PANAXIS COMPANY

WAS BOUGHT BY

PROGRESSIVE CONCEPTS

ON OCTOBER 11, 2007

NEED ANY INFORMATION ON PAST

PANAXIS ELECTRONICS PLEASE CONTACT

Eric Hoppe
Progressive Concepts
305 South Bartlett Road
Streamwood, IL 60107
PHONE. 630.736.9822 Fax: 630.736.0353
www.progressive-concepts.com

COMPILED BY JEFF MORRISON APRIL 14, 2015

THE BROADCASTER'S GUIDE TO RADIO STATION DEVELOPMENT

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

Printed in the United States of America

DEDICATION

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

CONTENTS

CONTENTS

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).

FM Broadcast Stations

The best place for an FM station antenna is on top of a hill or building. The radio waves at the frequencies of the FM band travel a line-of-sight path. Objects, buildings, hills, etc., between your antenna and your listener's receivers will reduce the quality of reception. Best coverage it is usually obtained with antenna height rather than increased transmitter power. Greater antenna heights also tend to reduce attenuation due to ground reflections.

The FCC requires a strong signal coverage of the community in which the station is licensed. This means your antenna site must be fairly close to the center of the community. It may be hard to find a tall hill in the center of town so you'll have to make do with a building. Fortunately FM antennas are not very large so a building roof usually provides plenty of room.

The antenna system consists of one or more antennas mounted on a common support. The support can be a wooden telephone pole, a metal mast or tower, or even the side of a building. Ring type antennas are only about 2 feet in diameter and are made from 2 inch pipe. "V" type antennas are only about as long as your two arms when you raise them up and put them straight out in front of you. Vertical dipoles are about 5 feet long. By "stacking" antennas on a common support you can raise the gain of the system. A two-bay (elements) array increases your effective radiated power by 2 times, a four-bay by 4 times. Each bay (element) must be spaced from 8 to 10 feet away from the others. This means a four-bay system requires about 30 feet on the support. The bottom bay should be at least 20 feet (or more) above the ground or roof top.

A four-bay antenna seems to be about the best compromise for a system. It increases your effective radiated power by 4 times but still maintains a relatively uniform pattern. When more bays are used the radiated signal starts to compress into a flat beam. The resultant beam can reach great distances but to do so it may overshoot the nearby community. In some cases the beam can be deliberately "tilted" to fill in "shadow" areas.

Be sure to check local building codes and ordinances. Some communities have strict ordinances about where antenna towers may be erected. You must also take into consideration the local airfields and airports. The FAA will not approve towers which are too close to aircraft glide-paths and landing areas. In addition, towers over 100 feet in height must have obstruction lighting installed on them.

Metal towers can be either self supporting or require guy wires. Guy wires should be placed every 30 feet up the tower. The angle of the guy wire in respect to the tower should be about 45 degrees. This means the guy wires at the 90 foot point on a 100 foot tower would be anchored in the ground 90 feet from the base of the tower. From one guy to an opposing guy could therefore be about 180 feet. Keep this in mind when looking for an antenna site..you'll need some space to stretch out.

A simple tower is a wooden power pole. A 110 foot pole with 10% (about 10 feet) buried in the ground is self-supporting. Wire mesh run down one side of the pole acts as a lightening arrester. A wooden pole will last for years if it has proper drainage around it. The-mounting hole should be back-filled with rocks or gravel, or as a last resort, just plain dirt.

Do not set the pole in concrete - it would rot within a few years. The pole shrinks after being set but the concrete doesn't. This leaves a gap between the pole and the concrete for rain water to get into. The water can't get out because it's in a concrete "bathtub".

On hill top or building you still must consider year round access, audio (phone) lines, a weather tight room for your transmitter, and electrical power. Large transmitters require 230 volts AC, and some even a 3-phase service. These may not be easy to come by on top of a building or a mile up a hill. Even if electrical power is available it does not guarantee that phone lines can be brought in. It's important therefore to check with your local power and phone companies while site hunting. They'll let you know if they can service the site, and if not immediately, how much it would cost to do so.

Be sure you talk with the right people at the phone company. The business office seldom understands what broadcasters are looking for. Ask for the "long lines" or "broadcast loops" department. Even though a potential site has telephone service to it, it still may not support broadcast lines. Telephone lines are "loaded" with inductors to hold audio response down to voice frequencies. You would need unloaded and equalized lines with an audio response from at least 50 Hz to 15 kHz. In addition to your audio lines you'll need at least one low-grade or data line for remote control of your transmitter. If the cost of phone lines is prohibitive, or they can't be installed, your next consideration is an STL.

The STL (studio transmitter link) would operate on a microwave channel above 900 MHz. If you're within a couple of miles of your studio a simple rod or yagi antenna may work OK. If you are farther than that from the proposed studio you'll need a "dish" antenna. You'll need room to install that also.

Others have looked for suitable transmitting sites before you. Take advantage of what they have learned. Check your telephone directory for 2-way radio outfits, other broadcast stations, and your county communications department. They've probably checked out every available site in the area and can tell you the good and bad points of each.

As you can see there are several items of expense involved with your transmitter site. The FCC may not ask you for the specific costs, but they'll want you to certify you'll be able to meet all costs necessary to construct the station. Include these items on your list of transmitter site expenses:

(1) Site purchase, lease, or rental

(2) Installation of electrical power

(3) Installation of phone lines or purchase of an STL

(4) Tower installation

(5) Antenna cost and installation

(6) Installation of the transmitter

(7) Ongoing maintenance and monthly operating costs.

AM Broadcast Stations

Standard (AM) Broadcast station usually require more ground area than FM stations. This is due to the size and complexity of the antenna system needed at this lower frequency. A quarter of a wavelength antenna for FM (100 MHz) is only about 30 inches long. On the AM band however a quarter of a wavelength works out to be about 240 feet at 1000 kHz.

An antenna 240 feet high when guyed at the top with guy angles of 45 degrees requires 480 feet of ground area for the anchors. With the number of AM stations in existence the chances are good that new stations will need a directional antenna system. Three to five tower systems are not uncommon. The distance between antenna towers is from 1/2 to the full height of the tower. In our example it would be 120 to 240 feet between towers. A 5 tower system could require up to 1500 linear feet (including guy wire anchor points).

Ground conductivity is a very important consideration. The ground is 1/2 of the antenna system itself. The better the electrical conductivity of the ground the more efficient the antenna system. Where ground conductivity is poor a network of wires may have to be buried under the towers to act as an artificial ground. Information on ground conductivity throughout the United States is included in (FCC R,R, 73.190)

Because of the space requirements AM station transmitter/antenna sites are quite often located outside the space limitations of cities. The unused portion of the site can be used for cattle grazing, car parking, storage, etc. Care must be taken however to protect the antenna system from damage. It should be completely enclosed with a strong fence to keep live stock, people, and automobiles away from it.

As with the FM site you'll need phone lines or an STL to get your program material from the studio to the transmitter. You'll also need electrical power, perhaps 230 volt service or 3-phase service. Many AM stations have been built in cow pastures and have paid a fortune to get phone and power lines brought in to them.

To keep costs down some stations build a double-duty building. One part of it houses the transmitter, the rest is for offices and studio. This way only one site and building are required.

Things to include on your expected expense list are: (1) possible installation of a directional array (2) purchase, or long term renewable lease of the site(3) antenna tuning and phasing units(4) possible construction of a building (5) electrical power (6) audio (phone) lines or if a common site, your business phone line (7) extensive fencing around the antennas.

Pirate Broadcasting

The Pirate broadcaster doesn't want to call too much attention to the location of the station. FM antennas might be disguised as amateur radio or TV antennas. AM antennas may look like an amateur radio or TV antenna "tower" for example. AM antennas are generally much shorter than they should be for best performance. Most pirates operate from their home. The transmitter is usually just a few feet from the studio. See appendix (A-30).

Studio and Production Facilities

Below is a suggested list of studio equipment. These items are the ***minimum*** requirement for a satisfactory station operation:

Quantity	Description	Quantity	Description
1	5-8 ch mixing board	1	Monitor speaker
2	12" turntables	1	Monitor amplifier
2	Equalized preamps	1	Microphone(Cardioid type)
2	Rugged phono cartridges	1	Microphone stand/support
1	Studio clock	1	Monitor receiver
1	Reel-reel tape recorder	1	Cartridge tape recorder
1	Set of headphones	1	* Modulation Monitor
1	Transmitter remote control	1	* Frequency Monitor

Additional equipment which can enhance the quality of sound would be a compressor/limiter, 5 to 8 band Equalizer, tape eraser, etc. For more about studio equipment see appendix (A-11) and (A-26).

The studio and production rooms should be as far away from noise producing areas as possible. A production room is not absolutely necessary, but if you have one it should have all the same equipment as the studio except for the Frequency and Modulation monitors and Transmitter remote control.

Acoustic deadening materials should be used on walls, ceilings, and floors to reduce sound reflections. Floors should be carpeted. Walls and windows can be covered with heavy drapery. If the studio is enclosed but with a common wall to a hall or other room, you'll probably want a window. That window should have the glass leaning slightly from vertical. This way any sound that hits it is reflected toward the floor or ceiling.

Equipment mounting cabinets must be solid, free from vibrations, and perhaps even shock mounted to the floor. Doors should be solid core or mineral filled, weather stripped and lockable.

Don't forget..if you're planning a stereo station then all your studio equipment should be stereo units. The exception would be the microphone and any tape machine that will be used just for voice announcements.

* The Frequency and Modulation monitors are not required for unlicensed stations. The frequency of licensed stations should be checked as often as is necessary to assure it is within tolerance. This is + or - 20 Hz for AM stations and + or - 2000 Hz for FM stations.

Commercial FM Stations

The first step is to gather together all the reference materials you'll need to make a frequency search. This is what you'll need:

Code of Federal Regulations, Title 47, Volumes 70 -79 See appendix (A-15) (You'll only need Part 73 but these come all in one book)

Broadcasting Yearbook, latest edition (current year) See appendix (A-11)

FM Station Atlas See appendix (A-22)

A map which covers up to 200 miles in all directions See appendices(A-20,21) from your proposed transmitter site. This may require more than one map. The map should also include latitude and longitude markings.

A sheet of "6 mil" clear plastic to draw circles on, (available at most stationary stores)and which will cover the map. Use small tip felt marking pens which will write on plastic.

You are now ready to begin.

(1) Cut a strip from the edge of the plastic sheet so that you have a long piece about 2" wide. Lay it on top of the map's mileage scale. With the felt tip marking pen make a mark at "0" miles, and at 10 mile intervals out to a point which represents 200 miles.

(2) Place the rest of the plastic sheet on top of the map.

(3) Search through the Table of Allotments (FCC R,R 73.202) and find the channels which are allotted to your community. If your community isn't listed then look for the next closest community.

(4) Look through the FM Atlas to see if the channel(s) found are in use.

(5) Look through the Broadcasting Yearbook to double check if the channel(s) is already in use, or has an application pending.

(6) If the channel is not assigned locate the community on the map. On the plastic sheet covering the map mark the center of that community.

(7) Place the long plastic strip on the map so the "0" mile mark is at the center of the community. Use a thumb tack through the "0" line to hold it there. Place the tip of the felt marker at the "200 mile" mark on the strip. Keeping the plastic strip stretched out, slowly move it in a circle using the thumb tack as the pivot point. This is your 200 mile radius.

