Government of Canada
Department of Communications

Gouvernement du Canada
Ministère des Communications

Community distribution of satellite programming

Canada

COMMUNITY DISTRIBUTION OF

SATELLITE PROGRAMMING

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Social Policy Branch
Department of Communications
October 1982

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NOTICE: The materials provided in this handbook are based on the author's research, and are published to provide preliminary guidelines to assist in planning satellite-fed broadcasting undertakings. Examples provided are for illustrative purposes only. For exact legal interpretations, please consult the appropriate legislation and regulations. For exact information on services offered by various companies mentioned in this publication, please contact their marketing representatives.

FOREWORD

Canadians are living in a period of rapid expansion of both television and radio programming carried by communications satellites. A variety of broadcasting services are now available on the Canadian Anik satellite system; Canadian Satellite Communications Inc. (CANCOM) and La Société d'Edition et de Transcodage T.E. Ltée (La Sette) offer a wide variety of programming on a user-pay basis, while CBC English and French programming, the House of Commons proceedings and provincial educational services are available free to Canadian broadcasting undertakings in remote areas. Moreover, several pay television services and more private television stations are scheduled to deliver programming by means of Canadian satellites too. These services provide the opportunity for people in remote communities to obtain the kind of varied radio and television programming that their counterparts in Canadian metropolitan centres have been enjoying for many years.

Many entrepreneurs and community organizations have expressed an interest in establishing community distribution systems to make these services available to audiences in remote areas. The Department of Communications is committed to assist in this process, by providing information to all applicants regarding licensing procedures and technical requirements for satellite earth stations and broadcasting undertakings.

This booklet provides an introduction to the choices available to entrepreneurs and community organizations interested in establishing a television and/or radio distribution system in a remote community. Further information and advice are available from the regional and district offices of the Department of Communications across Canada.

Francis Fox.

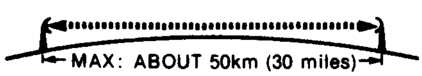
Francis Fox
Minister of Communications

October 1982

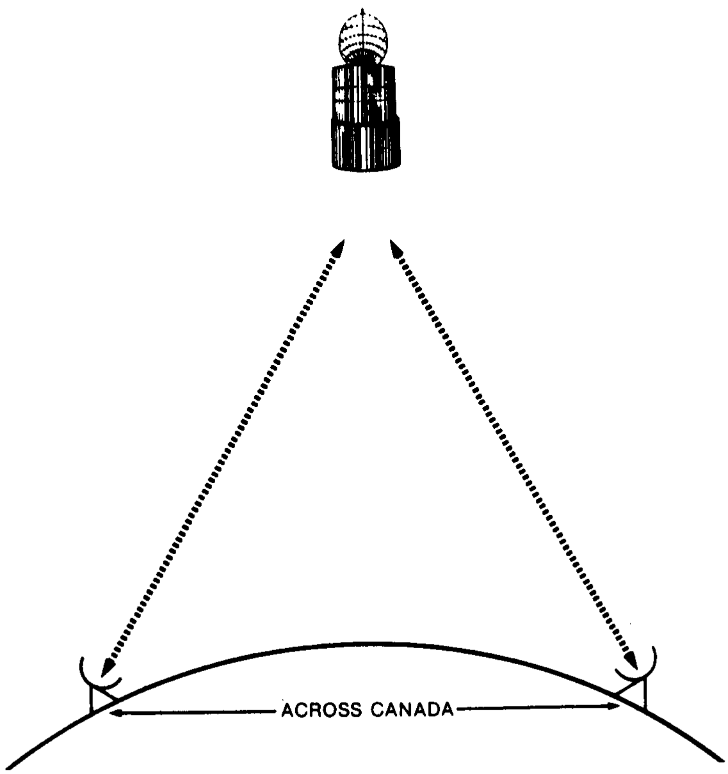
1. INTRODUCTION

1.1 CANADIAN SATELLITES

The basic idea behind satellite communications is quite simple. A transmitting station on the ground sends microwave signals up to the satellite. When the satellite receives these signals, it amplifies them and sends them back down to earth. Microwave relay systems on the ground are limited by the fact that microwave signals can only travel in straight lines, they cannot bend to follow the curvature of the earth, so relay towers must be built at approximately 50 kilometre (30 mile) intervals along the routes between the network centre and each receiving centre. Satellites, however, because of their height above ground, have a bird's eye view of the entire country, and can therefore receive and/or transmit microwave signals to or from almost any location in Canada.



CONVENTIONAL MICROWAVE SYSTEM



SATELLITE COMMUNICATIONS SYSTEM

Satellites are playing an increasingly important role in the distribution of radio and television programming in Canada. Several companies transmit radio and television signals up to Canadian satellites, to be relayed back down to earth and redistributed by cable systems or broadcasting stations for consumption by local audiences.

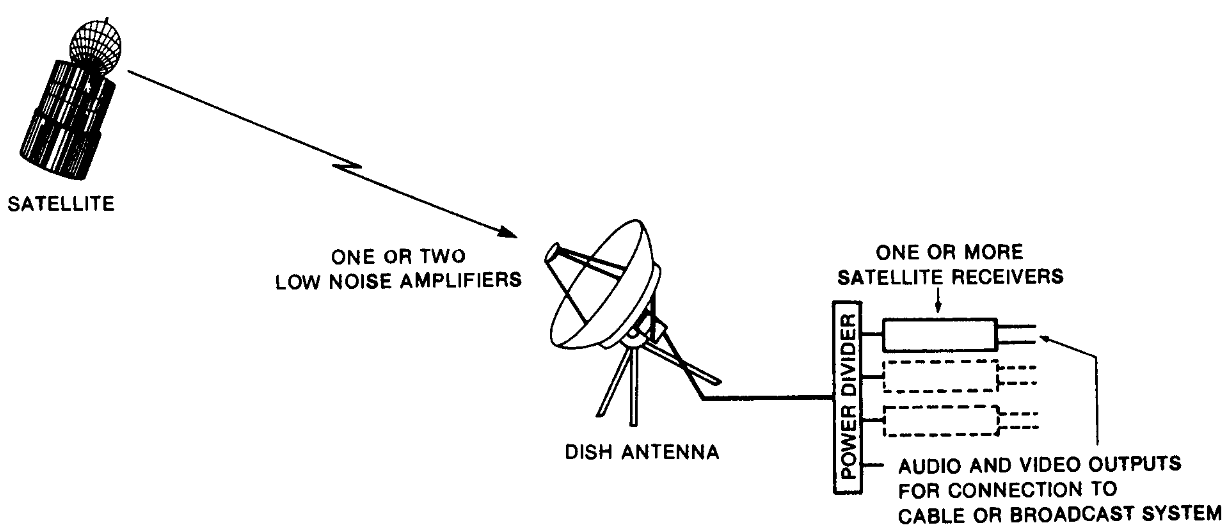
To receive these programs, special satellite receiving stations are required, as the signals from satellites travel 37,000 kilometres (23,000 miles) on their way back to earth, and are very faint by the time they reach ground level. These satellite receiving stations are made up of three major elements.

1. A specially designed dish-shaped antenna (dish) which is used to focus the microwave signals transmitted by a satellite to a point where they can be received.

2. A Low Noise Amplifier (LNA) which boosts the microwave signals.

3. A receiver which converts the microwave signals into video and audio signals suitable for viewing on a television monitor.

SATELLITE RECEIVING STATION



In the past, these stations were very expensive, but a satellite receiving earth station designed for TV reception only (TVRO) can now be purchased for $5,000 to $25,000. There are many factors which affect their cost, such as quality, the size of the dish required, the number of channels received, and the location.

1.2 RADIO AND TELEVISION SERVICES AVAILABLE

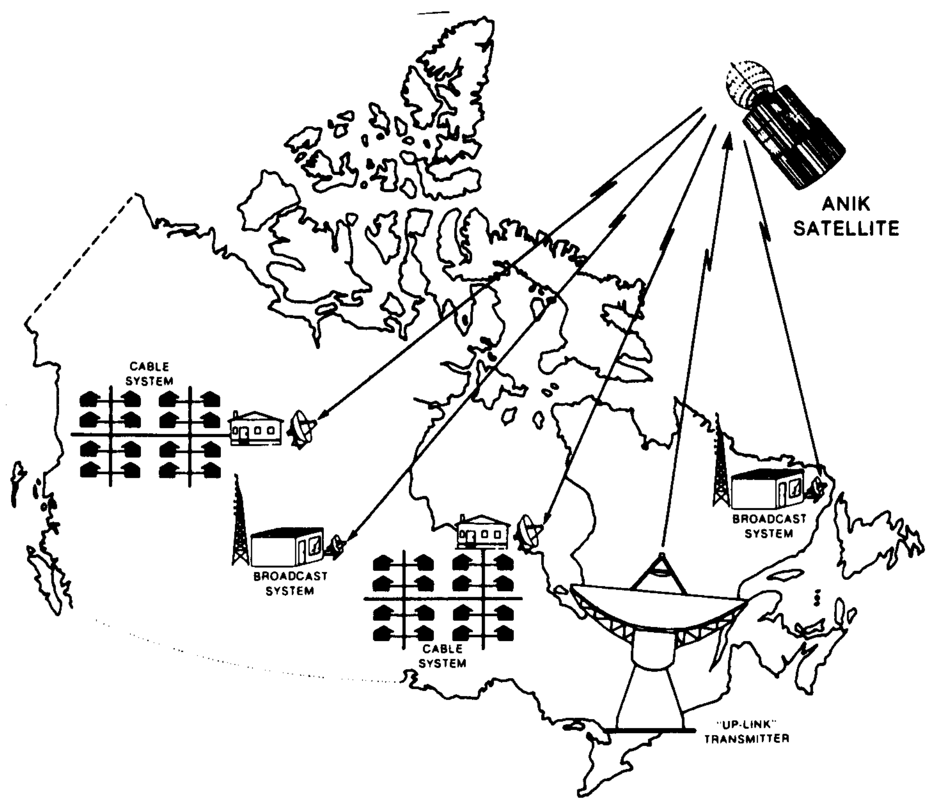
There are now a number of Canadian domestic communications satellites carrying a wide range of telecommunications services, including telephone calls, computer to computer data transfers, as well as television and radio programs. At the present time the TV and radio services listed on page 9 are being relayed on Canadian satellites

Service	Language	Description of programming	hours/ week	Local Distribution Alternatives	Affiliation cost per month per subscriber	Auxiliary Services
CANCOM		Package of 4 television channels	168	- cable - broadcast - scrambled broadcast	Package price: $4.00 (French language communities may receive TCTV only for $1.45) (Predominantly native communities may receive one channel only for $1.00) (Communities of less than 150 homes may receive one channel only for $1.45)	**radio stations** CFQM-FM Moncton CKAC-AM Montreal(French) CITE-FM Montreal(French) CKO-FM Taronto CIRK-FM Edmonton CFMI-FM Vancouver CKRW-AM Whitehorse 2 native radio services to be added in the future
	English	CHCH-TV - independent station from Hamilton, Ontario providing a mixture of popular Canadian, U.S. and locally produced programming.				
	English	BCTV-TV - Vancouver station providing locally produced programming, popular U.S. and Canadian programming; as a CTV affiliate, it also provides CTV network programming.				
	French	TCTV-TV - a mixture of TVA, Télé-Métropole Télé Acadie, CHOT Hull, CHLT Sherbrooke, Intervision Montréal, and Radio Québec programming				
	English	CITV-TV - independent station from Edmonton providing a mixture of popular Canadian, U.S. and locally produced programming.				
CBC	English	Canadian Broadcasting Corporation programming. Two channels are available for Pacific and Atlantic time zones with some native language programming included in both channels.	119	- cable - broadcast	no charge	- English CBC radio from Montreal with Inuktitut programming.
CBC	French	Canadian Broadcasting Corporation programming originating from the Eastern time zone.	119	- cable - broadcast	na charge	- French CBC radio services, includes CREE, Attikamek, Montsgnais programs. - CBC network service for N.W.T.-Eastern zone, English and Inuktitut.
House of Commons	English + French	Two channels providing televised proceedings of the House of Commons in French and English. During hours when there is no parliamentary broadcasting, CBC network programming is carried.	variable	- cable - broadcast	no charge	
6/4 Gigahertz Satellite						
C-Channel	English	A national pay-television service with a diverse selection of Canadian and international opera, dance, theatre, music, and film. To be operational February 1983.	55	- cable - broadcast - scrambled broadcast	$ 8.00	
First Choice	English + French	Two national pay-television channels (one English, one French) with a mixture of first-run uninterrupted Canadian and foreign feature films as well as specially produced feature presentations. To be operational February 1983.	168	- cable	$ 9.57 each	
Star Channel	English (with some dual tracking French)	A pay-television service for Atlantic Canada of Canadian and foreign feature films, theatre presentations, variety shows, music specials, sports, and documentaries with special emphasis on programming with regional appeal. To be operational February 1983.	168	- cable - broadcast - scrambled broadcast	$10.15	
Super Channel (Ontario Independent Pay Television)	English	A pay-television service for Ontario with a variety of feature films with 30% mixed programming (variety, sports, music, and comedy specials) of special regional appeal. To be operational February 1983	168	- cable - broadcast - scrambled broadcast	$ 8.85	Stereo soundtrack
Super Channel (Alberta Independent Pay Television)	English	A pay-television services for Alberta with a variety of feature films as well as mixed programming (theatrical, musical, variety, comedy specials and sports) of special regional appeal. To be operational February 1983.	168	- cable - broadcast - scrambled broadcast	$ 8.85	Stereo soundtrack
TVFQ-99	French	A service providing a broad range of programming from 3 television networks in France for cable systems in Quebec.	100	- cable (scrambled broadcast may be possible in the future)	$ 0.20	
TVOntario	English + French	Province of Ontario educational channel available to communities in Ontario. Monday through Saturday; programming in English, Sunday; programming in French	112	- cable - broadcast	no charge	Teletext (developmental Telidon service)
Knowledge Network	English	Province of British Columbia educational channel available to communities in British Columbia	91	- cable - broadcast	no charge	
TENTATIVE SERVICE						
ACCESS	English	Province of Alberta educational channel available to communities in Alberta		- cable - broadcast		
14/12 Gigahertz Satellite						

