## 4.5 Sites of Main TV/FM Stations

### 4.5.1 Co. Arco

As the present service areas of Ch-7 and Ch-9 in Mendoza city are narrow as shown in Fig. II－2－11, the idea of concentrating all television and FM transmitting stations on the top of Co. Arco (altitude 1680m), to serve a broad area where inhabitants are distributed may be the best method. Distance from the border to the city of San Luis is about 50km and the viewers in the province of Mendoza those living near the border tend to view television service of San Luis. In order to make reception of the program of Mendoza, service of TV broadcasting station in Mendoza has to cover the wide area as much as possible by constructing the stations at the summit of high mountain like Co. Arco with large effective radiated power (E.R.P.).

As the space on the summit of Co. Arco is comparatively narrow, if all the transmitting stations are to build their antenna towers, the condition of propagation of some of the antennas may be insufficient according to the place they are constructed. To avoid the occurrence of such problem and to maintain an almost identical transmitting condition to each station, the only solution for it will be to jointly construct an antenna tower. Fig. IV－4－4 shows the structure of antenna tower. The station building is built right under the antenna tower and it is placed on the underground beam of tower base, to lower the gravity center of antenna tower as much as possible, and the TV/FM and parabolic antennas for program transmission etc., are attached.
As a flat space of about 30m×55m can be obtained easily by leveling the summit, joint construction of all TV/FM stations would become possible. Accordingly, it will be a more sophisticated plan than the dispersedly located plan which is under consideration by the Government of the province.

The advantages of such joint construction are shown in Table IV—1—3, but there are some unavoidable restrictions on operation. However, on the other hand, there are many matters which could be carried out beneficially by inter-dependency. Especially, the advantage of this plan is that the construction cost and running expense could be cut down considerably. The facilities which can be used in common are as follows.

1) Emergency engine generator
2) Measuring instrument
3) Station building
4) Antenna tower
5) Access road
6) Site
7) Fuel tank
8) Electric power line
9) Antenna
10) Ancillery facilities and others.

In addition to these, it has an advantage that the spare parts etc., can also be used in common. Moreover, according to the design, remote control and supervisory equipment for unattended operation can also be used in common.

Expected service area of TV broadcasting by the construction of the stations is shown in Fig. IV—4—2 and the northern region of the province of Mendoza excluding mountainous area of the western territory can be covered.

The structure of building may differ according to the design, but draft design forecasting the future expansion from the initial stage should be made under the mutual consultation of all broadcasters. It is regretful that the field strength at La Paz is expected to be somewhat low as about 33 dB (Band III) according to topographical undulation and it may be necessary to locate a translator station at La Paz using UHF for television to avoid interference between San Rafael VHF TV station and La Paz station.

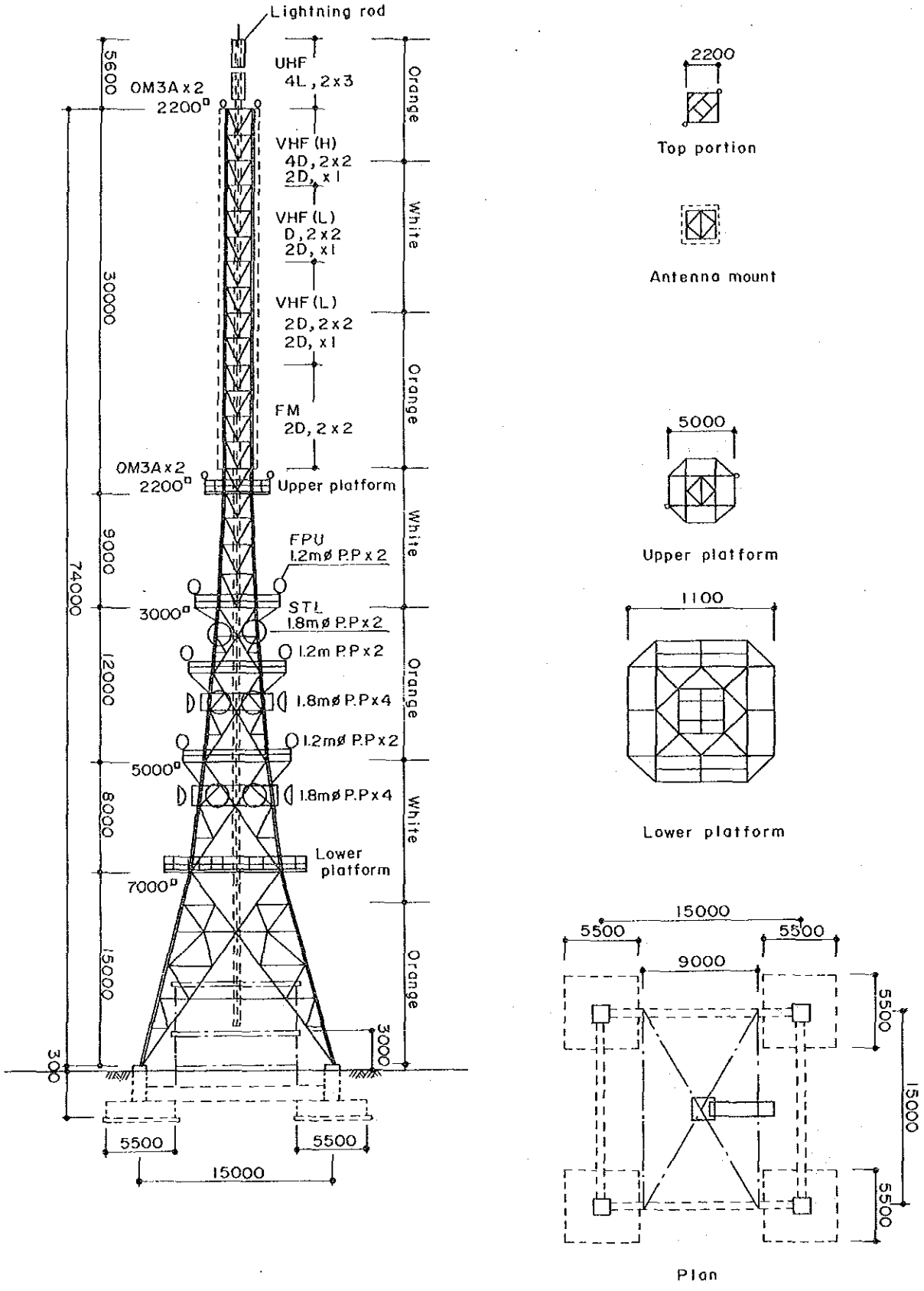



Fig. IV – 4 – 4 Structure of TV/FM antenna tower at Co. Arco

### 4.5.2 Co. Diamante translator station

In order to serve a broad area as wide as possible, it is a common sense to install a transmitter on high summit, but it will be necessary to take various factors into consideration; the danger involved in access to station for maintenance and repair, interference of radio wave to other stations and transportation during winter seasons as well. Therefore, the limitation of altitude is about 1000m above ground level and in respect to snowfall, in the case of steep mountains as there is a fear of snow slide and drop of stones, special considerations must be paid.

In this plan, as a fundamental concept to serve the southern region, by utilizing the isolation of the three provinces of San Luis, San Juan and Mendoza from other provinces, a transmitting station is constructed on Co. Alto plateau of 1700m height (a.s.l.) which lies west of San Rafael, as there will be comparatively no fear of radio interference to other provinces even in considering the service only in this district.

The service area of Co. Diamante translator station is aimed at the districts of Malargue and Nihuil and the households to be served are dispersed over a comparatively broad area but the population is few. The radiated signal of Ch-8, Ch-11 and Ch-13 from Co. Diamante are received at grade $3^-$ or less than grade 2 at some parts of the east side of San Rafael district, thus it is an interfering signal but not serviceable.

Co. Diamante is located too far from the main service area of San Rafael and Gral. Alvear district where most of the residents of the southern part of the province are living. Expected service area of Co. Diamante in the east territory is rather narrow than that of Co. Alto.

### 4.5.3 Co. Alto

Present service area of Ch-6 in San Rafael is somewhat narrow because broadcasting is conducted with an antenna in low height and 1 kW transmitter, and more broader service is required. There is a defect that Malargue cannot be completely covered from the plateau of Co. Alto, 1700m in height, but Nihuil can almost be served and Gral. Alvear can also be sufficiently covered.

In addition, it is sufficient for relaying to Malargue district and it could be served sufficiently with about 50W (E.R.P. 100W) transmitter output power at El Chacay to serve Malargue, El Sosneado and relay to Valle Hermoso at the same time.

Furthermore, almost all of El Sosneado district can be sufficientry served from Co. Alto excluding a part of it, and the field strength at El Chacay translator station is sufficient for relaying the received signal to Valle Hermoso.

In addition, as the service from Co. Alto to Dique Agua del Toro district is also sufficient, there is no problem except that the service for Malargue district is somewhat insufficient, and reception for relaying to other districts as Horquetas etc., is possible.

Considering this point, the existence of Co. Diamante translator station is not so important. On the contrary, as program relay to Malargue are possible, the method of locating a relay station at Malargue will be better and convenient for maintenance. Especially, if San Rafael station is to be constructed with an objective of providing a broad service area, the station have to be established at the high altitude of Co. Alto. Therefore, it could be said that the mission of Co. Diamante station is over. Especially, considering the problem of maintenance of Co. Diamante station, difficulty of access to the station (difficult to climb except for use of Unimoque) and dangerousness involved, it will be more convenient to relay program between San Rafael and Malargue from the new San Rafael station. Access road to San Rafael station at Co. Alto will be comparatively easy to build and it could be said that it is an ideal site for locating a main station.

In addition, Co. Diamante station is located at a site which is ideal as the base station of wireless communications, but it is obstructed by the mountains laying in the west of San Rafael. Therefore, a sufficient service is impossible. Furthermore, in order to relay commercials of San Rafael station to Co.Diamante, as San Rafael and Co. Diamante are not within the line-of-sight, it is almost impossible to connect the stations with one hop relay of microwave link from San Rafael city.

Accordingly, in order to insert commercials of San Rafael, two hops of microwave transmission will be required, hence it is not appropriate to locate a transmitting station at Co. Diamante.

The above points are summarized for reference in Table IV－4－7. In Fig. IV－4－5, map in the vicinity of Co. Alto indicating the access road and the route of existing power lines is shown. Profile from Co. Alto, Co. Diamante and other expected sites to each direction are shown in the separated reference material "Profile for TV and FM Broadcasting".

### 4.5.4 Co. Negro

Co. Negro is situated just west side of San Rafael city, and the distance from San Rafael is very near, however height of the mountain is 1080 meters a.s.l and about 400 meters high from average ground level.

The coverage from the mountain is narrow than that of Co. Alto, although densely populated areas are sufficiently covered. As the mountain is rocky and the summit is narrow, construction of guyed antenna mast is somewhat difficult. Construction of access road is also difficult, however length is short.

Comparison of the service area of Co. Alto, Co. Negro and Co. Diamante is shown in Fig. IV－4－2. In the west side of Co. Negro there is mountains, height of about 1300m a.s.l, however as these mountains are placed in the inconvenient territory and are not suitable for TV broadcasting in many aspects.

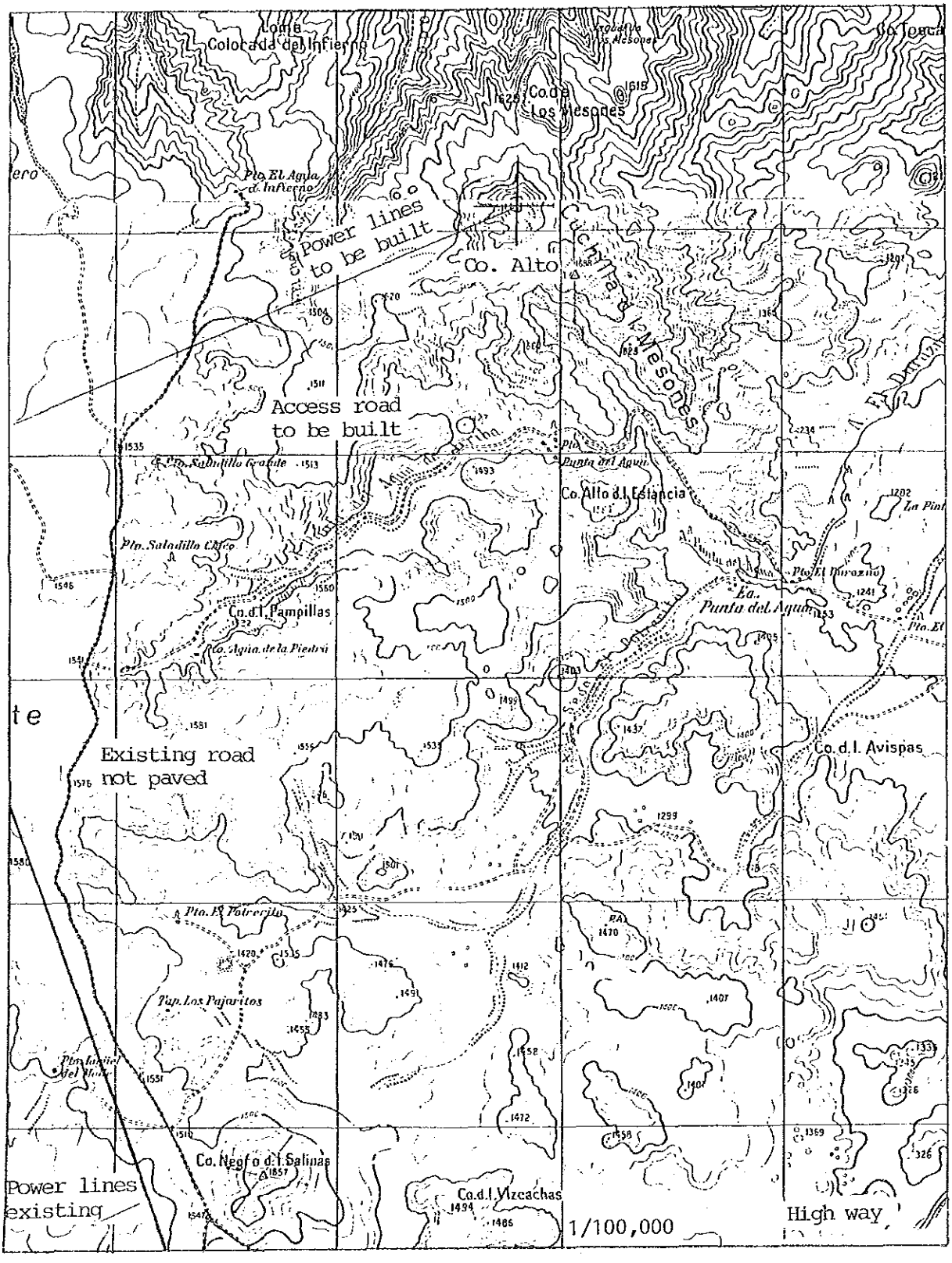
In Fig. IV－4－6, map in the vicinity of Co. Negro is shown.

**Table IV-4-7 Comparison of Co. Diamante, Co. Alto and Co. Negro (1/2)**

| | Co. Diamante | Co. Alto | Co. Negro |
|---|---|---|---|
| Cochico | not receive | not receive | not receive |
| Canalejas | not receive | not receive | not receive |
| Nacunan | very poor | can receive | can receive but poor |
| Punta de Agua | not receive | not receive | not receive |
| Grl. Alvear | not receive | good | inferior than Co. Alto |
| Nihuil | good | good | not receive |
| Malargue | good | not good, but saved by Chacay translator | not receive |
| Dique Agua del Toro | not receive | not receive | not receive |
| San Rafael | Shielded by mountain in the west of city | Almost all of city can be served | good |
| | | | |
| | | | |
| | | | |
| | | | |

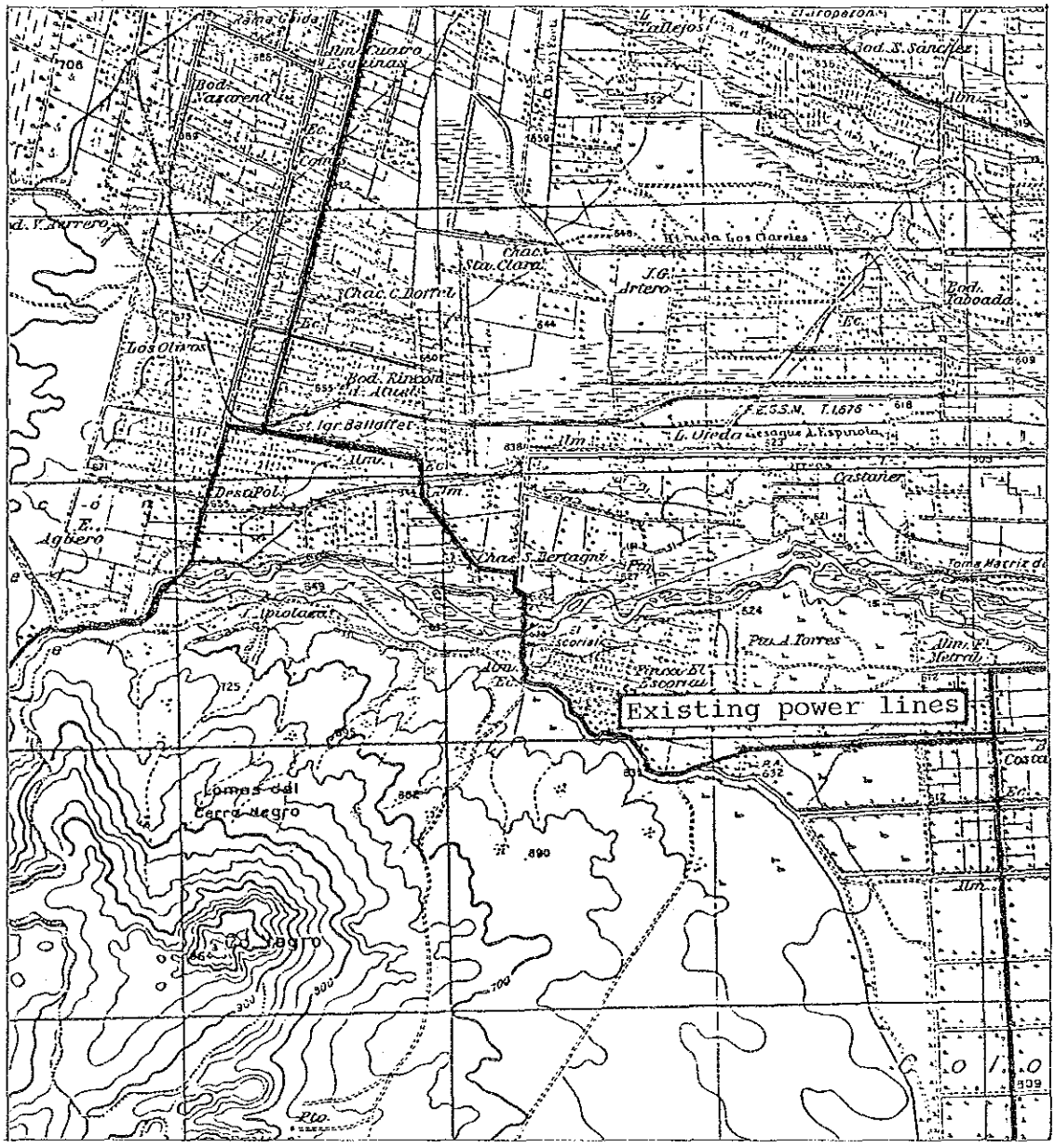
Table IV-4-7 Comparison of Co. Alto, Co. Negro and Co. Diamante (2/2)

| | Cero. Alto | Cero. Negro | Cero. Diamante |
|---|---|---|---|
| Frequency plan | Easy, VHF channel 4,6,8,12 will be assigned | Easy, same as of Co. Alto, channels at Co. Diamante shallbe changed. | Difficult, UHF channels have to be used |
| Service area | Wide enough, but Malargue must be served with translator. | Wide, Nihuil and Malargue are not served | San Rafael is not served sufficiently, partially shielded |
| Accessing | Three hours, Road condition is not so bad. | One hour and a half. Road condition to the foot is good | Six hours or more. Road at slope of mountain is dangerous |
| Electricity | About 10 km length power lines must be constructed | Power lines length of 5 km must be constructed. | Existing . |
| Site | Wide enough for constructing guyed antenna mast | Rocky. Not so wide. | Wide enough. |
| Programme relay | Easy from San Rafael | Easy from San Rafael | Relay via Cero Negro is necessary |
| Construction cost | Expensive than others | Expensive but cheaper than Co. Alto | Not so expensive. |
| Operation | Centralized communication system can be established | Not enough compared with Co. Alto | Environmental condition is most severe |
| Maintenance | Maintenance is somewhat difficult but easier than Co. Diamante | Maintenance is most easy. | Maintenance is difficult,especially in bad weather. |
| Others | E/U broadcasting in the San rafael prefecture will be served with one station. FM broadcasting also served widely than the others. | Service to the western territory must be covered with stations at Co. Diamante | In case, Co.Negro is selected as main station, programme shall be received from Co. Negro |
| | | | |




