THE BROADCASTER'S GUIDE TO RADIO STATION DEVELOPMENT

A step-by-step guide to planning, licensing, building and operating a broadcast radio station.

DEDICATION

To my wife Joan who has stood by faithfully while radio has engulfed my life.

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APPENDICES

ABBREVIATIONS USED IN THIS BOOK

AC	Alternating current
HAAT	Antenna height above average terrain
AM	Amplitude modulation
ATV	Cable television
CAFM	Cable FM
C-C	Carrier-current
CP	Construction permit
D.C.	Direct current
ERP	Effective Radiated Power
FCC	Federal Communications Commission
FM	Frequency modulation
H	Horizontal
kHz	Kilohertz (1000 cycles per second)
kW	Kilowatt (1000 watts)
MATV	Master Antenna System
MHz	Megahertz (1,000,000 cycles per second)
MSL	Mean sea level
V/M	Microvolt per Meter
mV/M	Millivolt per Meter
TV	Television
R,R	Rules and Regulations
FAA	Federal Aviation Administration
dB	Decibel
STL	Studio Transmitter Link
SCA	Subsidiary Communications Authorization

INTRODUCTION

"Any qualified citizen, firm or group may apply to the Federal Communications Commission for authority to construct a standard (AM), frequency modulation (FM), or television broadcast station" is a direct quote from an FCC Bulletin. Sounds simple doesn't it? It is, IF you go about it calmly and in an organized way. There will be certain rules and procedures you must follow in order to succeed. These are not difficult to follow but they do require some work on your part. You CAN do it!

This booklet contains the latest FCC changes pertinent to submitting an application for a licensed broadcast station. There are other types of stations besides those which are licensed however. These will be discussed also, and references will be given to direct you to more information about them. Some stations may sell advertising time for example, others may not. Some stations may legally operate without a license, some stations operate without a license..illegally.

You must first decide just what type of station best suits your needs. Then you must find a frequency on which to operate, find a suitable location, and perhaps obtain financing. If your proposed station will be owned by an institution or corporation you will need approval from its officers. A licensed station requires a filled-out application form, maps, exhibits, and various other documents. How to go about all this is included in the following pages with step-by-step instructions, hints, references, and where to get additional help if needed.

I suggest you read through this booklet once to get a feel for what you are getting into. Much of the information is inter-related. Make a list of those items you feel you should come back to later. Make some decisions about what you want to accomplish. Then use this booklet as a reference as you go about completing your project.

Costs of the various materials and services are not included as they tend to change with time. Current price levels may or may not stabilize resulting in substantially different price levels two or three years from now.

Occasionally your attention will be called to a reference appearing in the appendices or in the FCC Rules and Regulations. Appendices references will be shown as a letter designator and item number such as (A-3). This would indicate appendix A, item number 3. (FCC R,R, 1.573) is an example referencing FCC Rule, part 1.573.

Good luck with your project.

Ernest G. Wilson

WHICH TYPE OF STATION IS BEST FOR YOU?

There are many things to consider before jumping into broadcasting. Begin by asking yourself several questions. Even though you may rationalize your answers in favor of your enthusiasm for broadcasting, they will undoubtedly give you a greater insight. Here are a few questions to get you started:

Who will be your audience?

How large of an audience do you wish to serve?

Will you be programming what you want, or what your audience wants?

How much money do you have for equipment, working expenses, wages, etc.

Is there a suitable site for your transmitter and tower?

Will the station be operated for profit?

Are you willing to work with a business partner or partners?

Do you or a friend have some knowledge of broadcast electronics?

Do you have an attorney that can help you with the paper work?

What legal entity will own the station (individual, corporation, etc.)?

Will your station become involved with community affairs?

Do you want a station as a hobby or as an investment?

Are you willing to settle for something less than what you want?

Do you have any sales experience?

Do you have any business experience?

Are you willing to wait 6 months to 2 years for what you want?

Hopefully the following pages will provide some answers for you or at least head you in the right direction for finding them.

TYPES OF STATIONS

There are several types of stations from which to choose. Some types require licensing by the FCC, some do not, and others operate outside of the FCC Rules. It is possible to operate more than one station at a time in order to serve different types of audiences. Some stations operate for a profit, others operate as non-profit (non-commercial) stations.

Low Power Broadcasting

Many years ago the FCC made provisions for limited low-power broadcasting aimed mainly at "in home broadcasting devices". These consisted of devices connected to a record-player, commonly called a "phono-oscillator", and which had a range of a few hundred feet at most. Provisions were also made for the use of ac power lines for communications by radio frequencies. The original Rules dealt mainly with the transmission of AM at frequencies between 160 kHz and 1605 kHz. The standard broadcast band being between 535 kHz and 1605 kHz made this ideal for individuals who wanted to experiment with their own limited-range radio station.

Direct Radiation Stations:

The direct radiation station may use an antenna or special "leaky" type of coaxial cable. Its field strength is limited by Part 15 of the FCC Rules to just a few microvolts at a specified distance. The Rules specify the antenna, if one is used, must not exceed 10 feet in length, including the transmission line (coax) and ground wire. Input power to the final stage of the transmitter must not exceed 100 milliwatts (.1 watt). Under these conditions it is quite difficult to obtain a broadcast range of more than a few hundred feet.