1.3 DISTRIBUTION OF RADIO AND TELEVISION PROGRAMMING IN REMOTE COMMUNITIES

Community organizations, corporations, or individual entrepreneurs can apply for licences to establish satellite receivers and community distribution systems in remote and under-served communities. These organizations may be licensed to operate a satellite receiver and distribute television programs in the community by connecting the receiver to a broadcasting transmitter, or to a cable system that connects individuals homes.

SATELLITE TRANSMISSION SYSTEM



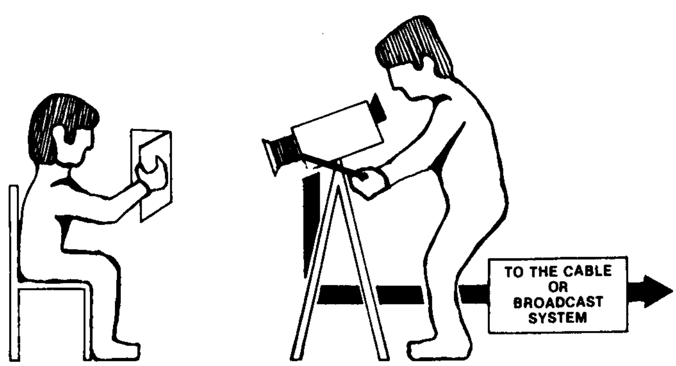
By organizing a community distribution system, and spreading the costs out among all those who want the service, the cost of providing three to five television services can be reduced to \$15 - \$40 per household per month.

The creation of a local broadcasting or cable system to bring in satellite programming also provides an opportunity to improve local communications by incorporating a community radio or television studio in the distribution system.

The following are some examples of the type of community programming you may want to transmit:

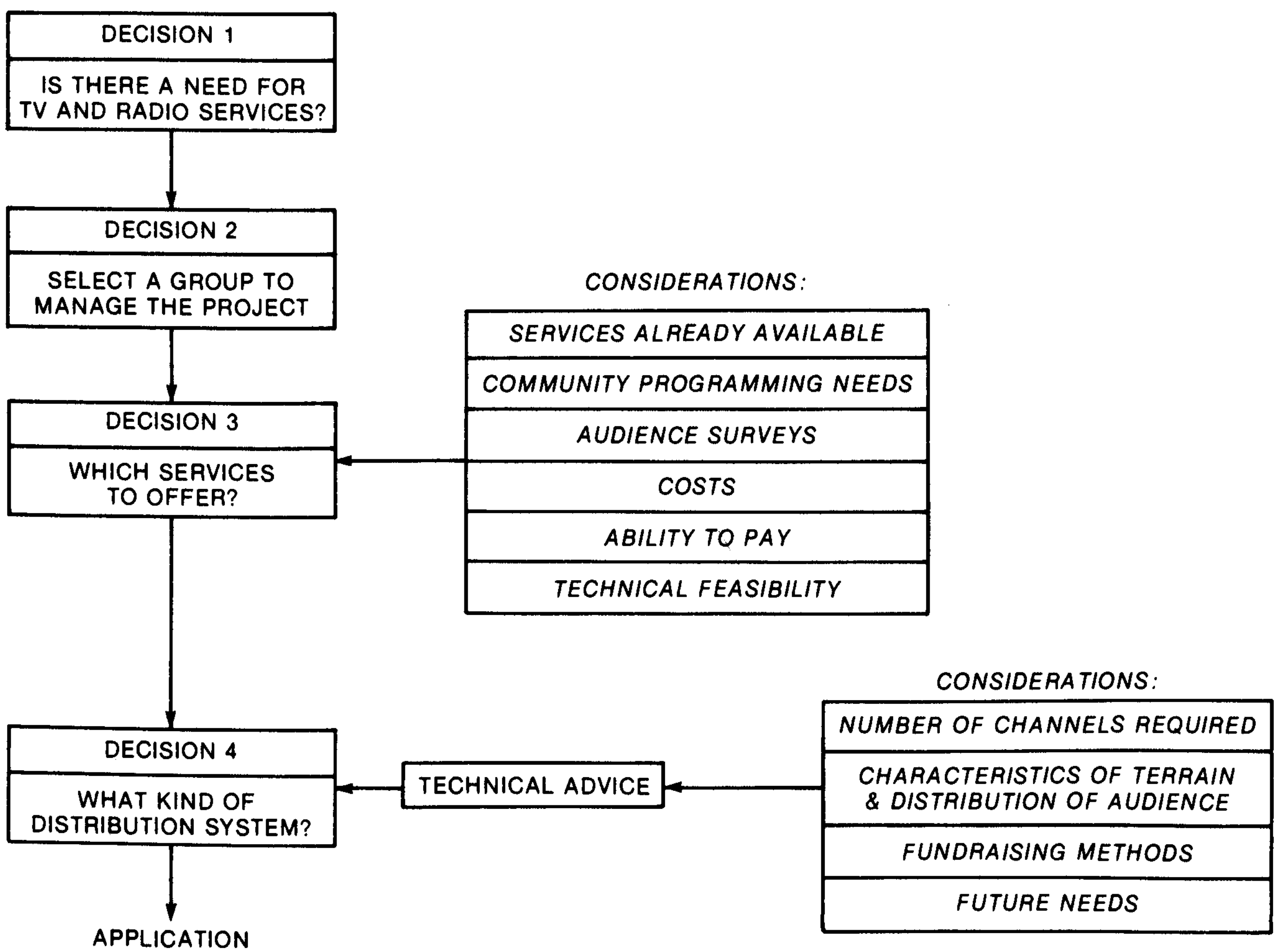
- news and information about local events (news about the winter festival)
- community bulletin board ("the church bingo has been postponed...")
- public service announcements ("a new dog control bylaw")
- local weather (from the closest airport)
- performances by school children (school plays, music)
- local sports (baseball scores or entire hockey games)
- fund raising specials (fund raising for recreational facilities)
- all-candidate meetings before various elections (village council, school board)
- programs produced in neighboring communities (winter festival, etc.)

COMMUNITY TELEVISION PROGRAMMING



There are two ways to broadcast local programming: install equipment to provide an additional channel or cut into the programming of one of the existing channels.

2. DECIDING WHAT TO DO AND HOW TO DO IT



2.1 IS THERE A NEED FOR ADDITIONAL RADIO AND TV SERVICES IN YOUR COMMUNITY?

Everyone has different tastes in radio and TV programming. In order to determine what services people in your community want, some kind of survey is advisable. Be sure to survey a wide variety of people; different groups of people tend to have different preferences.

- -men
- -women
- -elderly
- -teenagers
- -children
- -native people
- -non-native people
- -transient workers
- -permanent residents
- -francophones
- -anglophones
- -others

- What kind of programs do they like/not like?
- How much TV do they watch?
- Are they willing to pay?
- How much are they willing to pay?
- What kind of local services are needed?
- What language services do they want?

The first step is to draw up a good questionnaire and test it out on a few people. There are then several different ways to conduct a survey.

1. Mail a questionnaire to every household in the community.
2. Organize students to interview people in every household.
3. Conduct telephone interviews of people in every household.

2.2 PLANNING

A committee should be established to plan the project. To make decisions appropriate for the community, this planning group must be sensitive to the needs of the audience and have experience in business or community affairs. (Be sure that the group members are TV watchers.) During the planning and implementation stages, these people will have to meet regularly and do a fair amount of research on their own. They must be prepared to allocate time for these activities. Arrangements should be made to cover their costs for long distance telephone calls and to provide them with occasional secretarial services. Committee members and the public should be made aware that it will take a long time to do a good job of putting services in place.

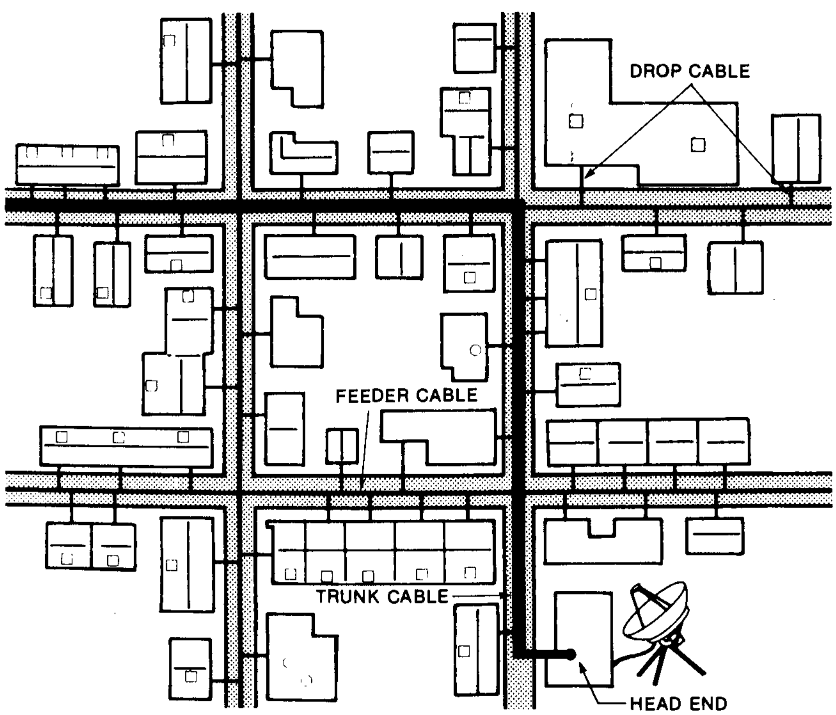
2.3 SELECTING A DISTRIBUTION SYSTEM

Once you have a good idea of the kind of services people in your community want, the next problem is to select an appropriate distribution system. There are basically three choices: cable, "scrambled" broadcasting or "free" broadcasting.

Cable

A cable system distributes TV and radio signals to individual homes using a network of cables. Cable systems usually distribute a large number of signals, including TV, FM radio, community programming, and teletext channels providing information on the time of day, the weather and news.

A cable system consists of a "head end", where signals are collected by an outdoor antenna and/or a TVRO and converted into appropriate signals for transmission on the cable. A cable then runs from the head end down every street or back lane in the community, usually following existing telephone and/or hydro lines, with amplifiers installed at regular intervals along the cable. In order to connect individual homes to the system, connecting points are established on the cable with devices called "taps". When someone wants to subscribe to the cable service, the cable company installs a "drop" wire, which runs from the closest tap into the subscriber's home.



There are many factors which affect cost, such as the size of the system, the number of channels, the location of the receive site, security, maintenance, the quality of the telephone or hydro power distribution system in the community, and whether the cable is buried or suspended overhead on poles.

In smaller systems which have shorter cable runs than large urban systems, there are many ways to cut costs. For very small systems (under 500 subscribers), where conventional technical standards are not mandatory, further costs savings are possible. Engineering consultants can provide details on low cost options. However, cable operators in small communities may run into difficulties obtaining the rights to attach cable to existing power or telephones poles, and modifying any substandard poles to make room for the cable equipment. Also, it is important to keep in mind companies which specialize in installing cable systems may charge higher rates for work in remote areas.

