

BASIC DESIGN STUDY REPORT
ON
EDUCATIONAL TELEVISION BROADCASTING PROJECT
IN
THE REPUBLIC OF LIBERIA

JUNE, 1985

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

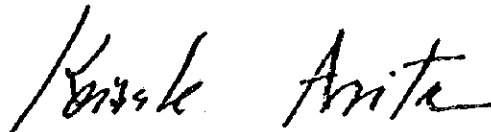
In response to the request of the Government of the Republic of Liberia, the Government of Japan decided to conduct a Basic Design Study on the Educational Television Broadcasting Project and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to Liberia a study team headed by Mr. Shinichi Takeuchi, Special Advisor for International Cooperation, Communications Policy Bureau, Ministry of Posts and Telecommunications from January 13, 1985 to February 18, 1985.

The team had discussions on the Project with the officials concerned of the Government of Liberia and conducted a field survey. After the team returned to Japan, further studies were made and the present Report has been prepared.

I hope that this Report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of the Republic of Liberia for their close cooperation extended to the team.

June, 1985



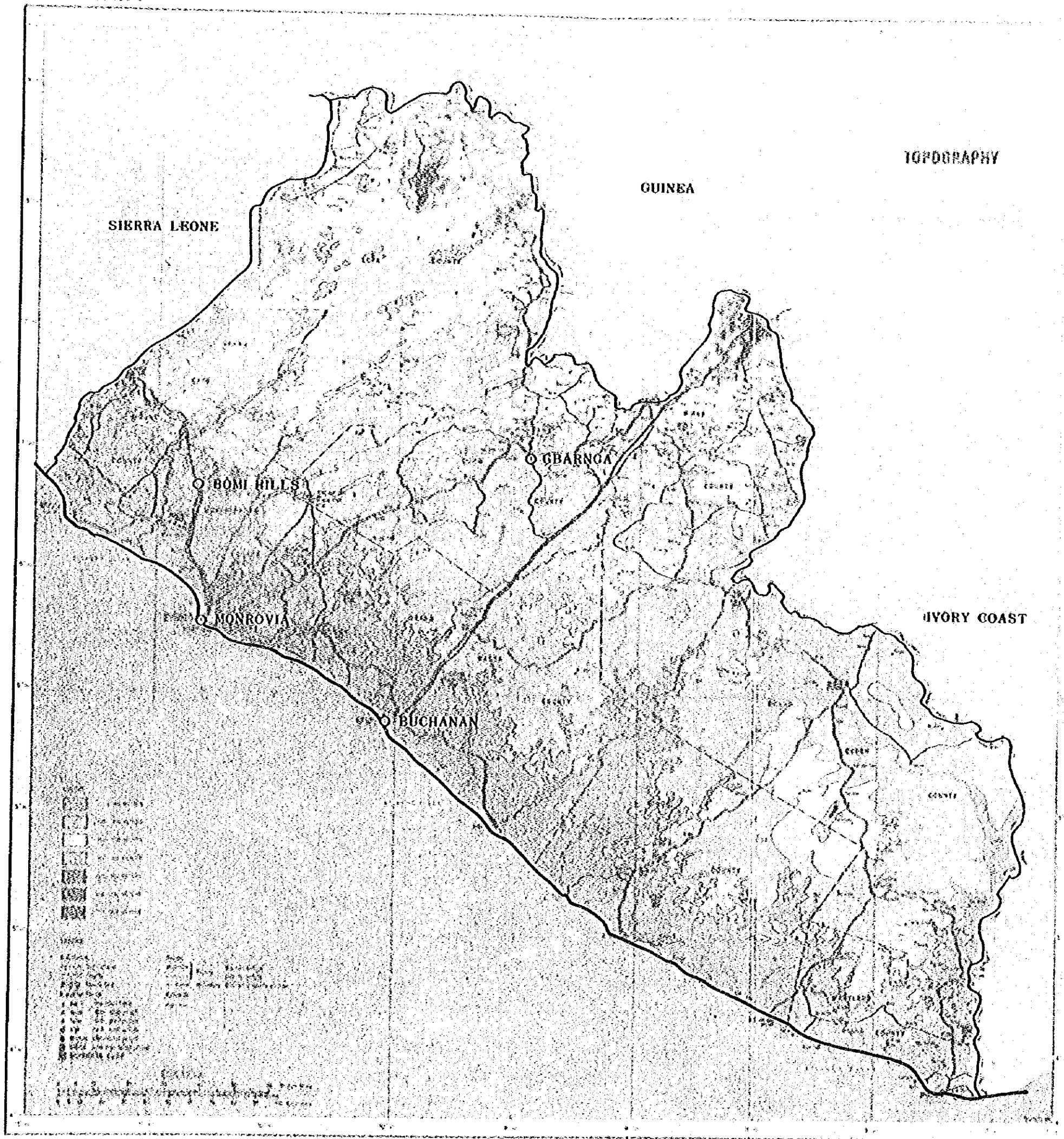
Keisuke ARITA

President

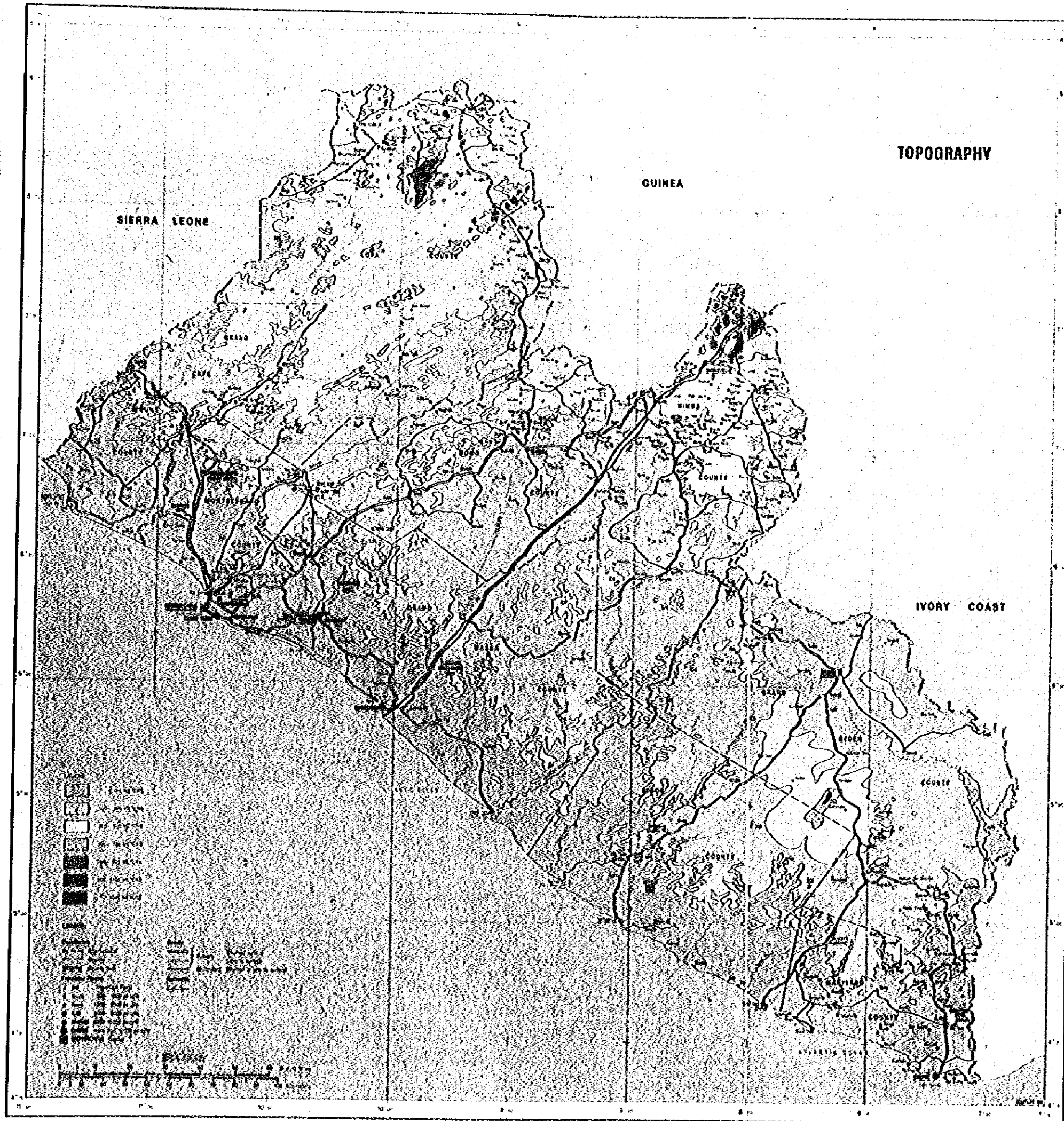
Japan International Cooperation Agency

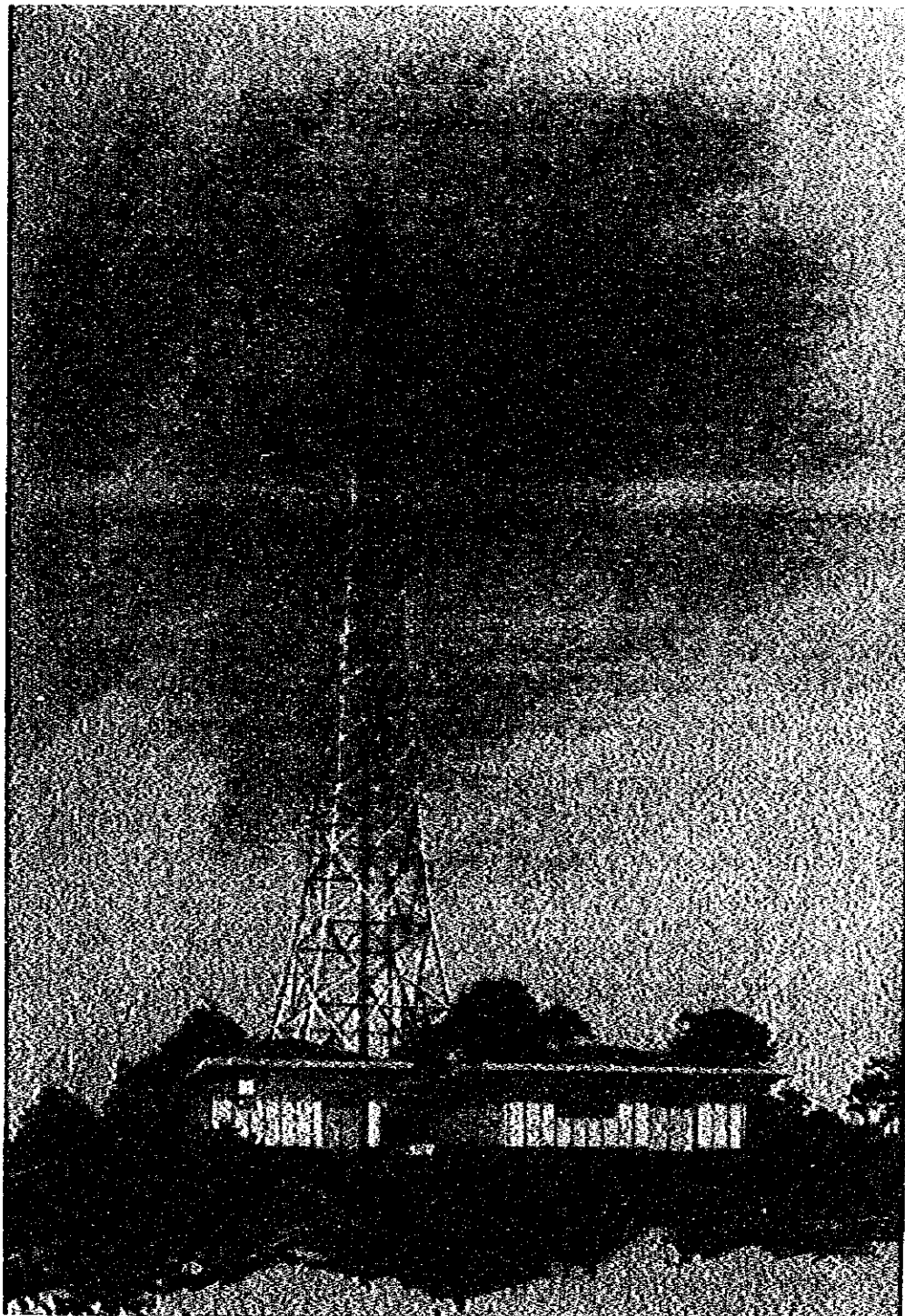
LIBERIA

TOPOGRAPHY



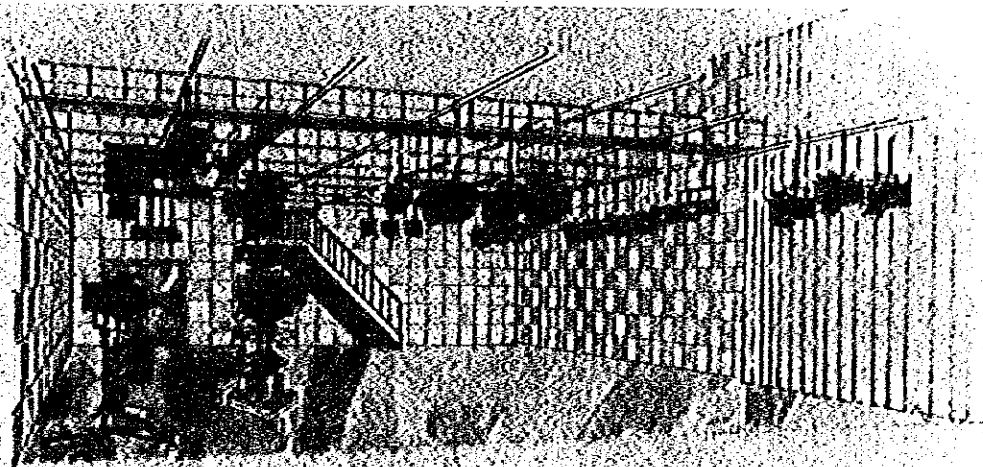
LIBERIA





Conceptional picture
at completion
(Buchanan Transmitting
Station)

Conceptional picture
at completion →
(Monrovia Studio B)



SUMMARY

The Republic of Liberia is known to have a relatively long history among all African nations and is also quite stable in both political and economic situations. However, the country is composed of a number of tribes having different customs and habits, and speaking different languages. At present, more than 17 tribal languages are used in addition to the official language, English.