(8) You must now find the co-channel, the 1st,2nd, and 3rd adjacent channels, and the 53rd and 54th channels from you ,which are within 200 miles. Check the Broadcasting Year book(A-11) and the FM Atlas (A-22) to find which of them has been assigned. Mark the exact latitude and longitude of the antenna site for each of the assigned stations. For Channels which haven't been assigned yet, simply mark the center of the community to which it is allotted.

(9) For each mark that shows an assigned station also show the following information: (a) call letters (b) channel number (c) class of station (d) antenna height (HAAT) (e) ERP

(10) In accordance with (FCC R,R, 73.207 and 73.208) measure the distances between your proposed antenna site and each co-channel, 1st adjacent channel, 2nd adjacent channel, 3rd adjacent channel, and the 53rd and 54th channels above or below your proposed channel.

(11) Compare the distances with those in the minimum distance tables. These are reproduced for you in appendix M. If the distance between your proposed site and the above channels is greater than those listed in the tables, you have found a frequency. Separate tables are included for proposed sites which will be located within 320 kM (199 miles) of the Mexican or Canadian borders.

(12) If the spacings between your proposed site and the above channel sites are less than the table allows you may still be OK. Some provisions of (FCC R,R, 73.208) allow shorter spacings under certain conditions. If the site is reasonably close to the minimum spacing and a suitable antenna site would still provide the minimum field strength requirements of (FCC R,R 73.315) the station may be allowed.

Non-Commercial FM

All the procedures for finding a commercial FM channel also apply to finding a non-commercial channel, with some exceptions. Non-commercial stations operate on the reserved channels of 201 through 220. Channels 220, 219, and 218 are just below the commercial channels. Therefore they become the 1st, 2nd, and 3rd adjacent channels for 221, 222, and 223. Because of this 218, 219, and 220 must meet the minimum spacing requirements of (FCC R,R 73.207). You must also take into account the distance to stations which are 53 and 54 channels above you. In addition to these similarities to the commercial channel search, you have some additional requirements.

All the other non-commercial channels may be assigned to any community, and you may apply for any class of FM station, as long as you don't cause interference to the other channels. The amount of interference is determined by the ratio of field strength contours between stations. This applies to your co-channel and 1st, 2nd, and 3rd adjacent channels. Objectionable interference is considered to exist if the ratio is 1:10 for co-channel, 1:2 for 1st adjacent, 10:1 for 2nd adjacent, and 100:1 for 3rd adjacent channels. These ratios apply to the 1 mV/M contour of both the proposed station and each of the other stations. This is further clarified in appendix J.

(1) Pick a frequency (channel) you think is fairly clear of possible interference or spacing problems. Using the same procedures as outlined under "Commercial FM" in the preceding pages show the location and pertinent information for co-channel, 1st, 2nd, 3rd adjacent, and 53 and 54 channels on your map

(2) Temporarily pick a proposed output power. You must also have some idea of what your antenna height will be.

(3) Draw a circle around each station's location which represents their 1 mV/M contour. You may have to visit each station and ask to see their public inspection file. It should contain their engineering data and a copy of their FCC application. Their application should have an exhibit very much like the one you'll be preparing which shows their 1 mV/M contour. It may also show the contours for other stations in the area as well. You'll also need to know their antenna height and effective radiated power. Get all the information you can.

If you can't get the other station contours this way you'll have to calculate them yourself. To do this you'll need to read the section on "HOW TO USE THE FCC FIELD STRENGTH CHARTS". Do that now and then come back to here.

(4) The map showing a 200 mile radius may only be necessary for determination of minimum spacing requirements. You may want to use a map which gives greater detail to your immediate area. In this case you can use a Geological Survey Topographic map, or maps which show up to 50 miles from your proposed site.

Be sure to get plenty of plastic overlay sheets. You'll be making lots of circles on them and may want to change now and then. Here comes the fun part... Around each station draw to scale,circles which represent the 100 mV/M, 10 mV/M, 1 mV/M, .5 mV/M, and .1 mV/M. If it is obvious that any of the circles won't even come close to your proposed site, or any of your circles won't come close to the other sites, don't draw them.

(5) Now check all the circles that overlap between your proposed site and any other site. If any of the overlapping circles (contours) represent interference according to the ratios in appendix J then the channel has failed the test. Pick another frequency and try the whole thing over again. If you find a condition where it is very close to being acceptable you might consider:

(a) Lowering the power of your proposed station. (b) Propose using a directional antenna (part of your application exhibits)

(6) The FCC has allowed the use of directional antennas in areas where a station might not otherwise be permitted. The antenna may offer up to 15 dB of discrimination in the offending direction. Use this only as a last resort however. First exhaust all the possibilities of channel changes and differing amounts of effective radiated power.

Commercial AM

An available AM frequency will be quite difficult to find. Some consulting engineers believe that no more are available. The FCC, has in the past, not accepted applications for new AM stations. This doesn't stop the persistent and potential broadcaster however. Channels can be found although the chances are the station will need a directional antenna system. This means a lot of communication back and forth with the FCC.

Get together all your references. These include BROADCASTING YEARBOOK, see appendix (A-11 and A-12) and a map that shows 200 miles inside of the Mexican and Canadian borders. Get plastic overlay sheets and markers as described in the procedures under "Commercial FM".

Prepare a work sheet consisting of each AM frequency from 540 kHz to 1600 kHz, a column showing the class of station assigned to that frequency, and a column for comments. With the information contained in the "Yearbook", and the procedures outlined in (FCC R,R 73.14 through 73.190) , prepare your map.

From the above FCC Rules and tables, determine the distance to the 25 uV/M, .5 mV/M, 2 mV/M, and 25 mV/M contours for each station on your work sheet. These must include both the night time and day time contours. Draw circles around each of the stations on your map.

Look for an "opening" between contours. This opening will be an area where contours do not overlap in accordance with the following interference criteria:

(a) Co-channel stations may not have their 25 uV/M and .5 mV/M contours overlap one another.

(b) First adjacent channel stations may not overlap each other's .5 mV/M contour.

(c) Second adjacent channel stations may not overlap each other's 2 mV/M and 25 mV/M contours.

You may find that an AM channel is not available in your area. If this is the case you may want to search elsewhere in the country. At best your AM frequency search can only turn up "possible" availability. When it comes down to the fine points of determining coverage area for each station, and your proposed station, a consulting engineer will probably be needed. If all else fails, consider an FM station instead.

HOW TO PREPARE YOUR APPLICATION

General Information

You'll need either: FCC Form 301 (Application For Construction Permit For Commercial Broadcast Station)

FCC Form 340 (Application For Construction Permit For Noncommercial Educational Broadcast Station.

See appendix (A-5 and 6), (H).

A few general hints should be considered first. Use one copy of your application form as a work sheet. Mark on it only with a pencil so you can make changes when required. Remove sections of the application form that don't apply to you such as the AM and TV sections if you're proposing an FM station.

Look over the entire application thoroughly. Read all the instructions. Some of the sections require additional information. This information is attached to the application as an "exhibit". You'll have several exhibits to prepare. These forms are used for both new station applications, renewals of existing stations, and modifications of existing stations. As such you'll find some of the questions simply don't apply to what you're doing. To avoid any confusion it is best to answer those questions with "not applicable" or "does not apply". This can be shortened to "N/A" as the answer to the question.

You will need the "Code of Federal Regulations, title 47, Parts 0 (Commission Organization), 1 (Practice and Procedure), 17 (Construction Marking and Lighting of Antenna Structures), and 73 (Radio Broadcast Services). See appendix (A-13 to 15).

All the sections may be filled-out by you, even the engineering section. All the signature lines may be signed by you. You don't have to be a registered engineer or an attorney, just be honest. If you doubt any of the information you enter on the forms and would feel better about it, have an attorney and/or an engineer look it over before you submit it.

Check your work over twice or more. The FCC will reject incomplete applications or one's that have too many things wrong with them. They usually tell you what's unacceptable however so you have a chance to correct it. After correction it can be resubmitted.

Commercial AM and FM Stations (Form 301):

Section I: General Information

Nothing too complicated about this section. Just fill in the appropriate boxes. Any question pertaining to "renewal, change, modification, pending applications, etc., get an N/A for an answer. You want a "New Station".

Section II: Legal Qualifications

These are questions about your legal qualifications. Answer every question. If you are a U.S. citizen, have not been in jail for a major crime (Felony), have not been a party to civil or criminal proceedings related to business practices, you can probably answer "no" to most of the statutory requirements. If you have partners or stockholders they must be listed in this section..and...the above statutory requirements applies to them also.

Section III: Financial Qualifications

The FCC just wants to make sure that if a Construction Permit is granted you'll be able to build and operate the station. Section IV: Program Service Statement

Here comes your first exhibit. Remember that survey of the community you were supposed to do? You were supposed to find out what the community needs are and how your station could address those needs. This section wants you to submit as a written exhibit the results of that survey. You can number the exhibit as P- 1. P for "program" and 1 for the number of the exhibit. The rest of the questions are for TV only.

Section V-A: AM Broadcast Engineering Data

This section should be filled out by an engineer as you're probably getting into directional antenna systems and complex contour predictions. Its not required of course if you're planning an FM station.

Section V-B: FM Broadcast Engineering Data

The purpose of this application is a "new" station, disregard what doesn't apply to you. You'll need the exact geographic coordinates of your proposed antenna site...to the nearest second. A surveying office can help you on this, or perhaps your county planning commission has a wall map large enough to pinpoint the location. You can do it yourself if you have a large enough map and are instructed how to determine the degrees, minutes, and seconds. This information is available from geological survey offices (they also sell the maps). Check your telephone directory under U.S. Government offices.

An explanation of Effective Radiated Power (ERP), antenna radiation center, horizontal and vertical polarization, circular polarization, preparation of engineering exhibits such as profile graphs, can be found in this book under "FM ENGINEERING DATA". This will help you answer all the technical questions for this section.

You must also comply with the National Environmental Policies. In this section you are asked to submit a statement as an exhibit only if your proposed station is a "major" environmental action. You really have to read through (FCC R,R 1.1305 and 1.1311) to see if you are in this category. In general, if you propose to: put your antenna in a wildlife refuge, a wilderness area, a highly scenic area, or on or near a building of historic significance, or dig deep trenches for cables, or put up a tower over 300 feet high.....you get the picture. These are "major" items which must be included in your "Environmental Statement".

Section V-G: Antenna and Site Information

Remember these forms are used for changes to existing stations as well as applications for new stations. The question asking for your call letters can not be answered since you don't have any assigned yet. Simply type in N/A.

Under "Facilities requested" simply state "New FM Station" or "New AM Station"

The FAA wants to know of all towers which might be a hazard to aircraft. The FCC will notify them as part of your application if you answer "no" to the question "Has the FAA been notified of proposed construction?"

Antenna structures too near landing fields may be within an area called the "glide path". For this reason the FAA wants you to list all landing fields within 5 miles of your proposed antenna site. You must also show the distance to the boundary of each landing area and its direction from your site. This information is easily obtainable from a Sectional Aeronautical Chart (A-20).

This section also calls for an exhibit describing the proposed antenna system. They're not much interested here in the gain characteristics, but more about the support system and its overall height. A simple sketch similar to the one shown as appendix (K) should suffice for FM stations and single tower AM stations. For an AM multiple tower system the description must include all necessary data on support system, counterpoise, tower spacing, etc.

An additional certification sheet may be attached to this section of your application. It is called "Certification of Site Availability". Here the FCC is looking for reasonable assurance that the proposed site will still be available to you if they approve your application.