(1 / 100, 000)

Fig. IV－4－5 Map of the vicinity of Co. Alto




(1 / 100,000)

Fig. IV – 4 – 6 Map of the vicinity of Co. Negro

### 4.5.6 Program transmission via satellite

At present, terrestrial microwave links in Argentina have been operating and extending total length of about 12,000km and coaxial lines 1,300km and the total number of repeater stations is about 300. Under the condition, it would be worth while to consider the comparison of future construction of terrestrial microwave and satellite links. However, as it was impossible for the study team to inspect many repeater stations and earth stations in the country, only the tentative estimation is given in the following; (refer to Fig. IV－4－7)

(1) Earth station. (San Martin and Valle Hermoso)

Two earth stations are existing, one is in San Martin and the other in Valle Hermoso. However both stations are not utilized because of the lack of transmission lines to connect to the trunk lines operated by ENTEL or broadcaster. Both stations belong to ENTEL.

Existing equipment at San Martin is somewhat aged and the dimension of the down link receiver is large, and the space for future extension is not taken into account. Prefabricated housing is used for ease of construction. The small housing limits the installation of wave separator and also additional equipment for the future installation.

Establishment of systematic nationwide expansion plan is urgently required for each earth station such as R.O station and T.R station. Fortunately, as it is tentatively determined by the S.O.C. to make the Mendoza as one of the program originations in the country, San Martin earth station has to be improved in 1992 when the national TV broadcasting commence its service and in 1995 education/university TV broadcasting in the province.

For the installation of the down link receiver and uplink transmitter, it is necessary to provide well designed plan to make sophisticated equipment arrangement and also peripheral auxiliary equipment for ease of operation and maintenance.

The development plan is made under the assumption of the increase of television program from present two to six and the provision is required as explained later.

And the construction of two down links and one up link is expected. Future plan of the San Martin earth station is tentatively made under the assumption that the national and education/university TV programs are sent via satellite and the links are also used for the program transmission of other broadcasters during the vacant hours. In the block diagram shown in Fig. IV－4－7, existing equipment is shown within dotted line, and the construction in 1995 within chain line and the conversion from R.O to T.R station within broken line.

1) First stage.

   Existing downlink is used by readjusting the receiver to make possible the reception of superimposed national radio program with national television program. And the construction of program transmission link is expected from San Martin to Mendoza ENTEL or to national TV studio which is expected to function tentatively using the existing studio in soccer stadium. CODEC is installed in the tentative national studio, if tentative procedure is taken at the first stage, and the microwave receiver is installed in the national studio.

2) Second stage.

   New building shall be constructed at San Martin to accommodate existing and new down link receivers, expecting the future increase of down link receiver and uplink transmitter for television to arrange systematically together with the future expansion of telephone link, VHF link and so on. Antennas are commonly used for existing down link and future uplink, by inserting splitter to separate the incoming and outgoing signals.

National FM program superimposed upon the education/university TV program is separated in ENTEL Mendoza after receiving the superimposed signal from San Martin via microwave link between them, and the both programs are sent to each destination. Transmission route of national TV program from San Martin to national studio is changed from San Martin to ENTEL Mendoza and then to national studio after separating the superimposed national radio program. Change of the route is executed to conform with the construction of new national studio.

Installation of equipment is implemented in ENTEL Mendoza to send the program to each broadcaster by microwave link or coaxial cable. Switching is not necessary to send the received program to each destination except for special event, and the programs are sent to each broadcaster in the separated format of video and sound. Procedures are shown in Table IV－4－8. If time share use of the satellite link is permitted among other broadcasters, switching of the incoming signals to each destination are conducted within ENTEL at the request of broadcaster.

In Fig. IV－5－7 and Table IV－4－8, sharp and its number shows the order of the construction time to achieve smooth transition from tentative installation to permanent one.

3) Third stage.

Uplink network is constructed. This is not included in the development plan, however as the social requirement is becoming to enter the information society, program exchange among provincial key stations would become necessary and the construction of the uplink will be required. In Fig. IV－4－7, block diagram of uplink equipment in ENTEL Mendoza and San Martin are roughly indicated. Capacity of the power supply is increased and the standby engine generator is also installed within the premises which is constructed during the second stage.

All equipment is operated unattended with supervisory and remote control equipment, although automatic function are provided. In order to make smooth transition from station to station for program exchange without pause on the picture, nation-wide free access system shall be provided including cuing information delivery.

As for the program relay to San Rafael, almost same procedure is taken except for the first stage, because down link receiver is installed within the premises of TV transmitter station tentatively. Program transmission from San Rafael to Mendoza is conducted through the converted TV microwave link from telephone. And no uplink for satellite use is constructed in San Rafael ENTEL.

### 4.5.7 Comparison of terrestrial and satellite links

Assume that the additional expense for increasing one more link for each repeater station is about 150,000 US dollars/station, then total construction cost for 300 repeater stations becomes, 0.15 mil.US $\$ \times 300 = 45$mil.US$.
On the other hand, rental fee of one transponder is one million dollars/year. And the construction cost of 32 earth station are as follows;

1 million US$ × 8 station = 8mil.US$
0.1 million US$ × 24 station = 2.4mil.US$

Total cost of satellite links becomes;

1 mil + 8 mil + 2.4 mil + 1 mil (Uplink) + 5 mil (Uplink of five provinces) = 17.4 mil. US $

In the above estimation, no construction of terrestrial link from earth station to ENTEL is included. If it is included to the above, about 120,000 US dollars should be added for each 32 station, i.e. 0.12 mil. × 32 = 3.84 mil. US dollars.
And the construction of satellite link for one program becomes about 21.24 mil. US dollars.

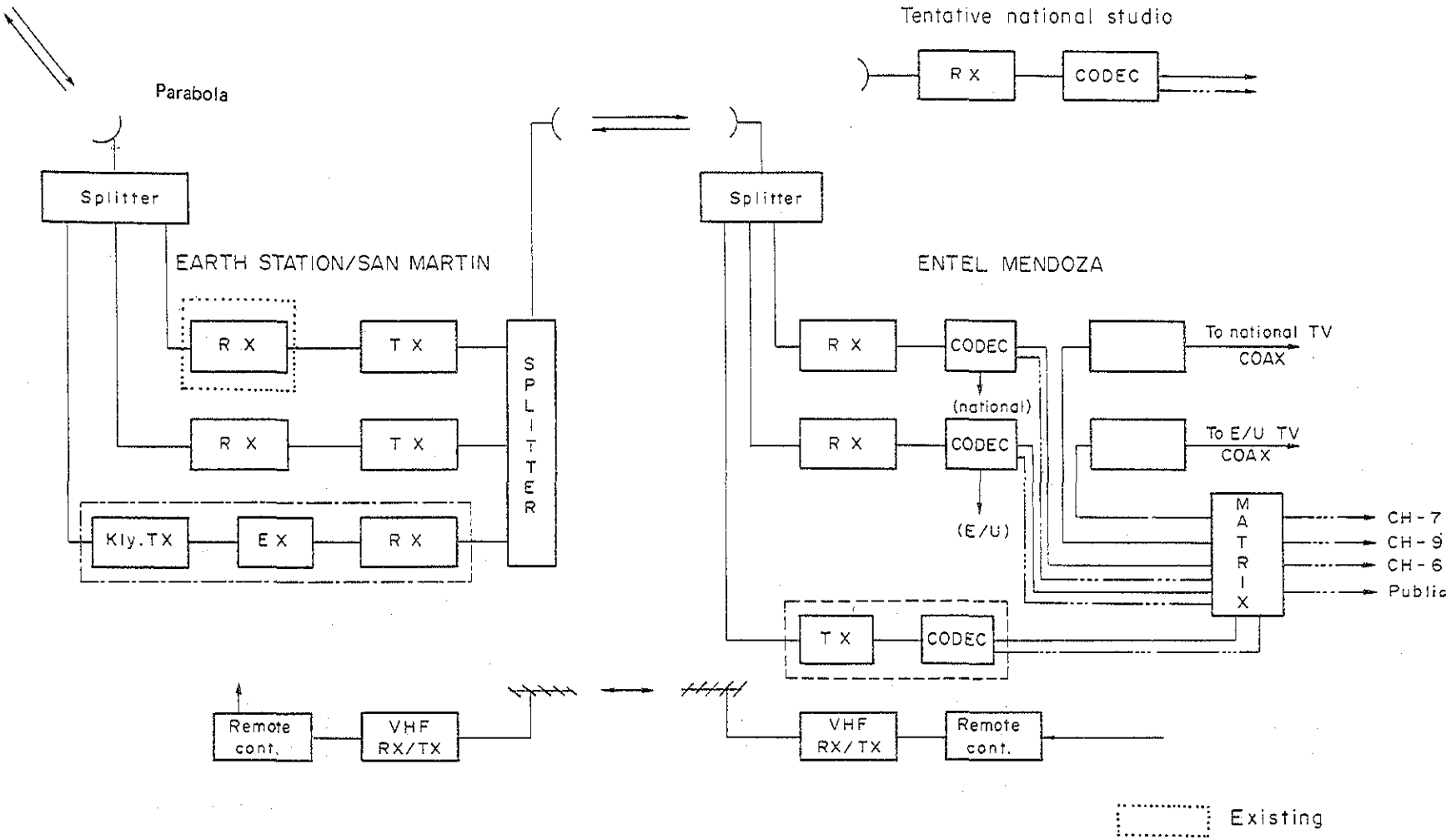



Fig. IV-4-7 Schematic diagram of earth station

## Table IV – 4 – 8 Construction schedule of TV program link (satellite)

| Place | | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 00 | 01 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MENDOZA | San Martin | ** | #1 | | | #6 | #4 | | | | | | |
| | ENTEL | | #1 | | | #6 | #4 | | | | | #5 | |
| | ENTEL to Broadcaster | | #1 | | | #6 | #4<br>#3 | | | | | #5 | |
| SAN RAFAEL | Earth Station | | | * | | | ** | | | | | | |
| | ENTEL | | | | | | #4 | #11 | #13 | | | | #12 |
| | ENTEL to Broadcaster | | | | | | #9<br>#10 | #11 | | | | | #12 |
| Total | | | | | | | | | | | | | |

* --- Tentative station
** --- Building
# --- Refer to Fig. IV-5-7

However, program transmission from each provincial city where earth station is constructed, to each regional station is not included in above calculation and the additional construction of terrestrial microwave link should be added. And the condition is quite different by the constitution of the program transmission network in each province.

In the case of the province of mendoza, as tandem connection of TV translator stations is being planned, installation of repeater equipment in the six existing station is required which counts 6/15 of the total repeater stations in the province. Above condition is different in each province and if 70% of the whole station is to build additional terrestrial link, then cost of the satellite and terrestrial transmission becomes almost same, although satellite transmission is somewhat cheaper than terrestrial.

By the reason, it is somewhat difficult to compare the both expenditure. However if it is considered to use satellite for the transmission of national radio and FM programs superimposed on TV program through the link, it can be said that the satellite relay is superior than that of the terrestrial link.

Average life of each terrestrial link for satellite relay will be about 15 to 25 years and the fixed amount depreciation of the construction cost becomes;

(150,000 US$/20)×210=1.6 mil US$.

and the rental fee of one transponder is 1 mil. dollars/year.

Terrestrial microwave transmission would require the depreciation of about 3 mil. US dollars annually and if average life is extended to 25years then the above becomes 1.8 mil. US dollars.

Furthermore, maintenance and operation cost have to be taken into consideration besides other factors such as interest, maintenance and operation cost.

**Table IV-4-9 Comparison of terrestrial and satellite link**

| | Terrestrial link | Satellite link | | |
|---|---|---|---|---|
| Initial Investment | 300 repeater stations (45 mil. $) uplink repeater 100 (15 mil. $) | 8 main stations (8 mil. $) 5 uplink stations (5 mil. $) 1 transponder (1 mil. $)/year | | |
| | | 150 repeater | 180 repeater | 210 repeater |
| | | (22.5 mil.$) | (27 mil.$) | (31.5 mil.$) |
| Total | 60 mil. $ | 39.5 mil.$ | 44.4 mil.$ | 48.9 mil.$ |
| Operation cost/year | 3 mil. $ | 3.5 mil.$ | 3.25 mil.$ | 3.5 mil.$ |

* for program exchange

( in US$ )

At present, "SOVEREIGNTY PLAN" has been implemented to send one TV channel (CH-7/ATC) and telephone, with one and half transponder respectively in order to complement the lack of terrestrial microwave transmission lines.

As shown in Fig. IV-4-8, if two television programs are transmitted within the bandwidth of one transponder, it would be the most economical way for sending programs. However, use of half transponder requires the lowering and limiting of signal levels to avoid the mutual interference, and the use of sharp cutoff IF filters for uplink transmitter and down link receiver. If such transmission is possible, lease of one more transponder for E/U TV broadcasting is not necessary and the rental fee shown in Table IV-4-9 will be saved. Practically, present equipment were designed for one transponder use, so it is required to change the IF bandpass filters of all earth stations scattered in the country, together with phase equalizer units.

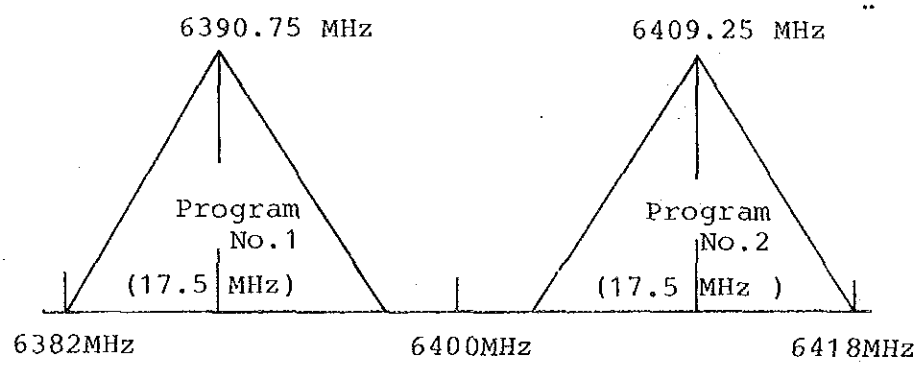



Fig. IV－4－8 Frequency spectrum for half transponder use

# CHAPTER 5 TRANSMITTER AND ANCILLERY EQUIPMENT

## 5.1 Medium Wave Broadcasting (MF)

### 5.1.1 MF transmitter station

All of the broadcast equipment which are introduced during the period of the development plan, are semi-conductorized equipment. Up to now, plate modulation is widely used in the conventional MF transmitter. However, it is necessary to change the concept that the sound quality of MF broadcasting is inferior than that of FM broadcasting.

Accordingly, use of PWM (Pulse Width Modulation) transmitter might be ideal from the view point of high fidelity, especially in the lower and higher frequency band in which PWM provides transparency. In Fig. IV-5-1, conceptional block diagram of transmitter is depicted. At present, vacuum tubes have been utilized for processing PWM signal, however as it requires the series connection of vacuum tubes, impressed voltage becomes about twice times of the ordinary transmitter, resulting some instability due to its intrinsic nature. And it was almost perfectly solved by the improvement of semiconductor performance, using its large current and low voltage.

Protections are provided such as arresters and surge protectors to suppress lightning surge and no serious damages have been heard of. Efficiency of transmitter is also greatly improved and reached to about 70% and the most effective transmitter device has been obtained economically and the danger to the human's body is almost perfectly avoided with low voltage impressed.

Existing transmitter housing will also be used with slight modification and repair.
In Table IV-5-1, construction plan of MF broadcasting is shown.

### 5.1.2 STL (Studio to transmitter link)

Replacement of old STL will be made as it is commonly used with FM program transmission in some cases. Two sets of STL are installed, one for MF and the other for FM.