If special attention is given to the antenna system then greater range is possible. The antenna may be "base loaded" to make it appear "electrically longer". It may have a "capacitive hat" to increase its efficiency, and, it may have an extensive grounding system consisting of "radials". All of this could increase the range of a 100 milliwatt AM station to perhaps a quarter of a mile.

Carrier-Current Stations:

A carrier-current (C-C) station is one that transmits its signal over the AC power lines. Although governed by Part 15 of the FCC Rules it offers some advantages over direct radiation. Broadcast range varies from a couple of blocks to a mile in the city, and up to 5 miles in rural areas.

The signal is fed to the power lines through a special coupling device. This device matches the output of the transmitter to the low impedance of the power line. The signal travels over the conductors, radiating some signal along the way. As long as the radiated signal doesn't exceed the amount specified in Part 15 all is well. This often means more power can be utilized - sometimes as much as 20 to 50 watts, and still remain within Part 15 specifications.

For the most part the signal is traveling over a "closed system" - leaking a little signal out here and there. It is still stronger on the power line than "through the air". Any AM radio connected to the power line, or within 100 feet or so, can pick up the station. This makes it ideal for coverage of school campus, dormitories, cluster housing, apartment houses, small communities, churches, drive-in's, shopping centers, etc. Ranges of 1 to 5 miles are quite possible in small communities for example.

Other "transmission lines" can also be used. A special "leaky" coaxial cable can be strung down corridors of a building for example. Even old intercom lines & unused phone line can be used.

These stations don't require a license. If operated in accordance with Part 15 as to radiation and interference limits they can be an ideal "first time" station. In addition the station may sell advertising time, has unlimited operating time, can be a "training facility" for announcers, DJ's, and starting engineers. And, further, you can build all your own equipment at substantial savings over commercial equipment. See appendices (A-3), (A-4), (A-25), and (A-26).

Cable FM Stations:

A cable FM (CAFM) station is one which transmits its signal over an existing cable TV (CATV) system. Although transmission takes place over a closed system the audience can far exceed that of a carrier-current station. Commercial cable TV companies may have 5,000 to more than 100,00 subscribers in any one area. This gives you a potentially good market not just for listeners but for selling advertising as well.

An FM modulator is installed at the "head end" of the CATV system. Your audio signals are sent to it by one of three ways. The first is by special telephone lines (two are required for stereo). The second method is possible only if the cable TV company has a "two-way" system. This is where you send your audio "up" the cable on a sub-carrier, it goes into your modulator at the head end, and comes back "down" the cable on an FM channel. The third method is an STL (studio-transmitter- link). This is where you transmit on a special higher radio frequency to the head end. You would receive it with a special receiver, then feed it to the modulator so it comes down the cable. Anyone with an FM radio connected to the cable can tune in your station.

Operating hours are unlimited. The station doesn't require a license. You don't have to worry about signal strength limitations as you would with carrier- current. High signal strength levels are maintained by the cable company's equipment.

With potentially large audiences the sale of "air time"can be rather profitable. Income can range from $2,000 to more than $20,000 a year depending on the size of the system. And, this is possible while operating just in the evening hours from 6PM to Midnight. See appendices (A-24) and (A-26).

CAFM stations are not limited to CATV facilities. Master Antenna Systems (MATV) used by schools, colleges, and apartment complexes work the same way.

Commercial FM Broadcasting

FM stations are classed according to their location (zone), effective radiated power, and their antenna height above the average terrain (HAAT), and require a license to operate.

Generally, Class A stations are allowed up to 3 kW of power, class B1 to 25 kW, B and C2 to 50 kW, and C1 and C to 100 kW. Each class also has a maximum antenna height assigned, as well as a minimum operating power. This information is compiled for you in appendix L. Antenna heights greater than the maximums listed may be used providing power is reduced accordingly. The criteria here is that the coverage area with a higher antenna must not exceed what it would be under the maximum power and antenna height listed.

The "Table of Allotments" (FCC R,R,73.202) indicates what channels are permitted in what communities in each state. Only those allotments will be considered by the FCC for licensing. Some of the channels have been reserved just for Class A stations (FCC R,R,73.206). Others have been reserved for non- commercial stations (FCC R,R,73.501). Still other channels have limitations determined by their physical location to the borders of Mexico and Canada. And still other channels are reserved for specific use in New York City and Alaska.

In past years the FCC has allowed petitions to amend the Table. This action made it possible to reassign an allocation from one community to another nearby community. Current Rules do not address this issue. New station assignments are determined by procedures outlined in "Docket 80-90". Where it can be shown however that an FM station could be constructed without interference to other stations, the FCC may consider a "Petition to amend the Allocation Tables"

Although channel allotments have been assigned as to Class of station and specific communities, the station must still meet "Separation" requirements. These requirements are shown in (FCC R,R, 73.207). They have been included for you in appendix M. There are no guarantees of protection of your coverage area other than what the Minimum Separation Tables allow.

