City: WINTER HAVEN **County:** POLK **State:** FL **Telephone Number:** (863)291-5330

Associated Call Signs

Waivers/Conditions:
NONE

Page two of the sample license lists "control points," which would be a location where a person responsible for system operations may be reached. The commission only needs an address or geographical description, as well as the city, county, state and phone number. This

would be a place from which a transmitter's functions may be controlled. Again, *control points* should not be confused with *control stations*.

Also on the second page of the license is a section for associated call signs. This section would show any other call signs associated with this license that make a complete system. You could have repeaters on one license and the mobiles that work with those repeaters on a different license. The waivers and conditions section would include any information regarding approved waivers for this license and/or special conditions for this license approved by the commission.

Most licenses are now valid for 10 years. It is the licensee's responsibility to review their licenses on a regular basis to verify that all information on the license is correct and that their radio system operates according to the parameters on the license.

If the APCO-AFC Spectrum Management Division staff can be of any assistance to you with licensing, license management, frequency coordination, engineering services or any other area, please contact us at afc@apcointl.org.

CHRISTINE PHELPS is a licensing specialist with the APCO-AFC Spectrum Management Division. Reach her at phelpsc@apcointl.org.

CDE EXAM #36494: UNDERSTANDING YOUR RADIO STATION LICENSE

1. Referring to the license copy, the "Ant. AAT" is actually which of the following:
   a. Antenna tip
   b. Antenna average height
   c. Height above average terrain

2. Call signs are assigned by the FCC Certified Frequency Coordinator.
   a. True
   b. False

3. Where would an applicant obtain an FRN on the FCC's website?
   a. APCO
   b. FRN
   c. ULS

4. Public safety applicants are eligible to apply for frequencies under which FCC rule?
   a. Part 88
   b. Part 1
   c. Part 90

5. FB2 station class is used for what type of operation?
   a. Repeater
   b. Vehicular repeater
   c. Mobiles

6. A control station is a location where a person responsible for system operations may be reached.
   a. True
   b. False

7. Licensees must notify the FCC that the frequencies/sites granted are fully constructed and operational within what period of time?
   a. 180 days
   b. One year
   c. 30 days

8. Mobiles are considered by the FCC to be units from which group?
   a. Portable, handheld, aircraft and marine
   b. Vehicular, portable, handheld and marine
   c. Vehicular, portable, handheld, aircraft and marine

9. What is the station class for a mobile/vehicular repeater?
   a. FB2
   b. MO3
   c. MO8

10. A "city-wide" mobile area of operation is acceptable by the FCC.
    a. True
    b. False

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