Advantages of a cable system:

- large channel capacity capable of handling future needs and offering a great deal of choice; generally 12 TV channels and 50 FM radio channels initially and upgradeable to 21 TV channels or more

- user-pay system is simple to operate and widely accepted by the public

- collections system is straight forward; non-paying homes may be disconnected from outside

- capital cost per channel is relatively low for large channel capacity if suitable poles are available

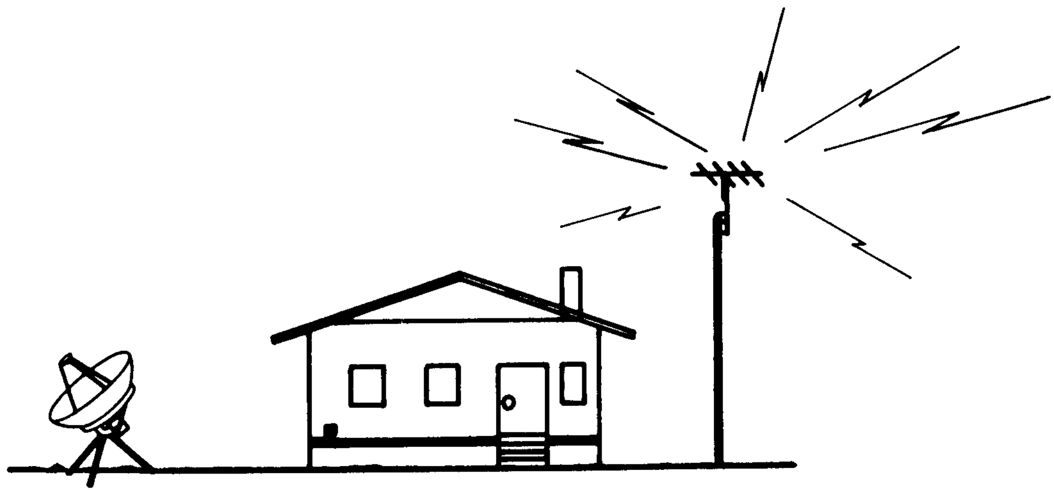
- it is relatively easy to modify the system to offer pay television to those subscribers who are willing to pay extra subscription fees

Disadvantages of a cable system:

- homes beyond the reach of the cable get no service

- higher initial capital cost per channel for small channel capacity

NOTE: Some provincial laws require that the cable be owned and maintained by the provincial telecommunications company, but local operators manage the delivery of programming. If this is the case in your province, contact the telephone company for an estimate of cable costs.



Broadcast - Low Power TV (LPTV) or Very Low Power TV (VLPTV)

One or more transmitters can broadcast the television signals received from the satellite. They may use "very high frequencies" (VHF channels 2-13) or "ultra high frequencies" (UHF channels 14-69). In addition, the broadcast signals may be scrambled* in order to ensure that users must pay for the service.

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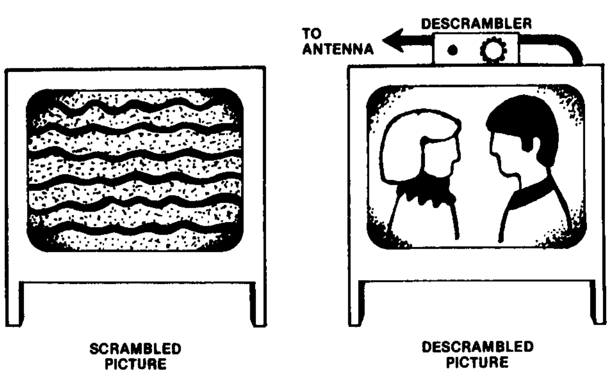
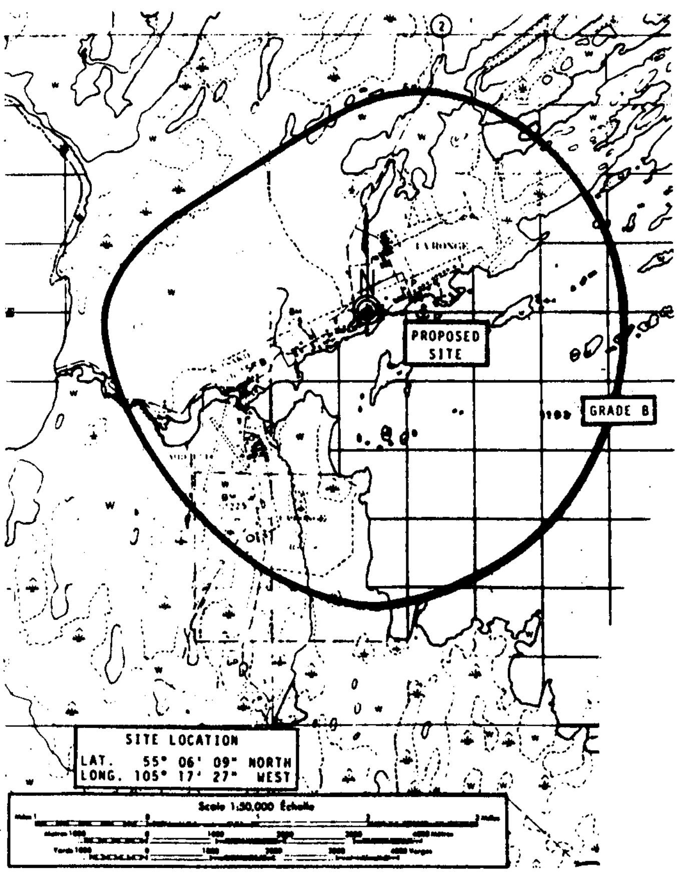
* Scrambling: In order to restrict viewing to paid-up subscribers, equipment is now available which will encode television signals in the transmitter; the picture will appear scrambled on an ordinary television set, but clear on television sets equipped with a decoder, or "descrambler". The distribution company can collect subscription revenues from viewers by leasing descramblers to them thus providing a means of ensuring that those who wish to receive the television signals share in paying the costs of delivering the service.



There are a broad range of transmitters available. In general, the best approach is to select a transmission system which is just adequate to cover the community to be served, as the cost of buying and operating transmitter equipment increases with increased power, and regulations are more stringent for high power stations. The area covered by a broadcast signal will vary according to the power of the transmitter, the channel (frequency) selected, the design and height of the antenna, and the local terrain.

The lowest cost alternative is a very low power (VLP) TV or FM transmitter, with output power limited to one watt. Regulations allow VLP transmitters to be somewhat less complex and therefore less expensive than higher power units, but the use of VLP transmitters is restricted to remote communities. Equipped with a good transmitter antenna, a VLP transmitter can cover a 1.6 kilometre (1 mile) radius in favorable conditions. This range can be increased somewhat by using a directional transmitting antenna or by using outdoor receiving antennas for TV or FM receivers in fringe areas.

The next step up the power range are low power (LP) transmitters, which are restricted to 10 watts maximum transmitter power on VHF, or 100 watts on UHF. In the case of a typical omnidirectional low power transmitter, signals could be received using an indoor antenna within approximately 3 kilometres (2 miles) from the transmitter site. Up to 5 kilometres (3 miles) from the transmitting site, it should be possible for an individual to receive a signal using an outdoor antenna.



EXAMPLE OF A LOW POWER TELEVISION INSTALLATION, SHOWING THE APPROXIMATE COVERAGE FOR HOMES EQUIPPED WITH OUTDOOR ANTENNAS

Broadcasting operations will be limited by the number of unused TV channels still available in your area. In many rural and remote areas of Canada, which are not located close to existing broadcasting stations, a number of unused TV channels may be available. However, due to the relative shortage of TV channels, multichannel broadcast systems would not be possible in most urban/suburban locations, nor even in rural areas in proximity to such locations. In other areas of the country, even with the use of very low power transmitters, care will be required to ensure that interference is minimized. This will be of particular concern in mountainous areas where a transmitter placed on top of a mountain could prevent the reuse of a number of UHF or VHF channels over a wide area.

The number of VHF-TV channels available in a given area can only be determined through an appropriate engineering study, however, four channels is a likely maximum in any one location. Television channels in the UHF range are generally more readily available. For any one system, a maximum of eight UHF channels could be assigned.

Advantages of a broadcast system:

- less expensive than cable in some rural communities for distributing a limited number of channels

- may be the best alternative for a widely dispersed population

- some scrambling systems can be adapted to offer pay television services to those who are willing to pay additional subscription fees

Disadvantages of a broadcast system:

- limited number of frequencies available may result in less program choice, particularly in less remote areas

- low cost scrambling systems are not well accepted by the public and are not proven as security systems for such applications

- collection of subscription fees from delinquent clients may be rather difficult

- low-power TV channels are assigned on an "unprotected" basis. If your transmitter causes interference to the reception of existing or new standard TV stations you may be ordered by the Department of Communications to change the frequency of the transmitter, to cease operation or to take other suitable remedial action.

Cable versus Broadcast

Whether you select cable or broadcast distribution will depend to a large extent on the layout of your community. If the majority of the homes are close together, then cable would probably be the best alternative. If they are spread out over many miles of rural roads, then a broadcast system may be appropriate.

In making your final decision, however, be sure to plan for the future. Given that the number of channels available from satellites is growing rapidly, cable would appear to be the best choice to offer a broad selection of radio and television programming. Although the start-up costs for cable are high, a cable system becomes more cost-effective as the number of channels increases, because only a minimum capital investment is required to distribute additional channels. On the other hand, it is difficult to upgrade a broadcast system to handle more channels. Frequencies for broadcast systems are scarce and becoming more scarce in all but the most remote areas. Once available TV frequencies are used up, no further broadcast expansion is possible. Communities should fully evaluate each alternative with the advice of broadcast consulting engineers prior to submitting any applications to the CRTC or the Department of Communications.

3. FINANCING

3.1 THE "FREE BROADCASTING" SYSTEM

Several community groups in remote and under-served areas feel that people should not have to pay subscription fees for additional television services which are available "free" in metropolitan centres.

Instead they choose to raise funds through bingos, grants from local governments and businesses, and fund raising campaigns. The money raised is used to install a satellite receiving station with one or more broadcast transmitters, and to pay monthly fees to satellite programming suppliers (where applicable). As a result, all television viewers in the community can watch TV without being charged directly for the costs of delivering the programming.

There are many advantages to this approach:

- capital costs are lower; no cable or scramble/descramble systems are required
- no need to collect and account for subscriber fees
- everyone gets the service, adequate television service does not become a financial burden on lower income families

There are also many disadvantages:

- only a limited number of frequencies are available for TV broadcasting
- some local organization must dig into its treasury to pay capital and operating costs for an entertainment service

- if the local government provides the funding, then all taxpayers are forced to pay, whether or not they watch a great deal of TV

- some municipal government laws forbid local councils from spending tax revenues on broadcasting; councillors could find themselves personally liable for the costs of the operation

- if people do not have to pay for the service out of their own pockets they may demand more services without regard to costs

- fund raising can be a constant hassle for community volunteers

- no new funds are generated to pay for community programming or the expansion of the service

- if the TV operation proves too costly, it could be very difficult to switch to "user-pay" once people are accustomed to an apparently "free" service

In order to avoid some of the disadvantages, there are other means of providing "free TV" without asking the local government to pay the entire bill.

1. Some provincial and territorial governments provide grants to help establish TV services in remote regions.

2. In some settlements, the major employers in the area have contributed a share of the cost of operating the system. This is a good investment for them, because they may reduce staff turnover by improving services in the community.

3. Some broadcasting societies have asked various groups for partial subsidies: the town provides an interest-free loan, the mining company provides an installation crew, local residents contribute $100 per household, etc.

4. In one community, a "TV surtax" of $10 per month was added to the sewer and water bill. The community council felt that those who didn't have sewer and water service were disadvantaged, and therefore deserved to get TV for free.

5. In some towns, TV Bingos are used to pay costs.

In all financing arrangements, it is the responsibility of those involved to follow federal, provincial/territorial and municipal laws.

3.2 THE "USER-PAY" SYSTEM

In a cable system where people pay a monthly fee to be hooked up or in a scrambled broadcast system where people pay for the use of a descrambler to receive the television programming, operating costs can be covered by the fees collected. In these systems, only those who use the service pay for it, thus they are called "user-pay" systems.

A user-pay system costs more to install and operate than a simple broadcast system, because scrambling/descrambling and cable systems require extra equipment and additional bookkeeping, accounting and collection activities. However, once installed, such a system can finance it's own expansion in response to the needs and the ability of the subscribers to pay; it does not have to rely on subsidies from local governments or charitable associations.