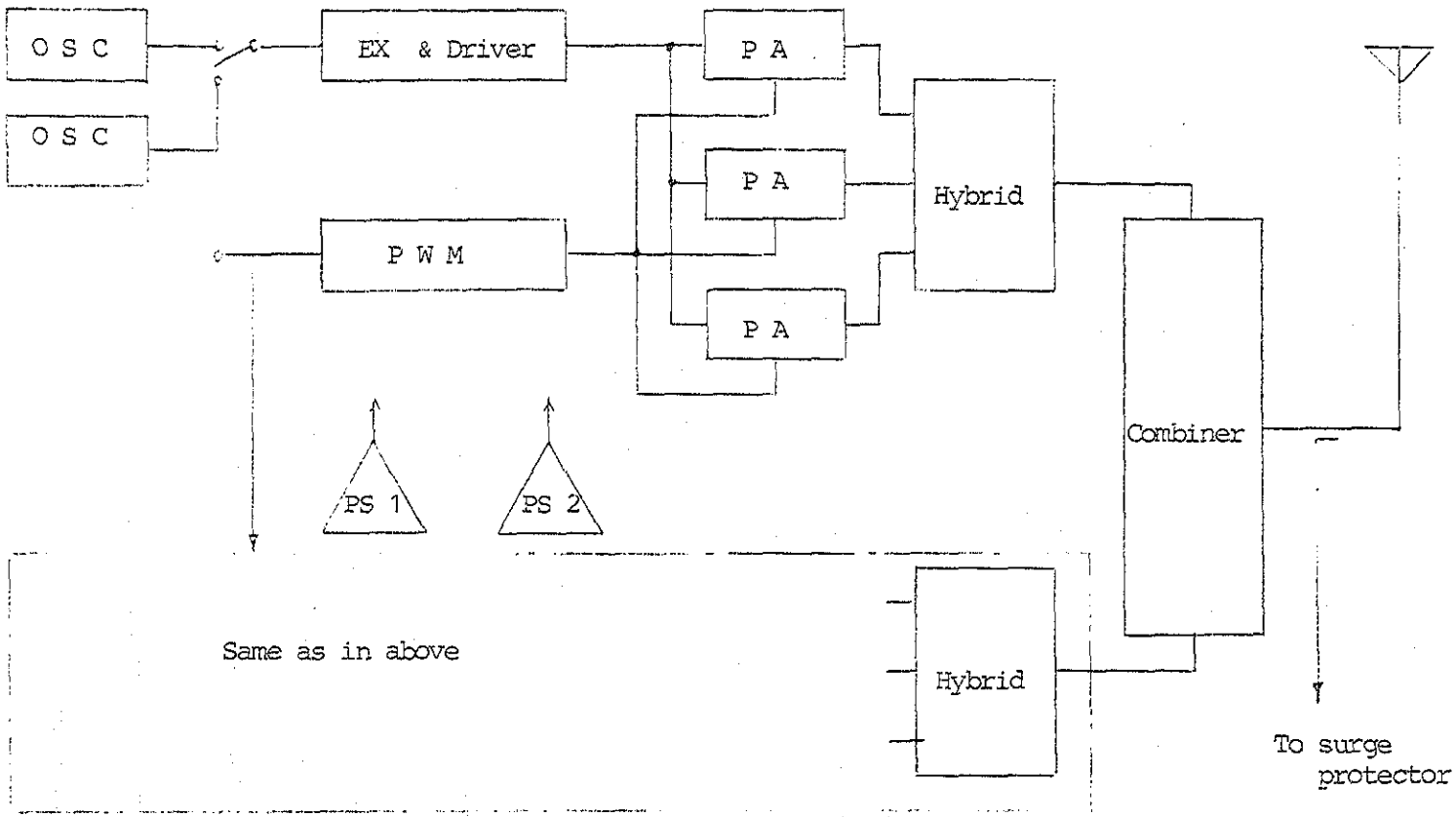



Fig. IV – 5 – 1 Schematic diagram of MF 10/25 kW transmitter

## Table IV – 5 – 1 Summary of constructions for MF broadasting

| | TX output | Ant.Height | Program link | Building ( TX ) | Matching hut | Power supply | Studio | Engine-Gene. | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| San Rafael / N | 25kW | 140 m | VHF/225MHz | 130 $m^2$ | 10 $m^2$ | AC 11000V 3 phase | 100 $m^2$ x 1<br>20 $m^2$ x 2 | 90 kVA | CD x 3 Player x 3<br>Recorder x 3<br>Cassette x 3 etc. |
| Malargue National | 10kW | 150 m | Off-air relay ENTEL line | 100 $m^2$ | 10 $m^2$ | | 50 $m^2$ x 1<br>20 $m^2$ x 1 | 45 kVA | CD x 2 Player x 2<br>Recorder x 2<br>Cassette x 2 |
| Uspallata | 1kW | 60 m | | | | | | | Under construction |
| Las Cuevas | 50 W | 30 m | Off-air relay | Telephone box | ----- | 230 V | ------ | Battery | |
| Mini-power TX | 1 to 5 W | 30 m | Via satellite or off air relay | Weather or Telephone box | ----- | Solar cell or AC 230 V | ------ | Solar cell | |
| Cable service | less than 1W | Higher than 20 m | ditto | ditto | ditto | ditto | ------ | ditto | |
| Tunuyan | 1 kW | Existing | Existing | Existing | ----- | Existing | Existing | Renewal | |
| San Rafael SIP | 25kW | Existing | Existing | Existing | ----- | Existing | Existing | | CD x 3 Player x 3<br>Recorder x 3<br>Cassette x 3 |
| Mendoza National | 25 kW Renewal | Existing | Existing renewal | Existing | Existing | Existing | Existing | Existing | CD x 3 Player x 3<br>Recorder x 3<br>Cassette x 3 |
| " Libertador | 25 kW Power increase | ditto | ditto | ditto | ditto | ditto | ditto | Replace with new 90 kVA | ditto |
| " Cuyo | 25 kW Renewal | ditto | ditto | ditto | ditto | ditto | ditto | Existing | Improvement, under way |
| " Nihuil | ditto | ditto | ditto | ditto | ditto | ditto | ditto | ditto | ditto |

### 5.1.3 Antenna

Antenna mast of new station shall be about 0.53 λ in height and base insulated to increase antenna efficiency. Existing antenna shall be used together with new replaced transmitter. However, in order to improve the radiation efficiency of antenna, feeding of antenna shall be partially modified.

### 5.1.4 Intercom network

Principally exclusively used telephone lines are introduced between studio and transmitter station. While VHF FM link is constructed for emergency.

### 5.1.5 Remote control and supervisory

Considering the stability of MF transmitter facilities, staff stationing and the short distance from studio, remote control equipment is not used.

### 5.1.6 Synchronous broadcating

Independent synchronous broadcasting is introduced by replacing conventional crystal oscillator with precise ones.

## 5.2 FM Broadcasting

### 5.2.1 Main FM transmitter

Studio modulation is principally used to lower the construction cost and to make maintenance easy compared with the separate transmission of left and right signals beside with the easiness for providing a common standby transmitter. It enables the reduction of construction cost and simplification of transmitter system as shown in Fig. IV−5−2, by covering the frequencies of all transmitters with one standby transmitter while it requires the provision of several local oscillators and its switching function.

If such system is made, it will be very easy for improving the function of multiplexing signal in the future and the modification will be made only in the studio modulator.

In Fig. IV－4－4, layout of the structure of antenna tower in Co. Arco is shown.

VHF transmitter and receiver for remote control will be installed at national broadcasting studio, sharing the control function among all broadcasters.

### 5.2.2 FM translator

Schematic diagram for FM translator is almost same as of the main transmitter stations, except for the provision of detection circuit of coming signal from upstream station and the detection of the failure of translator and its logic circuit. And remotely controlled functions are taken off.

### 5.2.3 Antenna (Transmitter)

2－D (dipole) or 4－D antenna is commonly used in all main transmitter stations and Yagi or corner antenna is used for translators to use in common.

### 5.2.4 Multi－hop relay

Degradation of sound signal through the transmission of multi－hop relay shall be low enough to serve with the requirement of audience. Typical deterioration of sound quality is shown in Fig. IV－3－3, as explained previously.

### 5.2.5 Others

Introduction of facsimile, Quad and/or SCA service are not taken into consideration, although in some countries such an additional service have been continued.

However, extended use of FM for other service is under study and definite objective is not yet established internationally. So in the development plan, such kind of service is not included. And even if the new service becomes necessary, modification of the system is quite easy because of the studio modulation.

Separation of each channel is sufficient in each region, and it will enable the future expansion of bandwidth for the extended use of FM signal as explained previously.

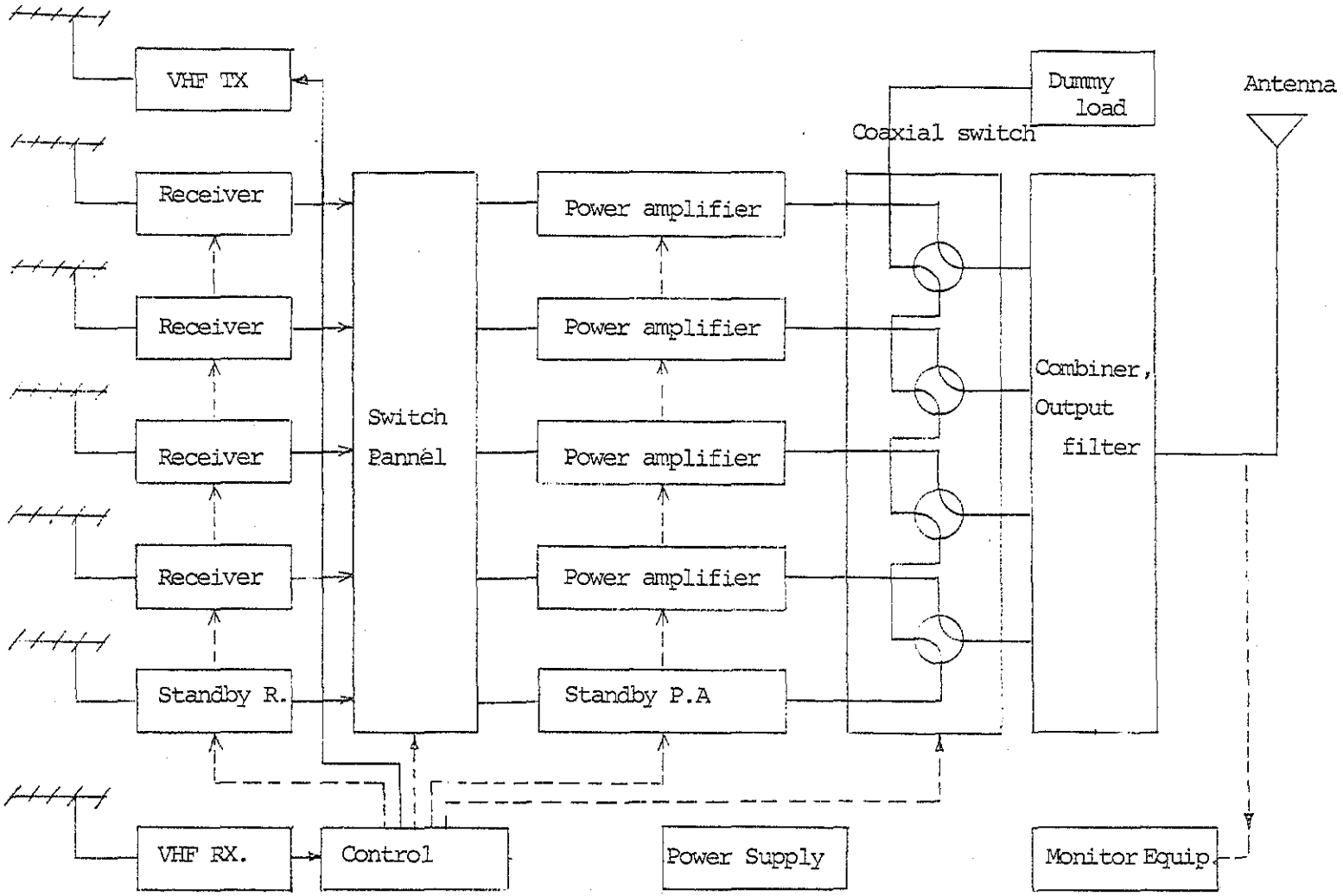



Fig. IV – 5 – 2 Schematic diagram of FM transmitter and translator

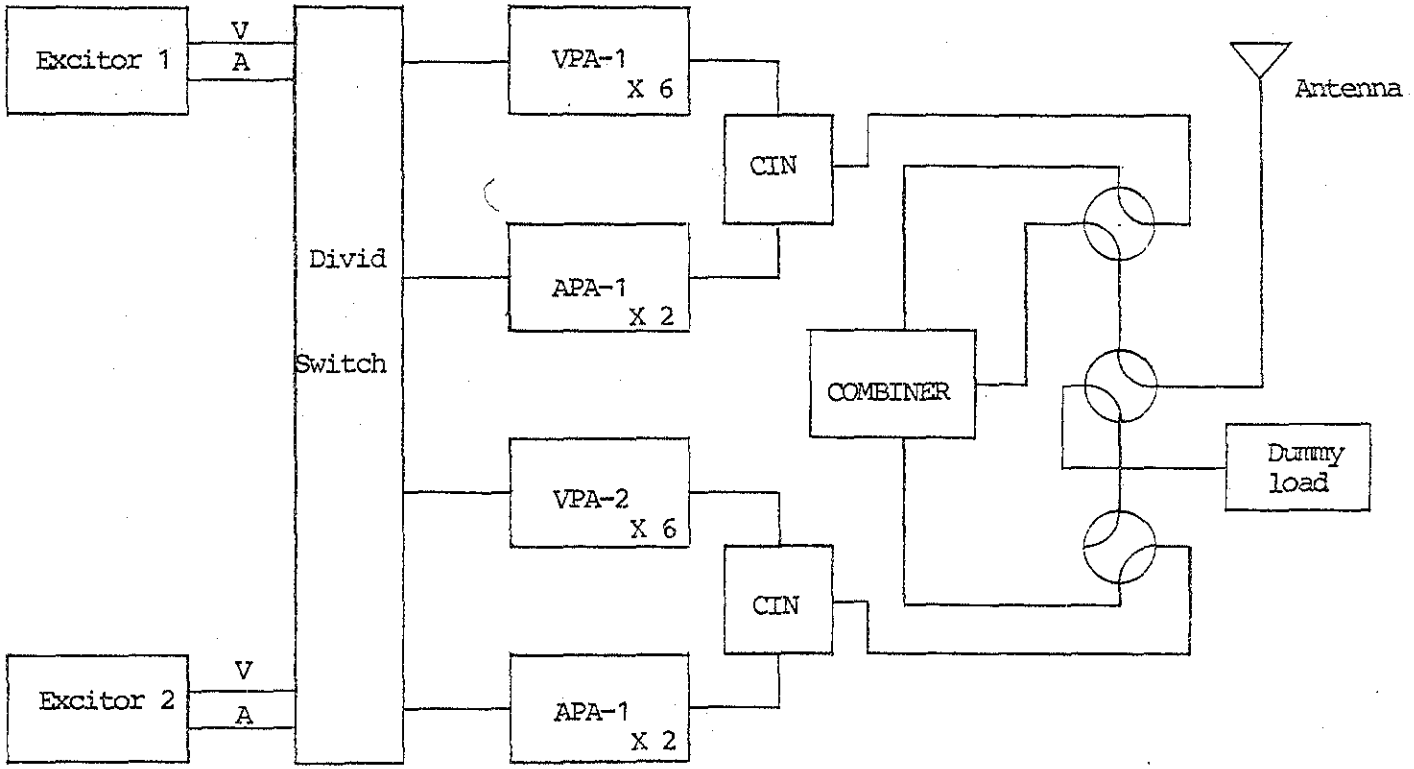



Fig. IV – 5 – 3 Schematic diagram of UHF 10 kW transmitter

## 5.3 Television Broadcasting

### 5.3.1 Television transmitter station

All solid state transmitter shall be introduced for VHF and UHF broadcasting. This results reduction of failures and the MTBF (Mean Time Between Failure) becomes more than several tenth of thousands hours. Provision of redundancy for excitor is required for keeping the reliability of transmitter, because other parts are almost fully dually equipped with and the provision of spare parts will be reduced greatly except for special ones. Applied voltage to each circuit is low enough and the reliability of equipment becomes extremely high.

Although it can be expected to serve ideally when redundancy system is fully provided from power supply to antenna system, however as the failure of antenna system scarcely happens, redundancy is not provided for aerials.

As already explained, it is required to serve with higher field strength for UHF than VHF, and output power of UHF transmitter will be specified to 10 kW together with high gain UHF antenna to give sufficient field strength for reception. An example of schematic diagram of UHF transmitter is shown in Fig. IV−5−3, and in Fig. IV−5−4 block diagram of main TV station is depicted.

### 5.3.2 Translator

In order to receive the TV signal of upstream station for rebroadcasting by suppressing neighbouring interferring signal, extremely sharp R.F. and IF filters are used together with the aid of antenna shielding and so on.

Protection for lightning surge shall be made sufficiently and provision of standby equipment is not considered except for some important stations.

### 5.3.3 Antenna

Like in the case of FM, 2 or 4−dipole antenna is used for main transmitter station and Yagi or corner antenna is used for translator stations in common as much as possible.