In order to cope with such ethnic background, the Government of Liberia has long been promoting education as one of top priorities in the policy of the Government. At present the percentage of primary school attendance in Liberia is exceeded more than 60% which is much higher than the levels in neighboring countries. However, the adult literacy is still rather low, averaging about 30% at present, although it has pursued a steady and gradual upward trend in the last decade.

This low literacy rate made the Government to focus its attention on the immense educational effect of TV broadcasting service which can transmit a huge amount of information to the people by appealing directly to their visual senses, and this led to the formulation of National TV Broadcasting Network Development Project aimed at enhancing school program, health and hygiene education, agricultural education etc. by the augmentation of TV broadcasting service.

The project is intended to expand the coverage of the current TV broadcasting service, which is available only by the National Broadcast Service Liberia Broadcasting System in the capital city, Monrovia, to a nation-wide network to operate primarily for educational purpose. The Liberian Government requested the Government of Japan to cooperate in the project with the grant aid necessary for its implementation.

Based on such process and background as above, the Japanese Government sent to the Republic of Liberia a basic design study team through Japan International Cooperation Agency in order to analyze the feasibility of the project and to formulate the contents and the scope of cooperation through its study on the broadcasting service of the Liberian

Broadcasting System, operation of its facilities, and proposed sites for new TV stations.

As a result of both the field survey and domestic analytical works, the Agency sent another team to explain to the Liberian side the Draft Report for the project and to discuss the contents of the proposed basic design scheme.