3.3 FINANCING A USER-PAY SYSTEM

The most common means of financing the capital costs of a self-supporting broadcasting undertaking is through a loan from a bank or credit union. Unfortunately, few financial institutions in smaller centres are familiar with the operation of broadcasting undertakings, so extensive negotiations may be required to develop a financing deal. Offering a copy of this handbook to your loans officer may help him or her understand your proposal.

Banks, credit unions, trust companies and other money-lending institutions usually want certain basic features in a loan application for a new commercial undertaking:

- financial viability over a three to five year plan
- proof of management ability
- loan guarantees or equity investment by the applicants
- a list of capital equipment on which they can hold a mortgage
- adequate insurance coverage

In order to ensure that you will be able to pay interest costs and repay the principal, a three to five year plan is required. This shows capital costs, monthly operating costs, revenue projections and how you intend to manage the money in order to meet all commitments when they fall due. In preparing these estimates, always assume that the interest rates <u>might</u> go up.

In a subscriber system, the critical question is "How many people will buy the service." There is no easy answer to this question until the operation is underway. A simple survey is not adequate, because people respond differently to questionnaires than they do to monthly bills. One of the best ways to determine beforehand how many people will want the service is to send out a prospectus describing the services to be offered at a stated price (remember to include provincial sales tax, where applicable) and ask for a deposit of $25 to $100 from potential subscribers to help the project get started. Offer special rates or priority service to those who send in money. Even this is not a fool-proof system, because people in some communities have experienced problems with fly-by-night operators who offer a broad range of services, take the money and then install inadequate equipment, so people may be reluctant to offer money before they see the service in operation. Still, a carefully worded prospectus supported by respected organizations and individuals may well alleviate such concerns.

Once a system is in operation, the number of subscribers will depend on:

- the quality of the service
- the price
- the security of the scrambling/cable system
- the effectiveness of the sales campaign

Good management means juggling these variables to allow the operation to be successful; special discounts or additional services might attract revenue, replacing a faulty security system might be cost-effective, and undertaking a door to door sales campaign might bring in customers who didn't know how to subscribe.

Your loans officer will be anxious to ensure that he or she is not the only one going out on a limb to finance this new and unproven commercial venture. Therefore, he or she will probably ask for a loan guarantee, or at least a 25 per cent investment share by the organization proposing the project. For non-profit co-ops or membership associations, there are several ways to meet this criterion:

1. Your local government, band council, service club or mining company may be willing to provide a loan guarantee. This will cost them nothing as long as the operation runs well.

2. The board members or the organizations they represent may be willing to sign a number of loan guarantees for $2,000 to $4,000 each.

3. You may be able to credit the subscribers' deposits towards the association's investment share.

Once the operation has been established for a number of years, and the debt load has been reduced, these guarantees can be eliminated.

At the beginning, the loan should be designed to cover capital costs, with a minimum amount of "start-up costs". As long as this is the case, the value of the mortgage on the broadcasting undertaking's equipment will equal or exceed the value of loan. This makes the loan application more attractive.

In order to protect your own organization's investment and the bank's mortgage, be sure to get adequate insurance on your equipment and your premises.

Some equipment distributors offer their equipment through lease-purchase contracts, where you lease the equipment for 2, 3 or 5 years and take over ownership of the equipment at the end of the lease. This is a different way of getting a loan to buy equipment, but interest rates and other costs associated with such lease-purchase agreements are usually considerably higher than you could negotiate with a financial institution close to your community.

Finally, in some areas, low-interest loans are available from government sponsored "economic development" agencies or "business development banks". These should be considered in order to save on interest costs. A TV distribution system can be promoted to these agencies as an economic benefit in an area; it offers a few jobs in maintenance, management and community programming, and it improves community services, making your community more attractive for prospective businesses and employees. Such government agencies usually take a long time to process loan applications, so be sure to allow enough time in your planning.

4. ESTIMATING THE COST

4.1 GENERAL

In order to compare the relative costs of cable, scrambled broadcasting and conventional broadcasting, three examples are provided to typify budgets for the different systems. Each example is for a community of 175 households and each system provides three satellite TV channels.

These estimates are based on April 1982 prices, and they are intended to be quite conservative. The theoretical community is rather small and the equipment selected in each case is probably more elaborate than absolutely necessary. As every community has different characteristics, these estimates just provide ball-park figures.

A fourth example provides a budget for a simple, single channel very low power television system.

4.2 EXAMPLE 1 - CABLE

The cost of the transmission system depends largely on the length of the cable and the number of drops required. In a small community the costs for the cable transmission system including coaxial cable, amplifiers, power supplies, installation and engineering costs range from \$3,800 to \$6,000 per kilometre (\$6,000 to \$9,500 per mile). Cabling costs vary a great deal from community to community and depend on how close together the houses are situated and on the availability of suitable telephone and power poles. If the existing poles are in any way indadequate for carrying the cable, the costs could be far higher. In addition there is the cost of the installation of drop wires which is a capital expense that can vary a great deal in rural areas from \$20 to \$30 for a home adjacent to the main cable and up to \$2,000 to \$3,000 for a home one kilometre away where expensive cable and possibly an amplifier would be required.

The following budget estimates the cost of distributing three channels of television from CANCOM in a community of 175 households, 9 kilometres (5.6 miles) of cable system, 19 households per kilometre. We shall assume that approximately 60 per cent of the households subscribe and that suitable office space is provided by local agencies or businesses.

The system provides 3 satellite TV channels plus local CBC-TV initially, with room for up to 12 channels, or even 21 channels if subscribers buy converters. There is also room for a total of 50 radio channels.

Capital costs

VHF receiving antenna and tower	$ 500
TVRO and receivers - 3 channels TV	17,000
TV modulators (3) and channel processor (1)	4,000
Installation and hardware	1,500
Cable transmission system - 9 kilometres x $5,200	47,000
Total	$70,000

Operating expenses

Affiliation cost - $4 per subscriber x 100 subscribers	=	$ 400/month
Loan payments (5 year term 20 per cent interest rate)	=	1,900/month
Operating costs - maintenance, pole rental, insurance, power, collections.	(minimum)	1,200 month
Total		$3,500/month

Minimum monthly subscriber fee would be $35. The installation fee should be based on the real cost of installing the dropwire.

Economic viability improves if:

- a higher percentage of households subscribe
- the households are located closer together
- a low-interest loan can be arranged

Economic viability decreases if:

- wiring costs are higher
- fewer households subscribe

Expansion costs

To add 1 channel of TV

1 receiver	$3,500
1 modulator or processor	1,000
Total	$4,500

To add 1 channel of radio

1 receiver audio adapter	$ 200
1 modulator	1,800
Total	$2,000

The addition of extra channels of radio or TV will probably draw extra customers to the service.

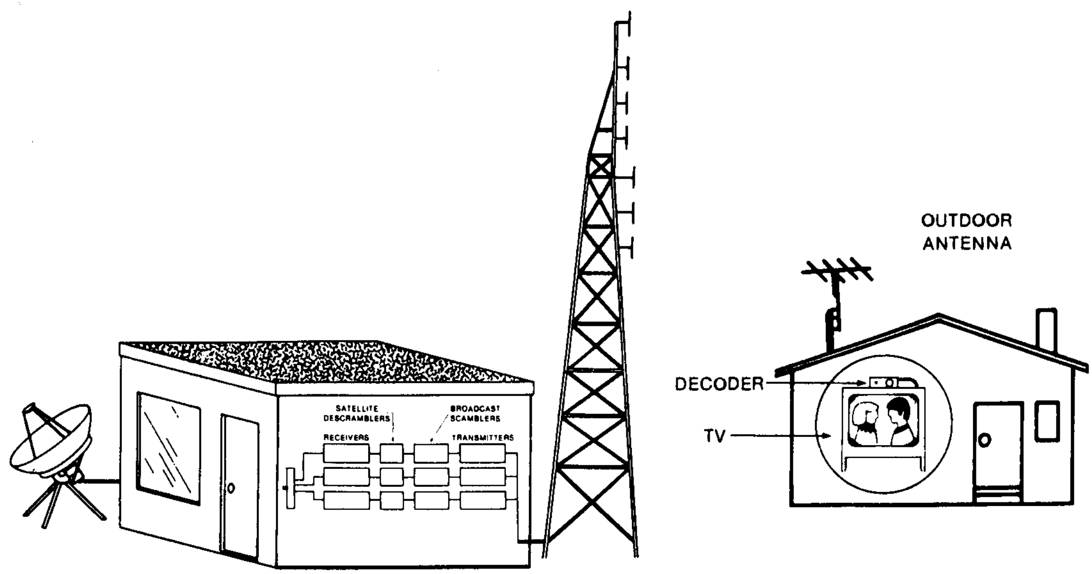
Risk factor

Cable is a relatively safe long term investment because the equipment offers room for expansion.

4.3 EXAMPLE 2 - SCRAMBLED BROADCAST

For the same community of 175 homes, providing the same service, assuming that 60 per cent of the households subscribe and that the installation of the equipment will be done by volunteers in the community.

MULTI-CHANNEL SCRAMBLED BROADCAST INSTALLATION



<u>Capital costs</u>

	VHF	UHF
TVRO + 3 receivers (3.7 metres, 12 feet)	$17,000	$17,000
Scramblers (3)	6,000	6,000
TV transmitters (3)	12,000	24,000
Antennas + towers	7,000	7,000
Shipping + installation	4,000	4,000
Engineering	4,000	4,000
Descramblers (100 units)	6,000	16,000
Totals	$56,000	$78,000

NOTE: Subscribers are generally required to pay installation costs (example $20) plus a deposit on the descrambler (example $60 to $150). The installation fee is equal to the cost of the descrambler installation in the subscriber's home. The deposit is usually based on 50 to 100 per cent of the cost of the decoder and the deposit monies may often be used to reduce the total bank loan required.
100 subscribers x $80 deposit = $ 8,000
Therefore, bank loan required: $70,000

Operating costs (UHF system)

Affiliation cost $4 per subscriber x 100 subscribers	=	$ 400/month
Loan payments (4 year term, 20 per cent interest rate)	=	1,800/month
Operating expenses (minimum)	=	1,200/month
Total		$3,500/month

Minimum monthly subscriber fee $35. The installation fee should be based on the real cost of installing the descrambler. Most subscribers will also have to buy themselves a rooftop TV antenna.

Expansion costs

	VHF	UHF
To add 1 channel of TV		
1 receiver	$ 3,500	$ 3,500
1 transmitter	4,000	7,500
1 scrambler	2,000	2,000
Totals	$ 9,500	$13,000

NOTE: An additional transmitting antenna may also be required, depending on the type of antenna used for the original installation. Additional television services should attract more subscribers.

To add 1 channel of radio	
1 receiver audio adapter	$ 200
1 transmitter + antenna	5,000
Total	$5,200

As radio signals are not usually scrambled, the additional radio services will not necessarily attract more subscribers.

Economic viability improves if:

- there are more households in the service area
- a higher percentage of the households take the service

Risk factor

Such a system is not as safe an investment as cable for several reasons. The scrambling/descrambling equipment may become obsolete in a few years and require replacement if too many viewers can descramble the programming on their own. The frequency of one or more transmitters may have to be changed if interference problems arise. In less remote areas, there may not be channels available for expansion.

4.4 EXAMPLE 3 - LOW POWER BROADCAST (UNSCRAMBLED)

Budget for the same community as in examples 1 and 2.

Capital costs	VHF	UHF
TVRO + 3 receivers	$17,000	$17,000
TV transmitters (3)	12,000	24,000
Antennas + towers	7,000	7,000
Shipping + installation	4,000	4,000
Engineering	4,000	4,000
Totals	$44,000	$56,000

The $44,000 to $56,000 total could be raised from contributions at the outset, or financed through a loan and an ongoing fund raising process. Loan payments would amount to a maximum of approximately $1,500 per month over 5 years at 20 per cent interest.

Operating costs

Affiliation costs - (in the first year)	$400/month
Other costs - insurance, rental, heat, power, maintenance	200/month
OPERATING COST	$600/month

Expansion costs

	VHF	UHF
To add 1 channel of TV		
1 receiver	$ 3,500	$ 3,500
1 transmitter	4,000	7,500
Totals	$ 7,500	$11,000

NOTE: An additional transmitting antenna may also be required

To add 1 channel of radio - $5,200 (see example 2).

Risk Factor

This equipment is less likely to become obsolete in the forseeable future, however, changes may have to be made in the equipment if a change in channel is ordered by the Department of Communications.