Section VI: Equal Employment Opportunity Program

If you plan on having 5 or less full time employees you can answer "no" to this section. If you propose having more than 5 full time employees you'll have to submit a 5 point program in accordance with (FCC R,R 73.280). This program must be designed to offer equal employment opportunity to qualified persons regardless of race, color, religion, national origin or sex. Women must be included in the program, however minority groups don't have to be if that minority group is less than 5% of the available work force.

Section VII: Certification

See the section in this book on "Local Notice of Filing" (FCC R,R 73.3580)

Non-Commercial Stations: (FCC Form 340)

Section I through Section III:

Essentially the same as for commercial station applications

Section IV: Program Service Statement

The exhibit called for in this section asks for your purpose and objective in establishing the station as well as stating your program policies. If the proposed station will be used mostly for the training of students in the art of broadcasting then you should state that here. Most school stations which are operated by students offer musical entertainment as their main programming goal. There is nothing wrong with that, but...the FCC may look more favorably on educational stations which also offer some "educational" programs. These might include expanded news, coverage of local events, school plays, sports, etc., which might not be covered by other local stations. A non-commercial station is usually an educational station. The FCC will be looking for local community involvement.

Section V-A and V-B: Broadcast Engineering Data

Section V-A requires the same information as for a commercial station.

The first part of Section V-B is the same as for Commercial FM. The non- commercial station has some additional requirements however.

Several exhibits will be required.

(1) A showing that minimum spacing requirements have been met regarding channels 221, 222, and 223.

(2) A showing of possible interference to or from stations which are 53 and 54 channels removed.

(3) A showing of possible overlapping contours of co-channel and 1st, 2nd, and 3rd adjacent channels.

(4) A showing of possible interference if you propose to be within 320 kilometers (199 miles) of the Canadian or Mexican border.

(5) A showing of possible interference to TV Channel 6 Grade B contours.

All the exhibits containing contour predictions are prepared the same way. You just use a different set of figures for each. Applicable Rules range from (FCC R,R 73.501 through 73.513). Appendix E gives examples of interference map exhibits. Also see the FM ENGINEERING DATA section in this book.

Section V-G through Section VII:

See Commercial FM section.

LOCAL NOTICE OF FILING

You're required by (FCC R,R 73.3580) to publish a legal notice of your filing of an application. The notice must be published in a newspaper of general circulation and for a prescribed length of time. The time requirement is for twice a week for two consecutive weeks within a three week period immediately following your mailing date. If your local paper is published weekly then the notice must appear once a week for three consecutive weeks. If you don't have a local paper then a notice should be posted at public buildings such as the Post Office.

The notice must contain the following information:

(a) Name of the applicant

(b) Date of submission

(c) Purpose of the application

(d) Type, class and power of proposed station

(e) Location of the transmitter site

(f) Antenna height above average terrain

(g) Where copies of the application may be seen

EXAMPLE

American Heritage Broadcasting, on August 10, 1991, submitted to the Federal Communications Commission an application for authority to construct a new commercial FM station in the city of Anytown, California. The proposed class A station is to operate on channel 221, 92.1 MHz, with an effective radiated power of 3000 watts at an antenna height of 300 feet above the average terrain. The transmitter is to be located at number 42, Knob Hill circle, Anytown, California. Individuals who wish to advise the Commission of facts related to this application should file comments with the FCC, Washington, DC 20554. A copy of this application is available for public inspection at 1712 West 11th St., Anytown, California, during normal business hours.

SELECTING YOUR CALL LETTERS

Unlicensed stations such as Carrier-Current and Cable FM may use whatever call letters they desire. The Pirate station may do the same, but not legally. Care should be taken to choose call letters that will not be confused with those of existing stations. This not only misleads the public, but might also bring a letter from the FCC. A call of KIZZ in a city that has a KIZE would be a poor choice. Cable stations often use a "C" instead of "K" or "W" as the first letter.

The FCC does not reserve call letters for licensed stations. Call letters are assigned on a first-asked-for,first-to-get basis, and then only during the processing of your application for CP. Immediately following the grant of your CP the Commission will request your choices of call letters. These should be submitted in the order of preference. If you don't submit your request within 30 days after the grant of your CP the Commission will choose them for you.

Call letters must consist of 4 letters beginning with a K in the west or W in the east.

Your selected call letters may be clever, even cute, but they should show good taste. Call letters such as KRAP, KRUD, etc.,should be avoided. Most often letters are chosen to indicate the location or some particular facet of a station. Some examples are:

KFOG in San Francisco where it is foggy ; KVHS for Clayton Valley High School (K used in place of C) ; KJAZ programming is mostly jazz.

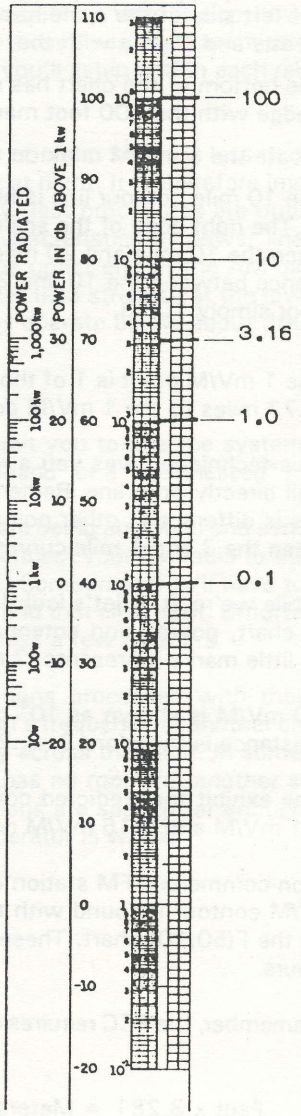
Check the AM, FM, and TV call letter section of the BROADCASTING YEARBOOK (A- 11) to find what call letters are already in use. Sometimes, four letter calls are used by certain documented sea vessels. These are not listed in publications of common circulation. If you have applied for a licensed station and have submitted one of these, don't worry, the Commission will ask you to submit a new request.

Your call letter request is made informally, that is, by a standard letter. Your request must contain a statement that a copy of the letter has been sent to all stations within a 35 mile radius of your community. You then send a copy to each station and a copy to the Secretary, Federal Communications Commission, Washington, DC 20554. Don't forget to include at least 5 choices in descending order of preference. For example:

> Pursuant to Federal Communications Commission Rules, Part 73.3580, American Heritage Broadcasting requests consideration of the following call letters. Calls are listed in descending order of preference:
>
> (1) KAHB (2) KHER (3) KANY (4) KCOM (5) KTOO
>
> A copy of this letter has been mailed to all stations within a 35 mile radius.
>
> John Jones , Technical Director

How To Use The FCC Field Strength Charts (FCC R,R 73.333)

Copies of the FCC's Field Strength Charts appear as appendices B and C. For all their numbers and lines they are really quite simple to use. You first choose the appropriate chart. The scale shown here is placed on the chart and positioned according to antenna height and effective radiated power. The predicted distance to the desired field strength contour can then be read from the right side of the chart.



The scale and charts have been photographically reduced by the same percentage to fit these pages. They may be used as they are for your rough predictions. Simply make photo copies of this scale and appendices B anc C. If you desire greater accuracy they should all be enlarged by the same percentage. Trim off the excess paper on both the left and right sides of the scale before you use it.

DONOT USE THESE for data you intend to submit to the FCC however. Instead, obtain copies of the charts and scale directly from the FCC and use them to prepare your data. They are larger in size and much more accurate.

The field strength contour values you'll need have been marked on the scale for you. The values themselves will be cut off when you trim this edge. If you lose track of which line is which just refer back to this page.

SPECIAL NOTE: The FCC has been changing measurement values from feet and miles to Meters and kilometers. Some forms ask for one, some the other, and some may even have them mixed. The examples of how to use the charts shows the old version. The charts in appendices B and C show distance in kM and antenna height in Meters. You should submit all your height and distance data in Meters and kilometers.

Example

For a power of 500 watts ERP, antenna height (HAAT) of 400 feet, find the distance to the 1 mV/M contour on the F(50,50) chart. A sample chart appears in appendix D.

(1) The left side of the scale has markings for different power levels. Find the mark for 500 watts and align it with the horizontal reference line on the chart.

(2) The bottom of the chart has markings for different antenna heights. Align the scale's right edge with the 400 foot mark.

(3) Locate the 1 mV/M mark on the scale (10^3, to left of right edge)

(4) The 10 mile contour line is not quite at the 1 mV/M mark on the right edge of the scale. The right edge of the scale has evenly spaced marks. There are 13 of these marks between the 10 mile and 20 mile lines. The space covered by the 13 marks is the 10 mile difference between the 10 and 20 mile lines. Each mark therefore represents 1/13th of 10 miles or simply 10/13.

The 1 mV/M point is 1 of those marks past the 10 mile point. This makes it 10 + 10/13 or 10.77 miles to the 1 mV/M contour.

This technique gives you a reasonably close interpolation for distance points which do not fall directly on a line. Remember however that the number of marks between distance curves is different at other points on the chart. For example, there are only about 5 marks between the 3 and 4 mile curves. Each mark would then be 1/5 or .2 miles.

While we're at it, let's look for the 10 mV/M contour as another example. We'll use the same chart, power, and antenna height. From the preceding paragraph we know each of those little marks represents .2 miles.

10 mV/M is shown as 10^4 on the scale. It's about 2 marks down from the 3 mile line. The distance is therefore 3 + .2 + .2 which is 3.4 miles.

The exhibit for predicted coverage of commercial FM stations requires the showing of your 1 mV/M and 3.16 mV/M contours. You'll use the F(50,50) chart for this.

Non-commercial FM station exhibits require both the F(50,50) and F(50,10) charts. The 1 mV/M contour is found with the F(50,50) chart. The interference contours are predicted using the F(50,10) chart. These will be the 100 mV/M, 10 mV/M, .5 mV/M, and .1 mV/M contours.

Remember, the FCC requires data be given in Metric units. Here are the conversion factors:

Feet x 3.281 = Meters	Miles x 1.609 = Kilometers
Meters x .3048 = Feet	Kilometers x .622 = Miles

How To Calculate Your Effective Radiated Power

It is easy to just say "OK, I'm applying for a Class A FM station, I'll just go for the maximum power for that class, 3000 watts". When it comes right down to it however there is a bit more to consider. First of all, will your antenna have any gain?

As a general rule a single bay horizontal antenna has a gain of slightly less than 1. A single bay circular polarized antenna has a gain of .5, not really a gain at all. If you stack antenna elements the gain increases roughly as the number of elements. A two-bay horizontal would have a gain of about 2, a four- bay horizontal, a gain of 4. If you had a four-bay circular polarized antenna system you'd have 4 times .5 for a total gain of 2.

If you split the transmitter power between horizontal and vertical antennas then each gets one half. If you have a four-bay horizontal and four- bay vertical you'd have a gain of 2 in both planes. You get the power from your transmitter to the antenna with coaxial cable. Some amount of power is always lost in the coax due to electrical friction called resistance. The smaller the diameter of the cable and the higher the frequency it must pass, the greater its loss. At FM band frequencies the loss can be considerable. How much power actually gets from one end of the cable to the other is the cable's "efficiency".

Suppose we have a 100 watt transmitter. We use an RG-8 cable 100 feet long from the transmitter to the antenna itself. And suppose we have a single circular polarized antenna (gain of .5). Appendix I shows that RG-8 cable has a 2 dB loss per 100 feet at 100 MHz. When we calculate the efficiency we find it to be only 63%. The ERP equals the transmitter power output (TPO) x the coax efficiency as a decimal number (F) x the antenna gain.