Thus, the basic design of the project is summarized on the following items.

(1) Expansion of TV Broadcasting Network

- 1) Increase of the output power at Monrovia Transmitting Station
- 2) Construction of three new local transmitting stations (Gbarnga, Buchanan, Bomi Hills)

(2) Rehabilitation and Improvement of Monrovia TV Studio

The improvement and construction of the above four transmitting stations are aimed at the construction of main station for the nationwide TV broadcasting network to expand its population coverage from the present 10% to about 45% for enabling TV-reception for about one million people thru the project.

An improvement and rehabilitation of TV studio improvement are intended to be made in the existing one TV studio, which is not currently in use. It is essential for upgrading and diversifying TV programs of the Liberia Broadcasting System including adult education and school programs to have at least two TV studios.

The project will require the Liberian Government to bear a cost of \$32,800.00 and the period required for the project implementation is estimated at about 21 months after the Exchange of Notes between both Governments.

An increase of about 25 program production personnel and engineers will be required for smooth production of programs, appropriate maintenance and operation of the new TV broadcasting facilities, and an annual budget amounting at least to 1% of total facilities cost should be secured for fault-free routine operation of the facilities and their maintenance service.

In order to enable the Liberia Broadcasting System to provide higher maintenance, and operation capabilities and upgrade its program producing ability, it is desired to request to related Japanese Organizations for the despatch of experts and to train the LBS staff in Japan.