In general the station's transmitter site should be located near the center of the community to which it is assigned. It is not always easy to find a suitable site. The transmitter therefore may be located some distance from the community, but....the community must receive a strong signal. The coverage of the assigned community is determined by "signal contours". The two main contours are the 70 dBu (3.16 millivolts per Meter) and 60 dBu (1 millivolt/M). Typical methods of plotting contours is shown in appendix E.

Zone I-A consists of Puerto Rico, the Virgin Islands, and that portion of California which is below the 40th parallel. Zone II consists of Alaska, Hawaii, and the rest of the United States not covered by zone I. The definition of zone I is rather lengthy and complex so we won't include it here. All the zone information is covered in (FCC R,R, 73.205)

Commercial FM stations derive operating capital through sales of spot announcements. Additional revenue may be obtained from offering an SCA service. SCA (Subsidiary Communications Authorization) permits the station to broadcast a sub-carrier as well as its normal programming. The sub-carrier can only be received by special receivers, not by regular radios. It may be used to broadcast "background music" to stores and offices, teletext, slow-scan TV, computer signals, etc. Revenue is obtained by renting out the special receivers or services.

Non-Commercial FM Broadcasting

Many of the Rules for non-commercial FM stations are the same as those for commercial FM stations. There are a few exceptions.

The FCC has reserved the lower end of the FM band, channels 200 to 220, for the exclusive use of non-commercial FM stations. A non-commercial station is one that operates solely in the public interest. Licenses are only granted to non- profit groups such as schools, colleges, churches, and other institutions of a similar nature. This is not to say that a group of individuals, once incorporated as a legal entity, can not apply for a non-commercial station. They must be a non-profit organization.

The non-commercial station is also subject to the minimum separation requirements as outlined in (FCC R,R, 73.207),as well as limitations around border areas. The classes of station also apply but with the addition of a Class D station. Class D stations operate with effective radiated powers of less than 100 watts. Transmitter power is usually about 10 watts. In the past the FCC had provisions for licensing new Class D stations. At present however only applications for Class D stations in Alaska will be accepted. Class D stations already in existence are permitted to continue operation but with some limitations.

By definition the non-commercial station may not sell air time. It may accept contributions however and charge for services. The amount received is only supposed to offset the cost of operation. This might include reimbursement for a newsperson's gasoline expenses while on assignment, but is not supposed to be used for wages.

Commercial announcements may not be broadcast. But, acknowledgment of contributors is permitted. If the contributor operates a business then it and/or the product may also be mentioned. An additional source of revenue may be an SCA service provided it is not used for commercial type gain. This might be for a computer data link for county offices for example. If in doubt the FCC should be contacted to confirm or deny if a revenue idea is within the Rules.

Non-commercial stations have an advantage over commercial stations in that they can often obtain equipment through donations. See appendix (A-26)

Commercial AM Broadcasting

Standard (AM) broadcast stations operate on local, regional, or clear channels. These are also separated as to power and frequency and coverage areas. A general compilation is listed for you in appendix L. Further information is contained in (FCC R,R, 73.21 through 73.29).

The wave propagation of AM band stations is much different than with FM stations. Range can greatly increase during night hours. For this reason some AM stations may not sign-on before a certain time in the morning nor operate past a certain time in the evening. Where engineering studies indicate interference would not be a problem, the FCC will permit different sign-on and sign-off hours determined by the study.

There is no way around it. The establishing of an AM station requires much more technical work than does an FM station. If you have a good background in electronics theory, and do some studying on RF and antenna systems, and go through the FCC's references and tables, you can put something together. Most often however this kind of work is best left up to a professional engineer who works specifically with AM station construction.

Construction of an AM station requires a large area for your antenna system. An even larger area is needed for directiona l antenna systems. A directional system might require up to 5 towers, each of which might be 300 to 500 feet apart, plus guy wires. The antenna system also requires a phasing system, ground radials, and antenna monitors.

Because of the additional engineering, and the extensive antenna system usually required, AM stations can be rather costly to construct. Give this a great deal of thought before getting started. Even a Class IV daytimer of 250 watts and a small directional antenna could cost just under $150,000.

Summary of Licensed Stations

Some things are common to all applications for a licensed station. These include:

Submission of a plan or statement regarding compliance with Federal guide lines in regards to an active Equal Employment Opportunity program.

An application for Construction Permit also requires a fee be paid of a few hundred dollars. The license grant fee is over $1000.00 and is determined by the class of station. Non-commercial stations are exempted from the fees.

From time to time the FCC requires an "Ascertainment of Community Needs" survey. The survey must include items of public interest and need of the surrounding community. The FCC is looking here for evidence that the proposed station will actually serve the public interest.

Operators of the proposed station must have an FCC operator's license or permit of ANY GRADE. The minimum grade is a Restricted Radiotelephone Permit. The new "General Radiotelephone License" now replaces the old and discontinued "First Phone".