TPO x F x G = ERP 100 x .63 x .5 = 31.5 watts

Obviously this is a waste. If we go to 7/8 inch coax with an efficiency of .92. This is a little better, 100 x .92 x .5 = 46 watts

If we double-up on the antenna we get a gain of 1. With the 7/8 inch coax efficiency of 92 % we have 100 x .92 x 1 = 92 watts.

In other words, to get 100 watts ERP our transmitter must be larger or we must use more antennas and an efficient coax. It is generally accepted that more antennas is better than a larger transmitter..within reason. A four-bay antenna is usually your best compromise.

Working backward now. You want 3000 watts ERP, you use a four-bay circular polarized antenna (gain of 2), 7/8 inch coax (F = 92%)...what size transmitter do you need?

3000 /(.92 x 2) = 3000/1.82 = 1648 watts. Since this isn't a "standard" transmitter power you'll need a 2500 watt transmitter operating at reduced power.

This information will be more helpful when you actually apply for your station's license. The license forms require this kind of calculation. Right now it gives you an idea of where you'll be spending your money.

Determining Your Antenna Height

There are 3 antenna heights you'll be asked about. These are:

(1) Antenna height above the ground

(2) Antenna height above mean sea level (MSL)

(3) Antenna height above the average terrain (HAAT)

The first is easy. If your tower is 30 Meters tall and it sits on a building roof that's 5 meters from the ground - its 35 Meters above the ground.

To find the other two you'll need maps which show terrain elevation above mean sea level. For accuracy the FCC recommends 7.5 minute U.S. Geological Survey topographic quadrangles. See (A-21). You'll need to see the whole area within a 10 mile radius. One map however won't cover the area you'll need for your calculations. It may take up to 9 maps. The edges of each map are matched to the other maps to form one big map. The result is a map better than 6 feet square. Take good care of this composite map, you'll need it for another exhibit which is explained later. Do NOT draw directly on the map, use plastic overlay sheets and a felt tip marker that writes on plastic.

Locate your proposed antenna site and make a mark there. Use a long clear plastic strip as a large drawing compass. At one end of the strip make a pinpoint mark. Place that mark on the "0" point of the maps scale. Make marks at the 3 kilometer and 16 kilometer points. Thumb tack the "0" mark on the strip to the mark you made on the map (your antenna location). Poke a hole through the plastic at the 3 and 16 kM points on the strip. Now draw two circles around your transmitter site. One to indicate the 3 kM radius, the other the 16 kM radius.

Locate True north on your map. Draw a north-south line from the 3 kM circle to the 16 kM circle. Draw another line like the first except this one is perpendicular to the first (180 degrees). Draw another line half way between the first two (45 degrees), and one more on the other side of the circle to make 8 equal "pie" slices. You should now have 8 lines which start at the 3 kM circle and extend to the 16 kM circle. These are called your "radials". Each represents 45 degrees of the circle. True north is 000 degrees. Moving clock- wise to 45degrees, then 90 (3 o:clock), 135, 180 (6 o:clock), 225, 270 (9 o:clock), 315, and back to 000 (360 degrees). Your circles and lines should look like those on the Aeronautical Chart shown in appendix G.

Your next task is to divide each of the radials into at least 50 equal points. Place a yard stick or a Meter stick on the 000 radial between the 3 and 16 kM circles. For that distance only divide the length on the stick into 50 or more equal divisions. This might come out to be 1/2 inch, or centimeter divisions. Pick whatever is right to get 50 or more equal points.

Sharpen your pencil and get some scratch paper. Begin at the 3 kM circle and work your way out to the 16 kM circle. Determine the elevation for each of the 50 or more points along a radial. Write the elevation down on your paper. Put the radial number at the top and set it to one side. Get a new piece of paper and do it again on the next radial. Do this for each of the 8 radials.

With an adding machine (one that has a paper tape output) add together the elevation points for a radial. Divide your answer by the number of points taken. This is the average elevation for that radial. Write it down and do the other pieces of paper the same way.

Determine the height above MSL of your antenna. This is the elevation of the ground above MSL at your antenna site + how high your antenna is above the ground. The height above the ground is up to your "radiation center".The radiation center is the mid-point of your antenna array (see appendix K for example). This is your antenna height above MSL. Write this down also.

Pick up one of the radial papers. Subtract the average elevation from your antenna height above MSL. Your answer is the antenna height above the average terrain for that radial. Write this on the paper. Do it again for each of the radials.

New piece of paper. Write down the antenna height above the average terrain for each radial. Add them together and divide by 8 (the number of radials). Your answer is the antenna height above the average terrain, HAAT (including all radials). An example of this calculation is on the sample tabulation sheet in appendix N. Note the special conditions....if a radial average is ZERO it is not added, and, it can't be used as a divisor either. In this case you divide by 7 instead of 8. Also note it is possible to have a negative number. If that happens just add the positive numbers together, then subtract the negative numbers.

Use your calculations to prepare a Terrain Tabulation similar to that in appendix N.

Preparation of Profile Graphs

For this next little job you'll need several sheets of 1/10 inch grid drafting paper. Its available at some stationary stores or any store that sells drafting supplies. Stop and take a look at appendix F to see what you're getting into.

Allow yourself a 2 inch margin all around. Up the left side of your graph you'll put elevations in Meters. Mark the bottom of the graph, left to right, from 0 to 16 kM. The bottom line should be divisible by the 50 points or more used on your terrain tabulation. You're going to use those figures to make this graph.

Make all your marks with a pencil in case you have to change them. Take the figures of a radial from your tabulation sheet. From the left edge of the graph move to the right to the first elevation point. Move up the graph to the elevation listed on your tabulation sheet. Make a small dot with your pencil. Do this for all the elevation points on that radial.

Connect the dots so you have a continuous line running from left to right. This line represents a cross-section of the terrain of that radial.

Find the height of your antenna (radiation center) above MSL on the left edge of the graph. Make a mark there. Get the terrain average for this radial from your tabulation sheet. Locate the elevation on both the left and right edge of the graph. Place a long straight edge on the graph from the left to the right edge. Mark the average elevation with dashes.

Use the F(50,50) chart to determine distances to your field strength contours. Use the antenna height above average terrain for this radial. The lowest elevation on the F(50,50) chart is 30 Meters. If your height is less you must assume it is 30 Meters to use the chart. Determine the distance to your 1 mV/M and 3.16 mV/M contours. Make a mark for each at the top and bottom of the graph. With a straight edge from top to bottom draw a dashed line for those distances.

Type the description of each pertinent point on self-adhesive labels and place them accordingly. Label each: Radiation Center elevation, Average Terrain elevation, 3 kM distance, 16 kM distance, distance to 1 mV/M contour, distance to 3.16 mV/M, vertical scale in Meters, horizontal scale in kilometers,etc. Also label the graph with: Radial degrees, Name and Address of Applicant, and who prepared the graph. For the final touch use India ink and pen to darken all necessary markings and lines.

Do a profile graph like this for each of the radials. The originals do not have to be submitted with your application. An 8 x 10 glossy photo of each will suffice.

Preparing The Aeronautical Chart

Obtain a Sectional Aeronautical map which shows the area around your proposed site for a radius of at least 15 miles. It must be marked showing the scale for distances.

Now clearly outline the legal boundaries of the principal community you want to serve.

Refer to "Determining Your Antenna Height" and how radials and distance circles were drawn. You'll need to do the same with this map. You need 8 radials exactly like the ones drawn to determine your average terrain. You'll have a 000 degree radial, 045, 090, 135, 180, 225, 270, and 315 degree radials. You must also draw circles which represent the 3 kM and 16 kM points. See appendix G for an example.

Using the F(50,50) chart and your data on HAAT and ERP, find your predicted 1 mV/M and 3.16 mV/M contours for each of the 8 radials. Distances along each radial will probably be different. Connect each of the 1 mV/M contour points together to form an irregular circle. For an example, look at appendix E, KVHS channel 213. Its contour distances are affected by a 3000 foot mountain (dent) and a ridge of hills (flat spot). Do the same for your 3.16 mV/M contour.

Calculate the square mile area within the 1 mV/M contour. This is simply the radius of the circle (distance predicted) x that same radius x 3.14. In other words if you determined the distance to your 1 mV/M contour is 10 miles then the square area would be: 10 x 10 x 3.14 = 314 miles

Using the latest population census for that area, determine the population within your 1 mV/M contour.

Get our your self-adhesive labels again. You'll want to properly identify each of the information points on the map. You may also include your calculations of the square mile area and population within that area. Simply type the information on the labels and stick them on the map at the appropriate places. See appendix G for an example of the labeling and 3 and 16 kM circles.

It is permissible to submit two maps for this particular exhibit if you'd like. One to show your predicted 3.16 mV/M contour will completely cover the community you want to serve. The other can have your 1 mV/M contour, square mile, and population information.

At least one of your radials is supposed to pass through the principal community. If none do then draw an extra one that will. A profile graph must be prepared for this additional radial and labeled accordingly. The average terrain figure for this radial is required on the application form, but..... it is not used in the 8-radial calculation for HAAT.

Don't send this map to the FCC with your application. Instead, have a commercial photographer, or yourself if you're good with a camera, take a picture of it. A glossy photograph, 8 x 10 inches, is then sent with your application.

Topographic Quadrangle Exhibit

Now you need the composite map that was used for determining your terrain data. Don't mark on it directly, use a plastic cover sheet. Draw on the plastic with a felt pen that writes on plastic. On this, show your antenna location accurately plotted with the latitude and longitude lines clearly marked and showing a scale of statute lines. You must also show the location and call letters of all AM stations within 2 miles of your proposed site. Use self-adhesive labels to show call letters, and to identify the map as an (Exhibit #).

Don't send this map with your application either. The FCC will accept an 8 x 10 glossy photograph. Since this map is so large, take a photo of each of the individual 7.5 minute maps. Each must have its section of the plastic cover sheet in place when its photographed. It's probably wise to identify each as part of the exhibit with a label all its own.

If there are any FM ,TV, or commercial or government receiving stations within 200 feet of your proposed site, you'll need another exhibit. This one however is a statement of what type of interference is expected, and whether all stations involved are willing to accept it.

Non-commercial Station Interference Maps

Non-commercial station applications require additional exhibits to show compliance with the following:

(1) Minimum spacing requirements: if the proposed station location is within 320 kM (199 miles) of the Mexican border.

(2) Minimum spacing requirements: if the proposed station location is within 320 kM (199 miles) of the Canadian border.

(3) Minimum spacing requirements: if the proposed station's channel is 218, 219, or 220.

(4) Separation requirements: between the proposed station and stations which are 53 and 54 channels higher.

(5) Channel 6 TV interference study: if the proposed station is within the Grade B contour of the television station.

(6) Interference free contours: between proposed station and all co-channel, 1st adjacent, 2nd adjacent, and 3rd adjacent channels.

All map exhibits can use the same map with different plastic over-lays if necessary. This can be a larger scale map like that shown in appendix E. The map shown is really just a portion of a larger map. Only the area needed is included in the finished map. The border was trimmed from the original map to keep the latitude and longitude lines. The scale of miles and kM was trimmed and glued onto the smaller section.

The original maps are never sent with the application. The Commission accepts 8 x 10 glossy photographs.

Minimum Spacing and Separation Requirements (Items 1 through 4 above):

Accurately locate the antenna site of your proposed station on the map, it should be near the center. Show the distance to the applicable border or to the applicable stations. The distances must comply with those shown in appendix M. TV Channel 6 Interference study:

Check with the nearest TV Channel 6 station. Ask to see their Grade B contour map. If your proposed station's antenna is within that contour you'll have to work something out with the TV station. There is a strong possibility of interference. The Commission wants assurance the interference will be minimal and what steps you'll take to remedy the problem. If the TV station agrees to accept whatever interference would result, they must say so in your exhibit.