With completion of the project will be produced an additional, highly effective means of national education which the Liberian Government has long been eagerly expecting. Therefore, realization of this new means of education by Japan's grant aid would be of very great significance, and it can be safely said that the project will yield immense cooperation effects.

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CHAPTER 1
INTRODUCTION

CHAPTER 1. INTRODUCTION

More than 70% of the Liberian people live dispersedly in rural areas, their literacy rate is still low, moreover they speak many different tribal languages. Radio and TV broadcasting services therefore play a very important role in promoting the national development and improving the people's living standard. In particular, TV broadcasting is regarded as being highly effective in enhancing school education, health and hygiene education, and agricultural education because it can transmit voluminous visual information directly to the audience. It is for this reason that the Liberian Government formulated the project to expand the scale of its broadcasting service, currently available only in the capital city, to a nation-wide network by the following plan, asking Japan's grant aid for its implementation.

- (1) Increase of transmitter power in Monrovia
- (2) Installation of 3-regional transmitter stations at Gbarnga, Buchanan and Bomi Hills.
- (3) Improvement of TV Studio at Monrovia.

Complying with this request, the Japanese Government undertook to conduct a basic design study and entrusted Japan International Cooperation Agency with its execution. The Agency organized a basic design team headed by Mr. Shinichi Takeuchi, Communications Policy Bureau of the Ministry of Posts and Telecommunications, and sent them to Liberia for a period of 37 days from January 13 to February 18. During the stay in Liberia, the team conducted various surveys, collected relevant data and information, and also held a series of discussions with the competent Liberian authorities. This report presents the outcomes of survey activities analyzed by the team after returning to Japan for each project cooperation item.

The Agency dispatched a team headed by Mr. Naoyoshi Sasaki, Second Basic Design Study Division, Grant Aid Planning and Survey Department of Japan International Cooperation Agency, to Liberia over a period of 13

days from May 22nd to June 3rd 1985. Based on the draft basic design report, the team had a series of discussion with the Liberian counterparts, and as a result, this report has been prepared.

Member list and itinerary of the survey team are shown in Appendix I to V.

CHAPTER 2
BACKGROUND OF THE PROJECT

CHAPTER 2 BACKGROUND OF THE PROJECT

2-1 General Condition

Liberia, situated on the western coast of the African Continent, covers an area of 110,000 km² and has a population of about 2.2 million.

The country faces the Atlantic Ocean with its coastal flat land area extending to a stretch of hills and mountains in the inland area, and is bounded by three countries Sierra Leone, Guinea and Ivory Coast. It is in the tropical rain belt where the climate is featured by high temperature and humidity. Rainfall is copious and the climate is divided into two seasons, the dry (November - April) and the wet (May - October).

In the case of capital city, Monrovia which is located at the plain of coastal side, rainfall is amount to about 4,000 to 5,000 mm annually and the average temperature is about 30°C. Similar climatic conditions exist in Bomi-Hills and Buchanan. Gbarnga a hilly zone, 150 km north from Monrovia, although rainfall is somewhat less than the above and temperature there is almost same. Cyclone hits the land without much violence and earthquake happens scarcely.

Liberia was founded in the 19th century and has a long history of independence compared with other African countries. The country began taking its course of modernization in 1920 when the cultivation of rubber plants was initiated by Firestone Co.. Mr. TUBMAN who assumed the 18th presidency in 1944, stayed in power for 27 years during which he encouraged private investments in rubber plantations, iron ore mining, forestry and manufacturing industries and enforced a free trade policy. The Liberian economy pursued a smooth course of development until the early 1970's when it was plagued by the impact of the crude oil crisis, and therefore followed downtrend thus eventually causing general business stagnation, inflationary trend and employment problems.

In 1980, a new administration led by the Head of State Mr. DOE was organized, and a new constitution was promulgated in 1983. The general ban on political activities was lifted in July 1984, and a general election for Presidency, Vice-presidency and membership of Upper and

Lower Houses is scheduled in October 1985. It is planned that a National Assembly will be called in January 1986 to complete the transfer of power to a civil government.

The most outstanding feature of the Liberian economy is that it depends heavily on primary products. 50 to 60% of total exports is accounted for by iron ores, then followed by rubber and timber which are all highly susceptible to the changes in the international market situation.

GNP of the nation amounts to about \$500 per capita which is considerably higher than the levels in other African countries, but it shows large differences by industrial category. For example, it registers \$1,600 for foreign capital-dominated industries such as iron ores and rubber, \$780 for modern industries and only \$185 for traditional industries. Manufacturing industries are still at the initial stage of development, except those operated for production of export items and so the country is forced to depend on import for the supply of various daily necessities. Tax revenues account for the greater part of funds for national finance and the Government has long suffered from a financial deficit, although the growth of individual income tax has been notable in recent years. Payment of Wages account for more than 50% of the ordinary expenditure. Owing to the mounting burden of interest payment, the Government has been facing with difficulty with payment of public servant wages since last year.

The country's population which recorded with an average annual growth rate of 4% in the 1974 - 1981 period, is estimated to have reached about 2.2 million in 1985. 23% of total population is living in Montserrado County where the capital Monrovia is located and urbanization is occurring at a fairly high speed throughout the country. On the other hand, 70% of total labor forces is dispersed in rural farming areas and the people have little opportunity for receiving vocational training. Promotion of education by broadcasting service is therefore hoped strongly, especially for adult education. The Government shows grave concern over the declining self-sufficiency in rice, one of staple foods for the Liberians, as it is one of the main causes of the recent deterioration in international payments. Hence, a plan for augmenting paddy production by utilizing TV broadcasting was formulated by the Government.

Infrastructures of Liberia have not yet been completed. The differences between urban and rural areas are large in medical care and school education.

The trunk roads connecting Monrovia to Gbarnga, Buchanan and Bomi Hills are paved, but many local roads are left unpaved.