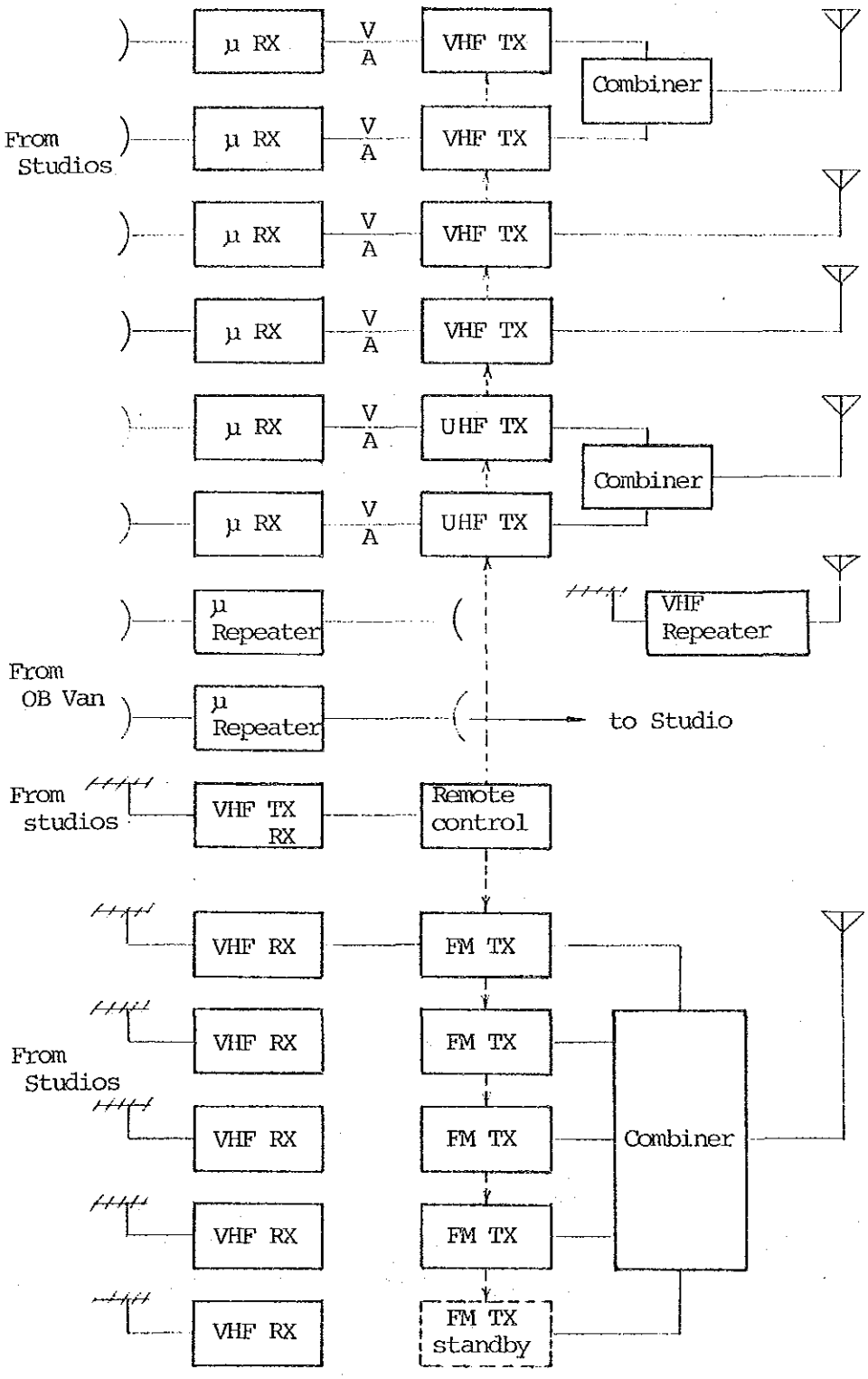
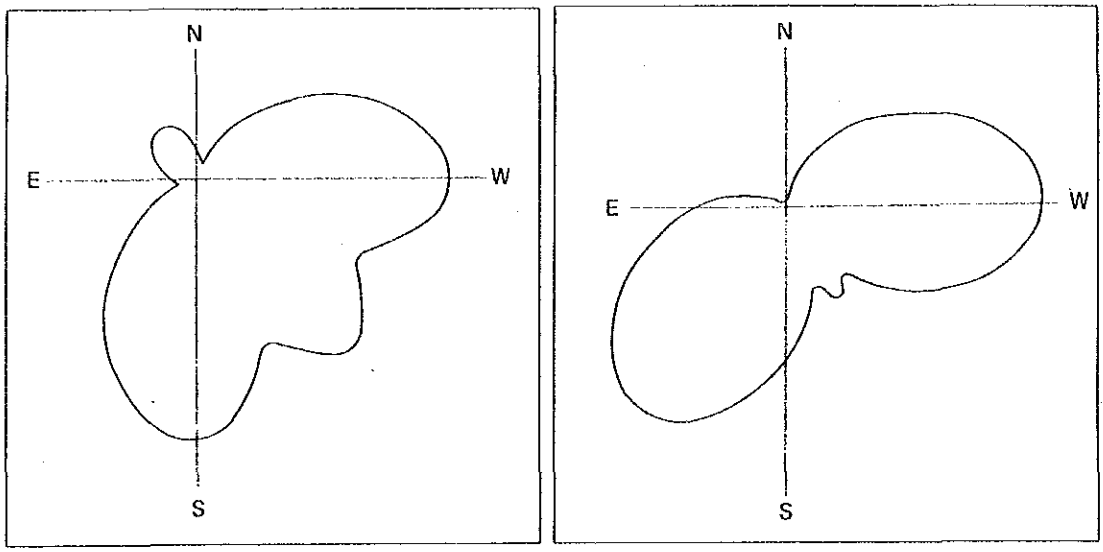



Fig. IV – 5 – 4 Transmitter block diagram in Co. Arco and Co. Alto

Typical example of antenna directivity which conforms with Mendoza and San Rafael stations are shown in Fig. IV－5－5. Beam tilting is applied to the main transmitter antenna at the top of high mountain.




Directivity of TV antenna at Co. Arco

Directivity of TV antenna at Co. Alto

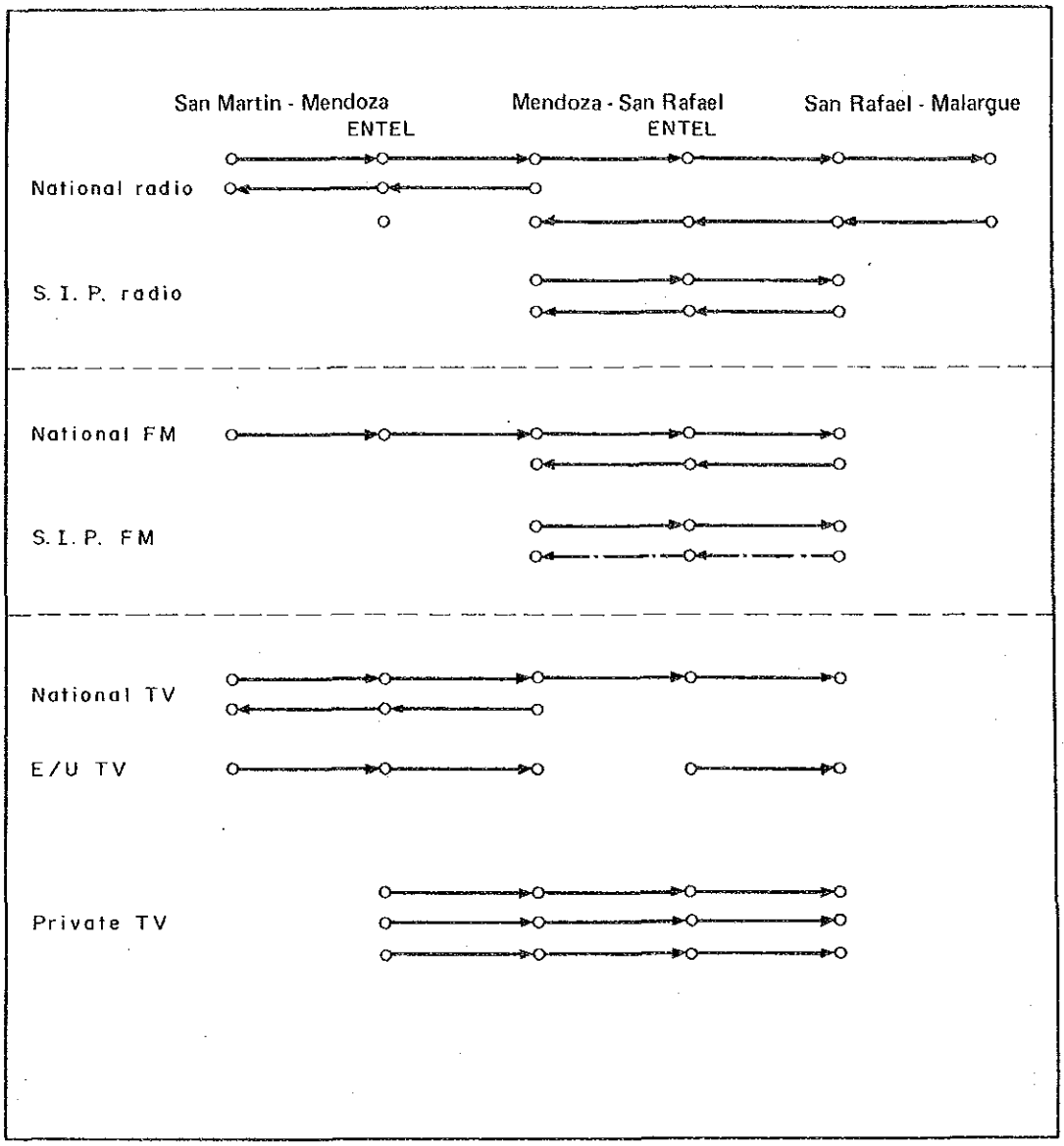
Fig. IV－5－5 Directivity of TV antenna

## 5.4 Sound Program Transmission Line

### 5.4.1 National radio and FM broadcasting

Table IV－5－2, Fig. IV－3－4 and Fig. IV－5－6 indicate the routes of program transmission for MF and FM broadcasting respectively. Formation of news program will be national, provincial and municipals for making switching easy.

## Table IV – 5 – 2 Sound program transmission lines




Note : 1. Sound program transmission of TV is included

2. For radio and FM, transmission lines of private broadcaster is excluded.

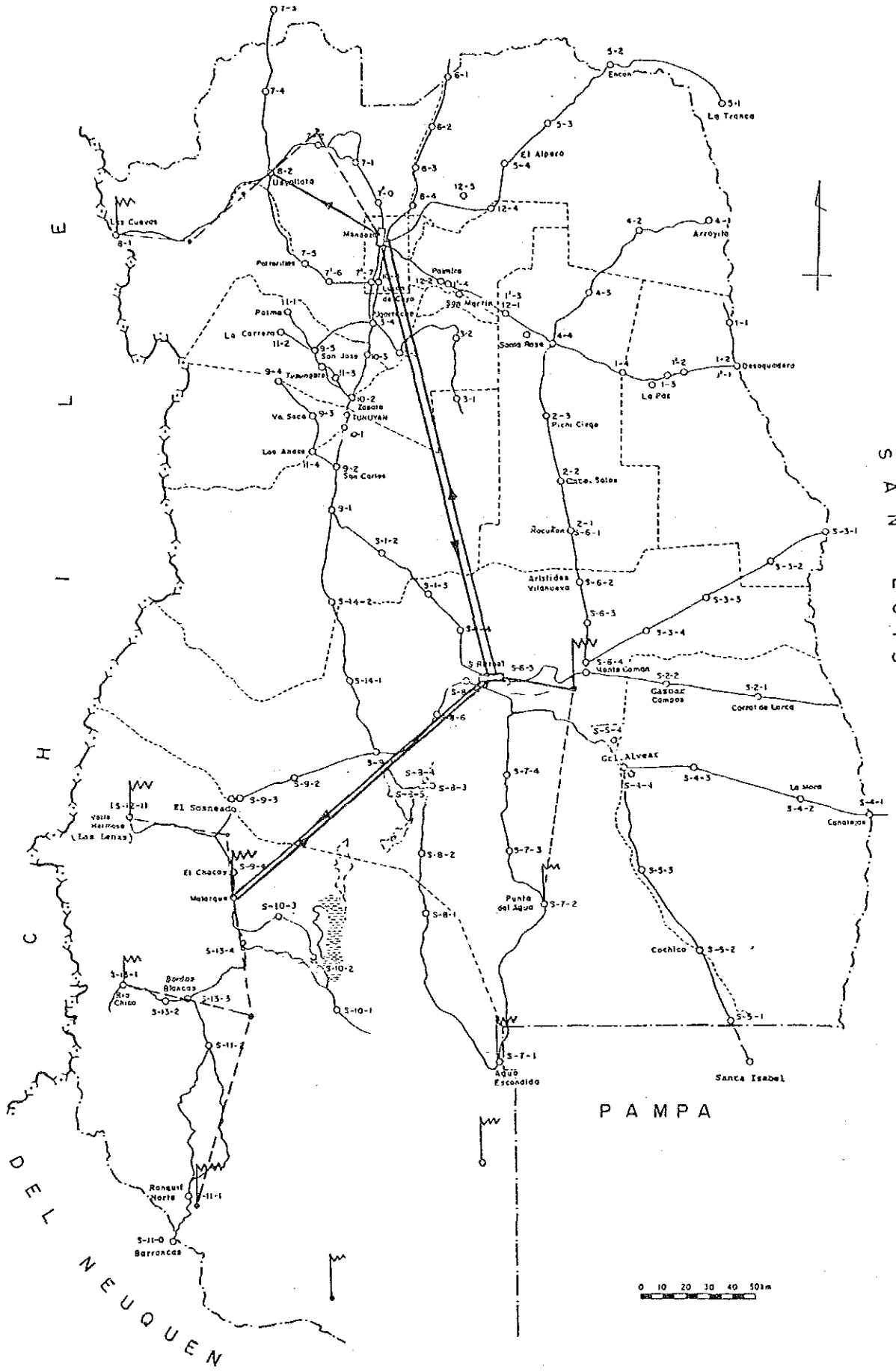



Fig. IV – 5 – 6 National radio program transmission network

### 5.4.2 Other broadcaster

As shown in Table IV－5－2, network composition of each broadcaster is different regionally. There is a possibility of program exchange between Libertador in Mendoza and Radio San Rafael, because they belong to S.I.P. and the exclusively used both way program transmission lines are necessary at least one for both MF and FM in common.
In the case of commercial broadcaster, it is not clear the mutual cooperative relationships in the program exchange so it is excluded from the plan. Both Radio San Rafael and Radio Malargue belong to S.I.P., however as it is included in the telecommunications network plan to provide wide－band program transmission lines, program exchange becomes possible and off air relay is used for emergency.

### 5.4.3 Mini－power MF station (incl. CATV)

Both mini－power MF and FM transmitter and cable transmission service relay the program coming from satellite or signal received from upstream station.
In the case of satellite reception, decoder is used to separate the multiplexed sound signal.

## 5.5 Television Program Transmission Lines

### 5.5.1 Program transmission line between Buenos Aires and Mendoza

As for the TV network expansion plan, it is expected to serve with six TV programs, four programs in VHF band and two in UHF in Mendoza and San Rafael. And the provision of six transmission lines will be necessary in general. However, it might be financially difficult for the ENTEL to install during the period and considering the saving of construction and rental cost, effective use of program transmission lines is taken into account as explained later.

(1) Satellite program line

In connection with the Presidential Decree on CH－7(ATC), one transponder is exclusively used for national program transmission. Transmission lines are constructed between Mendoza earth station at San Martin and ENTEL Mendoza until June 1990, to send the received signal to the national studio and then to Mendoza TV transmitter station. Concerning the education/university broadcasting programs, it is sent via satellite. In order to superimpose the national radio and FM programs with television program, base band spectrum shown in Fig. IV－2－1 is recommended to use.

(2) Terrestrial link

Digitalization of existing telephone network is realized between Mendoza and San Rafael and vacant link is reused for TV transmission in 1995.

(3) Use of program transmission line

Effective time share use of the limited number of program transmission lines is a difficult matter for broadcasters and in some cases, there happens competition of contract for special programs among broadcasters to broadcast through their own channel, however as it is a matter of political problem, it is not the subject of this report. So time sharing only is taken into account for obtaining the consensus of each broadcaster. As it is expected to broadcast national program from 11:00 to 01:00 in the midnight for a while, so satellite can be used for other broadcasters from 01:00 to 11:00 beside with the use of existing one transmission line connected to Buenos Aires. Before the start of broadcasting of CH－7 and CH－9 program in San Rafael, CH－6 can exclusively use the TV microwave link between Mendoza and San Rafael, accordingly it might be convenient for each broadcaster if such use is approved by the Government of Argentina. To do so, it will be necessary to coordinate with program originating company, however as it is belonging to the matter of nationwide problem, it is hoped that the Government and ATA will moderate to solve the problem of lack of transmission lines.

### 5.5.2 Program transmission line between Mendoza and San Rafael

Composition of program transmission lines will be determined with the commencement of TV broadcasting in San Rafael by CH−7 and CH−9, the digitalization of telephone lines (1995) and lease of one more transponder channel for education/university broadcasting, and the following procedures are taken.

(1) First stage

As shown in Fig. IV−5−7 and in Table IV−4−8, TV transmitter stations for national and CH−6 are constructed by the end of 1992 at the top of Co. Alto (or Co. Negro) and the receive only earth station for national program is built within the premises to receive the signal coming from satellite directly.

(2) Second stage

Digitalization of telephone lines between Mendoza and San Rafael and the conversion of vacant lines to television are not completed by 1991 when the start of broadcasting by CH−7 and CH−9 is expected in San Rafael, so it is required to relay their own program through off−air relay to San Rafael from Mendoza.

As it is meaningless to broadcast Mendoza's commercial in San Rafael, it will be necessary to insert San Rafael's commercial by constructing small studios in San Rafael. In the fall of 1995, above mentioned one more converted television transmission line will be available, and the two lines can be used by CH−7, 9 and 6. In case, broadcast program hour is increased more than the present state, it is required to increase program transmission line at the same time, however as its increase can not be estimated at present, future plan will be made based on the assumption that broadcasting is continued with same order of program hour.

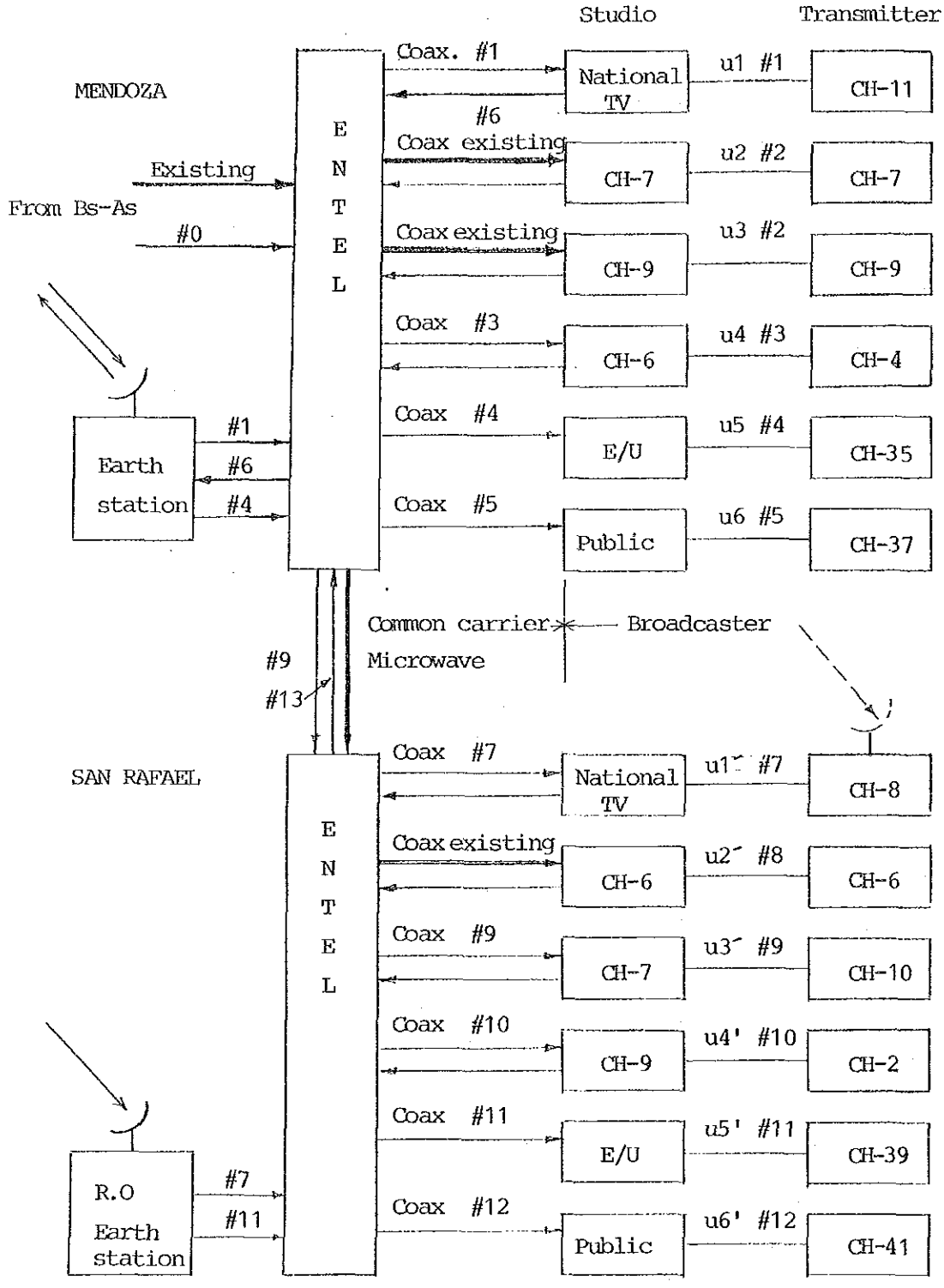



Fig. IV – 5 – 7 TV program transmission lines

(3) Third stage

Commencement of education/university broadcasting is expected in the middle of 1995, so lease of one more transponder will be effective in that day. However as this kind of programs are broadcast more than two times repeatedly, so it is not necessary to occupy the transponder fully for 24 hours. If video cassette filing system which operates automatically, is installed in each E/U station, to record and reproduce the programs, and assuming that the broadcasting will start at 9:00 in the morning and finish at 24:00, then net use of satellite transponder becomes less than half of broadcasting hour, i.e. about 7 hours and 30 minutes per day. Vacant hour can be used for the transmission of other channel programs directly from Buenos Aires as mentioned before.