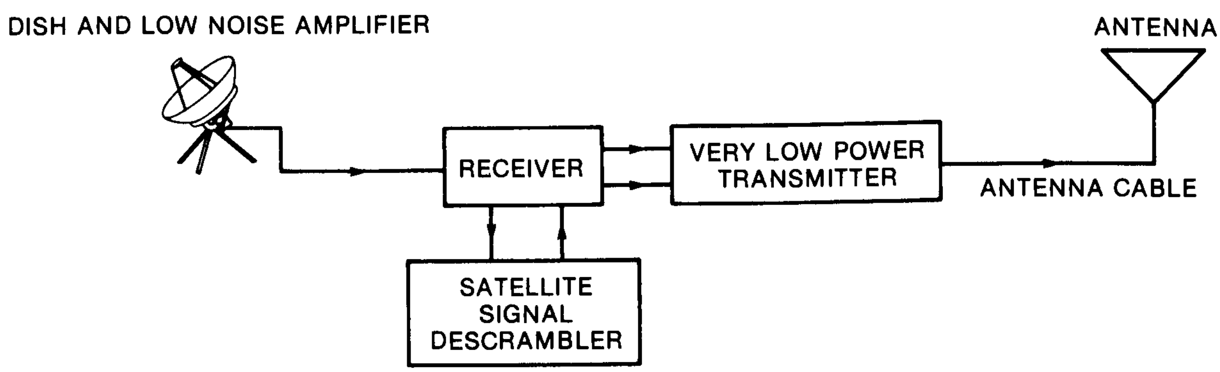
4.5 EXAMPLE 4 - VERY LOW POWER BROADCAST

The following example provides an illustration of how very small communities (for example, 100 homes) can get a single channel of TV service at minimum cost. This model would be appropriate for bringing CBC, educational television, or any other single channel service into a small community. It would be of particular interest to small francophone communities wishing to receive the French language TV channel from CANCOM or to predominantly native communities wishing to receive just one channel of TV service from CANCOM. Although CANCOM requires most communities to pay at least $4 per month per subscriber for their package of four Canadian TV channels, they do allow three special exemptions.

1. Francophone communities may distribute just the one French channel for $1.45 per subscriber per month.

2. Predominantly native communities may choose to distribute just one channel of CANCOM TV service and pay $1 per subscriber per month.

3. Communities of up to 150 homes may distribute just one channel of CANCOM TV service for $1.45 per subscriber per month.



<u>Capital costs</u>

- Receiving antenna (3.7 metre, 12 feet) high efficiency
- Low noise amplifier, receiver and dual polarized feed
- Modulator and transmitter (1 watt VLP)
- Tower
- Broadcasting antenna and cable
- Shipping and engineering

Total (approximately) $15,000

Assuming building, power, light and heat are provided by the community.
Fund raising:

$100 per home from 75 homes	7,500
Grant from local government/council	7,500
Total	$15,000

or loan for $15,000 paid in 4 years at $500/month (at 20 per cent interest)

Operating costs

If there are no fees charged by the satellite distributor for the programming (for example CBC or educational TV), operating costs would be limited to maintenance, heat, electrical power and insurance. These costs will vary from location to location, but often a community group can provide the necessary facilities and pay only increased insurance premiums and the cost of a maintenance check-up every year or two.

To receive a channel of CANCOM programming, the above costs would apply, plus the following fees payable to CANCOM:

Francophone community (receiving the French channel only)
$1.45 x 100 homes = $145 per month

Predominantly native community (receiving a single channel only)
$1.00 x 100 homes = $100 per month

Any other community (receiving one channel only)
$1.45 x 100 homes = $145 per month

Risk factor - same as for example 3

5. COMMUNITY TV PROGRAMMING

The CRTC requires that all cable systems provide a separate community channel. This channel can be used for community programming during prime time and then display several pages of community bulletins and weather information for the remainder of the broadcast day. In smaller centres using off-air distribution, it may not be necessary to allocate a separate channel to local programming. A community group could decide to substitute their programs in lieu of a local news show being relayed from a distant city. This would reduce capital costs, but restrict the selection of times available for community programming. Approval of such arrangements should be included in the affiliation agreement with the satellite programming supplier.

Community programming must be financed from fund raising drives or from subscriber revenues. No advertising is allowed on community cable channels, but community radio and television stations in remote areas may be able to receive CRTC approval to collect revenues from commercial sponsors.

The minimum amount of equipment required to produce a community TV news program would be a camera, a microphone and some powerful lights. These could be purchased for less than $2,000. In order to record events from various locations, or edit together a program, more equipment is required. There is no upper limit on how much can be spent!

If you want to provide live coverage of sports or other community events, your television transmitters or cable system network centre should be located close to "where the action is".

Further information on community programming is available from the CRTC.

6. RADIO

6.1 SATELLITE RADIO SERVICES

Some of the program services delivered by satellite offer radio programming as well as television. Most satellite receivers can be adapted to receive these additional radio signals. Some can be adapted for as little as $100, others require components costing as much as $800 per additional radio channel.

Radio signals can be readily added to a cable television service by installing the appropriate modulators at the head end at a cost of $1,800 per modulator. Depending on the type of equipment you use, and local conditions, you would be able to transmit as many as 50 FM channels on your cable system in the future as more radio services become available on satellite.

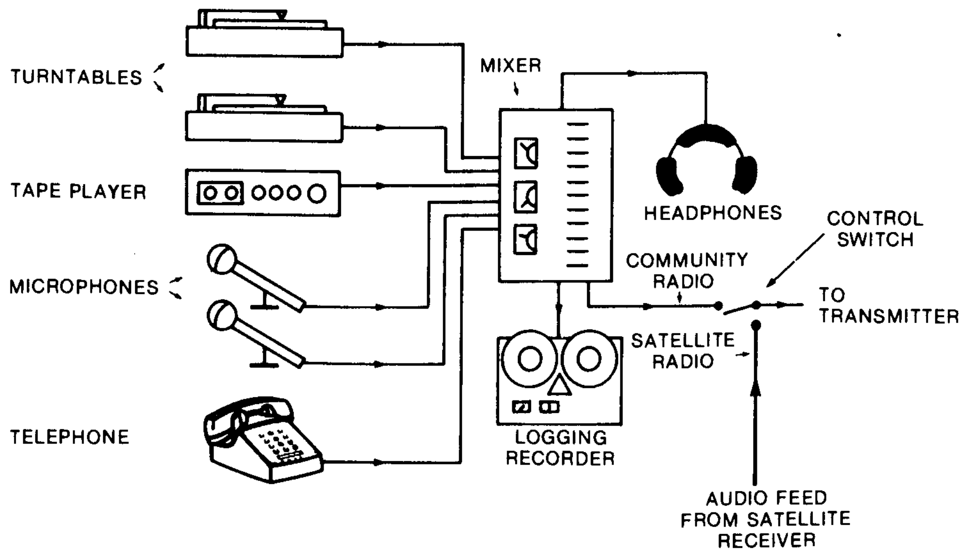
Distribution of radio signals over the air is a little more complicated. FM transmitters are recommended over AM transmitters for community distribution because FM channels are more readily available, and the appropriate transmitter-antenna combinations are considerably less costly and more reliable. As with television, the CRTC is responsible for deciding which services may be offered in a given community, while the Department of Communications governs the technical aspects of each application - frequency allocation, power, type of equipment, etc. For the purposes of community distribution of radio programming, two types of FM transmitters may be considered.

"Very low power"	- less than 1 watt transmitter + antenna cost - approximately $1,000
"Low power"	- less than 50 watts transmitter + antenna cost - $4,000 and up

6.2 COMMUNITY RADIO

A radio transmitter or cable system can also be used to transmit radio programming originating in the community. A community radio studio can cost as little as $1,000 to $4,000 for two turntables, two tape recorders, two microphones and a mixer. A simple switch is all that is required to change from satellite feed to local programming.

COMMUNITY RADIO STUDIO

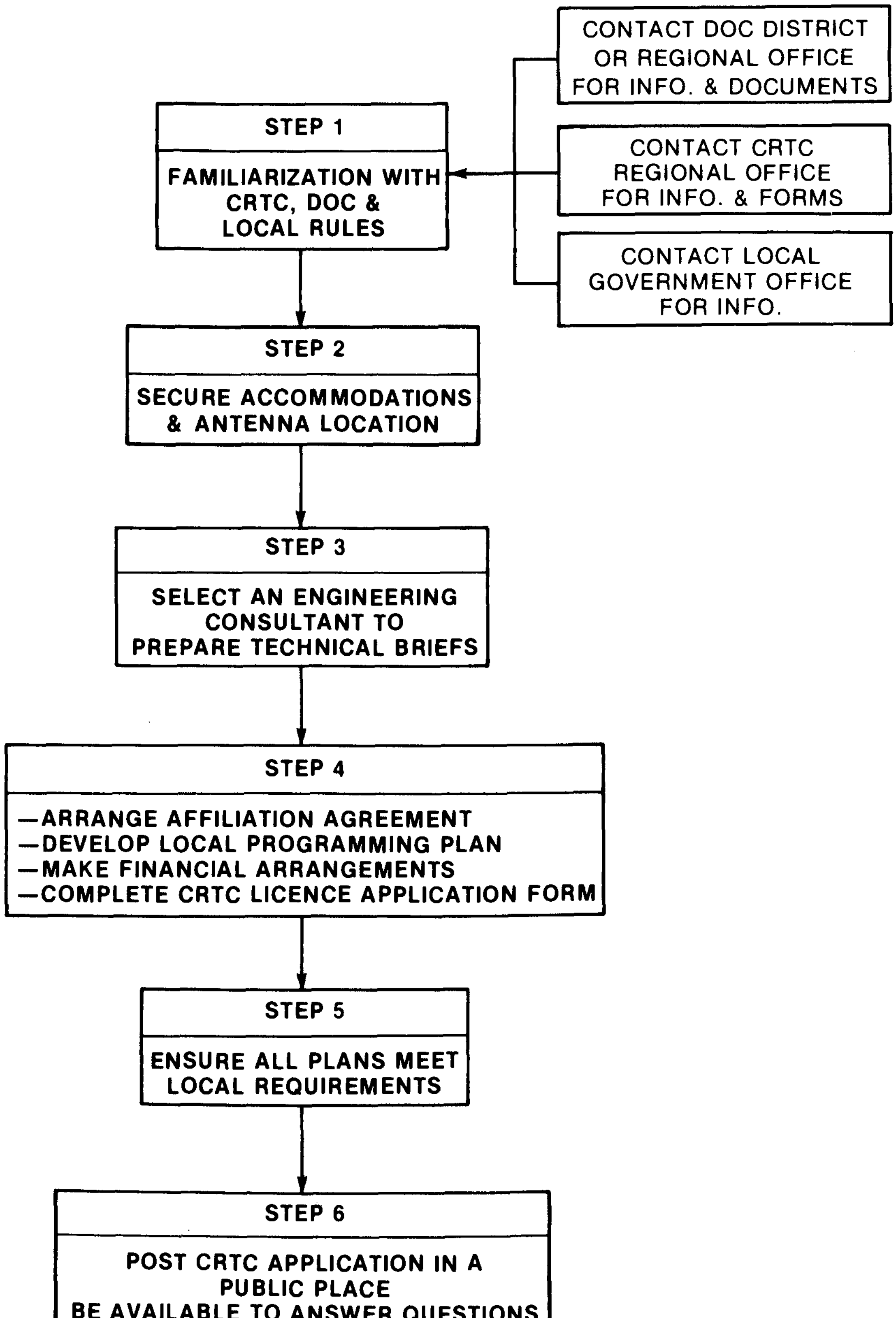


If you plan to include local programming in your radio services you must include details of these plans in your CRTC licence application. If you plan to include community programming on a radio transmitter or cable system which is already in operation, you must file an application for an amendment to your licence with the CRTC. No changes in the DOC certificate or engineering study are required, provided no alterations are made to the transmitter or the antenna.

If you plan to insert locally produced radio programming into any of the satellite-delivered radio programming, you must ensure that the satellite program supplier agrees to this arrangement. However, if you broadcast locally produced radio programming on a separate channel or transmitter, no such agreement is required.

The Publications Office of the CRTC Information Division in Ottawa has information available on community radio.