The number of telephone subscribers in 1981 was 6,989, and 90% of them were concentrated in Monrovia. The facilities are generally superannuated and are not useful in daily life. As a result walky-talkies are widely used. International telephone calls have been improved lately and the calls are available from the telephone office.

The total amount of electric-power generation in 1980 was about 830 million kWh and 70% of them was hydraulic, accordingly electricity runs short in the dry season and the planned blackouts are executed for about five or six hours daily in each area. For distribution of electricity high tension 12.5 kV (3-phase/3-line) for low tension, 208/115 V (3 phase/4-line) are adopted.

Voltage fluctuation and frequency fluctuation are officially reported to be $\pm 10\%$ and $\pm 3\%$ respectively. However, according to various investigations, it is necessary to design to be with the voltage fluctuation of $\pm 30\%$. In Liberia water resources of rivers are abundant, and presently the country is planning to develop new hydraulic power plants.

Urban water supply is available only in the major cities, such as in Monrovia, Gbarnga and Harper. About 20% of the urban population utilize it. Drainage is provided only in Monrovia and it covers 30 km from the center.

2-2 Education

The promotion of education is one of top priorities in the policies of the Liberian Government because young people occupy a large portion in the total population of Liberia. Education has always been the largest account item in the national expenditure, for which 13% of

the national budget was appropriated in 1977. In other words, great importance attached to education in budget formulation is ascribable to the Government's developing human resources which are not necessarily big (2.2 million) in order to make the best use of an abundance of natural resources which the country is blessed with.

Along this policy, the 6-3-3 schooling system is adopted in Liberia, under which the primary school attendance registers 67% (1979) which is notably higher than the levels in other African countries. However, the adult literacy rate is still rather low, and the number of junior and senior high school graduates is not very large either. Students attending higher educational institutions such as the University of Liberia, Cuttington College, Tubman College, number only about 750 in total graduates, and the resultant shortage of capable technocrats and experienced engineers is supplemented by a large number of specialists invited from abroad in carrying out important duties in the Government offices, and the foreigners assuming managerial posts at foreign-capitalized enterprises. To bring a remedy for this situation, the Government is energetically carrying out a number of progressive policies which includes the construction of new schools, training of school teachers and improvement of their treatment, and introduction of a free educational system for primary and junior high school students.

Adult education, planned to be strengthened especially for rural inhabitants, is another focal policy of the Government. For the youth education is aimed primarily at building the future of the nation, but it does not suffice for industrial development or national welfare improvement conducive to the country's rapid modernization. Adult education is given importance from this viewpoint, and radio and TV broadcasting services are considered essential for its promotion because the low adult literacy rate makes the education by direct image and speaking transmission more desirable than the regular education using textbooks.

From the reason mentioned in above, the Government of Liberia is expecting fruitful results obtained by the expansion of nation-wide educational television network.

2-3 Present Status of Broadcasting

The first radio station was founded in 1959 by British civilians. TV broadcasting started in 1964.

Just after the inauguration of TV broadcasting, the Government purchased the station which has now become Liberia Broadcasting System, LBS, the Government Body. Studios were located in the premise of the Ministry of Information, Culture and Tourism, and programs were transmitted from the antenna on the roof top of Ducor Hotel situated on a hill in Monrovia.

In 1979, on the occasion of Africa Union Organization Conference, Organization of African Unity (OAU) held in Monrovia, the transmitting station moved to Paynesville, and started the color TV broadcasting since then.

In Liberia, the following broadcasting organization are in operation as explained briefly: Detailed explanation on the present status of LBS is given later.

- . RADIO ELWA
- . LAMCO BROADCASTING STATION
- . ELCM
- . VOA

(1) Radio ELWA

It was opened in 1954 in the suburb of Monrovia, by Missionaries, Sudanese Interior Mission, to propagate of the Christian faith through broadcasting.

The programs are broadcast from 12 to 16 hours daily for Liberia and other African countries by MF and HF. The program contents are mainly composed of news and information with religion and religious music.

(2) LAMCO Broadcasting Station (ELNA)

This FM station was inaugurated by Liberian American-Swedish Minerals Company, LAMCO, the largest iron ores mining company in Liberia for the service of their employees. The station is located at Yekepa, Ninba County, near the boarder of Ivory Coast and Guinea (Neighbouring Countries).

(3) ELCM

This FM station was established in 1981, by the volunteers of Catholic Churches in Monrovia. Religious programs including music are broadcast.

(4) VOA

It was established in 1964. At present, the shortwave broadcasting is operated by using six 250 kW, and two 50 kW transmitters, at Careysburg in the suburb of Monrovia.

As described above, the radio broadcasts are operated by other than LBS, but TV broadcasting is conducted solely by LBS.

(5) Diffusion of TV Receivers

According to LBS's data, the total amount of receivers is about 35,500 sets (25,500 monochrome, and 10,000 color). Supposing five viewers for one set, about 14% of the total population in Liberia are enjoying TV programs.

This diffusion rate can be discussed to be quite high, considering the limited service area around Monrovia and the fixed production pattern of self-made program due to inadequate production facilities.

The price of 20-inch color set is about 1,000 U.S. dollars, while about 250 U.S. dollars for 14-inch monochrome set. Ordinary workers, whose average monthly wage is about 200 U.S. dollars, can expectedly afford to buy them.

In March 1981, LBS conducted the survey on "Purchase of TV Set" in Bong and Nimba County, where the broadcasts are not yet served. Although the number of samples are comparatively small with amounting only 563 samples, 85% of the samples expressed their hope to purchase a monochrome or color set with price of 250 - 1,250 dollars.

For the diffusion of radio and TV receivers, LBS established the LBS Enterprise, and is offering the receivers at lower price compared with ordinary market price such as 650 dollars for 20-inch color TV.