### 5.6 Program Exchange Network

In order to make possible the exchange of national local programs among many major provinces such as news and important event, improvement and conversion are made in San Martin from R.O. to T.R. station. This schedule will be determined by the Government of Argentina, however assumption is made to convert to T.R. station by the middle of 1996.

The S.O.C. has a plan to provide such installations in major cities, such as Cordoba, Mendoza, Comodor etc. Under the plan, it becomes possible to originate programs from above cities and to receive the program in every R.O. station scattered in the country. Terrestrial network will also become usable by the conversion of telephone network from analogue to digital successively. Concerning the program exchange of commercial broadcasters, it will be necessary to conform with the program affiliating relationships among major broadcasters of capital and provincial cities.

As for the start of commercial stations' program exchange, it must be studied by the whole commercial broadcasters within the country under the leadership of ATA, considering the future relationships of teletext service and TV program originations.

## 5.7 Multi-hop Relay

1) TV broadcasting

As shown in Table IV-4-4, multi-hop relay of television broadcasting at VHF band becomes adjacent channel reception in many cases because many stations are operated in multi-hop relay. The reason is that the service is mainly aiming at the use of VHF band effectively and to make easy for introduction of sound-multiplexed broadcasting in the future. Adjacent channel reception is difficult with conventional receiver which has ordinary selectivity to avoid interferrence, and reception of incoming signal at separated place from translator and the use of adjacent channel notch filter are the most effective way for the purpose, and it is not so difficult matters in case of low power translator station due to fairly large D/U ratio obtainable.

Out of band spurious radiation of each translator should be carefully suppressed which falls into the receiving channels of other station within the same premises. Picture quality radiated from the tandemly connected translator station shall be within the tolerance of grade three for five grade evaluation as shown in the polar representation of six parameters, S/N, C/L gain and delay, DP, DG and 2T in Fig. IV-4-3. Degradation of picture quality can be estimated following the law of addition for the above performance through tandem connection of network defined by CCIR. Routes of multi-hop relay and technical parameters are shown in Table IV-5-3.

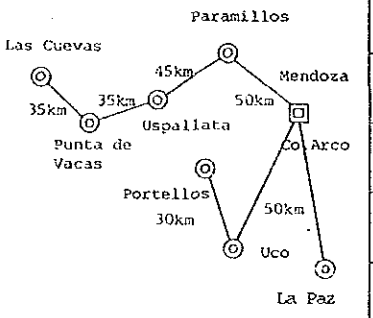
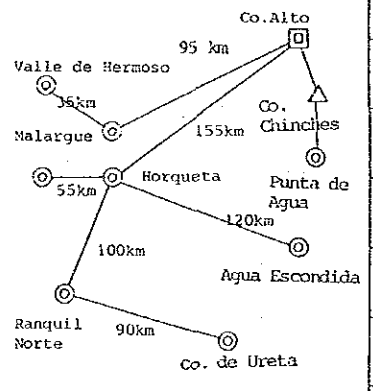
2) FM broadcasting

Under the assumption that the service area of FM broadcasting is defined as of the area served with more than 36 dB/10 m, then the coverage of each station becomes greatly wider and the necessary installations reduce in number to a great extent. Field strength of Co. Arco FM stations in La Paz is estimated to about 30 dB, so there is some perplexity whether installation should be made at the initial stage of construction or not. Field

strength in Malargue radiated from Co. Alto is estimated to more than 36 dB/10 m, so construction of FM station will be delayed for a while, however as the stereophonic reception requires to serve with 17 dB higher field strength than monophonic, construction of Malargue (El Chacay) and La Paz stations for national FM is made until 1995.

At Horqueta, construction of FM station is planned to cover the area of Bardas Blancas, Buta Billion, and the village in Ranquil Norte shielded from Horqueta will be covered by the translator constructed at the southern mountain of the village.

**Table IV－5－3 TV Program relay and estimated receiving field strength at each station**

| Programme relay route | Span | Distance | Ant. TX,RX Gain | TX Power | $h_1$ (m) | Direct. | Estimated receiving Field strength |
|---|---|---|---|---|---|---|---|
|  | Mendoza--Paramillos | 50 km | 6 dB | 5 kW | 150 | 0.2 2.5<br>2.3 | 55 dB |
| | Paramillos—Uspallata | 45 km | 10 dB (c)<br>6 dB (d) | 10 W | 1200 | 0.01 | 58 dB |
| | Uspallata--<br>Punta de Vacas | 35 km | 10 dB (c)<br>6 dB (d) | 50 W | 1000 | 0.04<br>0.01 | 62 dB |
| | Punta de Vacas—<br>Las Cuevas | 35 km | 10 dB (c)<br>6 dB (d) | 10 W | 1800 | 0.001<br>0.009 | 62 dB |
| | Uco--------Portellos | 30 km | 10 dB (c)<br>6 dB (d) | 40 W | 150 | 0.01<br>0.04 | 45 dB |
|  | Co.Alto--Horqueta | 155 km | 13 dB (4d)<br>6 dB (d) | 5 kW | 300 | 3<br>2 | 73 dB |
| | Horqueta--Ranquil Norte | 100 km | 10 dB (c)<br>6 dB (d) | 40 W<br>30 W | 1200 | 0.01<br>0.01<br>0.02 | 47 dB |
| | Horqueta--<br>Agua Escondida | 120 km | 10 dB (c)<br>6 dB (d) | 40 W<br>7 W | 800 | | 35 dB |
| | Ranquil Norte--<br>Co. de Ureta | 90 km | 10 dB (c)<br>6 dB (d) | 10 W<br>9 W | 600 | 0.001<br>0.009 | 45 dB |
| | Co. Alto—<br>Malargue | 95 km | 13 dB (4d)<br>6 dB (d) | 5 kW | 300 | | 40 dB |
| | Horqueta-- Rio Chico | 55 km | 10 dB (c)<br>6 dB (d) | 40 W<br>3 W | 1200 | | 55 dB |
| | Ap. El Chacay--<br>Valle Hermoso | 35 km | 10 dB (c)<br>6 dB (d) | 10 W | 70 | 0.01<br>0.01<br>0.03 | 50 dB |

Direct means antenna directivity of upstream station

Furthermore, new MF station which is expected to build in Malargue (10 kW) can not cover the such mountainous isolated areas, so complementary use of FM for MF program is also taken into account to cover the unserved area of MF, if necessary.

Signal transmission to Valle Hermoso is made via El Chacay, however if it is found that the sufficient field strength is obtained near the station Valle Hermoso, then direct reception of signal from San Rafael is adopted. Concerning the program relay to Las Cuevas, it is sent from Co. Arco to Las Cuevas via Paramillos, Uspallata and Punta de Vacas.
Deterioration of sound signal quality should be avoided as much as possible.

### 5.8 Intercom Networks

Telephone intercom network is constructed between studios and transmitter stations to allow the routine communication and data transmission on the job as shown in Fig. IV－5－8 and the VHF wireless link is also provided, as shown in Fig. IV－5－9.

1) National telephone intercom network

   Two telephone lines are exclusively leased from ENTEL for telephone and data transmission between Buenos Aires and Mendoza and the intercom network will be made within the province.

2) VHF intercom network

   VHF intercom network shall be built for inter-station communications including main station and translators. For small power station, VHF antenna only is provided to serve for maintenance purpose and so on. In case the maintenance job is implemented, portable wireless equipment is carried to communicate with upstream station.

3) Data network

One transmission line is constructed between the main office of national radio/TV in Buenos Aires and National Mendoza to make facsimile, telex and computer communication system, however its construction will be on and after 1995.

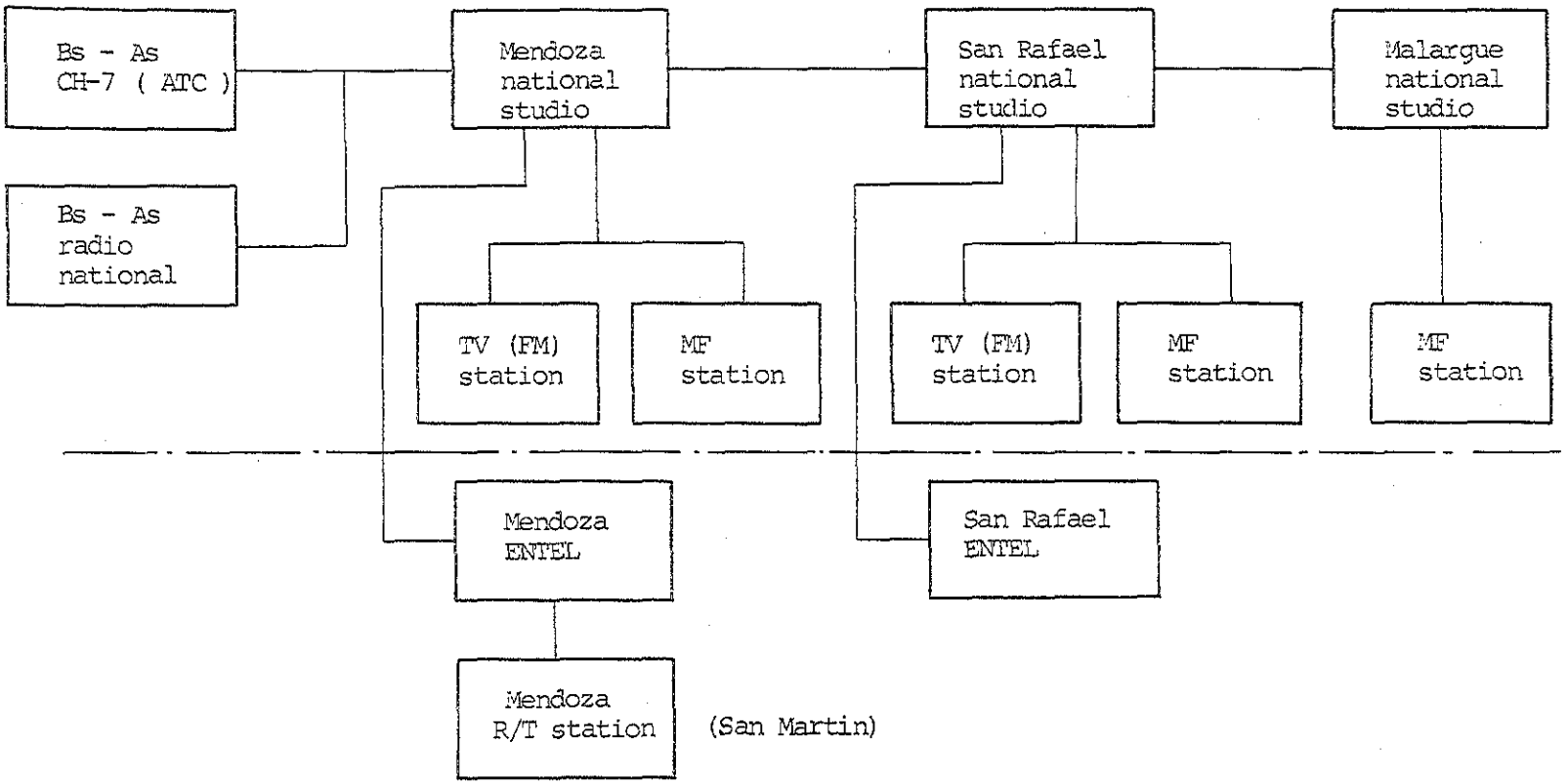
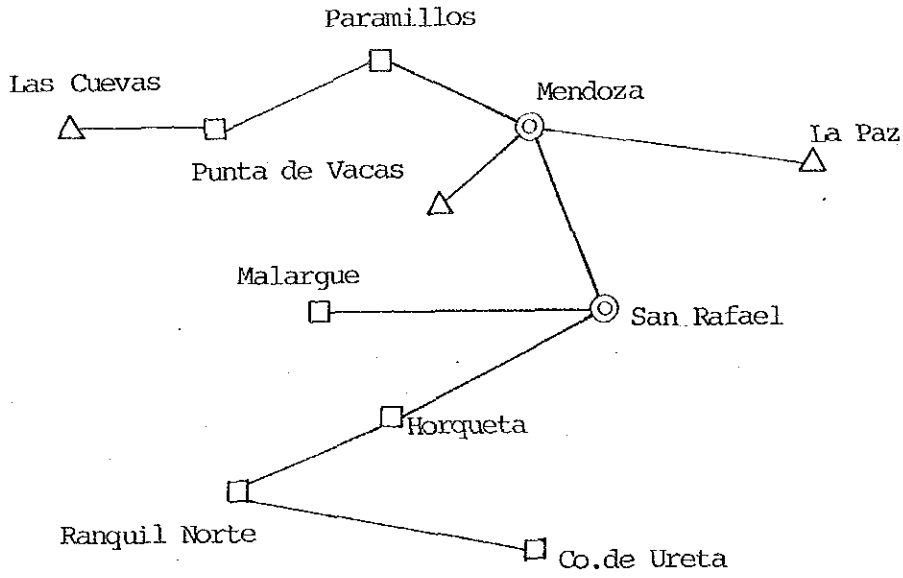



Fig. IV - 5 - 8 Telephone network of national broadcasting in Mendoza




| | TX Output | Antenna | Remarks |
|---|---|---|---|
| Mendoza | 50 W | Omni-direct. | Base station |
| San Rafael | 50 W | ditto | ditto |
| Paramillos | 1 W | Yagi x 2 | Relay station |
| Punta de Vacas | ditto | ditto | ditto |
| Malargue | ditto | ditto | ditto |
| Horqueta | 5 W | ditto | ditto |
| Ranquil Norte | 1 W | ditto | ditto |
| Co. de Ureta | ditto | Omni-direct. | ditto |

Fig. IV-5-9 Route of wireless link

## 5.9 Mini-power Station

As for the method of program transmission to each mini-power transmitter station, it is classified into the following three;

1) Signal reception via satellite

2) Signal reception via UHF relay station

3) Other methods

Sound programs are superimposed on the TV baseband to allow the transmission of national radio and FM programs from Buenos Aires. Accordingly isolated areas where terrestrial transmission of program is impossible, will be served with national program only and not provincial program.

If it is required to serve with provincial program, reception of upstream station is necessary to fulfil the requirement. To cope with such demand, use of the beverage antenna for MF reception will be one of the solution to suppress the interfering signal with its directivity.

As already mentioned, all radio, FM and TV programs are sent via Paramillos relay station to Uspallata and its downstream stations. As for the service of MF at Agua Escondida and Agua del Toro, reception of National San Rafael is effective although there is a possibility of suffering slight co-channel interference.

Output power of MF mini-power station is 10 or 1 watts and location of these stations is shown in Table IV-2-3. Equipment are put within the weather box or standard telephone booth and solar cell is used as a power supply together with battery and its charger, in case commercial power line is not available. Height of antenna is several tenth of meters. In case of isolated areas, all radio, FM and TV mini-power stations are built within the same box to save the construction cost. Equipment of mini-power stations are outlined in Table IV-5-5.

## Table IV – 5 – 5 Equipment list of mini-power translator stations

| | M F | | | F M | | | T V | | | Others |
|---|---|---|---|---|---|---|---|---|---|---|
| | Prog. | TX | Ant | Prog. | TX | Ant | Prog | TX | Ant. | |
| Paramillos | UHF | 3W,UHF | Parab. | FM/ VHF | 2W VHF | Yagi | | 10W UHF | Parab. | Solar Cell & Engine-gene 1kW |
| Uspallata | UHF RX x 2 | 1 kW | | FM/ VHF | 10W VHF | Yagi 5L x 2 | U/V | 50W VHF | Corner x 2 | A.C Engine Gene |
| Punta de Vacas | MF relay | UHF 3W | 16 EL Yagi | FM/ VHF | 2W VHF | Yagi 5L x 2 | VHF relay | 10W VHF | Corner | A.C Engine Gene |
| Las Cuevas | UHF RX | 10 W | 30 m | FM/ VHF | 1W VHF | Yagi 5L x 2 | VHF relay | 5W VHF | Corner | A.C Engine Gene. |
| Uco | ------ | ------ | ------ | FM/ VHF | 5W VHF | Yagi 5L x 2 | VHF relay | 50W VHF | Corner | A.C Engine Gene. |
| Potrerillos, Cachueta | ------ | ------ | ------ | | | | VHF relay | 3W VHF 1W VHF | Yagi | A.C |
| Malargue (Chacay) | | | | FM/ VHF | 5W VHF* | Yagi x 2 | VHF relay | 50W VHF | Corner | A.C. Engine Gene. |
| Valle Hermoso | | | | FM/VHF | 1W VHF | Yagi x 2 | VHF relay | 5W VHF | Corner | A.C Engine Gene |
| Horqueta | MF relay | FM 20W VHF | corner x 4 | FM/VHF | 20W VHF | Corner x 4 | VHF relay | 50W VHF | Corner | A.C Engine Gene |
| Ranquil Norte | FM relay | 1 W | 20 m | FM/VHF | 5W VHF | Yagi Corner | VHF relay | 10W VHF | Corner Yagi | Engine Solar Cell |
| Co. de Ureta | | | | FM/VHF | 5W VHF | Yagi x 4 | VHF relay | 10W VHF | Corner | Engine Solar CEll |
| Co. Chinches | | | | FM/VHF | 1W VHF | Yagi | VHF relay | 3W UHF | Yagi | Engine Solar Cell |
| Punta de Agua | FM RX | 1 W | 20 m | FM/VHF | 1W VHF | Yagi | UHF relay | 3W VHF | Yagi | Engine Solar Cell |
| Agua Escondida | FM RX | 1 W | 20 m | FM/VHF | 1W VHF | Yagi | VHF relay | 1W VHF | Yagi | Engine Solar Cell |
| La Paz | | | | FM/VHF | 10W/VHF | Corner | VHF relay | 40W UHF | Twin loop | A.C Engine Gene. |

When the reception of upstream station is impossible, satellite reception will be made, and the diameter of receiving antenna shall be small as much as possible, ensuring the carrier to noise ratio (C/N) of better than 12 dB. For transmission, Yagi or Dipole antenna is used to satisfy the local conditions. However, transcoding from PAL–B to PAL–N is necessary.