7. SEEKING LICENSING



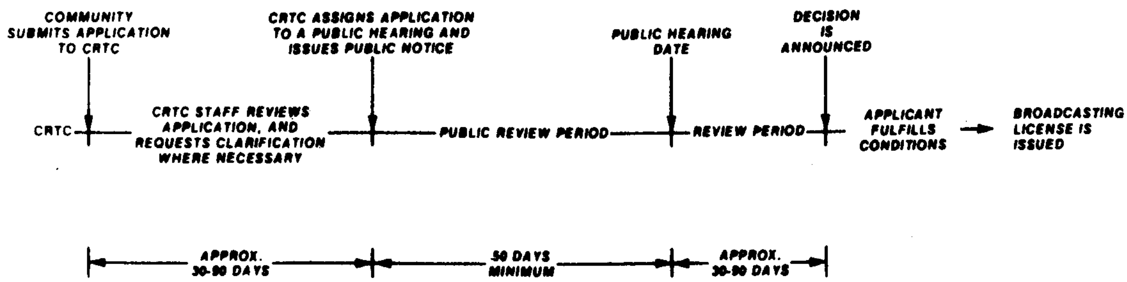
7.1 DOC - CRTC RESPONSIBILITIES

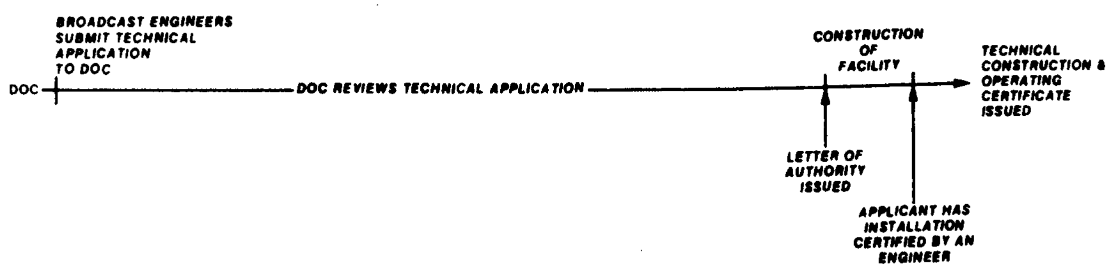
Once a distribution system has been selected, the next step is to apply for the appropriate licence from the CRTC and technical construction and operating certificate (TC & OC) from the Department of Communications.

The authorization of broadcasting transmitting undertakings or broadcast receiving undertakings (cable systems) is essentially a two part process involving both the Department of Communications and the CRTC. The Department of Communications assesses the technical aspects, such as radiated power, antenna location, frequency, etc. The CRTC assesses matters relating to ownership, programming and financial viability of proposed broadcasting undertakings.

The following pages describe the application procedures for licences for each type of undertaking.

LICENSING PROCESS TIME LINE





7.2 FORMS TO FILL OUT FOR THE CRTC

A few years ago, if you asked the CRTC for an application to set up a TV station, you would have received a considerable pile of paper. The current application forms for broadcasting or cable systems for underserved areas are less than ten pages long. They are designed to determine who will own and control the broadcasting undertaking, what programming will be carried, what distribution system will be used, and how the system will be financed.

For distribution of satellite delivered conventional television programming in a remote or underserved community, you can obtain the following forms from CRTC regional offices (see appendices):

- for a cable system "Application Form - Broadcasting Receiving Undertaking - Extension of Service - Phase II"

- for a broadcast system (scrambled or unscrambled) "Application Form - Broadcasting Transmitting Undertaking - Extension of Service - Phase II"

For distribution of pay television programming, the following forms are available:

- for a cable system "Application Concerning a Broadcast Receiving Undertaking - Application to Amend an Existing Licence to Add the Exhibition of Licenced Pay Television Services"

- for a broadcast system "Application Concerning a Television Broadcasting - Transmitting Undertaking - Pay Television - Phase II - Exhibition"

Two copies of the appropriate form must be filed with the CRTC for each licence application. For community TV or radio stations, another special application form is also available.

Generally speaking, the CRTC reviews these applications to ensure that:

- ownership and content is in Canadian hands

- the broadcasting organization is not controlled by a federal, provincial or municipal government

- the project is based on sound financial planning

- any local programming will provide a service which reflects the needs of all residents served by the system

- programming content reflects the requirements of the Broadcasting Act

In cases where two or more competing applications are received by the CRTC to serve the same location, comparisons of the services offered, the costs to the consumers, and the quality of the financial plans are generally made through a public hearing process which provides interested parties with the opportunity to intervene and make their views known.

CRTC Licence Evaluation Process

1. Receive the application.

2. Acknowledge receipt, you will receive a letter.

3. Check for deficiencies such as missing information, request additional information. You may receive phone calls, telexes or letters requesting additional information or to check details.

4. Schedule the application for a public hearing.

5. Publicize the application in the Canada Gazette at least 50 days before the public hearing date. You will receive a letter or telex, and see a notice appear in the local newspaper.

6. Interventions pro or con, you will receive copies of any interventions.

7. Hearing - you may or may not be asked to appear at a public hearing to describe your project.

8. Review of technical comments from the Department of Communications.

9. Time for consideration.

10. Decision - you will receive a telex or telegram.

Processing of an individual application can take from four to nine months.

A review of some of the decisions made by the CRTC reveals that, for distribution of programming in remote communities:

- CTV Network programs carried by CANCOM must be blacked out if there is an existing CTV station serving the area with CTV network programming

- the CRTC encourages local businesses and organizations to apply for broadcasting licences in their area

- the CRTC encourages cable licensees to make plans for community programming if it is financially feasible to do so

- if a licensed community radio or TV group receives the majority of its funding from a single source, it is generally a condition of the licence that the licensee retain control of all decisions concerning local programming, to prevent the sponsors from using their financial influence to control programming

- the broadcasting undertaking is expected to be in service within 12 months of receiving CRTC licence approval and Department of Communications technical approval

7.3 FORMS TO FILL OUT FOR DOC

The applications for Department of Communications technical approvals should be prepared at the same time as the CRTC application. The CRTC can issue a decision after a licensing hearing, but they cannot issue a broadcasting licence until DOC technical approval is granted.

7.4 ENGINEERING STUDIES

Engineering studies or "technical briefs", are recommended for all projects, even though they are not required for a licence application for very low power installations in remote areas, or for cable systems serving less than 500 households. The engineering brief should be submitted to the DOC at the same time as the CRTC application is filed.

It should be noted that, when a technical submission lacks detail or contains inaccurate technical data, lengthy delays in processing the application may be experienced. Such omissions and inaccuracies often occur as a result of unfamiliarity with the department's rules and procedures. Broadcast engineering consultants maintain a library of all pertinent information and subscribe to the department's information service which provides them with the current revisions to the rules and procedures.

It is also important to note that the planning and design of a broadcast undertaking, or a cable television system, and the preparation of technical briefs submitted in support of such applications may constitute the practice of professional engineering as defined under some provincial engineering acts. In these cases the brief must be endorsed by a registered professional broadcast engineering consultant.

Finding a registered broadcast engineering consulting firm to do the study is a fairly straight-forward task; the territorial or provincial association of engineers can provide lists of broadcast consultants in your region. Some suppliers provide engineering studies as part of their equipment package, and CANCOM representatives can also provide addresses of firms which have experience in handling studies for CANCOM distribution systems.

Engineering study costs vary a great deal, depending on the amount of work required. Generally, an engineering firm can put together the required brief at their own offices without incurring travel costs as long as they are provided with sufficient information by the applicant.

Based on information provided for broadcasting applications, the engineers can select frequencies, draw the maps of coverage patterns required by the department, select appropriate equipment, and fill out a number of forms associated with a licence application. This work should cost under $3,000 for a multi-channel TV installation. However, if additional services are required, additional costs will be incurred. They may include:

- visit to the site, $350 to $500 per day plus expenses

- analysis of potential interference for a TVRO, cost depends on complexity, not needed in most remote areas

- FM broadcasting application, costs similar to a TV application

- AM broadcasting application engineering costs are higher than for FM

If in doubt about the cost of your engineering study, be sure to arrange a firm pricing agreement before the work is started.

Generally, engineering firms are not accustomed to dealing with smaller communities and organizations, so they may require full payment for their services before releasing the technical briefs to the Department of Communications.

Once you have selected an engineering firm, be sure to submit a "Consultant Retention Form" 16-653 to the Department of Communications. This will advise the department which company is authorized to act on your behalf.

Your engineering consultants can prepare all the DOC forms for your signature. However, sections 7.5 to 7.10 provide a list of the forms required. This will allow you to double-check that all the required documents are filed.

If you need any of the forms listed, contact the closest DOC field office (see appendices).

7.5 SATELLITE RECEIVING EARTH STATIONS (TVROs)

In order for any individual or company to install and operate a TVRO, a radio licence from the Department of Communications is required. Generally TVRO licences are issued only to certain categories of users, such as: broadcasters, cable companies, telecommunications carriers and provincial educational communications authorities. In addition, there is a special provision for isolated resource development camps (e.g. mining, petroleum exploration, etc.) which exempts them from the need to hold a licence for a TVRO.

Now that new Canadian satellite services are expanding, all operators of unlicensed earth stations are expected to apply for the necessary licensing approvals and to cease the unauthorized interception of U.S. satellite signals. Those earth station owners unwilling to respect the law in this regard are liable to prosecution action under the Radio Act and/or the Broadcasting Act. Such action could include the seizing of equipment and the laying of charges by the Department of Justice.

There are two types of TVRO licence - protected and unprotected:

"Protected" satellite receiving stations are protected by the department from receiving unacceptable levels of interference from other microwave services licensed in the same area in the future. Protected status is only available for satellite receiving stations with dishes at least 4.5 metres (15 feet) in diameter.

"Unprotected" earth stations are those for which no protection will be afforded and the owners accept the risk of interference from existing, planned and future microwave facilities. In general, an unprotected licence is suitable in most remote communities, and is relatively easy to apply for.

If it is desired to apply for a protected TVRO, then a more detailed engineering brief is required. This involves additional engineering costs.

For either type, information regarding the location of the proposed site relative to airports is required as well as a suitably scaled topographical map indicating the site location. It is customary that the technical design and submission be done by a registered broadcast engineering consultant.

Forms required for a licence application for an unprotected TVRO:

1. Consultant Retention Form 16-643 (1 original - 1 copy)

2. Consent from programming originator or satellite programming supplier (affiliation agreement)

3. Form 16-879 "Particulars of Proposed Site and Radio Antenna Structures" with appropriate maps (1 original - 3 copies)

4. Form 16-894 "Application for Unprotected TV and Radio Receive Only Earth Station" (1 original - 2 copies)

The policy outlining departmental requirements is detailed in RSP116 available from district offices.

Note: No application to the CRTC is required for a TVRO licence.

7.6 CABLE SYSTEMS

The following forms are required for DOC technical approval of a cable TV installation:

1. Consultant Retention Form 16-653 to indicate which broadcast consulting engineering firm you have selected (1 original - 1 copy)

2. Form 16-879 "Particulars of Proposed Site and Radio Antenna Structures" with appropriate maps, where applicable, for a TV reception antenna tower (1 original - 3 copies)

3. Form 16-8 "Application for a Technical Construction and Operating Certificate for a New Broadcasting Receiving (Cable Television) Undertaking" (1 original - 3 copies)

OR

If the service area encloses fewer than 500 households, and the system will distribute signals only on the standard VHF (channels 2-13) and/or FM channels, and will not be connected with another system, you may use:

Form 16-878 "Application for a Technical Construction and Operation Certificate for a Broadcasting Receiving Undertaking (Cable Television) Exempt Category Cable Television System" (1 original - 3 copies)

4. A technical brief (3 copies) should be submitted by a broadcast engineering consultant, except for a small cable television system in the exempt category.

Information covering technical standards and procedures for cable television is contained in BP-23, Issue 2.

7.7 RESOURCE CAMP DISTRIBUTION SYSTEMS

The CRTC has created a special exemption for broadcast receiving undertakings (cable systems) serving remote resource development camps which meet the following criteria:

1. The entire broadcasting receiving undertaking is operated by or on behalf of the person who owns or leases all of the property on which the undertaking is located and who supplies to the population served by the undertaking such common amenities as food and shelter.

2. The operator of the undertaking distributes through the system the signals of all local Canadian television stations, in each case with no degradation of received signal, and reception of programming from satellites is restricted to Canadian satellites.

3. No separate charge is levied or direct commercial gain obtained for any signal or service provided through the distribution cable.