2-4 Present Status of LBS

(1) Organization

LBS belongs to Government and people of Liberia and consists of 184 employees advised by a Board of Director and headed by a Director General. The organizational chart is shown in Fig. 1. The breakdown of staffs is as follows:

Production	Department	60
News	"	27
Engineering	"	34
Others	"	63

(2) Management

The balance sheet as of June 30, 1983 is as follows:

Total Current Assets	\$1,284,032.87
Fixed Assets	\$6,130,822.27
<hr/>	
Total	\$7,414,855.14
Accounts Payable	\$1,155,556.95
Loans and Interests Payable	\$5,825,733.00
Retained Earnings	\$ 433,565.19
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Total	\$7,414,855.14

As observed, the amount of loan and interest payment is rather high.

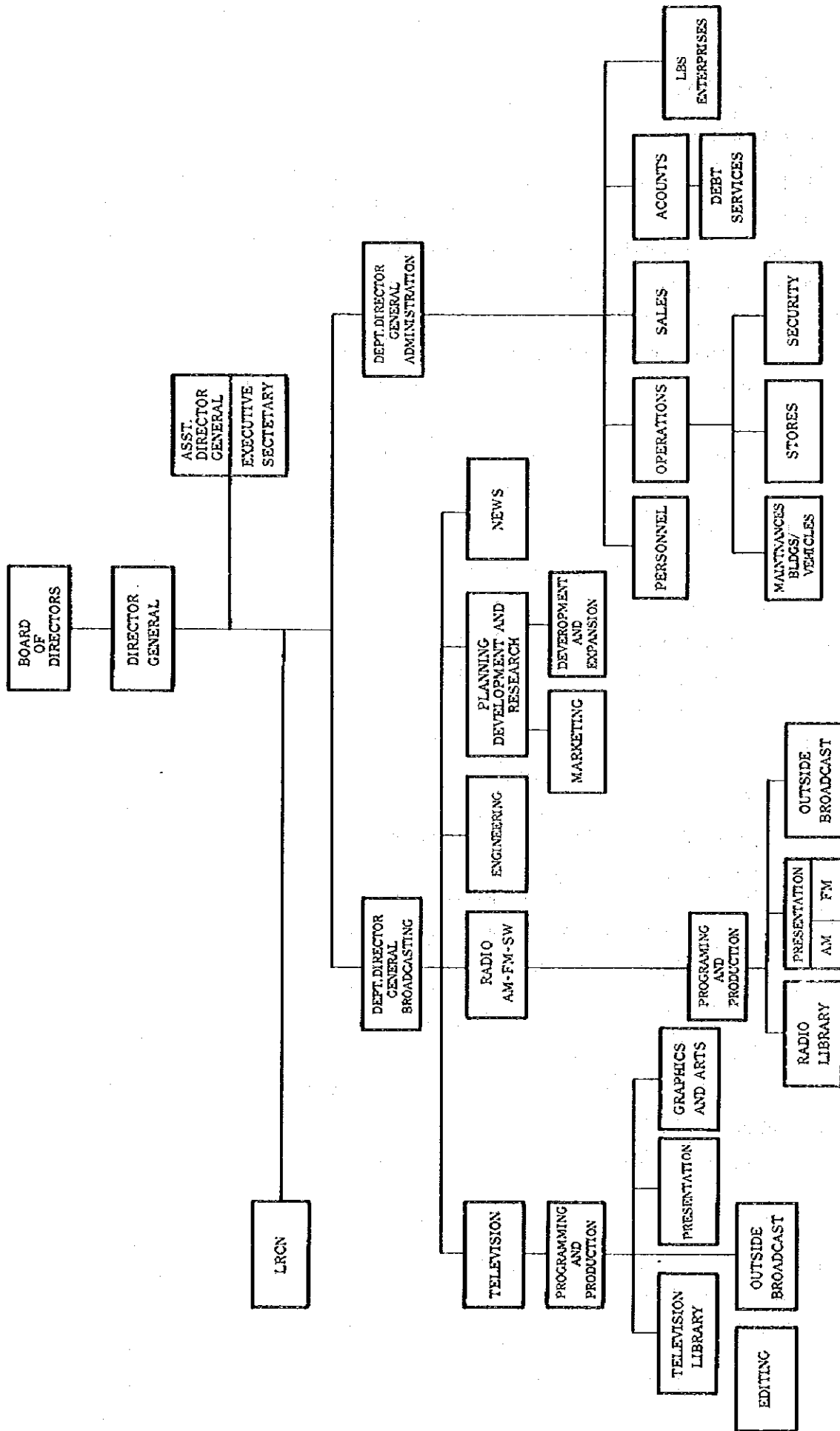


Fig. 1 LBS Organization Chart

\$4.4 million is appropriated for annual budget. Among the budget, governmental subsidy and advertizing income had expected, 60% and 40% respectively. At present, however, the subsidy is sliced sharply, Liberian Government subsidy to LBS at 20% actual and the advertising income falls in about 22%. These financial facts bring about a lot of difficulties on the management of the station and presumably this request of the project is based upon such background.

In order to cope with them, LBS is now taking into consideration adopting a receiver's fee system as in West Germany.

(3) Program

LBS transmits the following four media at Monrovia, Medium wave is served at Harper and experimental low-power TV broadcasting is conducted at Gbarnga.

Medium Wave	ELBC-MW	10 kW	630 kHz
Short wave	ELBC-SW	50 kW	6,090/3,255 kHz
FM	ELBC-FM	2.5 kW	89.9 MHz stereophonic
TV	ELTV	1 kW	6 ch, PAL-B

1) Radio Broadcasting

The medium wave transmission service has a history over 20 years, and with combining use of short wave transmission, it covers the whole territory. Radio Broadcast especially, plays an important role in the rural area, where the power supply services are inadequate.

At present, radio transmitting stations including studios are planned at seven regional cities by the cooperation of U.S.A. and construction works, totaling about 16 million dollars, are being carried out.