## 5.10 Emergency Engine Generator

(1) TV and FM broadcasting

1) Co. Arco and Co. Alto (Co. Negro)

Engine generators are installed referring to the construction schedule, power consumption and broadcasting hours, as shown in Table IV–5–6. Automatic functions shall be provided and high revolution engine generators are introduced to reduce the size of engine generator.

**Table IV – 5 – 6 Emergency engine – generator for main station**

| Station | Capacity | Remarks |
|---|---|---|
| TV national<br>TV CH-7 | 75 kVA/220 V | Diesel 3 phase |
| TV CH-9<br>TV CH-6 | 75 kVA/220 V | Diesel 3 phase |
| TV Public<br>TV E/U | 100 kVA/220 V | Diesel 3 phase |
| FM 4 stations | 15 kVA/220 V | Diesel 3 phase |

**Table IV – 5 – 7 Power supply for translator station**

| Output | Power supply | Remarks |
|---|---|---|
| 50 W | 3 kVA/220 V | TV VHF 50W (200W) x 4 = 0.8 kW<br>UHF 200W (450W) x 2 = 0.9 kW<br>FM 10W (100W) x 4 = 0.4 kW |
| Less than 10 W | Solar Cell | Capacity is determined refer to the local conditions |

2) Translator station

Capacity of engine generator and solar cell which are used commonly with all broadcasters within the same premises is determined referring to the power consumption of the station. Estimated power consumption of translator is shown in Table IV－5－7.

3) Solar cell

Capacity of solar cell and auxiliary battery is designed under the assumption that sun shine days are more than 250 days in a year and the continuation of cloudy or rainy days is less than one week. As the price of solar cell/watt is estimated less than 16 US dollars, comparison shall be made of the total construction cost of commercial power supply and solar cell including operating cost etc.

(2) MF broadcasting

40 kVA and 60 kVA emergency engine generators are installed at National Malargue and San Rafael stations respectively.

# CHAPTER 6 STAFF PLANNING

## 6.1 Staff

As aforementioned, in principle, the facilities of the television and FM transmitting stations in this plan are arranged on the basis of unattended operation, and the fundamental project is progressed on the concept of joint construction and joint operation partially.

Accordingly, as described in the section of facility, a general staff planning is made in considering an appropriated backup system. On the other hand, as local programs and a part of nationwide network relay programs are produced at studio and furthermore, coverage of outdoor events take place, staffs for these are also necessary to be taken into account.

### 6.1.1 Television transmitter station

(1) Television

As any facilities which are designed by the latest technique has some defects, even if sufficient running test is conducted during the period of initial acceptance and inspection tests, it is necessary to station some supervisory staff after the station is put into operation for a while.

As for the broadcasting hours, initially the present state of from 11:00 to 01:00, a total of 14 hours will continue for some time, but in the future a total of 18 hours is expected. For the reason, it is expected that the present two shifts shall be changed to three shifts.

However, from now to the end of 1995, it is continued with two shifts, and after that when one microwave line is added (diverted from telephone) it is expected to become three shifts.

For two shifts ..... 2 pers. x (2+1) team+1 pers. = 7 pers.
For three shifts ..... 2 pers. x (3+1) team+2 pers. = 10 pers.

It is to be noted that as all facilities become semiconductor type, the station will operate stably, and unattended operation is possible. Therefore, it is recommended to operate unattended at an appropriate time. However, as for both Co.Arco and Co.Alto (or Co.Negro) station, the above staff shall be initially stationed in order to cope with various kinds of activities.

If the staff could take charge of the common work of each station, the number of persons could be saved. Therefore, there are two methods: each broadcaster could mutually send out persons to form a team and entrust all the work to this team, or establish an affiliated company exclusively engaged for operation and maintenance, and entrust the work to the company.

(2) Maintenance staff for unattended stations (National TV/FM/Radio)

Considering the maintenance of national broadcasting network in the province and the surrounding three provinces, San Luis, San Juan and Neuquen, one patrol vehicle shall be provided in order to support the establishment of a maintenance system for the country. However, if a maintenance schedule of 1 or 2 day/year is estimated for one station, it is necessary to arrange (2 pers. + 1 pers.) /per year.

(3) Studio site staff

The number of staff depends on the amount of local program production and its hours, but the following staff is required at least.

| | |
|---|---|
| TV master control ..... Technical staff; | |
| 3 pers. x (2+1) team+1 pers. = | 10 pers. |
| Studio ..... Program staff; | |
| 4 pers. x (2+1) team+1 pers. = | 13 pers. |
| Outside broadcast ..... O.B staff; | 2 pers. |
| General affairs ..... | 14 pers. |
| Total | 39 pers. (44 pers.) |

Above is the staff necessary for one station, but regarding the E/U station which do not produce local programs, they can be operated unattended because they are merely sending out station call sign and test pattern into the nationwide program. As the E/U station will be operated as national broadcasting, the staff are not taken into account here.
(E/U: Education/University Broadcasting)

### 6.1.2 Radio/FM broadcasting

(1) Transmitting station

In principle, all FM transmitting stations are expected to operate completely unattended, and all medium wave transmitting stations will be attended until the old equipment are replaced with new ones. In addition, one technical staff will be stationed under the present staff system.

Accordingly, staff for one station becomes,

4 pers. + 1 pers. (custodian) = 5 pers.

(2) Studio

Master control.....Technical staff;

2 pers. x (2+1) team + 1 pers. = 7 pers.

Studio.....Program staff:

2 pers. x (2+1) team + 1 pers. = 7 pers.

General affairs..... 14 pers.

Total 35 pers.

On the basis of the above concept explained in 6.1.1 and 6.1.2, the staff required are shown in Tables IV-6-1 and IV-6-2.

## Table IV – 6 – 1 Television broadcast staff

| Station | Studio | | Transmitter station | |
|---|---|---|---|---|
| | (Headquarters) | (Branch) | (Headquarters) | (Branch) |
| National TV | 39 (44) | 5 (6) | 2 | 2 |
| CH-7/LV 89 | 42 (47) | 7 (8) | 1 (2) | 1 |
| CH-9/LV 83 | 42 (47) | 7 (8) | 1 (2) | 1 |
| CH-6/LV 84 | 42 (47) | 7 (8) | 1 | 1 (2) |
| E/U TV | 3 | 3 | 1 | 1 (2) |
| Public TV | 39 (44) | 30 (35) | 1 (2) | 1 (2) |

Branchs are located at San Rafael and Mendoza for LV89,LV83 and LV84 respectively.

## Table IV – 6 – 2 Radio/FM broadcast staff

| Broadcasting station | | Studio site | Transmitting station | Remarks |
|---|---|---|---|---|
| National R. | (N) | 35 | 5 ( 1) | (Custodian only) |
| Libertardo R. | (Pu) | 30(35) | 5 ( 1) | ( ditto ) |
| Cuyo R. | (P) | 35 | 5 ( 1) | ( ditto ) |
| Nihuil R. | (P) | 35 | 5 ( 1) | ( ditto ) |
| San Rafael | (N) | 20 | ( 1) | ( ditto ) |
| Radio Malargue | (M) | 13 | 1 | Under construction (Custodian only) |
| Radio Malargue | (N) | 14 | (1) | (Custodian only) |
| Radio Rio Actuel | (P) | 13 | 3 ( 1) | ( ditto ) |
| Radio Manantiales | (P) | 6 | | |
| Radio San Rafael | (M) | 20 | 5 ( 1) | ( ditto ) |

M: Municipal P: Private
N: National Pu: Public

In above tables, other studio staff such as producer, cameraman, soundman, light man, news editor, announcer etc., are not included because of the difference of each broadcaster.

Management of staff is very important because it is directly related to labour problems. For the reason, following items are of importance.

(1) To consider an appropriate staff composition along with the change of the times. As competition is expected to occur in the future with other industries, such as record disc, printing, publication and information service, it is undesirable to keep surplus staff from the initial stage.

(2) To review the arrangement of staff at a certain time, and further carry out education and training to cope with the development of new techniques of the era.

(3) To avoid expansion of organizational structure as far as possible that will become burden of personnel expenses.

(4) To consider measures for improving positiveness of staff.

### 6.2 Training

As for the training organizations related to broadcasting in Argentina, there are only ISER and Tele Escuela which belong to COMFER and the Ministry of Education respectively, the former deals mainly with dispatched training, and the latter deals mainly with training of persons graduated from junior high school on a small scale, and are equipped with only one television camera and a monitor etc. It is said that it is impossible to perform fundamental education and expert education for the operation and maintenance of the latest technical facilities.

Moreover, on the spot training at CH－7/ATC is possible, but it is impossible to carry out a systematic training and education.

In comparison with the AIBD (Asian Institute Broadcast Development) in Malaysia, it is undeniable that there is a difference in the scale of equipment and training capability.

Considering the above, the study team would especially like to emphasize the necessity of the establishment of unified training center related to broadcasting as explained later.

### 6.2.1 Training course

Staff training of broadcasting enterprises is conducted approximately according to the following categories;.

(1) Basic training
(2) Expert training
(3) General training
(4) Manager training
(5) On the spot training
(6) On the job training

As the broadcasting business involves an extremely complicated work, staff training shall be conducted sufficiently so that the work could be carried out smoothly.

(1) Basic training

Program: Program producing, announcement and coverage of events.
Technics: Program production, transmission, transmitter and receiver.
Office work: General affairs, management, broadcast

(2) Expert training

Broadcasting: Planning, program composition, production, sports, news coverage, compilation, editing etc.

Technics: Semiconductor, digital, power supply, program production, lighting, film, VTR, air conditioning, microwave, transmitter, receiver, technical processing.

(3) General training: Technical management, language, solution of problems.

(4) Manager training: Administration, management, society and broadcasting.

(5) On the spot training: Training by various experts.

(6) On the job training: Based on daily schedule.

As there is individual difference in ability and experience, it is necessary to provide an opportunity of training. By advancing such training positively, it becomes possible to entrust the operation of business to each employee securely. As the business changes rapidly with the development of electronics, the necessity of training is now becoming essential, and furthermore it is necessary to enrich training facilities.

6.2.2 Estimated number of trainees

Expected number of trainees is as follows:

1) S.O.C. ..... 50 at least

2) COMFER ..... 25

3) Telecom Depts. ..... 20 x 23 (province)

4) Broadcaster ..... 25 x 41 (station)

5) ENTEL ..... 500

6) Industry, University etc. ..... 200

Total ..... About 2,200 pers.

In order to make the effective training in each class room, it is required to reduce the number of trainees less than 30 and the training will be most effective if it is continued two or three months to train professionally.

Referring to the ability of training in the institute which will be established in the future, each course is repeated about four times in a year, resulting the training of about 120 persons in one course. If four courses are expected to conduct in a year, then it is necessary to provide at least four class rooms in the institute. And it becomes clear that more than four years is necessary to train the above persons to give the opportunity to participate in one of the training course. Trainees are mainly consist of administrative, engineering and program producing staff and other persons related to broadcasting industries.

### 6.2.3 Scale of training institute

In order to meet with the latest program production and engineering, practical training such as program production, post production, outside broadcasting including lectures and explanation on the knowhow of production and engineering which are necessary for keeping station and broadcasting, is required.

To cope with such requirement and to implement the actual broadcasting, it is necessary to provide latest equipment and facilities within the institute same as of the broadcaster. In Fig. IV－6－1, an example of the floor layout drawing of institute is illustrated aiming at the common use of broadcasting and training which will contribute to the educational program production.

At least, two television and three multi－purpose small studios are necessary, one for continuity and the other two for dubbing and other use together with control and recording equipment for program production. Furthermore, engineering experiment room, instructors room, meeting room which are necessary for conducting training shall be provided.

Other equipment such as power supplies, air conditioner, program link, computer, facsimile etc., expecting the future service such as teletext and bilingual broadcasting and so on are necessary. Scenery storage, workshop, makeup room, amenity space and garage for O.B Van etc., are also necessary.

### 6.2.4 Instructor

Instructors shall be trained in the advanced countries to learn the latest knowhow of broadcasting and also program production. Text book shall be amended and provided with the cooperation of staff who have ample experience in each expertized field. Professional publications related to program and engineering shall be provided and stored in the library to make retrieval easy for instructor and trainee.

Selected personnel shall be appointed as instructor who have the key to train the trainees effectively.

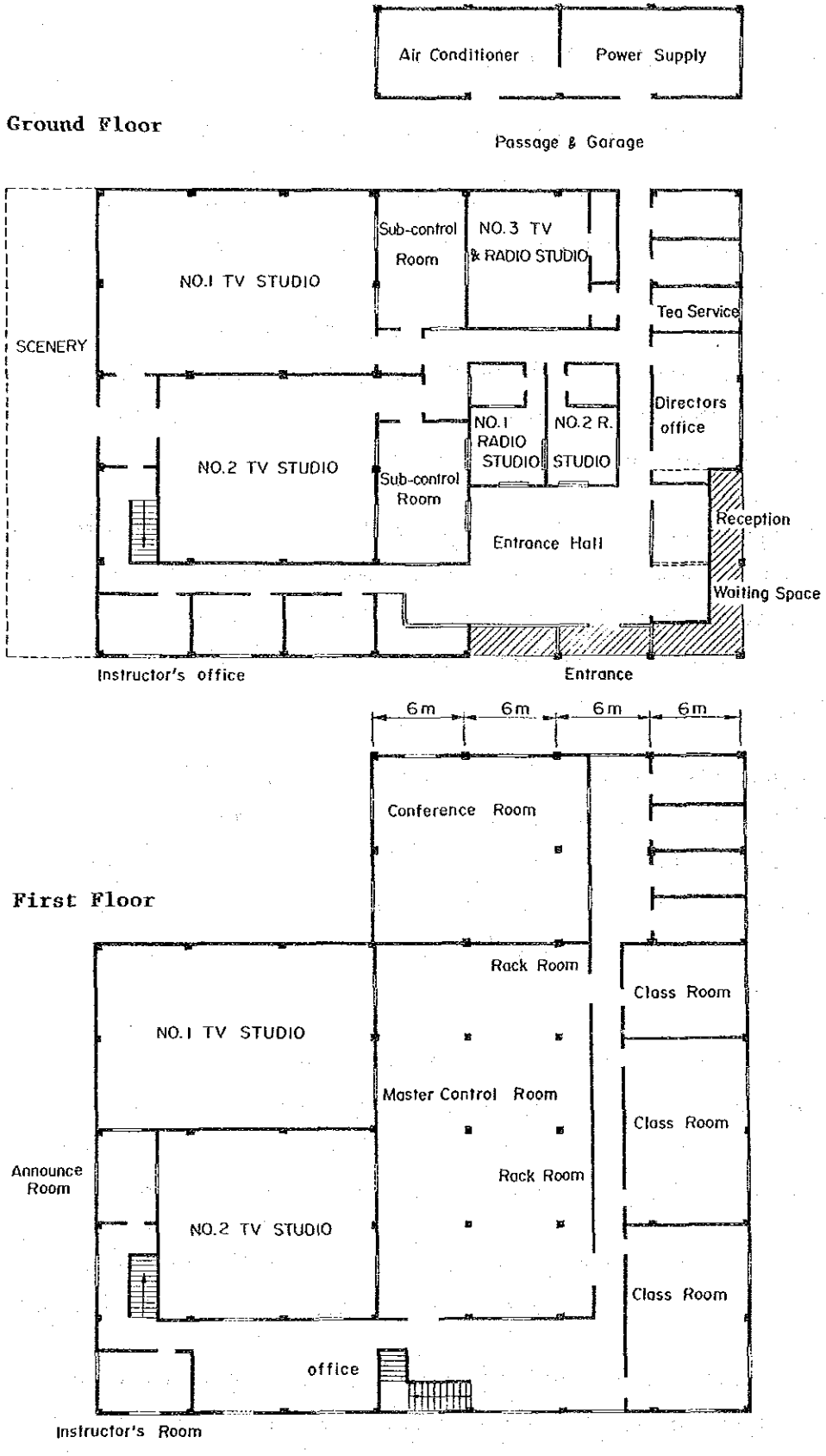



Fig. IV – 6 – 1 FLOOR LAYOUT OF TRAINING INSTITUTE

# CHAPTER 7 MAINTENANCE OF FACILITY

## 7.1 Necessity of the Establishment of Maintenance System

With the lapse of years, all equipment such as transmitters and even the studio equipment decrease the reliability to a great extent and the failure or unstable operation appeares. Especially, if it is used in outdoor, deterioration is undergone in many points. For instance, building, antenna, tower, cable and access road are severely influenced and impaired by the exposure to natural environmental conditions and it is required to extend the life of them to save the investment with adequate maintenance.

For the expansion of broadcasting network, it is necessary to investigate huge budget to construct many broadcasting stations under the support of elaborate work and even after the completion of the installation of facilities, it is also necessary to operate them and the maintenance of these facilities becomes necessary.

Furthermore, after the end of the system life, they should be replaced with new ones to keep the continuation of the service. As previously mentioned, present state of MF broadcasting network in Argentina has been developing rapidly, while S.O.R keeping 58 MF stations, S.I.P 15 stations and others 85 stations, and in the field of FM and TV broadcasting rapid increase of transmitter stations is also achieved.