Pirate Broadcasting

The term "Pirate" was originally a "nick name" for illegal broadcasters who placed their stations outside of national borders ....on the high seas. First they would install their transmitter aboard a ship of some kind. The ship would then be anchored in international waters. Outside the jurisdiction of any country they could broadcast with relative immunity. The term "Pirate" has come to mean anyone who broadcasts illegally. Just how illegal is a matter of opinion to some. **To Pirate or not to Pirate is a choice only you can make.**

As an example: You are driving and come to an intersection with a stop sign. You can see a mile in each direction and the roads are clear: Is it OK to run the stop sign? If you don't stop at the stop sign, is it OK to go thru it at 5 MPH? If it is OK at 5 MPH, what about at 10 MPH ?, 15 ?, 25 ?, 45 ? Suppose if you get caught running the stop sign you'll forfeit $25.00, would you risk being caught ? What about $50.00 ?, $250.00 ?, $1000.00?

Some "Pirates" broadcast on the AM band, some on the FM band, some on amateur radio bands, and some on short wave bands. Output powers range from FM wireless microphones and CB walkie-talkies (milliwatts) to commercial transmitters of tens to hundreds of watts. These are the "low-power" pirates, not the ones on the high seas. Ages of these broadcasters range from 10 years to 75 years old. For additional information see page 19.

They have differing reasons for their activity. Some feel that Government has no right to control the airwaves. They should be free to anyone who wants to use them. Others just want to broadcast for the fun of it and don't want to bother getting a license. They are willing to accept the risk of being caught, although most feel they probably won't be caught. Many have operated for years without any problems. Generally the following holds true:

The FCC Field Offices are somewhat understaffed. They appear not to have enough manpower to actively hunt down pirate broadcasters. In fact, they may tend to ignore any they hear about....unless they receive a complaint from the public. Then they must act. That action includes any one or all of the following:

(1) They will visit the pirate station and ask the owner to shut down permanently

(2) The pirate will be issued a written warning or Notice of Apparent Liability (NAL) which requires a written answer within 30 days.

(3) A fine of $1000 to $1250 is the typical amount levied against pirate operators as of the publication date of this book. Some pirates report the FCC may reduce the amount if asked. In some cases the FCC has permitted the fine to be paid off over a period of a few months. Fines for shortwave pirating are a different matter as they involve International agreements.

(4) If the pirate has been uncooperative, refuses to let FCC inspectors see the station, or continues to operate after being warned, a Federal Marshal with a Search and Siezure Warrant can confiscate the transmitting equipment.

PROGRAMMING

You'll undoubtedly want your station to be known throughout your community for its special character and rapport. Part of that character and rapport involves your programming, the material you present to your audience. Your programming can of course take many shapes depending on the community's needs and interests and your own particular interests. No one station can be all things for all people, of course. Let's examine some of the possibilities, remembering that your final programming may be a mixture of all of the following:

Entertainment

Entertainment programming includes general or specific public service messages, sports, news and recorded music. The recorded music may be Rock, Country, Middle-of-the-Road, "easy listening", Jazz, Contemporary, Underground, Classical, Background, etc. Usually entertainment programming includes a "personality" as an announcer or disc jockey. See appendices (A-27) and (A-29) for sources of program materials, records, etc.

Educational

Educational programming includes general and specific interest programs of an instructional nature. These may be prepared by schools, colleges, or any other educational groups, or by the general public. News, special events coverage, school-related activities, church-related programs, sports, drama, and musical entertainment are also included. Program material sources, records, tapes, etc., are included in appendices (A-27) and (A-29).

Community/Alternative

The community or "alternative" station tends to operate at the grass roots level. Its prime concern being communication with the people of the community. This communication may include open discussion on controversial issues which affect the community. Live coverage of public meetings to promote community awareness. Some give information about free health clinics, warnings about bad drugs, where to get free meals, etc., - all aimed at "street people". Musical entertainment may also be presented, usually classical and esoteric.

Religious

"Religious" stations offer educational programs of a religious nature, inspirational entertainment (including music and drama), theological discussions, and broadcasts of religious services. They are usually affiliated with a church or school. See appendix (A-27).

Controversial

Some stations devote a substantial portion of their broadcast time to open interviews, talk shows (with call-ins from listeners), and discussion groups. Program hosts must be articulate, knowledgeable, with a keen understanding of how to talk with an audience and conduct interviews.

All News

"All News" stations are generally limited to large market areas where potential advertising revenue can sustain the operation. The necessity to continually gather news throughout the day requires a large expense for a news staff, news wire services, affiliations with news gathering agencies, and mobile radio equipment and cars.

See appendices (A-11),(A-27) and (A-28) for more information.

Music Licensing

Contrary to popular belief the purchasing of a record, tape, or CD for broadcast does not give the station unlimited use of the music thereon. The composer of the music, the author of the lyrics, t the musicians that play the music and the singers that sing the words generally are entitled to extended royalties. This means every time the record, CD or tape is played some small amount of money is due the composer, author, musicians and singers. This is true even if the record, tape, or CD is a promotional copy given to the station by a distributer.

Obviously it would be exrtremely difficult to keep track of every record played on every radio station 24 hours a day, 365 days a year. For this reason the organizations which control the licensed use of music use a flat-rate method of payment. The amount is based on the coverage area and/or population covered by the station of concern.