The broadcasting hours of MW, SW and FM are from 5:00 to 24:00 including break hours. Programs are mainly musio, news, information etc., and some of them are broadcast in 16 different dialects spoken in the rural areas. According to the audience survey conducted by LBS in August 1983, an entertainment program "Martin Brown Show" showed to be most popular, followed by news

which is an important means to get information to the peoples of nation.

2) TV Broadcasting

Broadcasting hours are five hours and forty five minutes a day commencing 18:15 to 24:00, Monday through Friday; and nine hours and forty five minutes a day from 14:15 to 24:00, for Saturday and Sunday. (Forty eight hours and fifteen minutes in a week, and six hours and fifty three minutes in a day average.) These figures are rather high in the developing countries.

The breakdown of program contents, 4 to 10, February 1985 is as follows:

News	15.5%	}	54%
Information	18.5%		
Education	19.7%		
Entertainment	34.3%		
Sports	6.3%		
Public Relations and CM	5.7%		

The total of news, information and educational programs account for 54%, and it shows a well balanced program compilation. However, broadcasting service area is limited in Monrovia city and its suburbs.

Table 1 shows "Weekly Program Schedule".

Table 1 Weekly TV Program

TIME	MIN	MON	TUE	WED	THU	FRI	SAT	SUN
PM	15							
	30						EARLY NEWS	EARLY NEWS
	45						KING KONG	PTL CLUB
3	15						BIG BLUE MARBLE	ORAL ROBERTS & YOU
	30						INVITATION TO DANCE	
	45						WRESTLING	LOCAL SPORT
4	15							
	30							
	45							
5	15							
	30							
	45						SOCCER	
6	15	EARLY NEWS	EARLY NEWS	EARLY NEWS	EARLY NEWS	EARLY NEWS		
	30	HONG KONG PRONY	SUN TIME	ELECTRIC COMPANY	FUN TIME	TOP GUN	ECHOES OF LIBERIA CULTURE	REFLECTIONS
	45		MONDAY MAGAZINE	ADULT EDUCATION	CODE RED	RIFFLE OF SCIENCE	ADULT EDUCATION	CONCERN
7	15	ADULT EDUCATION	ECHOES OF LIBERIAN CULTURE	SALT OF THE EARTH		FRIDAY MAGAZINE	SATURDAY MAGAZINE	HI-Q QUIZ SHOW
	30	THE MOPPET SHOW		CHANNEL SIX NEWS	CHANNEL SIX NEWS	CHANNEL SIX NEWS	CHANNEL SIX NEWS	CHANNEL SIX NEWS
	45			BENSON	SANTFORD & SON	DIFFERENT STROKES	WEEK-END SPECIAL	GOOD TIMES
9	15	ARTS & ARTISTS	KNOW YOUR PUBLIC CORPORATIONS	WEDNESDAY MAGAZINE	TODAY'S WOMAN	LET'S FIND OUT		PUBLIC AFFAIRS PROGRAM
	30			SPOTLIGHT ON SOCIAL SECURITY	THE ARMED FORCES TODAY	FRIDAY SPECIAL	STAR TREK	
	45	KNOTS LANDING	LOVE BOAT	TO BE ANNOUNCED	TO BE ANNOUNCED			SUNDAY AT THE MOVIES
10	15			HART TO HART	COMBAT	CASSIE & CO.		
	30	CERISTOFEST	SOLID GOLD				CHIPS	
	45			LATE NEWS	LATE NEWS	LATE NEWS	LATE NEWS	REPEAT OF WEEK IN REVIEW
11	15							
	30	LATE NEWS						
12	15							
	30							
AM	0							
	15							

The percentage of self-production programs and purchased programs are 27%, 73% respectively. The ratio of self production program is rather high for a station which broadcasts about six hours a day.

At present only one studio is available for program production and allowable time for the production of 30 minutes program is limited to be about one hour. Therefore, the production method tend to be simple. Accordingly, many documentary and entertainment programs are purchased from foreign countries.

LBS itself is sometimes tackling the more sophisticated and higher programs, but is confronted with enormous difficulties such as long production hours and insufficient staff in number as well as equipment.

Table 2 shows "Weekly Production Schedule".

Table 2 Weekly TV Production Schedule

DAY	PROGRAMS	REC. TIME	REMARKS
MON	TRAINING REHEARSAL & MAINTENANCE		
TUE	LET'S FIND OUT LEC ELWA JUST FOR YOU	10:00 11:00 2:00 3:00	
WED	ARTS & ARTISTS MINISTRY OF HOPE FACE THE PRESS ADULT EDUCATION	10:00 11:00 2:00 3:00	
THU	ARMED FORCES TODAY HI Q TODAY'S WOMAN RIPPLES OF SCIENCE	10:00 11:00 2:00 3:00	
FRI	EPILOGUE CONSTITUTION FORUM BUSINESS & YOU WEEKEND SPECIAL	10:00 11:00 2:00 3:00	
SAT	FUN TIME CONCERN	10:00 11:00	
SUN	REST		

3) Future Program Planning

As mentioned above, the programs are compiled well-balanced, and LBS has a strong desire for production programs. In future, LBS is planning to extend the total daily broadcasting hours from seven to ten hours, 15:00 - 01:00, to add the programs of health and sanitation, and agriculture, and to increase school educational program from 08:00 to 10:00. With the construction of new facilities, LBS has also an intention to produce documentary and drama in future.

2-5 Present Status of Facilities of LBS

(1) Building

1) LBS Head Office

The building is located at Paynesville city, about 15 km east from the city center. The total floor area is 2,000 m², two-storied, ferro-concrete constructed. It consists of various office rooms, TV studios A and B, TV master control room, radio studios and radio master control room. As it was constructed seven or eight years ago, the interiors are modern, but some of air conditioners are not yet completed or already have failed and are abandoned due to the lack of spare parts.