4. No part of the undertaking is located within the area licensed to be served by any cable television licensee.

7.8 LOW POWER TV BROADCASTING SYSTEMS

The following forms are required for DOC approval of a LPTV installation (maximum peak transmitter output 10 watts VHF or 100 watts UHF)

1. Consultant Retention Form 16-653 (1 original - 1 copy)

2. Form 16-879 "Particulars of Proposed Site and Radio Antenna Structures" with appropriate maps (1 original - 3 copies)

3. Form 16-07 "Application for a Technical Construction and Operating Certificate for a new Low Power Television Broadcasting (LPTV) or Rebroadcasting Transmitting Undertaking" (1 original and 1 copy is required for each channel applied for)

4. Technical brief

Information covering the requirements for the establishment of low power TV stations is contained in BP 22.

NOTE 1: If a scrambler/descrambler system is used, the proposed system must be in accordance with the provisional Telecommunications Regulation Circulars 59 and 60 issued by the department.

NOTE 2: For multi-channel systems, the effective radiated power (ERP) of each of the signals transmitted from the system must be equal and the transmitting system must be co-sited. That is to say that either a single, broadband, multi-channel antenna system must be used for the transmission of all signals to be distributed in the community or, if more than one antenna is used for the transmission of the signals, all antennas must be located within a circle of radius 10 metres (33 feet) from the transmitter site.

7.9 LOW POWER FM RADIO BROADCASTING SYSTEMS

1. Consultant Retention Form 16-653 (1 original - 1 copy)

2. Form 16-879 "Particulars of Proposed Site and Radio Antenna Structures" with appropriate maps (1 original - 3 copies)

3. Form 16-850 "Application for a Technical Construction and Operating Certificate for a Low Power FM (Frequency Modulation) Broadcasting Station" (1 original - 4 copies is required for each channel applied for)

The policy outlining departmental requirements is outlined in BP 14 2nd edition, available from Department of Communications offices.

7.10 VERY LOW POWER TV AND FM

All the forms required to apply for technical certification of a very low power TV or FM transmitter are contained in a booklet entitled Broadcast Procedure #15 (BP 15). This procedure applies to TV and FM broadcasting transmitting stations, with transmitter power of one watt or less, in small remote communities using TV or FM channels on an unprotected non-interfering basis. It applies only in communities which are outside the major urban/suburban areas and remote in the sense of lacking access to a complete range of Canadian broadcasting services in English or French.

No engineering knowledge is required to complete this application, providing the equipment to be used meets Department of Communications standards. However, selection of the appropriate frequency may have to be done by qualified consultants.

8. CHOOSING THE RIGHT EQUIPMENT

8.1 GENERAL

In general, a broadcast engineering consulting firm should be contacted as soon as you have decided what services you want. This will provide an accurate analysis of the kind of equipment you will need and what it will cost. They will determine whether frequency allocations are available for broadcast transmitters, and whether a cable system would be cost-effective.

An engineering study will cost at least $1,500, but you should keep two things in mind:

1. If you buy the right equipment in the first place, you will save money.

2. You will probably need an engineering study (technical brief) to get the Department of Communications technical construction and operating certificate which is required by law for most broadcasting undertakings.

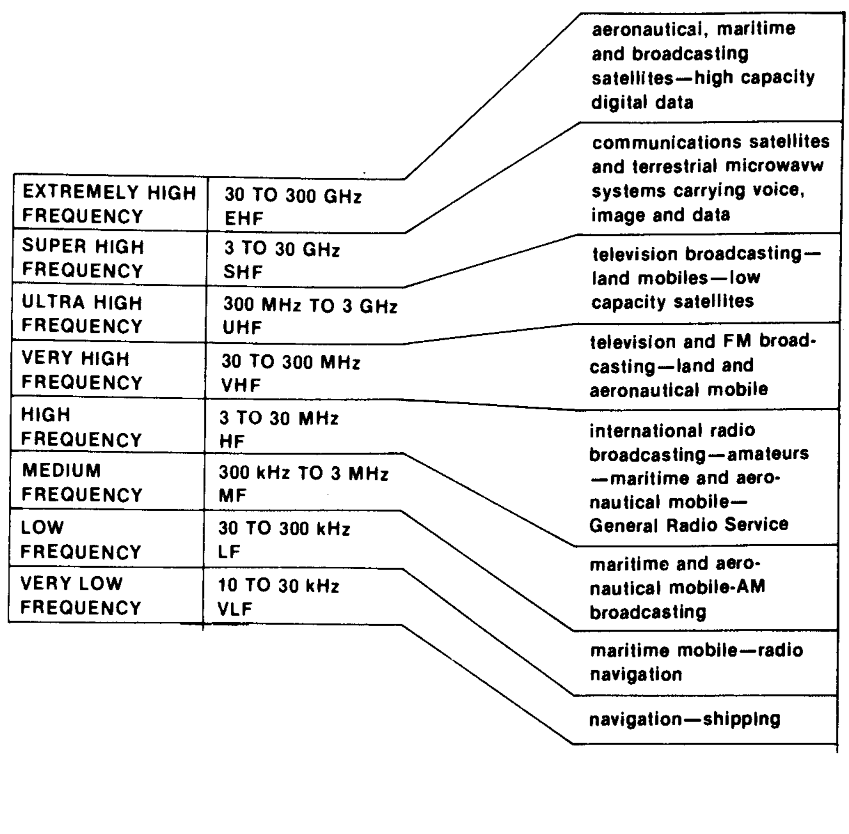
When you select a broadcast engineering firm, be sure to find one which has experience in dealing with small projects in remote areas. Some firms are very sympathetic to inquiries from remote communities, and will provide a great deal of free advice on equipment suppliers if you agree to contract them to prepare your technical brief.

The following information is intended for those who are interested in the technical aspects of broadcasting.

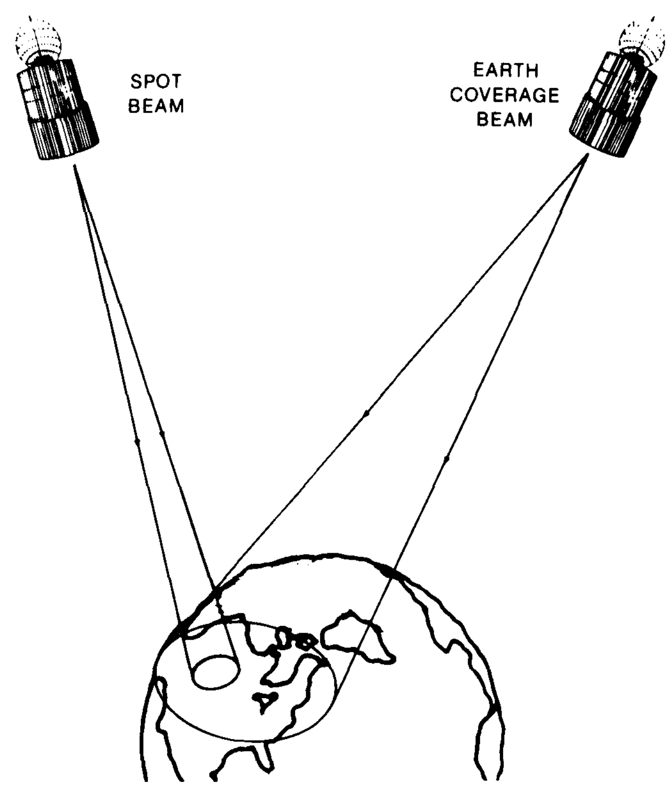
8.2 SATELLITE RECEIVING EARTH STATIONS (TVROs)

There are two types of satellites used for relaying radio and television services, operating at different frequencies:

1. Most satellites, such as the Anik D series, operate in the 6 and 4 gigahertz (GHz) band of the radio-frequency spectrum. Radio waves are characterized according to their frequency. Frequency is usually described in cycles per second or hertz - that is the number of wavepeaks passing a given point during one second. One gigahertz (GHz) equals 1,000 million cycles per second. For a 6/4 GHz satellite, signals from earth go up on the 6 GHz band and are relayed back down on the 4 GHz band by devices on the satellite known as transponders, which receive the signals on one frequency and retransmit them on another. The signal transmitted by the transponders on 6/4 GHz satellites, such as Anik D, cover the entire country, but their power is limited so as not to interfere with terrestrial microwave systems operating at the same frequency. Therefore, large receiving dishes (3.7 to 4.5 metres, 12 to 15 feet in diameter) are required to pick up signals from these satellites.



2. The Anik C series will be the first Canadian satellites operated on a commercial basis to use the 14/12 gigahertz band. The principal advantage of the 14/12 GHz band is that it is not shared with terrestrial microwave services. Higher satellite transmission power may therefore be used, decreasing the size of receiving antennas required, and thereby lowering their price. In order to obtain higher signal levels on the ground, Anik C signals are transmitted in narrowly focussed beams similar to the beam of a flashlight. Individual Anik C beams do not cover the entire country; they divide the country into four regions. However, these regional beams can be combined to cover two or more regions simultaneously.



The size of receiving antennas required to pick up television signals from Anik C satellites varies according to the location of the receiver, the transmission arrangements selected on the satellite, and the end use planned for the television signals. Under optimal conditions, a 1.2 metre (3.6 foot) dish can be used to feed an individual television set. However, broadcasters and cable companies would use 2.5 metre or 3 metre (8 to 10 foot) antennas to ensure suitable picture quality. Prices for 14/12 receivers are not yet well established, but should be lower than for 6/4 TVROs.

In the late 1980s Canadian "direct broadcasting satellites" may become a reality. These would have yet higher power output, thus reducing the size and cost of dishes to $1,000 or less, making them attractive to a large number of consumers in areas where over-the-air or cable services are not readily available, provided of course that the signals from the satellites are beamed towards these remote areas. These satellites would be designed to transmit TV and radio programs directly to home TVROs with dishes of about .6 metres (2 feet) as well as to community distribution systems.

Every distributor of satellite programming must install a TVRO earth station for reception of programs from the satellite. The decision as to what equipment to use for this purpose, and exactly where it should be installed, must be guided by two major considerations.

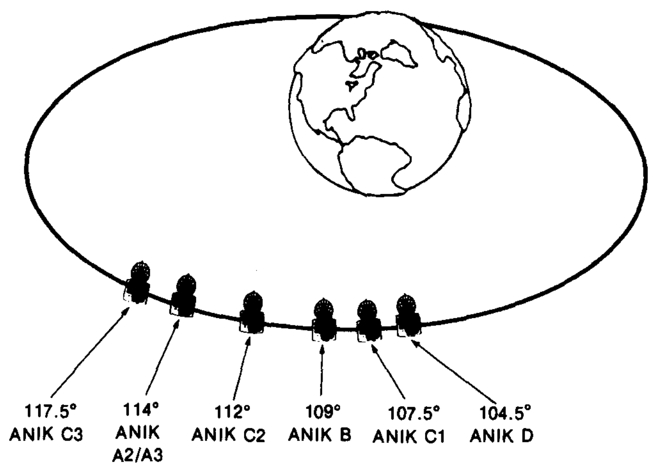
The first is to design an adequate antenna/receiver system to provide good picture and sound quality and to ensure that the signal received is strong enough to operate any descrambling system which may be used by the satellite distribution company. The second is to ensure in advance of installing the system that it will not suffer from interference from terrestrial microwave systems operating in the surrounding area.

One word of caution is in order here. The performance of the station is considerably affected by the size and type of antenna used, and this also is the largest single factor determining the cost of the complete receiving system.

Particularly in the smaller installations, there will be a strong temptation to use as small an antenna as possible in order to reduce the overall cost. When this is done, the system may provide poor picture quality, and cause data errors which may upset the descrambling process. Although the human eye is tolerant of degraded picture quality, the descrambling process and other new services employing data are not so tolerant.

There is another important consideration which must be taken into account in the design of the TVRO station. Although current plans are to have the satellites spaced 3.5 or 4 degrees from adjacent satellites, the present and expected future increase in the number of satellites is already dictating consideration of a possible reduction in satellite spacing. If this becomes necessary then larger antennas than might presently be used will be required to eliminate interference from adjacent satellites transmitting in the same frequency band. For these reasons the use of an antenna of more than the minimal size (one which might be used if picture signal to noise ratio were the only concern) is advisable.

LOCATION OF CANADIAN COMMUNICATIONS SATELLITES



The second consideration is microwave interference. Since the signals received from the satellite are very weak they require highly directional, high-gain antennas and very sensitive receiving equipment. This same equipment will inevitably be sensitive to any other nearby microwave signals present in this band. If these unwanted signals are received they will interfere with the desired signal from the satellite.

This aspect of the system design then consists of determining whether any terrestrial microwave systems are operating in this frequency band in the general vicinity of the proposed TVRO installation, and if so whether they are capable of interfering with the satisfactory operation of the earth station.