Although these orgainizations have jurisdiction over anyone playing the music which they represent usuually only FCC licensed radio stations are affected. Cable FM and carrier-current stations fall into the category of "closed systems" . As such they reach a smaller audience than say a commercial 10kW AM or FM station. Small non-commercial (educational and religious) stations may, in some areas, be exempt from paying the music licensing fees.

Normally you won't have to seek them out - they'll find you. They monitor new FCC station applications and license grants and contact the new station at the appropriate time. Appendix O lists the address and phone numbers of the major music licensing organizations.

Reference Materials You'll Need

There are several forms, information bulletins, reference materials, and FCC Rules that are both helpful and necessary to getting started. Some of these require several weeks for delivery. Others may be found as near as your local Public Library, FCC Field Office, or radio station(s). In any case, you should attempt to get them in your hands as soon as possible.

Appendix A lists the various materials, the source where they can be obtained, and the approximate cost if any. Depending upon which type of station you wish to start, some materials will be more important to you than others. These are listed below. Of course for a thorough understanding of broadcasting you may want as many informative materials as you can get.

Type of Station Desired	Appendix A Item Numbers
Low-Power Broadcasting	1,3,4,11,12,18,19,25,26,27,28,29
Cable FM	11,12,22,24,26,27,28,29
Commercial AM and FM	1,2,7,8,9,10,11,12,13,14,15,18,19,20,21, 22,26,27,28,29
Non-Commercial FM	1,2,5,8,10,11,12,13,14,15,18,19,20,21,22, 26,27,28,29
Pirate Broadcasting	1,2,3,4,11,12,14,18,19,25,26,27,28,29,30, 31,32,33,34

How To Get Along With The FCC

Contrary to popular opinion the Federal Communications Commission in not comprised of ugly monsters waiting with fangs bared ready to gobble up wrong doers. All my contacts with the FCC has shown me that the people that make up that group are just as human as you and I. They even make mistakes like you and I, and therefore...expect us to make mistakes.

The principal task of the FCC is to ensure coherent and dependable radio communications. They want to be certain that your station does not interfere with existing stations, that your station is needed, and that once you get your station,no other station will interfere with yours. In what occasionally seems to be outrageous bureaucracy and outmoded or unnecessary laws, the FCC does a reasonably good job. Anything you can do to make their job easier will result in less paper work for you and them. This means less wasted time, and a better working relationship between the both of you.

Now and then you'll find individuals on the FCC staff that are just plain difficult to work with. But this is also true in any number of other groups that must deal with the public. It will be to your advantage to try to get along with them anyway. Let these few individuals have there way if possible.

Most often you'll find the FCC staff courteous and helpful. If you try to follow all the Rules, admit your mistakes and correct them as soon as possible, you should have no problems with them. They are most disagreeable when they think you are willfully and knowingly disregarding the Rules.

Your local FCC Field office handles a few forms and bulletins and keeps a set of Rules for reference. They can't do engineering for you and are not supposed to give advice other than what's available in the Rules. It won't hurt however to visit the field office and get to know some of the staff. They may on occasion be able to give you advance information about up-coming FCC Rule changes and policies.

Ascertainment of Community Needs

The FCC has a continued interest in the effectiveness of broadcast stations meeting the needs of the community. Broadcast stations are licensed for the public interest, convenience and necessity. A part of your application for a construction permit may require a survey of those needs.

Visit your community leaders, church groups, civic officials, schools, newspapers, minority groups, and the general public on a door-to-door basis if need be. Get a cross-section of the residential, business, rural, ethnic, and educational background of the community.

Consider ways your station can be beneficial to the community, such as the presentation of local news, public service messages, open debates, free speech messages, editorials, minority discussions, live and prerecorded broadcasts of city and county meetings, etc. Compile all your information. It will make a neat exhibit to go along with your application and to use for future reference.

Relationships With Others

As a beginning broadcaster you'll need help and support from various persons, groups, agencies, and officials. The type of station, and your proposed programming, will have a lot to do with who'll be the most helpful and supportive.

For a commercial station you'll be most concerned with the business section of the community. You should also expect strong opposition from other radio stations in the area. If you propose a non-commercial station at a school for example, the teachers, school administrators, and school board will be your primary concern. The following information is offered as possible ways to assure a positive beginning for your station.

Relationships with other broadcasters:

Your entering into broadcasting won't be well received by other radio stations in the area. You'll have the potential to draw away some of their listeners. Without listeners the integrity of their station as a sales medium is lowered. Sales could drop off, and that gets the other stations where it hurts.

Visit some of the nearby stations and get to know the people there. Don't mention you are planning to start your own. Ask to see their "Public Inspection" file. By FCC Rules every station must maintain such a file, and...make it available to the public on demand-during normal business hours. The file should include letters from listeners, both commendations and complaints. You can find out if they broadcast local issues, free speech messages, and other matters of community involvement. You'll be able to see copies of their FCC applications for construction permit and license, as well as their technical data. In short, you can learn a great deal about your competition.

Area station owners will soon find out about your proposed station. Having their income threatened forces them to try to stop your application from being granted. This is done with a "Petition to Deny" being sent to the FCC. The chances are that one or more Petitions will be filed against your application. The Petitioner however must prove that your station either would not be in the public interest, that interference would be caused, or the community is not large enough to support another station. The FCC however leans toward what is good for the community, not necessarily what might be good for station profits.