Interference Free Contour Maps:

You will need two maps. Use the same map as above with two fresh plastic over- lay sheets. One map will be your "Interference To Other Stations", the other map is your "Interference From Other Stations".

Accurately locate all the co-channel, 1st, 2nd, and 3rd adjacent channel stations whose contours might overlap. You should probably plan on showing the ones which are within 50 miles of your site. Also show your site.

If you know the 1 mV/M contour of the other stations fine. If not use the F(50,50) chart, their HAAT and ERP to find it. Draw a circle around each station which represents their 1 mV/M contour. Label each location with the call letters and channel number.

Use the F(50,10) chart this time. Find the distance to your .1 mV/M contour in the direction of all co-channel stations and mark the plastic over- lay accordingly. You don't necessarily have to have a full circle, an arc in the direction of the other station will suffice.

Do the same thing again only this time its your .5 mV/M contour in the direction of all 1st adjacent channels. Next you do the 10 mV/M for 2nd adjacent channels and 100 mV/M for 3rd adjacent channels.

None of your contours must overlap any of the 1 mV/M contours. See appendix J and (FCC R,R 73.509). This is your "Interference to" map.

New plastic sheet. Locate and mark all stations as before. This time draw the irregular shape around your site which represents your 1 mV/M contour. Use your F(50,50) chart for this.

Now, using the F(50,10) chart find the .1 mV/M contour for all co-channel stations. Draw just that part of the circle (arc) which is toward your proposed site.

Next find and draw the .5 mV/M contour arc for all 1st adjacent channels. Then do the 10 mV/M for 2nd adjacent channels, and 100 mV/M for 3rd adjacent channels.

None of the other contours can overlap your 1 mV/M contour. This is your "Interference From" map. Label everything. Compare your finished work with appendix E. Photograph both maps to obtain 8 x 10 glossy photos to send with your application.

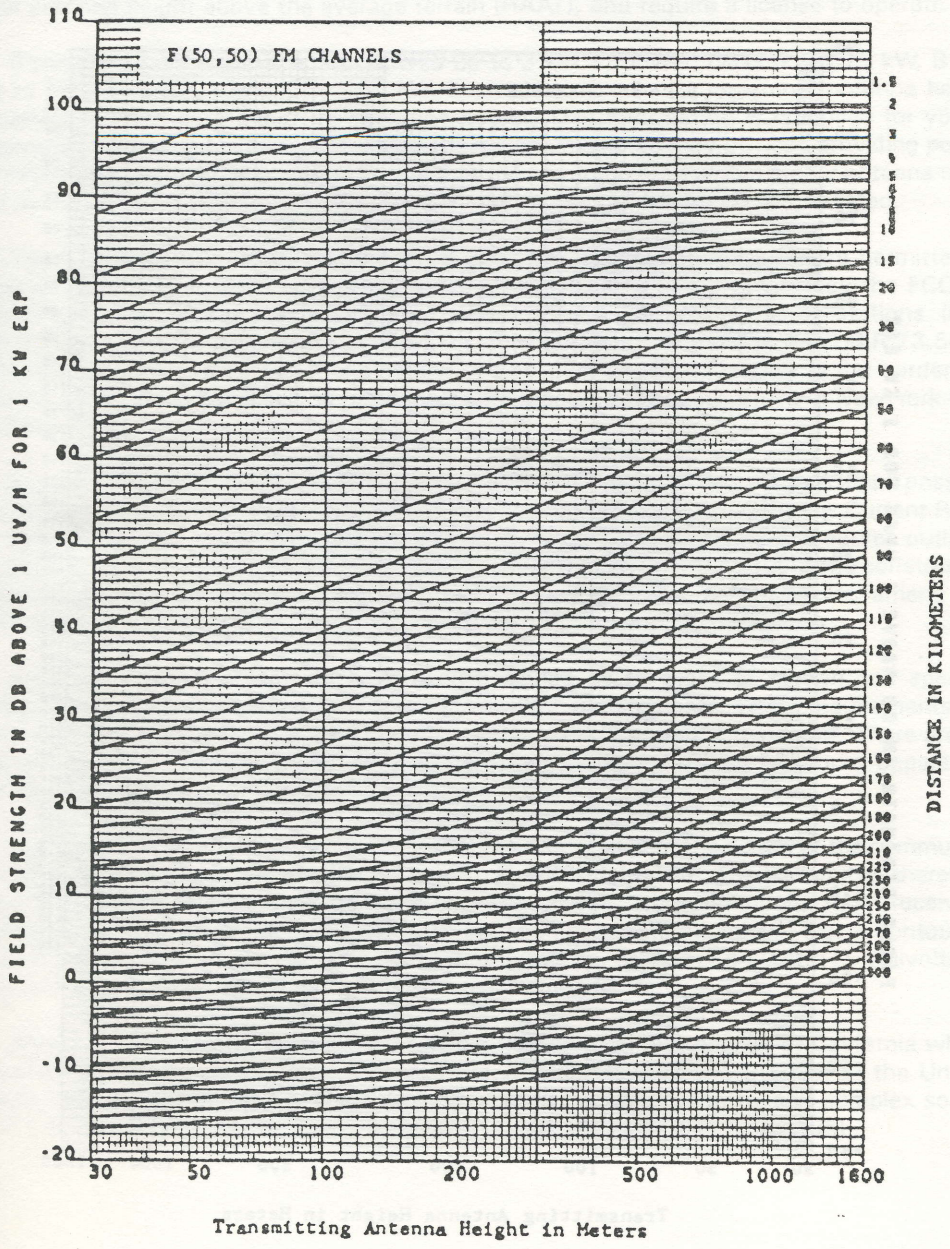
APPENDIX A

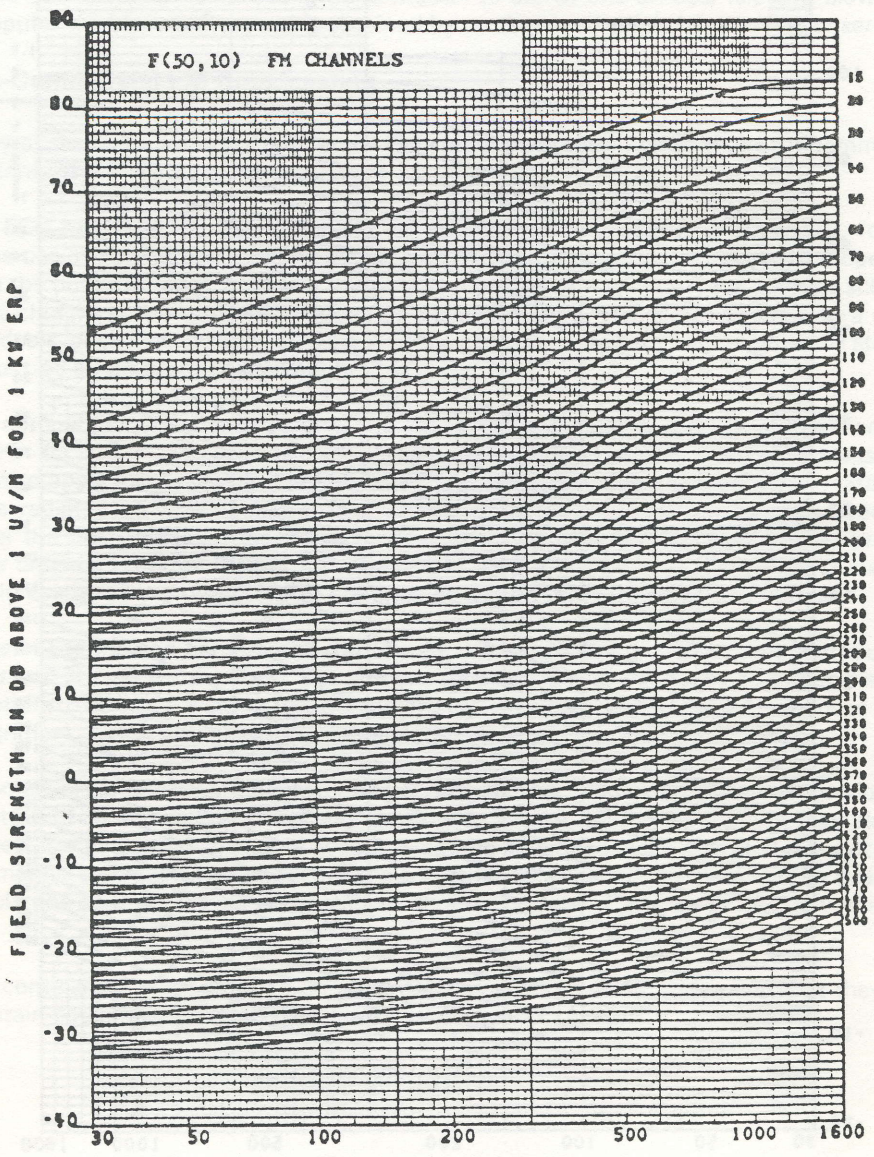
Reference Books, Materials, and Forms

Item	Title and Description	Available From:	
1.	FCC Bulletin 1-A: Printed Publications	Federal Communications Commission 1919 M St. N.W. Washington, DC 20554	
2.	FCC Bulletin 1-B: How to apply for a broadcast station	FCC Field Offices	
3.	OST Bulletin #63 Understanding FCC Rules Regulations under Part 15 for Low Power Transmitters	same	Replaces OCE-11 (Does my transmitter need a license?)
4.	FCC Bulletin OCE-12: Operation in the 535-1605kHz band	same	
5.	FCC Form 301: Application for a commercial broadcast station construction permit	same	
6.	FCC Form 340: Application for a noncommercial broadcast station construction permit	same	
7.	FCC Form 302: Application for a broadcast station license	same	
8.	FCC Form 753: Application for a Restricted Radiotelephone Operator Permit	same	
9.	Procedural Manual: The Public and Broadcasting	same	For inspection only.
10.	Radio Equipment List: Equipment acceptable for licensing	same	For inspection only.
11.	Broadcasting Yearbook Annual Edition	Broadcasting Publications Inc. 1735 DeSales St N.W. Washington, DC 20036 202-638-1022	
12.	Broadcasting Magazine Weekly Edition	same as above	

13.	FCC Rules & Regulations: Parts 0-19 Price: $13.00 Stock Number:022-003-95441-4	U.S Government Printing Office Superintendent of Documents Washington, DC 20402 202-783-3238
14.	FCC Rules & Regulations: Parts 70-79 Price: $13.00 Stock Number:022-003-954431	They accept Mastercharge and VISA orders over the phone.
15.	Rules in Print: (c) class of station Part 73 Price: $6.50 Stock Number:004-000-00411-6	All are from Title 47, Code Of Federal Regulations- Telecommunications as revised
16.	Rules in Print: Part 15 Price: $5.50 Stock Number:004-000-00410-8	Or read at your local FCC Field Office (see appendix H)
17.	Information Dissemination Broadcast equipment "Classified ads"	Information Dissemination 2501 Hilldale Blvd. Arlington, TX 76016 817-429-2255
18.	Radio World Weekly Trade Newspaper (also equipment ads)	Industrial Marketing Services 5827 Columbia Pike, Suite 310 Falls Church, VA 22041 703-998-7600
19.	Broadcast Management/Engineering Services Monthly magazine	Broadband Information 274 Madison Ave. NY, NY 10010
20.	FAA Sectional Aeronautical Chart	Flight suppliers at your local airport.
21.	Topographic Quadrangle Maps 7.5 minute series, Sectional	U.S. Geological Survey Offices offices listed in your phone directory under U.S Govt . Get 4 copies of each plus map reading instructions.
22.	FM Station Atlas	PO Box 336, Esko, MN 55733-0336
23.	Electronics & Radio Newsletter	Items 23 through 30 are available from Panaxis Productions PO Box 130 Paradise, CA 95967-0130 (916) 534-0417
24.	Cable FM Broadcasting	
25.	Carrier-Current Techniques	
26.	Guide to Equipment Sources	
27.	Guide to Program Sources	
28.	Reference Book or Reference Books	
29.	How to Get Into Broadcasting	
30.	The Pleasures and Perils of Pirating	