Even after the completion of broadcasting network, operation and maintenance works are continued forever and future replacement becomes necessary. Accordingly, engineers are always required to establish their policy to maintain and to replace the superannuated ones under the electronics innovation.

To cope with such increasing facilities and to keep the confidence and dignity of national broadcasting, it is required to operate the equipment without failure.

From the viewpoint of nationwide service, establishment of maintenance function which unifies the maintenance job throughout the country become inevitably necessary.

For the end, it is required to establish maintenance function as soon as possible, taking into consideration the regional speciality to meet with the political, cultural and economical relationships of each provinces for establishing the regional maintenance functions.

A tentative plan for dividing the whole territories into several blocks for the smooth continuation of broadcasting including programming such as news gathering and maintenance for the national broadcasting, is made following the suggestion of counterparts as shown in Table IV－7－1 and Fig. IV－7－1. Although there might be large problems for such plan, however without making such system, it would be very difficult to keep the stations in good condition.

This concept introduces the establishment of the effective maintenance and immediate recovery system for failure together with news gathering.

Table IV－7－1 Share of maintenance

| | | | | | |
|---|---|---|---|---|---|
| (34.7 + 14.9)% | 8.7 % | 3.2 % | 2.3 % | 2.0 % | 0.7 % |
| Buenos Aires | Santa Fe, | Entre Rios, | Corrientes, | Misiones, | La Pampa |
| 8.3 % | 2.3 % | 0.6 % | 0.7 % | | |
| Cordoba | Santiago, | La Rioja, | Catamarta | | |
| 4.3 % | 1.7 % | 0.8 % | 0.9 % | | |
| Mendoza | San Juan, | San Luis, | Neuquen | | |
| 2.4 % | 1.4 % | 1.0 % | 2.5 % | 3.5 % | |
| Salta | Jujuy, | Formosa, | Chaco, | Tucuman | |
| 0.9 % | 1.4 % | 0.4 % | 0.1 % | | |
| Chubut | Rio Negro, | Santa Cruz, | Tierra del Fuego | | |

Note: % shows the percentage of population

## 7.2 Jobs of the Maintenance Section in Mendoza

In order to carry out the maintenance work of distributed facilities effectively and to sustain their standard of reliability, information and data on existing facilities must be provided and the technical level of staff must be raised. In view of the above, necessary items for establishing the maintenance system are summarized in the followings;

1) Preparation of booklet on the outline of facilities
2) Establishment of technical maintenance standards to carry out maintenance work of facilities properly
3) Determination of communication method and reporting routes
4) Establishment of procedures for failure restoration
5) Planning and implementation of maintenance schedule
6) Grasp of equipment histories and relevant data
7) Standardization of format of technical service record and establishment of data processing method by computer
8) Centralization and effective operation of material/parts storage and inventory control
9) Compiling of technical information and its reporting format
10) Establishment of procedures for periodical maintenance
11) Training of maintenance staff
12) Budgeting and others

### 7.3 Allowable Broadcasting Interruption (FM and TV broadcasting)

In Table IV－7－2, a tentative allowable interruption time of broadcasting for each station is shown.

**Table IV－7－2 A tentative allowable interruption time**

| Classification of station | Population within coverage | Allowable interruption time/year |
|---|---|---|
| Main station | more than 100,000 | within 10 min. |
| Translator | more than 3,000 | within 5 hours |
| Mini-power translator | more than 500 | within 2 days |

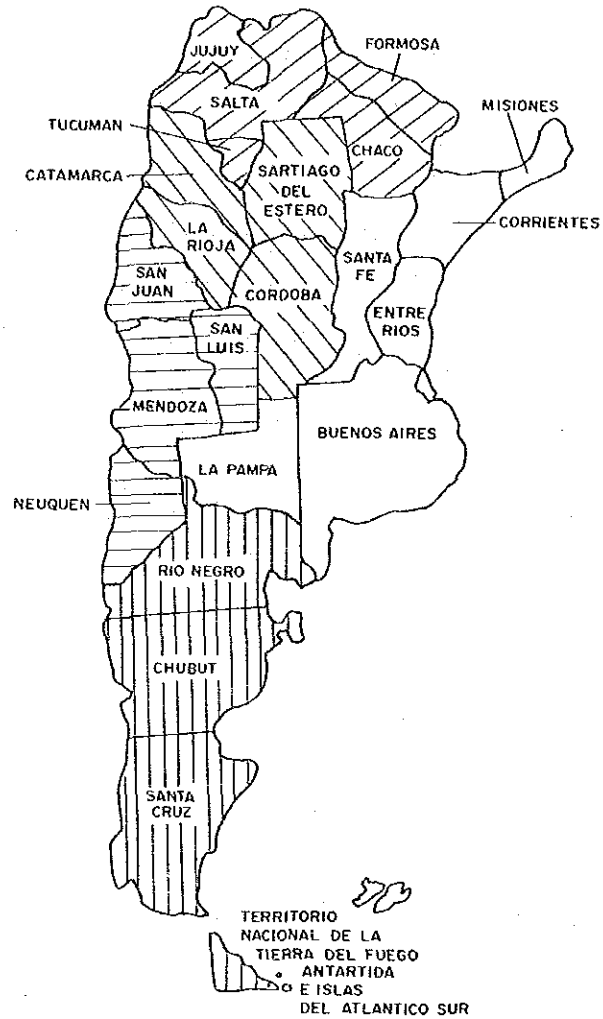



Fig. IV – 7 – 1 Division of territories for maintenance of national broadcasting

In order to establish such standard, practical conditions shall be taken into consideration, especially access time, traffic, road, weather etc.

At present, as it is impossible to grasp the actual conditions of neighbouring provinces, further study is required to make final object for maintenance. FC Van (Field Checking Van) which will be used for maintenance purpose shall be also taken into consideration for the above conditions.

## 7.4 Facilities of the Maintenance Section

The maintenance section in Mendoza is provided with a series of mechanical and measuring equipment necessary for the maintenance work of all broadcasting facilities.

Maintenance section is somewhat different from other operation divisions and it must be engaged to support the operation divisions. Such function shall be determined by the Government of Argentina, however in this plan it is assumed that the policy is made, and in Mendoza following facilities will be provided in future for maintenance purpose.

(1) Common broadcasting equipment for maintenance purpose

(2) Machine tools

(3) Measuring instrument

(4) Computer and peripherals

(5) FC Van

(6) Information equipment.

(7) Spare parts, warehouse.

In Fig. IV－7－2, an example of computer network for establishing information network for engineering is shown. Introduction of such information network is realized in the middle of 1990's.

## 7.5 Renewal of Equipment and Maintenance Cost

In the previous section, concept and philosophy on the renewal of the equipment is not explained. However renewal of equipment is inevitably taken into consideration in the development plan. Accordingly brief conceptional explanation is given in the following.

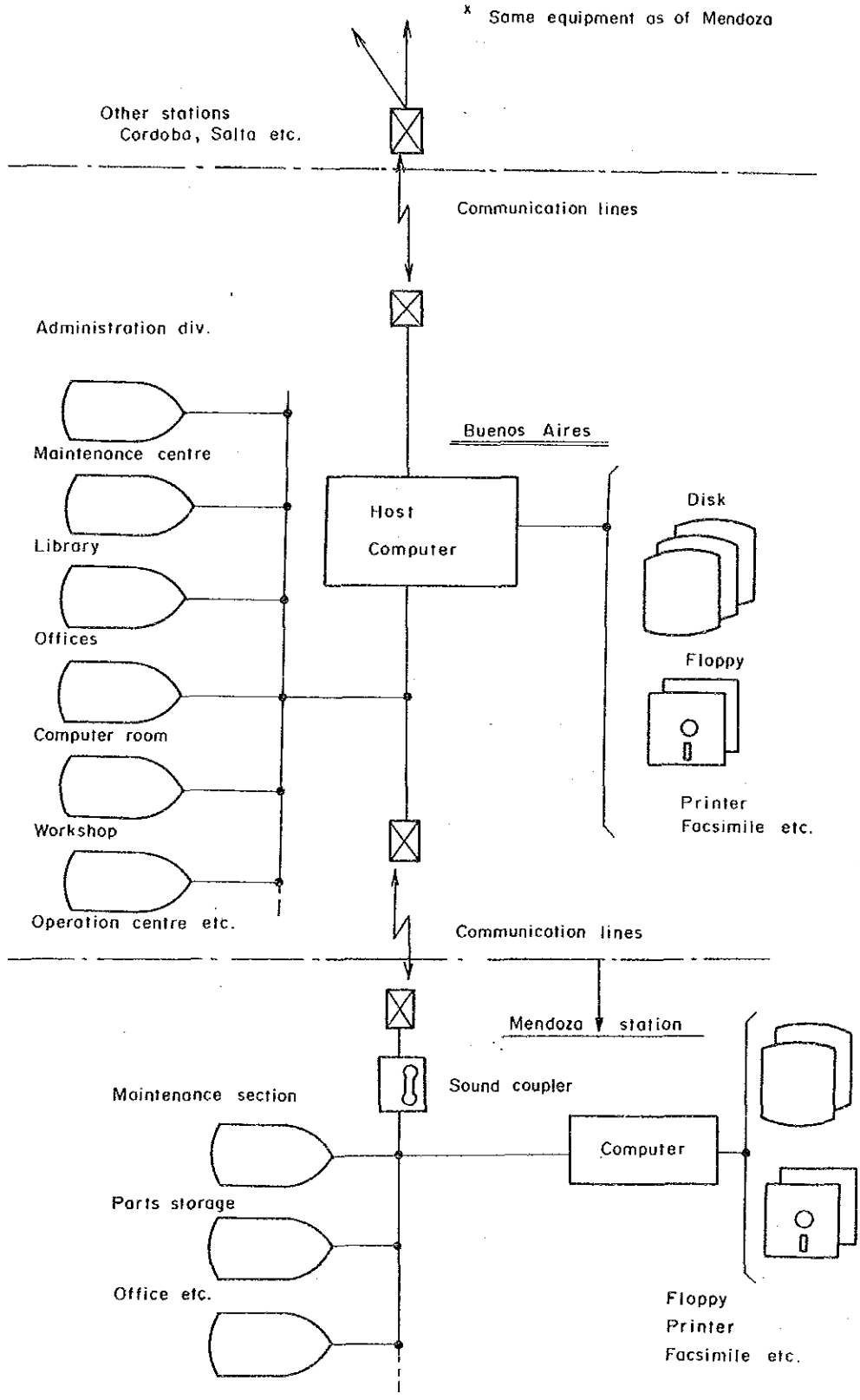



Fig. IV – 7 – 2 Data communication network for engineering purpose

Principally, renewal of equipment is required from the various factors related to operational problems. They are;

1) Failure of the equipment occurs frequently and repairement or recovery is difficult even for the experts.

2) Expenditure for maintenance work is comparably enormous.

3) Equipment is extremely antiquated than the expected average life and the functions are degraded.

4) Failures of equipment have been successively happened and the number of households served with the station is large, consequently giving large influence and many complaint are brought, resulting difficulty in gathering advertizing fee.

5) Others: security, social public requirement etc.

Assuming that the total expenditure of the renewal is A Austral and fix amount depreciation is applied during the equipment life of n years and interest rate is r percent, then fix amount depreciation per year becomes A/n, and apparent expenditure per annum by the renewal can be expressed with the following sum:

$$(A/n) + r \times A$$

Meanwhile, maintenance cost M which include labour, material, administration and other expenses, can be formulated by the following relationships:

$$C + M \leqq (A/n) + (r \times A)$$

where, C is the factor determined by the failure rate, labour problem, electromechanical antiquity, difficulty of parts acquisition etc., and it is difficult to define unconditionally.

However, if the life is assumed to 20 years and the interest rate is 5% per year, then right term of above equation becomes,

$(A/n) + (r \times A) = 0.1\ A$ and

$M + C \leqq 0.1A$

If above conditions are cleared and C is assumed to zero, and the maintenance cost is cheaper than 0.1A, then expenditure of maintenance cost becomes more cheaper than renewal in terms of economy.

From the explanation given in above, it can be clearly understood that the lowering of maintenance cost and extension of equipment life are tightly related to the saving of expenditure, resulting reduction of construction cost and accelerating of new installations.

Allowable failure rate of broadcasting is usually classified into several ranking by the number of households served. For large cities, of course, in order to reduce failure rate and nighttime work for maintenance, dual system with redundancy has to be adopted.

In case, acquisition of spare parts is difficult, substitution with other similar parts should be taken into consideration to reduce unnecessary expenditure. Social response on the failure or interruption of broadcasting is influenced by the common sense of the nation, so it is difficult to define clearly on the matter at present.

Anyway, tentative standard for allowable failure rate should be made and revised with the progress of maintenance work and technical skill referring to the stastical failure report.

Allowable expenditure for the broadcaster has some limitations, and it is estimated from above explanation that if the equipment life is prolonged by 50%, then broadcaster can keep and operate approximately more than 40% facilities with same expenditure. In the sense, technical skill of maintenance staff is tightly related to the cost saving and the ability of station keeping.

Accordingly, appointment of maintenance staff should be made with deep care and consideration to educate them professionally, differing from other engineering staff, and if necessary training in the advanced country on the special equipment should be made, or invitation of experts from abroad is recommended to train broadcast staff on the job with actual equipment to educate them as professionals.

### 7.6 Equipment Renewal and Countermeasure for Failure

Main cause of failures and interruption of broadcasting are classified into the following;

1) Failure of power supply
2) Failure of program transmission link
3) Failure of equipment in studio and transmitter station
4) Others, such as human error, disaster etc.

In order to reduce failures, well balanced countermeasures should be taken on the above four items, otherwise it is impossible.

Cause of frequent failures are mostly power supplies and next comes equipment failures including program relay link. Referring to the fact, attention should be paid on the establishment of systematic maintenance system under the support of statistical analysis of failure report which is expected to introduce for national broadcasting.

Renewal of equipment should be considered from the financial aspect and engineering service.

However, equipment which is stable and operates with sufficient functions and features is not to be replaced although they are superannuated. And renewal of equipment has to be determined politically by giving objective scores to each equipment on the aforementioned items in section 7.5 and so on, to determine the order of replacement from the standpoint of maintenance and financial conditions.

Procedures taken for the establishment of maintenance plan are as follows;

1) Investigation on the frequently failured equipment and laboursome stations is made statistically.

2) Investigation of the equipment should be made by professional experts.

3) Examine these equipment as the subject of maintenance or modification, and then determine whether they must be improved or renewed by the subjective score given.

   Estimated maintenance cost of each station is shown in Part V, Chapter 3.

4) Modification of original maintenance plan should be made, reflecting the opinion of staff in charge.

5) Financial plan for maintenance and renewal shall be made to meet with the whole construction and operation plans to reduce total expenditure.

# CHAPTER 8 NEW TECHNIQUES AND BROADCASTING

## 8.1 Introduction of New Techniques

There are some fundamental difference in the situation of developed countries and developing countries, in the way they think about the problems of introducing new broadcasting techniques. In the case of broadcasting organizations of developed countries, it is natural that they are in a situation to develop new techniques itself directly or indirectly, and moreover standardize the system, and to obtain international approval and exploit the market.

However, in the case of developing countries, it is possible to assure of the superiority or inferiority, to determine the introduction. In addition, there is a merit that the facilities could be introduced at the time the price becomes cheaper. In the present techniques, for instance, in case of the medium wave or FM broadcasting when they were initially introduced, there was nothing special which could cope with them, and it was necessary only to decide the introduction and production plan politically.

However, in respect to the introduction of color television, or other complicated technical systems, such as teletext and bilingual TV etc., it is necessary to carry out detailed investigation and research.

For the purpose, for example, it is required to establish the following Study Groups (SG) and appoint several competent staff of various fields to each study group, to prepare a report on the results of investigation for making decision.

(1) SG－1: Teletext broadcasting

(2) SG－2: Sound multiplexed TV broadcasting

(3) SG－3: Direct satellite broadcasting

(4) SG－4: High definition TV (HDTV) (IDTV) (EDTV)

(5) SG－5: Still picture TV

(6) SG-6: Computer techniques

(7) Others: Quad, SCA etc.

In addition, if necessary, an expert from outside could participate in the investigation, to arrange a versatile report which includes the objective and meaning of introduction, period and method of introduction, influence and effect upon society, budget, economy, staff and long-term prospect etc. The report must be used as an important support for deciding the policy.

It would be one of the superior system if this kind of SG is positioned as substructure of S.O.C or COMFER, to ask for opinions of various fields, including electronic industry, on electric wave administration as a national policy.

On the basis of these, the council member could make a report to the Minister of Information for decision of policy.

In order to collect the necessary materials for the SG to arrange the report, technical cooperation and participation of organization fully provided with experimental equipment will be required.

For the above reason, and in order to educate technical staff in the future, it is necessary to establish a research institute urgently, although the establishment of research and training institute is not included in the scope of the develepment plan.

### 8.1.1 Broadcasting and New Techniques

The original objective of techniques is to introduce a measure for all people to enjoy an intellectual, healthy and cultural living. In the modernized society, as it is impossible to separate the national power from technical development, it is no exaggeration to say that diffusion of education is essential for opening the road to modernization. On the other hand, if a technical system is once established; it will become a standard for the society and continue almost eternally.

From the viewpoint, the new techniques to be left as a property for the 21st century are to be decided upon sufficient consideration. In addition, it is necessary to consider the problem of introducing new techniques from all aspects to build up the foundation of the society.

Recently, in some of the developed countries, popularization of home-use VTRs is remarkable; especially along with the mass production of compact home-use video cameras, amateur groups are arranging video taped entertainments.

On the other hand, in the case of CATV, there is a narrow path in the so-called facility cost (transmission line composition). But in the case of broadcasting, as it is using the free space (it can directly access to any home), as far as the contents of programs are attractive, it can be connected directly with homes.

From this standpoint, the broadcasting station itself is one of the centers of the advanced information society which is directly connected with various societies. It is a social combination center in the fields of education, culture, science, religion and commerce. Not only revolution of bio-technology, development of material and popularization of computer etc., but also genuineness of broadcasting will be required. It will be almost impossible to maintain a national isolation now in relation to social thoughts and religious and political system, but the role of broadcasting as an information service organization is inscrutable.

Considering such a standpoint and movement of recent new techniques etc., the future image of the so-called mass communication and communications etc., is shown in Table IV-8-1. In the Table, as it becomes possible to use wide bandwidth transmission line, according to the development of fiber optics, it is sure that telecommunications will compete with broadcasting.

As broadcasting uses the free space to directly serve each household, the cost is lower than the cable system. However, broadcasting is sent one way but the cable is two way. In principle, the number of spectrum of cable which uses artificial space can be increased indefinitely.

Accordingly, the effect of broadcasting can be maintained with some restriction on number of channels, but in order to use the electric wave effectively, to cope with the development of various techniques, it is justifiable to direct toward multiplexing rather than increase in the number of channels.