As a cable or non-commercial station you have a much better chance of getting along with other area broadcasters. Although you may be a threat by capturing some of their audience, at least you won't be taking a large amount of sales away. In fact, non-commercial stations often get along very well with area stations. For example, the door is open for tax-deductible donations of equipment to school or church stations. Students in broadcasting classes often become the new supply of DJ's and technicians at local stations. And, station engineers are often glad to be of help in setting up a school or church station.

The Cable Company:

The cable system operator can gain a great deal by carrying FM and CAFM stations. There is considerable profit in selling second cable taps for FM receivers, and even more profit selling the original hook-up. Cable companies are usually franchised in the city or county where they provide service. To stay on the good side of civic officials the cable operator should be cooperative...besides, it 's just good business.

You may find however that some cable operators are a little less cooperative with broadcasters. A high powered station in the area can overload their system and bring quick complaints from their customers. It might be wise to discuss your proposed station with the cable people. Together you can identify and address potential problems before they can happen. If the question ever comes up during your station application process you'll be one step ahead with answers.

If your plans are for a CAFM station then talking with the cable company is the first thing you must do. The cable operator has no obligation to permit you to use the system. You must get on their good side right from the beginning. Then you must convince them your station will be good for their business. Submit a plan to them showing how very little effort is needed on their part. You may even get them to supply the FM modulator for your station. All you would need then is studio equipment.

Most cable operators are fearful of FCC Rules but don't know that much about them. When you first approach them about a CAFM station they may shy away from the idea. To discourage you they may invent reasons why they can't do it. Its been reported that some operators quote an unreasonable rental fee of several hundred dollars a month + liability insurance. The truth is it costs them practically nothing once your FM modulator is installed. Others claim "no room for another station on the cable"..this may or may not be so. Be prepared to discuss how these problems might be corrected. Don't be too aggressive however. It is still their cable and the fate of your CAFM station rests in their hands.

If all else fails to get you on the cable, and you want to be a little more aggressive, there are a couple of other things you can do. One, you can talk with the city or county officials that approved the cable company franchise. In some cases the franchise agreement includes "local origination of programs" and/or "public access". Your proposed station may be a way for the cable company to meet their obligations to the franchise agreement. Its worth investigating! Secondly, you might use a small FM transmitter with a "beam" antenna as an STL to enter the system through their antenna. See the section of "Pirate Broadcasting" and appendix (A-24) for further information.

The General Public:

All broadcasters should be sharply aware of the needs of the community they serve. Always be ready to help in providing public service and, as a leader in your community, offering advice. Make air time available for qualified spokespersons in your community. Let civic leaders know of your proposed station and that it will be of service to them.

Let the business people get to know you. Join the Chamber of Commerce, go to their coffee klatches, breakfasts, or whatever. Join local business and service clubs and organizations. This will bring you closer to the problems of the community. In turn, these groups will help support your station and your efforts.

Remember also that radio stations can overload TV sets and audio equipment if too near them. Look for a transmitter site that is far enough away from homes, office buildings, and cable head-ends. The public should only hear your station through their radios, not their tape decks, telephones and TVs.

Your Local School Board:

If you propose a school station (usually non-commercial) then you'll probably be under the jurisdiction of a school board. They'll be concerned about the start up and continuing costs. They'll be concerned about your programming and who will accept responsibility. Who will supervise students working at the station? They'll worry about libelous statements, editorials, obscenity and profanity being broadcast. Worry, worry, and why?, why?

Getting the board on your side is not an overwhelming task, it just takes a little work on your part. First check with school administrators and board members. Talk to them one at a time. Find out what their concerns may be and keep notes of what you learn. Next prepare a proposal for presentation to the school board during one of their regular meetings. Use your notes to find answers to everyone's concerns, and include those answers in the proposal. Send a personal copy to each of the board members at least one week before the meeting. This gives them a chance to read it.

Keep the proposal short and to the point. This helps assure that everyone will read it. Point out that an application for a non-commercial station costs little to nothing and does not obligate the board to actual construction.

While waiting for approval of your construction permit you'll have time to locate possible funding through federal or private grants. You can also search out donations of equipment from commercial stations. On-going costs of running the station would include electrical power, space, and perhaps some new equipment from time to time. Some equipment from the audio-visual department can be used in the beginning. Upgrading can come later from school capital outlay budgets, and/or instructional budgets.

Explain to the board that programming could include community interest, local and school news, interviews with civic leaders, school administrators, public service announcements, and music. A teacher or faculty advisor would be responsible for preparation and presentation of programming materials, although students may actually be doing the work. Point out also that the station can do live broadcasts of school games such as football, basketball, baseball, etc. There is nothing like showing off your school to get a board member in a positive attitude!

Explain also that the station can be used for instructional purposes. Students gain experience in announcing, reading, world events through exposure to daily news stories, etc. Maintenance can be done by electronics students, news reporting by the journalism department, station logs typed by typing classes, radio plays from the drama department, etc.