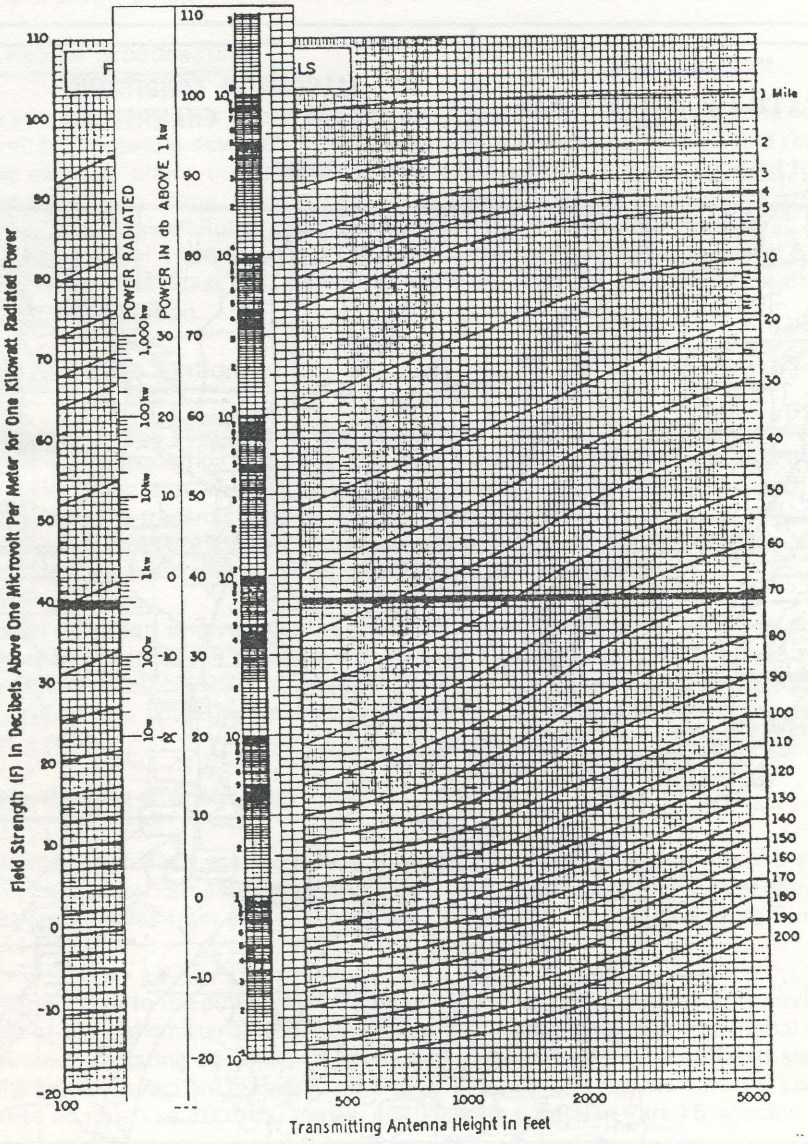
APPENDIX B


F(50,50) FM CHANNELS
FIELD STRENGTH IN DB ABOVE 1 UV/M FOR 1 KW ERP
110
100
90
80
70
60
50
40
30
20
10
0
-10
-20
30
50
100
200
500
1000
1600
Transmitting Antenna Height in Meters
DISTANCE IN KILOMETERS


F(50,10) FM CHANNELS
FIELD STRENGTH IN DB ABOVE 1 UV/M FOR 1 KW ERP
90
80
70
60
50
40
30
20
10
0
-10
-20
-30
-40
30
50
100
200
500
1000
1600
Transmitting Antenna Height in Meters