Of course, there may be other ways to use electric waves other than that of the conventional broadcasting system, but it is necessary to wait and see international movements. In the case of developing countries, introduction of new techniques is relatively easy.

The reason for this is that they can ascertain the actual results in developed countries, and sufficiently compare the various systems. Accordingly, it is desirable to compose an appropriate research group and after submitting the report to the Government, execute the project at the time when the maximum effects could be expected.

**Table VI – 8 – 1 Comparison of Information Media**

| | Transmission Delivery | Recording Display | Service | Object | Simultaneity | Defect |
|---|---|---|---|---|---|---|
| Broadcasting | ○ Electromagnetic wave, Fibre | × —*1→ ○ | V+A →(C+P) One way *2 | Not specified | ○ | Number of channels *3 |
| Telephone | ○ Cable, Fibre | × —*4→ ○ | A →(C+P) Bi-direc -tional | Subscriber | ○ | Narrow band |
| Mail Telegraph | × Paper, Manual delivery | ○ | C One way | Designated person only | △ | Manual delivery |
| Newspaper | △ Paper | ○ | C+P One way | Subscriber | △ | |
| Magazine | △ Paper | ○ | C+P One way | Subscriber | × | |

Note

○ : Excellent　　V : Video　　P : Photograph
△ : Fair　　A : Audio
× : Inadequate　　C : Character

*1 Recording or display is possible by the use of VTR, facsimile etc.
*2 Teletext and still picture extend the service to ( C+P ).
*3 Programme is supplemented by *2.
*4 Facsimile and videotex enables recording and display of received information.

### 8.1.2 New techniques

In order to introduce the new techniques, the items which are recommended to take into consideration are as follows.

(1) Study should be made on the reasons, process of introduction, results of usage, problems to be solved etc., in developed countries. Introduction of impractical techniques may stagnate the exaltation of national prestage.

(2) Even the problems which were difficult to solve technically at the initial stage, may be solved after the elapse of years and finally, in most cases, the best method will remain.

Especially, under the revolutionary development of semiconductor the display at each home are expected to be video integrated terminal with multipurposes and the best system under a unified idea is to be probed.

(3) In order to introduce new techniques effectively, there shall be difference in the way of thinking between highly and lowerly populated countries.

In the case of highly populated countries, if it is not aiming at the development of industry, including subcontractors, the effect of investment will be reduced remarkably. In the case of lowerly populated countries, introduction of techniques in the fields which are intended as speciality of country should take the precedence.

(4) The way to use the UHF band will be determined for the expansion plan of the present television broadcasting network and introduction of new technique in the future, considering that the frequency is a national property.

(5) Satellite broadcasting is to be realized as a new carrier of SHF broadcasting against VHF and UHF. Regarding the bilingual, teletext and furthermore, still picture, facsimile and high definition TV broadcasting in the future, it is necessary to consider the compatibility with the present broadcasting system to some extent. On the other hand, world-wide standards should be established for introducing high definition television.

Especially, concerning the transmission of digital sound signal, if it is possible, it is desirable to unify to a digital hierarchy system other than that of broadcasting.

The above mentioned are a conceptual way of thinking, but it is necessary to consider the new techniques from a political standpoint, some hints are described in the following.

### 8.1.3 New techniques and society

The way to introduce new techniques is naturally different according to the social environment of each country. Especially, as the tempo of technical innovation becomes rapid as in recent days, the field to proceed will become a problem. Fortunately, in the case of developing countries, there will be relatively less problems because developed countries will become a good example, but in case there are too many actual examples, it would be hard to select the right one.
Concerning the order in adapting the present new media technical system or standard seems to have been almost definitely determined. For instance, even in the field of teletext and bilingual, several systems are being proposed. It would be therefore hard to select the right one, but it is necessary to study the actual examples and to consider the influence upon the society in advance of introduction.

On the other hand, spread of mass media to society will continue regardless of developed and developing countries, and finally popularization will become almost 100%. At present it is only on its way to an ideal society.

### 8.1.4 New techniques and existing techniques

As terrestrial broadcasting is conducted on the basis of the existing techniques, it is natural that there is a restriction in introducing new techniques. The ones that can be easily introduced is the multiplexing technique such as time—axis multiplexing or frequency multiplexing and so on.

But in respect to digital television, as it is an entirely different kind of service, it is to be conducted by other frequency bands. As satellite broadcasting uses 12 GHz, the wide bandwidth characteristic can be used for all kinds of new media. Thus, the way of the use of this band must be planned under full agreement of related organizations for the service of the coming new era.

For this reason, services of new techniques are to be progressed under the agreement and cooperation of many countries internationally, together with the grasping of the movement of new techniques and consideration on the policy of social welfare and education concerned.

### 8.1.5 Commencement of new media service

Necessary items to be considered to open new service are;

(1) Whether the social demands are genuine or not.

(2) Whether there are economic and technical possibilities or not.

(3) Whether the objective of using the new service is clear or not.

(4) Whether the relationships with domestic industry is clarified or not.

Of course, political considerations are required. However, items (1), (2) and (3) are excluded because various considerations are to be taken under social circumstances.
Some considerations are given on item (4) in the following.

Fig. IV－8－1 shows the tendency of the diffusion of new media in developed countries from the first stage of development to diffusion, and the timing of introduction in developing countries. If the zero point of time axis is the start of service in developed countries, then the period of start in developing countries could be classified into three, A, B and C as shown in the figure.

In the case of A, even in developed countries, the price of receivers etc., is comparatively high. Therefore, if the developing countries are provided with high manufacturing capability, they will be possible to produce them even if

their population is small. In case, the start point is at C, it will be impossible to cope with the low-cost production of developed countries.

However, in South American Countries where the market is large, as far as they have mass production capability and ability to make parts, there will be possibility of production. On the other hand, regarding the facilities for broadcasting stations, some of them may be able to make at about the same price as of developed countries, which depends on the ability of producing parts.

Considering the above standpoint, if the period of start is at point C, as far as the social foundation is consolidated, it will be possible to make them economically excluding the ones which require relatively high techniques.

In addition, even for the ones which require relatively high techniques, as the time elapses, the techniques will become stereotyped and will be no more difficult techniques. Accordingly, in order to cope with such problem, if domestic capital is insufficient, it will be necessary to introduce foreign capital, to promote employment.

If suppression of import is conducted, as a result, it will not necessarily contribute to the benefit of the country, but may impede the economical activities, and the country may fall behind the economic activities of the world.

### 8.1.6 Latest new techniques in broadcasting

(1) H.D. Television (High Definition TV)

H.D. television which is envisaging the new era is competitively being studied in advanced countries. The principal ones are as follows.

1) I.D. TV (Improved Definition TV)
2) E.D. TV (Extended Definition TV)
3) MAC System
4) H.D. TV (High Definition TV)

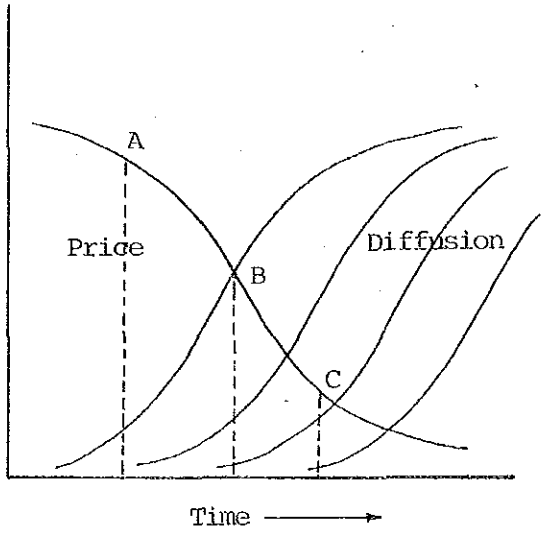



**Fig. IV－8－1 Relationship between price and diffusion**

1) I.D. TV: Separation of luminance signal and color signal, and compensation of scanning line etc., are processed. It will improve vertical resolution, none in horizontal resolution.

2) E.D. TV: This is a system for obtaining high quality picture as maintaining the compatibility with the present television system, by multiplexing the spectrum from 4.2MHz to 6.3MHz of the luminance signal component which is filtered out in conventional TV onto the signal of the present television system and multiplexed onto 2.1MHz－4.2MHz frequency band. The standards are expected to be determined tentatively at the end of 1988 in Japan, improvement of definition is also excellent.

3) MAC system: In this system, four system, such as A, B, C, D are proposed. Fundamentally, they are an improved version of the present system, but they are not so significant.

4) H.D. TV: At present, the system developed by NHK is considered as definite one. Future of H.D. TV is bright, because peripheral equipment are almost completely developed and the transmission via broadcasting satellite is experimentally confirmed in Japan.

(2) Teletext:

At present several kinds of methods are being operated in some advanced countries. As the price of intelligent terminal becoming cheaper year by year, its introduction shall be determined referring to the social request and also after the confirmation of the features of each system.

(3) Bilingual TV:

Two methods are put into practical use; one is two carrier and the other is FM–FM method, each has demerit of affecting on to the existing picture and sound signal and the former deteriorates mainly the picture quality, causing beat interference and the latter affects on the sound quality of multiplexed subchannel, however comparison of the both is somewhat difficult due to the complicated use of broadcasting facilities, and composition of transmission network.

(4) Still Picture Broadcasting

Number of the pages of present teletext services are limited within several hundred pages without verbal explanation. Still picture broadcasting system which is experimentally developed in Japan, can send several tenth of still picture with verbal explanation simultaneously. The former one requires the waiting time of several tenth of second for retreaval, but the latter no waiting time is necessary for changing the picture. If this kind of system is applied through one UHF TV channel exclusively, then it would be used for education and other information services widely.

(5) Facsimile

Studies have been made in many countries, however practical application will be somewhat late, because of the difficulty in coordinating the existing and future service, such as newspapers and other information industries. However if it is multiplexed with present television or FM channels in the form of second subcarrier, then it will become one of the innovation in the information society.

(6) Satellite broadcasting.

Satellite broadcasting has been planned in some developed countries, and in Japan experimental broadcasting has been conducted to investigate various future broadcasting such as high definition, MUSE (Multiple Sub-Nyquist Sampling Encoding, Bandwidth compression tecchnique for H.DTV), PCM sound and so on. It will be the pioneer of the future TV broadcasting, and the worldwide development will be made in the fall of this century.
PCM sound broadcasting with sampling frequency of 48 kHz and 32 kHz has been experimentally casting and also test transmission of MUSE system is conducted to confirm technological possibility.

(7) Other techniques

According to the development of home-use devices such as DAT (Digital Audio Taperecorder) C.D. (Compact disk) Home-use TV camera and so on, innovation in the field of program production and also news gathering will be seen in broadcasting.

# PART V ESTIMATE OF COST AND REVENUE

# CHAPTER 1 CONDITIONS FOR ESTIMATE OF COST AND REVENUE

## 1.1 Condition for Estimate of Construction Cost

Principal conditions for estimating construction cost are as follows, unless otherwise stated:

(1) Construction of facilities, including the subscriber station installation works, is executed wholly on turnkey base contract.

(2) Expenses for building construction and civil works are added as required.

(3) In the case of re-use of removed equipment, expenses required for removal and re-installation are added.

(4) Where new technologies are introduced, personnel training expenses and commissioned maintenance expenses are added as required.

(5) Cost of measuring instruments, tools and spares for maintenance to be prepared for at the start of operation is added.

(6) Cost of construction of transmission lines for broadcasting combined with the telecommunications network is shared with the broadcasting division.

(7) Prices are calculated based on the present worth at the end of the year 1986. Prices are indicated in US dollars using the following exchange rates:

US$1.00 = 1.257 Austral = ¥160

## 1.2 Estimate of Operation and Maintenance Costs

Costs necessary for the operation and maintenance of the facilities are estimated.

In order to calculate the internal rate of return of the telecommunications division, the service life of the facilities for financial analysis is set at 20 years, and the operation and maintenance costs for 20 years after construction are calculated.

With regard to the broadcasting division, since the development plan does not handle the matters concerning broadcasting programs production, calculation of internal rate of return is not required. Therefore, the estimate of the operation and maintenane costs is made up to the end of the development plan period (2005).

The method of calculating the operation and maintenance costs is described in the following chapters.

### 1.3 Estimate of Revenue

Based on the same reason as described in Section 1.2 above, revenue of the telecommunications division is estimated for the period of 20 years after the construction of facilities. No estimate of revenue is made for the broadcasting division.

The method of estimating revenue of the telecommunications services is described in the next chapter.

# CHAPTER 2 TELECOMMUNICATIONS

## 2.1 Estimate of Cost

### 2.1.1 Estimate of construction cost

Table V－2－1 shows the construction cost estimated according to the conditions as in Section 1.1.

Equipment cost for packet switching system shown in Appendix 6 is excluded from the estimate.

**Table V－2－1 Amount of plant and equipment investment for telecommunications**

(Unit: Thousand US dollars)

| Item | Phase 1 | Phase 2 | Phase 3 | Total |
|---|---|---|---|---|
| Subscriber telephone | 6,594 | 9,138 | 12,856 | 28,588 |
| Public telephone | 2,469 | 2,469 | 2,469 | 7,407 |
| Rural telephone | 9,969 | 4,613 | 13,537 | 28,119 |
| Switching equipment | 23,956 | 24,588 | 42,988 | 91,532 |
| Subscriber lines | 24,350 | 34,963 | 42,031 | 101,344 |
| Junction lines | 1,944 | 844 | 175 | 2,963 |
| Trunk lines | 10,756 | 4,981 | 10,856 | 26,593 |
| Mobile telephone | 0 | 0 | 4,875 | 4,875 |
| Telegraph | 44 | 6 | 69 | 119 |
| Total | 80,082 | 81,602 | 129,856 | 291,540 |

The construction cost is not divided into local currency portion and foreign currency portion, because most of equipment and materials for the construction will be manufactured in Argentina.

### 2.1.2 Estimate of operation and maintenance costs

Operation and maintenance costs can generally be estimated according to the following formulae.

Maintenance cost = Construction cost × maintenance cost ratio

Operation cost = Revenue × operation cost ratio

Since the ratios in the above formulae have not been available from financial statements of the telecommunications operating entity in the province of Mendoza, following values have been applied based on the data in various countries.

Maintenance cost ratio = 8% for switching system
5% for transmission system
3% for outside plant
10% for terminal equipment

Operation cost ratio = 30%

Due to difficulties obtaining CAT's costs and revenues data and related financial statements data in the province of Mendoza, the scope of study related to costs and revenues analyses and eventually that of financial and economic analyses have been restricted to considerably a narrower area.

## 2.2 Estimate of Revenue

### 2.2.1 Basic preconditions

In the province of Mendoza there has long been rushing torrent of inflation which makes it rather difficult to trace precisely the time-series trends of income per telephone subscriber in the past years.

Table V-2-2 shows the trends of message rate increase of CAT in recent years.

The average income per main line is adjusted by making use of this trend to determine the net monthly income per main line in 1986 in U.S. dollars for future estimation.

Basic preconditions for this estimation are as follows:

1) Average income per subscriber has no conspicuous differences among the provinces CAT operates, inclusive of the province of Mendoza.

2) By the forecast density of telephones of the province of Mendoza for this development plan there should be no increase or decrease of average income per subscriber at least until the development plan related date and years in future.

### 2.2.2 Base of main lines for the estimate of revenue

Another provisional measures taken into consideration for income estimation lie in the calculation of newly installed subscribers of this development plan. Number of subscribers to be installed by or related to the development plan is shown in Table V－2－3.

In the study of financial analyses of the development plan, not only the newly installed main lines which are shown in column (A) of Table V－2－3 but also the cases of columns (B) and (C) of the same table are taken into account as the bases of income estimation.

In the case of main lines belonging to column (B), which shows that they have already been installed and under use at the beginning of the development plan but the connected exchanges and cables shall be replaced during the prosecution of the development plan, 100% of income from these main lines shall be calculated in the income estimation.

On the other hand, column (C) main lines in which case exchanges shall be replaced with new ones but no changes of cables expected, 65% of income shall be calculated in the income estimation.

## Table V - 2 - 2 Trends of message rate increase

| Date of Effectuation | Message Rate | (%) Rate of Increase |
|---|---|---|
| 1.12.83 | $a 0.3480 | 20.00 |
| 16.01.84 | $a 0.390 | 12.06 |
| 21.02.84 | $a 0.43 | 10.25 |
| 21.03.84 | $a 0.52 | 20.93 |
| 20.04.84 | $a 0.645 | 24.04 |
| 21.05.84 | $a 0.79 | 22.48 |
| 10.06.84 | $a 1.00 | 26.58 |
| 11.07.84 | $a 1.196 | 19.60 |
| 11.08.84 | $a 1.471 | 23.0 |
| 11.09.84 | $a 1.706 | 16.0 |
| 11.10.84 | $a 1.979 | 16.0 |
| 11.11.84 | $a 2.335 | 18.0 |
| 11.12.84 | $a 2.709 | 16.0 |
| 11.01.85 | $a 3.17 | 14.0 |
| 11.02.85 | $a 3.677 | 16.0 |
| 11.03.85 | $a 4.49 | 22.1 |
| 11.04.85 | $a 5.66 | 26.06 |
| 11.05.85 | $a 7.47 | 32.0 |
| 01.06.85 | $a 10.08 | 35.0 |
| 11.06.85 | $a 11.06 | 15.0 |
| 06.04.86 | ₳ 0.0121 | 4.31 |
| 11.05.86 | ₳ 0.0124 | 2.48 |
| 06.06.86 | ₳ 0.0128 | 3.22 |
| 06.07.86 | ₳ 0.0136 | 6.25 |
| 01.08.86 | ₳ 0.0142 | 4.41 |
| 30.08.86 | ₳ 0.0147 | 3.52 |
| 30.09.86 | ₳ 0.0152 | 3.40 |
| 14.10.86 | ₳ 0.0179 | 17.76 |

## Table V-2-3 Number of main lines to be used for income estimation

(Unit: Thousand lines)

| | | Phase 1 (1991 ∿ 1995) | Phase 2 (1996 ∿ 2000) | Phase 3 (2001 ∿ 2005) | Total |
|---|---|---|---|---|---|
| (A) Newly installed main lines | Inside the cable service areas | 55.5 | 76.2 | 106.8 | 238.5 |
| | Outside the cable service areas | 0.8 | 0.4 | 0.8 | 2.0 |
| | Total | 56.3 | 76.6 | 107.6 | 240.5 |
| (B) Existing main lines to be replaced with new exchanges and new cables | | 17.6 | 7.4 | 37.5 | 62.5 |
| (C) Existing main lines to be replaced with new exchanges (no change of cables) | | - | - | 6.3 | 6.3 |