Supervision need not be a worry either. The station studio can be located within easy view of a supervisor or teacher. If the station is to operate after school hours then parents are often available for supervision on a rotating basis.

WHERE DO WE GO FROM HERE

Now that you have some idea of what is involved in starting a radio station your next step is to do something about it. You'll need a suitable site for the transmitter and the studio. You may need space for a tall antenna. You'll need to find a frequency which is clear, and if you propose a licensed station you'll have forms to fill out.

The following pages will help you achieve your goal by the easiest and shortest way possible. Included are examples of filled-out FCC application forms, exhibits, local notice of filing, etc. There will be a lot of work to do - it will take quite a bit of your time - but look at what you'll achieve!

Schedule of Events

If you're thinking about an unlicensed station (carrier-current, CAFM, or Pirate) you may skip the rest of this page. The following describes the sequence of events leading to a construction permit and station license for commercial and non-commercial stations:

You do the following: >____ *The FCC responds with:*____

(1) Do preliminary work..... Read applicable FCC Rules Search for an available channel Research community needs Find a suitable location

(2) Complete Application for CP.... Requested facilities , Legal qualifications, Financial qualifications, Purpose and Objectives, Program intentions, Technical info., maps, exhibits, Antenna site information

(3) Mail above to FCC in Washington> *Sends receipt by post card; Checks the application for errors, returns it for correction; When accepted for filing a public notice is published; Construction permit granted (90 days to a year); Requests preference of call letters*

(4) Post Construction Permit; Begin station construction; Submit call letter request *> Checks for valid call letters; Issues call letters*

(5) Complete construction ; Test facilities; Notify FCC Field Office> *Field office inspects station Approves or asks for corrective action*

(6) Correct errors if required ; Make informal request to conduct program tests; Complete license application and mail to Washington> *Authorizes progrtam tests; Checks application for errors ; Grants license (4 to 6 weeks)*

(7) Start normal operation (up to 90 days) (Program tests)

(8) Display station license when it arrives

Selecting Your Frequency

Each type of station requires a different method of determining channel availability.

Carrier-Current:

Several things must be checked while finding a suitable frequency. Various electrical noises appear on the AC power lines. Since carrier-current uses those lines for transmission you should look for the least noisiest portion of the band. Next you'll listen within each relatively quiet spot for the absence of other radio stations.

Noise factors are different during the day than they are at night. Noise is less during the evening hours while distant radio stations come in stronger at night. It is therefore important that you run several tests both at night and during the day. Test procedures are outlined in "Carrier-Current Techniques" (A- 25). The transmission characteristics of power lines gets worse at the higher frequencies. Noise is also greater at the upper end of the AM band (on power lines). Part 15 of the FCC Rules also permits a greater field strength at the lower end of the band. For these reasons most carrier-current stations operate below about 800 kHz.

Cable FM:

Your first step is to assure the cable company will permit you to use the system. Next talk with the chief technician to find out if they use a "broadband" or a "channelized" system.

With a broadband system all the receivable FM stations are being amplified and sent down the cable. Your task is to find a clear spot in all that mess. Connect your FM radio to the cable and carefully tune over the entire band to find a clear spot. Sometimes you'll have to go to the extreme ends of the band at 88.1 MHz or 107.9 MHz to find that clear spot. Unfortunately people don't often tune to the edge of the band so you'll miss a few listeners.

The channelized system has a few selected FM stations processed with their own amplifier. The cable operator will sometimes convert a station's frequency to another channel. This is done so the selected stations can be spaced equally across the band. In some cases the cable operator will insist that the channelized system has no room for another station. This may or may not be true. Usually the channelized stations are spaced far enough apart that another frequency can be squeezed in...if the cable operator is willing.

FM Broadcast:

The FM band includes frequencies between 88 and 108 MHz. The band is separated into 100 channels of 200 kHz each. The lowest channel is numbered 201 at 88.1 MHz. The highest channel is numbered 300 at 107.9 MHz

Channels 201 through 220 are reserved for use by non-commercial (educational) stations. The remainder of the channels, 221 through 300, are listed in the "Table of Allotments" (FCC R,R, 73.202) for use by commercial stations. Some channels have special restrictions or conditions, these are:

(1) Channel 206 in New York City is reserved for the United Nations.

(2) All FM channels in Alaska shall not cause harmful interference to but must accept interference from non-government stations.

(3) Non-commercial channels 201 - 220 within 199 miles (320 kilometers) of the Mexican border must comply with the U.S.A.-Mexico Agreement of assignments (FCC R,R,73.504) This applies to communities in Arizona, California, New Mexico, and Texas. For the rest of the U.S.A. these channels must comply with the Minimum Distance Separation requirements (FCC R,R, 73.207) in regards to commercial channels 221 - 223. See appendix M.

(4) Commercial channels 221-296 are reserved for class A stations.

(5) All of the channels in the Table of Allotments must comply with the Minimum Distance Separations in (FCC R,R, 73.207). The distances listed apply only to stations on the same channel (co-channel), and the first, second, and third adjacent channels, and channels which are either 10.6 or 10.8 MHz removed. See appendix M for domestic separation requirements.