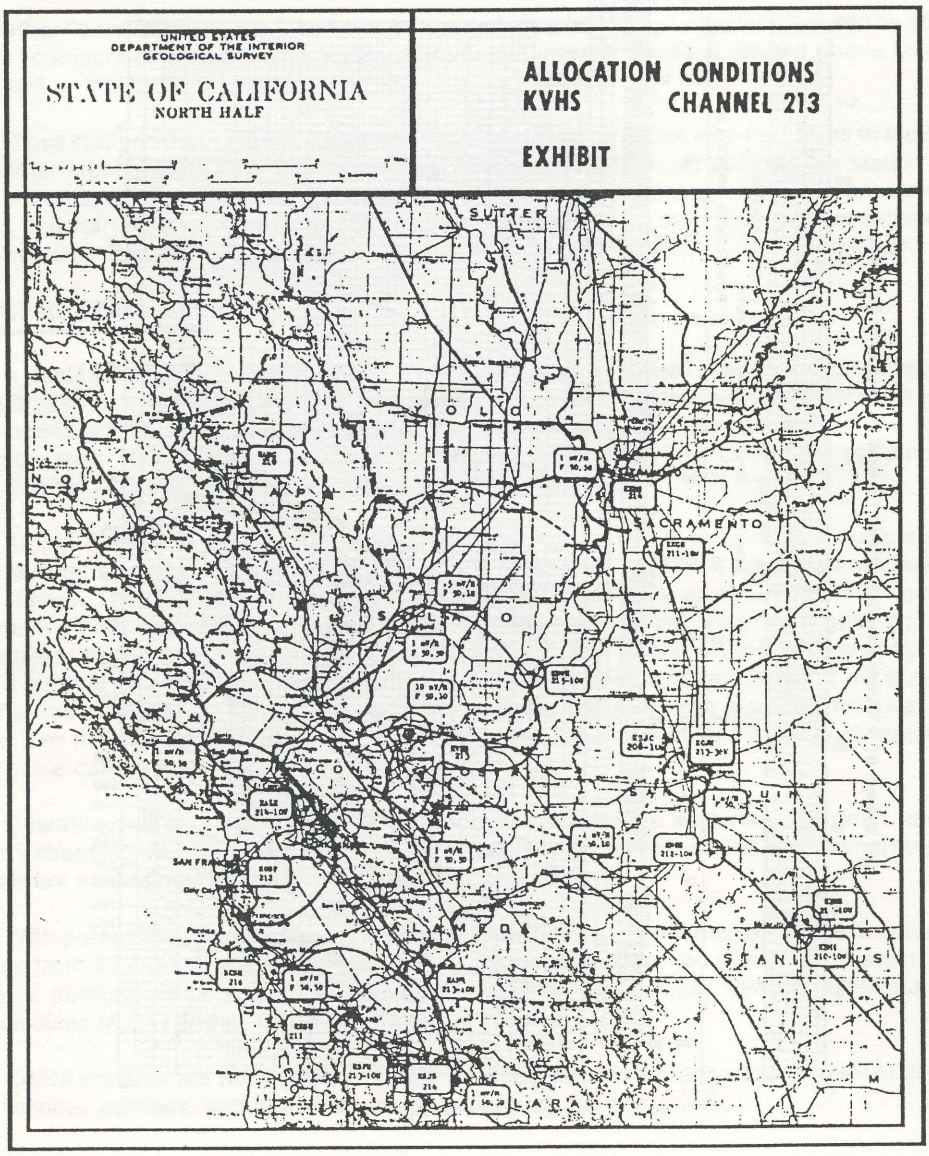
APPENDIX D

Example of Reading the F(50,50) Chart



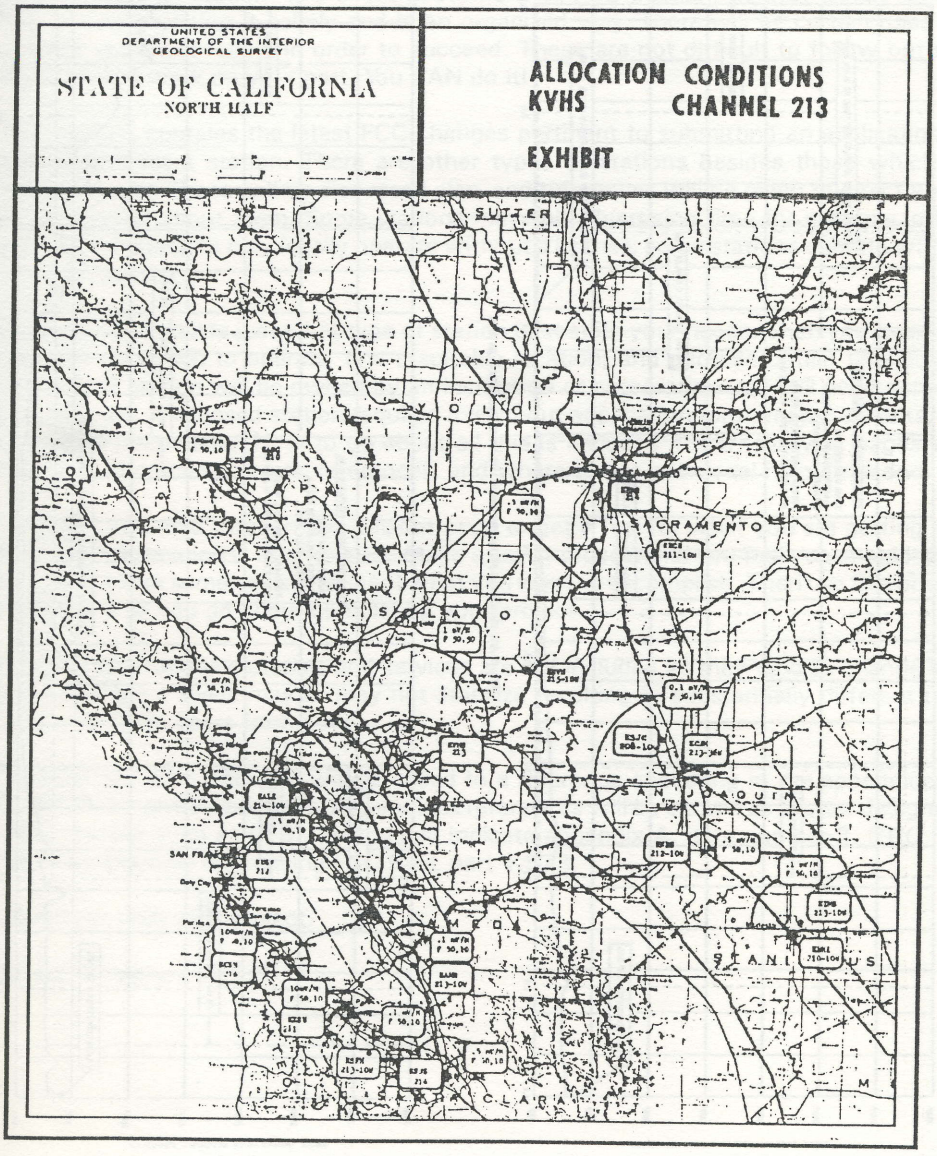
APPENDIX E-1

MAP OF INTERFERENCE TO OTHER STATIONS

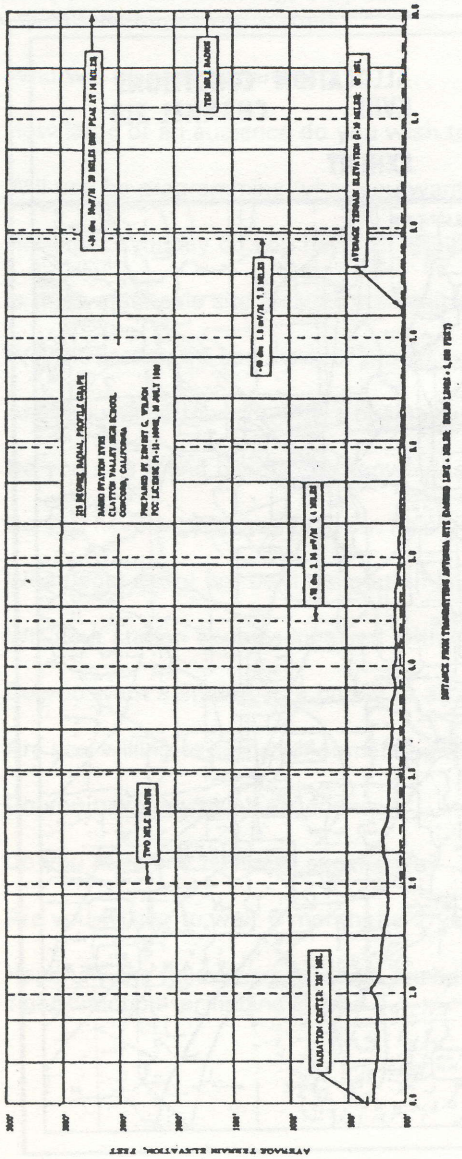


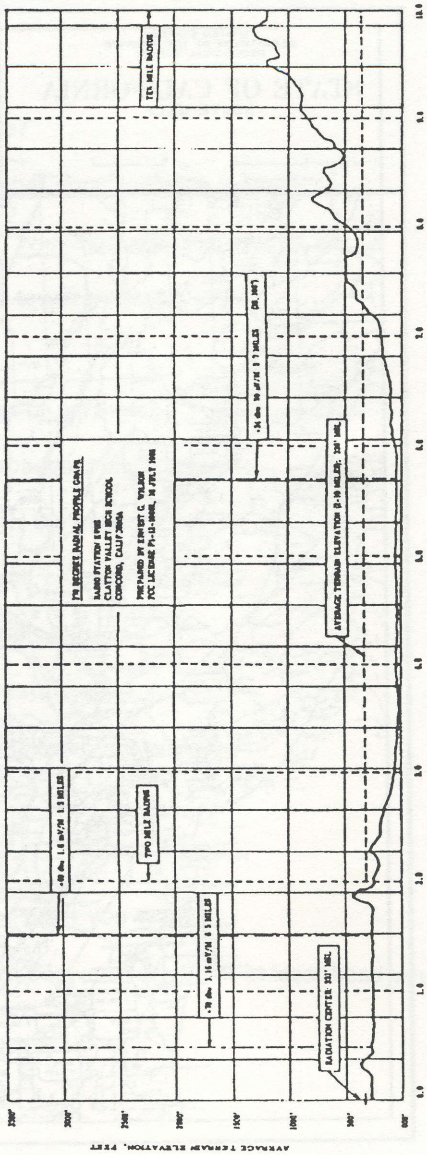
APPENDIX E-2

MAP OF INTERFERENCE FROM OTHER STATIONS



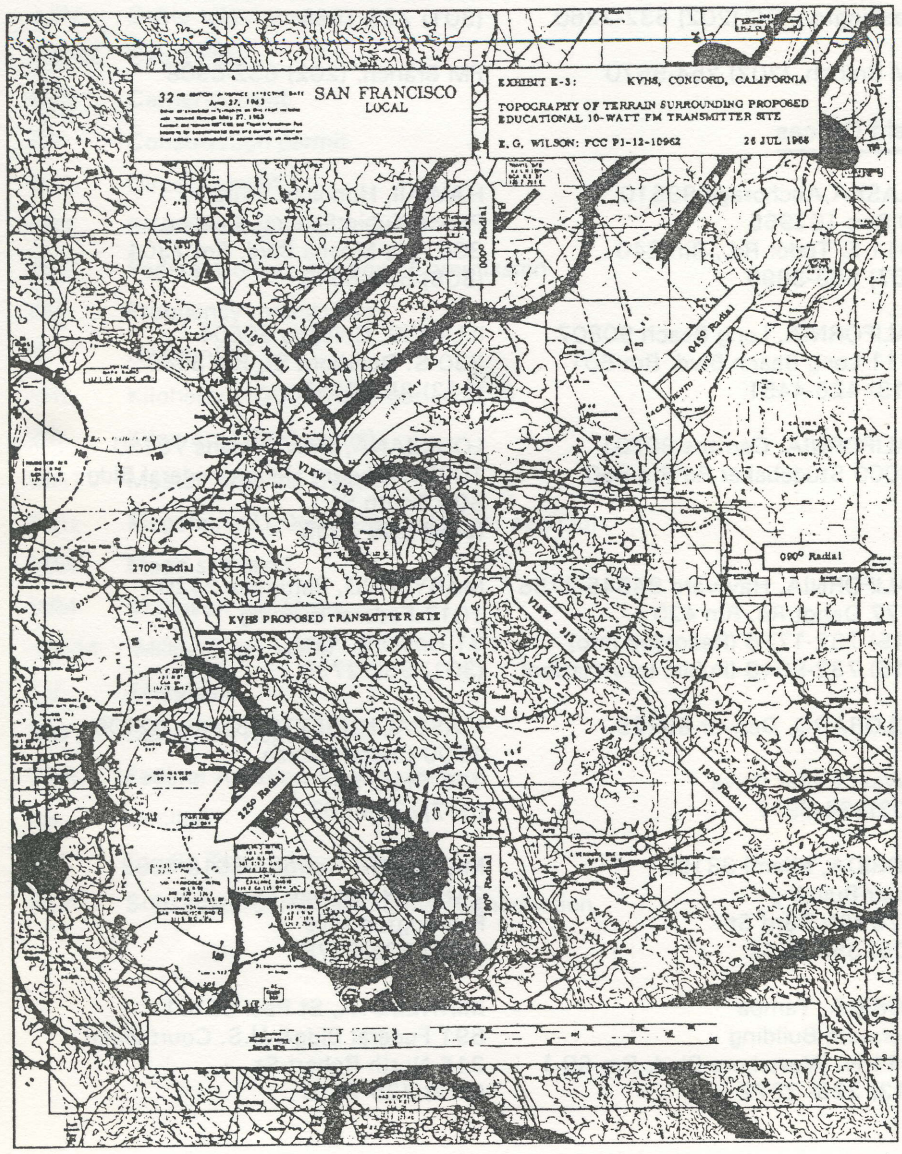
APPENDIX F





APPENDIX G

AERONAUTICAL MAP



APPENDIX H

FEDERAL COMMUNICATIONS COMMISSION OFFICES

Headquarters 1919 M St N.W.
Washington, DC (202) 632-7260

Authorizations & Standards
(301) 725-1585

AM Branch, (202) 254-9570

FM Branch, (202) 632-6908

Field Offices

ALASKA,Anchorage 99510
PO Box 102955
1011 E. Tudor Rd., Rm 240
(907) 563-3899

HAWAII, Honolulu 96850
Prince Kuhio Federal Building
300 A la Moana Blvd, Rm 7304
(808) 546-5640

CALIFORNIA, Long Beach 90807
3711 Long Beach Blvd. Rm 501
(213) 426-4451

ILLINOIS, Chicago 60604
230 S. Dearborn St, Rm 3940
(312) 353-0195

CALIFORNIA, Cerritos 90701
18000 Studebaker Rd Rm 660

LOUISIANA, New Orleans 70130
1009F. Edward Hebert Federal Bldg
600 South St
(504) 589-2095

CALIFORNIA, Hayward 94545-2756
3777 Depot Rd, Rm 420
(415) 732-1716 (Recorded Info)
(415) 732-9046 (Public Information)

MARYLAND, Baltimore 21201
1017 Federal Building
31 Hopkins Plaza
(301) 962-2729

COLORADO, Denver 80228

7 West Cedar Drive
(303)234-6977

MASSACHUSETTS, Boston 02109
1600 Customhouse
165 State St
(617)223-6607

FLORIDA, Miami 33166
Koger Building
8675 NW 53rd St
(305) 350-5542

MICHIGAN, Detroit 48018-1398
24897 Hathaway St
Farmington Hills
(313) 226-6078

FLORIDA, Tampa
Interstate Building
1211 N. Westshore Blvd. Rm 60 1
(813) 228- 2872

MINNESOTA, St Paul 55101
691 Federal Bldg& U.S. Courthouse
316 North Robert St
(612) 725-7810

GEORGIA, Atlanta 30309
1365 Peachtree St. N.E. Rm 440
(404) 881-3084/5

PUERTO RICO, San Juan 00918-2251

747 Federal Building, Hato Rey
(809) 753-4567

TEXAS, Dallas 75242
U.S. Courthouse, Room 13E7
1100 Commerce St
(214) 767-0761

TEXAS, Houston 77002
New Federal Office Building
515 Rusk Ave. Room 5636
(713) 229-2748

VIRGINA, Norfolk 23502
Military Circle One
870 N. Military Highway
(804) 441- 6472

WASHINGTON, Seattle 98174
3256 Federal Building
915 Second Ave
(206) 442-7653

MISSOURI, Kansas City 64133
Brywood Office Tower, Room 320
8800 East 63rd St
(816) 926-5111

NEW YORK, Buffalo 14202
1307 Federal Building
111 West Huron St
(716)846-4511/2

NEW YORK, New York 10014

201 Varick St
(212) 620-3437/8

OREGON, Portland 97204 V
1782 Federal Building
1220 S.W. Third Ave.
(503) 221-3097

PENNSYLVANIA, Langhorne 19047
Oxford Valley Office Bldg
2300 East Lincoln Highway
(215) 752-1324

APPENDIX I

Coaxial Cable Characteristics per 100 Feet

Cable Type	Pwr Rating	dB loss (90 MHz)	Efficiency	dBl oss (100 MHz)	Efficiency
RG-8 (213)	700 watts	1.9	64%	2.0	63%
RG-17 (218)	2 kW	0 .7	85%	0.8	83%
1/2" Heliax*	2 kW	0.79	83%	0.8	83%
7/8" Heliax	6 kW	0.34	92%	0.35	92%
1 5/8" Hel.	11 kW	0.19	95%	0.20	95%

To find the efficiency for other lengths of cable complete the following:

1. Divide the cable length (in feet) by 100 and multiply by the dB loss shown above. This gives you the total dB loss for your cable length.

2. Multiply the total dB loss by .1. Use this number as the exponent (e) in the following calculation. This is easily done with a good calculator.

3. Divide 100 by $10^{(e)}$. This is the % efficiency for your cable.

Example: 250 feet of 7/8" Heliax at 90 MHz.

(1) 250/100 x.34 = .85

(2) .85/.1 = .085

(3) 100/ $10^{(.085)}$ = 82.22%

* Trademark of Andrews Corporation

APPENDIX J

Interference Conditions as Derived from FCC R,R 73.509

Non-commercial FM Broadcast Stations Operating on Reserved Channels

CO CHANNEL STATIONS

Your 1 mV/M contour must not overlap their .1 mV/M contour.