The first requirement is to find out where the nearest microwave routes are which operate in the 4 GHz band. The fact that a microwave station exists in the vicinity of the site does not automatically imply the probability of interference. There are many bands in which systems operate at other than 4 GHz, and only systems operating in this specific band can cause interference with a TVRO station. In order to simplify this part of the problem, a set of maps has been prepared to show the current routes of all 4 GHz systems in Canada. These maps are available from CANCOM on request.

Other points to consider in selecting satellite receiving station equipment include:

- different types of dishes and electronic equipment are required for satellites of different frequencies (6/4 GHz or 14/12 GHz)

- the antenna, support structure and foundation must be strong enough to withstand the worst possible local climatic conditions such as high winds

- a dual polarized feed is necessary for certain ANIK D and C applications

- all components must be reliable and of commercial quality. Cheaper units may deliver an unsatisfactory picture and require constant adjustment

- receivers should be adaptable to accept add-on options for receiving associated audio (radio) signals from satellite

- electronic equipment suppliers must offer warranties and should provide readily available servicing and/or back-up units (ask the supplier to provide you with a list of customers who have already purchased equipment and seek out recommendations from these people)

- receivers must be compatible with descramblers if they are to be used to receive scrambled programming from the satellite

- make sure you are eligible for a TVRO licence before you buy your TVRO (check with the Department of Communications)

8.3 BROADCAST TRANSMITTERS

All equipment purchased for use in broadcasting stations must be type approved by the Department of Communications for its intended use. It is the responsibility of the manufacturer or distributor to have the equipment tested to ensure that it will provide a high quality signal and not create interference on other frequencies, and to apply for a type-approval number. However, it is the purchaser's responsibility to ensure that the equipment is properly used. For instance, a television modulator designed for use in a cable system may not be type approved for use in a broadcasting system. A broadcast engineer will be able to verify what equipment should be used in any given application.

8.4 SCRAMBLERS

A scrambling system is intended to ensure that your television service is received only by people who have rented a descrambler from you. Therefore to be useful scramblers must be "secure"; people must not be able to figure out a way to descramble your service for less than it costs them to lease the descrambler from you. The use of scrambled broadcast signals is a new phenomenon in Canada, and as a result, very few people have experience in this area. There are several types of equipment on the market today, but most of the equipment available (at the time of writing) is designed to provide security for pay-TV on cable systems. Some of this equipment is adaptable for use over the air, but much of it is not. There is also new equipment coming on the market which has proven very effective in laboratory tests, but which has yet to establish a track record in broadcast applications.

The Department of Communications has established interim standards for scrambling equipment for use in broadcast installations, but approval does not necessarily guarantee that the equipment will meet all your needs. The only way to make sure it is suitable is to talk with someone who is using the equipment in similar circumstances. You should check the following:

1. Does the equipment scramble the signal sufficiently so viewers will not be content to watch the "scrambled" picture rather than pay the fees? This is becoming more and more difficult as modern television sets are designed to overcome all kinds of interference.

2. Is the equipment hard to copy? This prevents electronic hobbyists from building descramblers for themselves and their friends.

3. Is the equipment relatively easy to adjust so that your subscribers receive a good picture and non-subscribers don't?

4. How do subscribers respond to using this equipment?

5. In the sales contract, does the distributor demand first option to re-purchase all the descramblers that have been sold? Is the distributor prepared to buy back any units which a local broadcaster feels compelled to sell? If not, one local broadcaster could sell off hundreds of descramblers on the open market, allowing consumers to buy these units and avoid paying lease fees to other broadcasters using the same scrambling system.

6. Is the equipment approved for broadcast use by the Department of Communications? This can be determined by checking with broadcast engineers.

Finally, consider your long-term plans carefully when selecting a descrambler. Some units can be programmed to descramble only as many channels as the subscriber has paid for. This would allow you to offer different services at different prices. For instance, you could offer CANCOM services for one price, pay-TV for another price, and both services together for a package price.

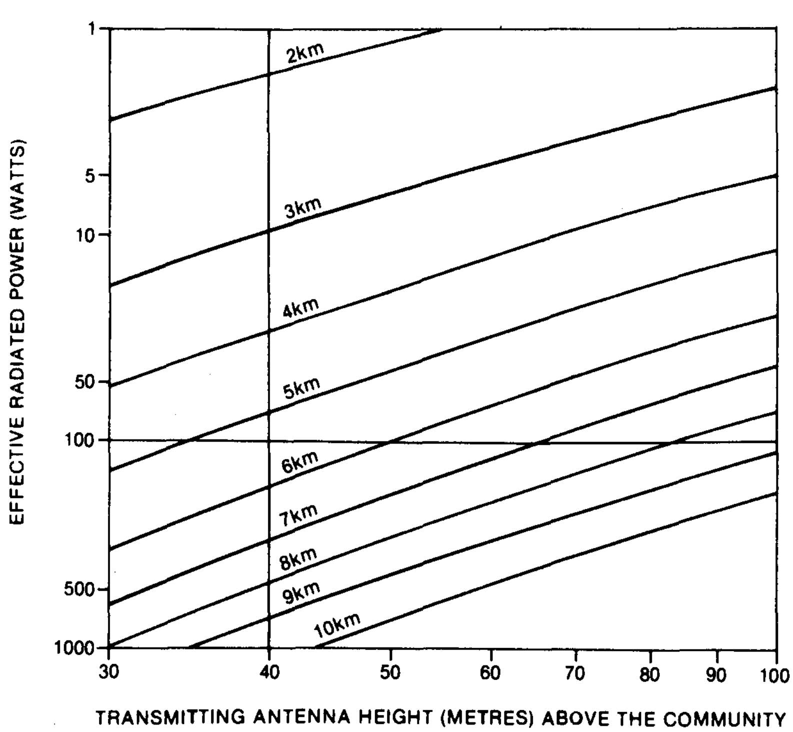
8.5 TRANSMITTING ANTENNAS

In many ways, the transmitting antenna is the most critical component of a broadcasting system. By selecting the appropriate transmitting antenna and location the broadcaster can boost the power in one direction or spread it out evenly in all directions.

It should be noted that some less expensive transmitting antennas may reduce the effective radiated power by as much as half.

Broadcast range is also greatly affected by the height above ground of the transmitting antenna and by the local terrain; a higher tower supporting the antenna will increase the range of the signal, but obstacles such as hills will block the signal.

CHART TO ESTIMATE RANGE OF UHF TV STATIONS



Instructions:

1. Draw a vertical line corresponding to the transmitting antenna height in metres (1 metre = 3.3 feet)

2. Draw a horizontal line corresponding to the effective radiated power of the transmitter-antenna combination (in watts).

3. The point of intersection of these lines relative to the curves labelled in kilometres gives an estimate of the distance at which a clean signal can be received with an outdoor antenna.

Example: A 100 watt UHF transmitter with a OdB omnidirectional antenna standing 40 metres above the community will cover a radius of approximately 5.5 kilometres (3.3 miles).

You may trust a qualified engineer to select the right antenna, but you also have to select a good, high location which will allow it to cover the community effectively. For multi-channel installations, all transmitting antennas must be close together. In a small community, a tall pole on the highest hill might do well enough, while in a larger community, a steel tower will be required. It is important to note that some antennas are large and heavy, requiring substantial towers, particularly if several antennas are to be mounted on one tower.

Towers must be situated so as not to interfere with air traffic while remaining close enough to the community to serve it and provide easy access to the station.

8.6 RECEIVING ANTENNAS

In order to use a descrambler, most subscribers will need a properly installed outdoor antenna, because descramblers need a good signal input. A bent coat hanger or a set of rabbit ears can only provide enough input in the very strongest signal areas. However, asking subscribers to install their own outdoor antennas creates a number of problems:

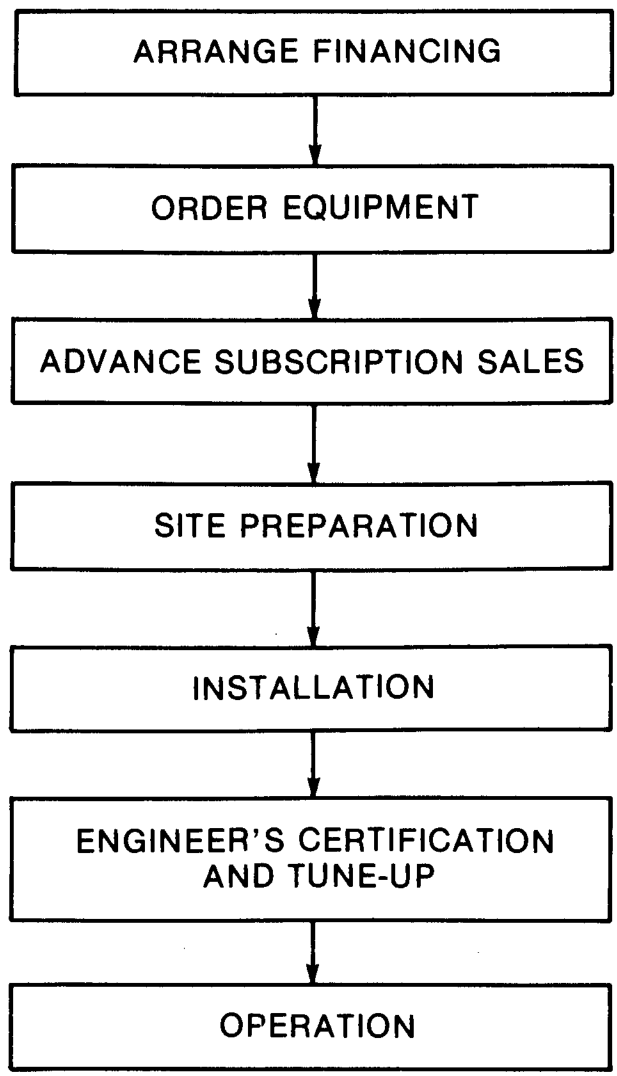
1. People may already have an antenna to pick up CBC or a distant station. This antenna may be pointed in the wrong direction to pick up your signal, or it may be designed to receive a channel other than the one you are using.

2. Most antennas commonly available in stores are expensive ($40 and up), because they are designed for reception of distant stations. You should ensure that cheaper antennas which meet your local requirements are available.

3. Most people do not know how to install an antenna, so they may complain their descrambler doesn't work, when in fact the antenna installation is at fault.

Checking antennas and making sure each descrambler works is an additional expense which must be covered in your "installation costs".

9. IMPLEMENTATION



If the licence application is approved, then your local planning committee will have to review all plans and financial projections one last time and make final decisions on major purchases.

In locations where cable or scrambled broadcast systems will be used, it may well be worthwhile to test audience demand at this time by requesting advance payments of $25 to $100 from prospective customers who wish to support the project and be among the first to receive service. This will allow you to decide which areas to cable first, or how many descramblers to order in the first installment. It will also give you some cash for any down payments required by suppliers. One note of caution, do not promise a start-up date any earlier than your own most pessimistic estimate.

Before placing orders, be sure to double check all prices and delivery dates. On critical items, do not trust one saleman's opinion, call the factory yourself and check the delivery dates, and base your plans on the most pessimistic estimate. Also double-check your final equipment list with the broadcast consulting engineering firm to make sure you will meet the licence requirements.

At the same time, you will also have to ensure that all the administrative details for your loan are taken care of, because some suppliers will not accept an order without appropriate guarantees from your bank or credit union manager.

Plan your requested delivery dates so that the equipment arrives in a logical order. You do not want to be stuck paying interest on equipment without being able to start collecting revenues. For instance, the logical order for a broadcast system would be: tower, transmitting antenna, dish and transmitter.

Once your equipment orders are placed, and you have checked that all suppliers have placed orders with their factories, then you can start laying foundations for the satellite receiving equipment and the antenna towers. This is also the appropriate time to arrange insurance coverage and in user-pay systems time to develop a billing and bookkeeping procedure. Also, complete affiliation procedures with the satellite programming suppliers at this time.

When the equipment arrives and it is installed, be sure to test all the equipment before announcing that the new services are operational. Also, once everything is in place, someone must certify to the Department of Communications that the system is operating in accordance with the technical parameters set out in the engineering study. This should be done by a qualified technician who can adjust the system with test equipment to ensure that it is properly tuned. However, in remote and very isolated areas, it may be possible for the local installer to certify that the equipment was installed in accordance with the engineers' instructions. An appropriate certificate must be sent to the Department of Communications.

The CRTC should be advised when the system goes into operation, and any conditions in the licence approval, such as sending in copies of the bylaws and a list of the names of the directors, should also be taken care of.

If all goes according to plan, you will have a licence from the CRTC, a technical certificate from the Department of Communications, and a broadcasting undertaking providing new radio and/or TV services to your community. Happy viewing.

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