(6) Commercial channels 221 - 300 within 199 miles (320 kilometers) of the Canadian border must comply with the Minimum Distance Separation of (FCC R,R, 73.207,2,i). (M)

(7) Commercial channels 221 - 300 within 199 miles (320 kilometers) of the Mexican border must comply with the Minimum Distance Separation of (FCC R,R, 73.207,2,ii). (M)

(8) Non-commercial channels are also subject to the provisions of (FCC R,R, 73.509) in regards to Protection From Interference for existing non-commercial stations.

(9) Applicants for non-commercial channels which would be located near a channel 6 TV station may be required to: (a) determine if interference would be caused to either station, (b) be required to install their antenna on the same tower as the channel 6 antenna.

(10) Only the channels and communities listed in (FCC R,R, 73.207), (FCC R,R, 73.504), and (FCC R,R, 73.501) are acceptable for filing a construction permit application.

AM Broadcast:

Appendix L shows what classes of station and corresponding frequencies are available for applicants (FCC R,R 73.21). Applicants must show:

(1) Signal strength contours of the proposed station would not overlap the pertinent signal strength contours of another station. Pertinent signal strengths are listed in (FCC R,R 73.37).

(2) "The proposed assignment will tend to effect fair, efficient,and equitable distribution of radio service among the several states and communities".

Pirate:

Since Pirate operation is not permitted within the FCC Rules, the Pirate operator usually picks whatever frequency seems best. Almost any clear spot on the FM or AM band is chosen. Some Pirates prefer frequencies at the extreme edge of either band. They reason the FCC might not look for them there...On the other hand perhaps the public won't be looking for them there either.

Some FM Pirates operate with very little power, only a few milliwatts, yet have a large potential audience. Instead of depending on direct radiation they use a highly directional "beam" antenna to send their signal to a nearby cable TV antenna system. Their station, just like the licensed stations, is then fed down the cable to all the subscribers. They can sound every bit as good, or better, than a large commercial station because the cable system's amplifiers do most of the work for them. There are many that have been doing this for years without any problem. They even broadcast in stereo!

FM Pirates using direct radiation use transmitter powers of a few milliwatts to hundreds of Watts. Antennas range from a simple wire to multi-element broadcast-type installations. Of course high power and/or a large antenna system puts the station at greater risk of being discovered by the FCC. Even a transmitter power of a few milliwatts and an efficient antenna can have a coverage of a mile or more under the right conditions. A 10 Watt transmitter with an antenna at a height of 100 feet above the average terrain can have a range up to 15 miles!

Pirates on the AM band prefer the higher frequencies. This is because an antenna for 1600 kHz is much shorter than for 540 kHz. It is therefore easier to construct and tune-up. An antenna for 1600 kHz is only about 150 feet long while one for 540 kHz would be 3 times that long. As an example,a 50 foot TV mast installed at ground level with a suitable loading coil would be much more efficient at 1600 kHz than at 540 kHz.

AM Pirates operate with transmitter power anywhere from 5 Watts to several hundred Watts.

Pirates on the shortwave frequencies are beyond the scope of this book.

Legal Low Power Broadcasting

Carrier-Current:

The carrier-current station transmitter should be located near a power distribution center. The RF signal is fed to the power lines from this center and travels anywhere the power lines go. Most buildings are wired for 220 volts which consists of two 117 volt phases. One phase may go to one floor of a building while another phase goes to a different floor. For best coverage then you should feed the RF signal to both phases. This is best done at a point where the 220 volt lines come in...the MAIN fuse or circuit breaker box.

The studio on the other hand can be anywhere that is convenient. A coaxial audio cable or a pair of low impedance lines are used to couple audio from your studio to the transmitter. A low impedance line simply means you should use a transformer coupling at both ends of the audio line. This reduces noise pick up on the line and helps to maintain a good audio frequency response.

Transmission by a special "leaky" coax cable is also possible. The cable would be strung near the ceiling in hall ways and corridors or around the edges of a building. In this case the transmitter should be located as near as possible to the intended coverage area.

Part 15 of the FCC Rules sets the limits of field strength for low power operation on the AM band. It is quite specific about the use of an antenna for transmission by direct radiation. The antenna can not be more than 10 feet long...including the transmission line (coax cable) and ground system. The transmitter itself is limited to 100 milliwatts of "D.C. input to the final stage" which works out to about 70 milliwatts to an antenna. There are ways to increase the efficiency of the short antenna somewhat. But, because of these limitations you should install your transmitter right next to the antenna. The "ground" of the system should also be kept very short (a few inches if possible). See appendix (A-1 thru A-4), (A-14) and (A-25).

CAFM:

Your cable FM facility will depend mostly on the conditions that exist at the CATV company. If your cable FM modulator is installed at the "head end" then you'll need a way to get your audio there. Phone lines are good, you'll need a pair of 15 kHz equalized lines for stereo. The tariffs for broadcast audio lines goes up every year however. Many broadcasters are now going for radio type STL's instead of phone lines because of the rising costs.

A better way to get your audio to the head end is to use a sub-carrier to send it "up" the cable. You send it back "down" the cable after converting it to your FM channel. Unfortunately this can only be done with CATV companies that have a "two-way" system. See appendix (A-24).