Your .1 mV/M contour must not overlap their 1 mV/M contour.

FIRST ADJACENT CHANNEL

Your 1 mV/M contour must not overlap their .5 mV/M contour.

Your .5 mV/M contour must not overlap their 1 mV/M contour.

SECOND ADJACENT CHANNEL

Your 1 mV/M contour must not overlap their 10 mV/M contour.

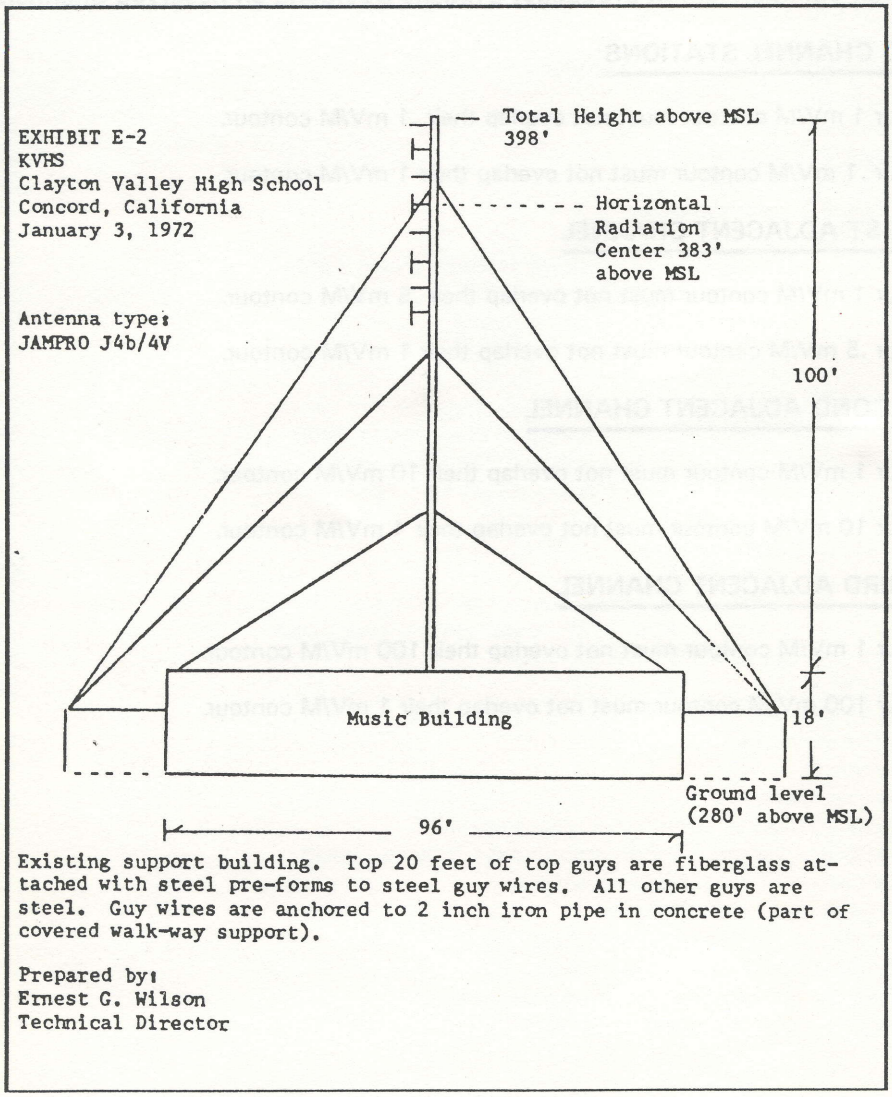
Your 10 mV/M contour must not overlap their 1 mV/M contour.

THIRD ADJACENT CHANNEL

Your 1 mV/M contour must not overlap their 100 mV/M contour.

Your 100 mV/M contour must not overlap their 1 mV/M contour.

Vertical Plan Sketch



Existing support building. Top 20 feet of top guys are fiberglass attached with steel pre-forms to steel guy wires. All other guys are steel. Guy wires are anchored to 2 inch iron pipe in concrete (part of covered walk-way support).

Prepared by:
Ernest G. Wilson
Technical Director

APPENDIX L

Classes of Stations

FM Stations

Class	Minimum Power		Maximum Power		Maximum HAAT	
A	100W	(-10dBk)	003kW	(4.8dBk)	100	(328)
B1	003kW	(4.8dBk)	025kW	(14dBk)	100	(328)
B	025kW	(14dBk)	050kW	(17dBk)	150	(492)
C2	003kW	(4.8dBk)	050kW	(17dBk)	150	(492)
C1	050kW	(17dBk)	100kW	(20dBk)	299	(981)
C	100kW	(20dBk)	100kW)	(20dBk)	600	(1966)

AM Stations

I	10kW to 50kW	Dominate clear channel stations which operate on frequencies: 640,650,660,700,720,750,760,770,780, 820,830,840,870,880,890,1020,1030,1040, 1100,1120,1160,1180,1200,1210 kHz
II	10kW to 50kW	Secondary clear channel stations which are limited by interference from "I" stations. Use directional antennas on: 670,720,770,780,880,890,1020,1030,1100, 1120,1180,1210 kHz
III	1kW to 5kW	Considered Regional stations which may operate on: 550,560,570,580,590,600,610,620,630,790 910,920,930,950,960,970,980,1150,1250, 1260,1270,1280,1290,1300,1310,1320,1330 1350,1360,1370,1380,1390,1400,1410,1420 1430,1440,1460,1470,1480,1590,1600 kHz
IV	.25kW to 1kW	Considered local stations and may oper- ate on: 1230,1240,1400,1450,1490 kHz

In addition there are Class II-A, II-B, II-E, III-A, III-B, etc., stations as well as limitations of assignments and hours near Canadian and Mexican borders. Consult (FCC R,R, 73.21 through 73.29) for further information. The FCC does permit other frequency assignments upon showing of evidence that the proposed station would not cause interference, and, it would serve the public interest.

APPENDIX M

Minimum Distance Separation Requirements, FCC R,R 73.207

Station/Station Class to Class		Co- channel	1st Adjacent 200 kHz	2nd/3rd Adj. 400/600 kHz	53rd & 54th Ch. 10.6/10.8 MHz
A	A	105 (65)	064 (40)	027 (17)	008 (5)
A	B1	138 (86)	088 (55)	048 (30)	016 (10)
A	B	163 (101)	105 (65)	069 (43)	016 (10)
A	C2	163 (101)	105 (65)	055 (34)	016 (10)
A	C1	196 (122)	129 (80)	074 (46)	032 (20)
A	C	222 (138)	169 (105)	105 (65)	032 (20)
B1	B1	175 (109)	114 (71)	050 (31)	024 (15)
B1	B	211 (131)	145 (90)	071 (44)	024 (15)
B1	C2	200 (124)	134 (83)	056 (35)	024 (15)
B1	C1	233 (145)	161 (100)	077 (48)	040 (25)
B1	C2	059 (161)	193 (120)	105 (65)	040 (25)
B	B2	041 (150)	169 (105)	074 (46)	024 (15)
B	C2	241 (150)	169 (105)	074 (46)	024 (15)
B	C1	270 (168)	195 (121)	079 (49)	040 (25)
B	C2	074 (170)	217 (135)	105 (65)	040 (25)
C2	C2	190 (118)	130 (81)	058 (36)	024 (15)
C2	C1	224 (139)	158 (98)	079 (49)	040 (25)
C2	C2	049 (155)	188 (117)	105 (65)	040 (25)
C1	C1	245 (152)	177 (110)	082 (51)	048 (30)
C1	C	270 (168)	209 (130)	105 (65)	048 (30)
C	C	290 (180)	241 (150)	105 (65)	048 (30)
		* * * * * * Following are the U.S./Mexico Agreement Requirements * * * * * *			
A	A	105 (65)	065 (40)	025 (15)	008 (5)
A	B	175 (110)	105 (65)	065 (40)	016 (10)
A	C2	010 (130)	170 (105)	105 (65)	032 (20)
A	D	095 (60)	050 (30)	025 (15)	008 (5)
B	B	240 (150)	170 (105)	065 (40)	025 (15)
B	C	270 (170)	215 (135)	105 (65	040 (25)
B	D	170 (105)	095 (60)	065 (40)	016 (10)
C	C	290 (180)	240 (150)	105 (65)	048 (30)
C	D	200 (125)	155 (95)	105 (65)	025 (15)
D	D	018 (11)	010 (6)	005 (3)	003 (2)
		* * * * * * Following are the U.S./Canada Agreement Requirements * * * * * *			
		Co- channel	1st Adjacent	2nd Adjacent	3rd Adjacent
A	A	145 (90)	080 (50)	040 (25)	032 (20)
A	B	217 (135)	137 (85)	072 (45)	064 (40)
A	C1	241 (150)	161 (100)	105 (65)	097 (60)
A	C	241 (150)	193 (120)	121 (75)	113 (70)
B	B	249 (155)	169 (105)	097 (60)	072 (45)
B	C1	274 (170)	201 (125)	121 (75)	097 (60)
B	C	274 (170)	225 (140)	137 (85)	113 (70)
C1	C1	306 (190)	225 (140)	145 (90)	113 (70)
C1	C	306 (190)	249 (155)	169 (105	121 (75)
C	C	306 (190)	257 (160)	169 (105)	129 (80)
		kM (miles)	kM (miles)	kM (miles)	kM (miles)

APPENDIX N

Example of Tabulation Exhibit

Radial Tabulation Applicant's Name Exhibit # ____

The following elevation data was taken from U.S. Geological Survey Topographic Quadrangle Maps. Data was read from 50 equally spaced points on that portion of each radial which is 3 to 16 kilometers from the antenna. Elevations are in 30 Meter increments. True North = 000 degrees.

Radial	000	045	090	135	180	225	270	315
	120	120	120	240	240	120	240	240
	120	120	150	240	270	150	480	180
	240	120	180	240	300	120	510	300
	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
	570	300	330	330	480	330	660	570
	10,200	8,200	5,100	9,800	12,500	6,000	13,500	20,000

The sum of each radial divided by the number of points taken (50) = average

204	164	102	196	250	120	270	400

Antenna height above MSL (270) - Average height of radial = HAAT

270	270	270	270	270	270	270	270
-204	-164	-102	-196	-250	-120	-270	-400
66	106	168	74	20	150	000	-130

Sum of Heights divided by number of radials which are not 000 = HAAT

66 + 106 + 68 + 74 + 20 + 150 + (000) - 130 = 454 & 454/7 = 65 = HAAT

(signed)_____ Technical Director

Music Licensing Organizations

American Society of Composers, Authors & Publishers (ASCAP)
One Lincoln Plaza, New York, NY 10023 (212) 595-3050

Broadcast Music Inc. (BMI)
320 West 57th St, New York, NY 10019 (212) 586-2000
10 Music Square East, Nashville, TN 37203 (615) 259-3625
6255 Sunset Blvd. Suite 1527, Hollywood, CA 90028 (213) 465-2111

Composers, Authors & Publishers Assn. of Canada (CAPAC)
1240 Bay St. Toronto, Ont. M5R 2C2 Canada (416) 924-4427

Performing Rights Organization of Canada Ltd.
41 Valleybrook Dr, Don Mills, Ont. M3B 2S6 (416)445-8700

SESAC
10 Columbus Circle, New York, NY 10019 (212) 586-3450