The site area is 22,000 m² and in the back yard, a transmitter house, TV antenna tower, power house etc., are built.

A new radio studio building (two-storied) is being constructed at the corner of the site by the cooperation of U.S.A.

2) Studio Construction

TV studios A and B, are constructed in a comparatively modern design with good interiors of wall and ceiling. The design is, however, of radio studio style and some defects are found such as no fixed cyclorama together with low ceiling of the scenery storage area. The reverberation time of the studio is adequate. As a whole, they will be reconstructed with minor changes and addition for the programs expected at present.

a) TV Lighting hanged from the Ceiling

The lighting system which was planned at first is not yet completed and the parts such as ceiling grid and light hanging barrels except the apparatus are left outdoors. Considering the construction presumption sketch of the studio obtained during the survey, and the strength calculation of the structure, by measuring the size of beams exposed at the ceiling, the construction of studio will bear the total weight of lighting system. (Design plan and construction calculation are missing)

b) Studio Floor

Since the studio B has been used for warehouse, its floor is slightly damaged.

c) Sound Insulating Door

As the doors are wooden-made, they are warped and the repair is difficult. Doors between studio A and the actual warehouse, Studio B and scenery storage and outdoors are all missing.

d) Noise Insulation

Ceiling is made of concrete slab and air-conditioning ducts are installed above the ceiling. Above the ducts, iron plates are roofed. Because of inadequate noise insulation as well as muffler treatment, the program production becomes impossible in the rainy season, due to noise caused by rain drops on the roof. Noise insulation between control rooms and the neighboring rooms are also insufficient.

e) Air Conditioner

Due to superannuation and serious lack of spare parts, one set of air conditioner for Studio A is operating and another one is not.

(5) Broadcasting Facilities

1) TV Transmitting Equipment

LBS has only one low power transmitter at Monrovia. Its service area is narrow, covering approximately 25 km in radius, servicing only about 10% of the total population, (At Gbranga, a low power experimental transmission has been conducted since October 1984, but the area is quite small).

The TV transmitting output power in Monrovia is 1 kW at channel 6 and the signal is radiated from the zigzag antenna of 2-stacks, 2-faces mounted at the top portion of a guyed mast of 119 m height.

Antenna elements are faced to east and north, and Monrovia City is placed comparatively in off beam direction. In some places of the city, the reception is poor.

The TV transmitting house, antenna tower, and FM transmitter house are located in the back yard of the main building. They are operated by the technicians of Engineering Division.

2) Studio Facilities and OB Van

LBS main building has four radio studios and two TV studios. The floor areas of TV studios A and B is about 165 m² and 82 m² respectively and only studio A is being used, while studio B is used as a warehouse.

In both studios, lighting and hanging equipment are not yet installed but left as they were. In Studio A, the lightings are supported with floor stands. For that reason, the available number of lights is extremely limited due to the restriction of floor space and so fine adjustment of lighting and camera works can not be expected. Under these conditions, shooting of moving scenes and to get high picture quality is difficult.

Some pickup tubes and CRT of cameras and monitors have aged and deteriorated. In the video control system, no effect machine is provided which is very important at present, so only simple programs are being produced.

There are two sets of telecine equipment and film projectors are of ITV (Industrial TV) use. Furthermore, one is out of order and the other one is seriously defected. They should be replaced with new ones as earlier as possible.

Four one-inch B format VTRs are provided and maintained by an expert from West Germany. However, they are not in use due to high price of tapes. Only 3/4-inch VTRs (low band) of Japanese made are utilized. Two sets of editor for 3/4-inch VTR are put into practical service.

In the TV OB Van, the standard equipment are provided. However, these built-in units or equipment are used as spare parts for the studio facilities. Consequently the Van lost its function for outdoor production. If not so, the program will have more variety.

For maintenance of studio facilities, a member of Japan Overseas Cooperation Volunteers and a volunteer from West Germany have been engaged, but due to the lack of spare parts, they cannot exert their ability fully.

3) Power Supply Facilities

Receiving capacity of commercial power supply is 750 kVA and three single-phase transformers of 250 kVA are installed outdoors.

Receiving voltage is 12.5 kV in 3-phase, 3-line and from the secondary of transformer, A.C. 208 V, 3-phase, 4-line, is supplied to the equipment.

The situation of electricity in Monrovia is not favorable. Specifically, the planned blackouts are conducted in each region in the dry season. For that reason, a self generator is required and an engine-generator of 175 kVA is installed. It cannot, however, supply power to run the air conditioner in Studio A, thus program production is forced to be prevent due to high temperature rise in the studio when blackout persists for a duration.

4) Existing Facilities

List of available existing facilities are shown in Table 3.

Table 3 List of Existing Facilities

Facilities	Q'ty	Remarks
Studio A		
Color Camera PHILIPS	3	LDH-20
Lighting Equipment PYE-TVT	1	
Video Switcher PYE-TVT	1	
Color Monitor BARCO CTVM 2/51	3	
Monochrome Monitor PYE-TVT	6	
Audio Console PYE-TVT	1	
Tape Recorder AMPEX	1	
Cartridge Recorder HARRIS	2	
Audio Monitor CELESTION	1	
Disc Player HARRIS	1	
Studio B, TV OB Van		
		Impossible to operate
VTR Room		
1 inch VTR Bosch	4	
Telecine Room		
3/4 inch VTR Sony VO-5850P	2	
Time Base Corrector CVS-517	1	
Telecine Camera PHILIPS	2	1 set is out of order
16 mm Film Projector Bosch	2	1 set is out of order
Slide Film Projector KODAK	2	
Master Control Room		
Master Control Console	1	
Rack Room		
Rack	5	

- continued -

Facilities	Q'ty	Remarks
TV Transmitter Room		
1 kW Transmitter PYE-TVT	2	1 set is out of order
Attached Rack	1	
Antenna (Zig-Zag)	1	2 stacks, 2 phases
Tower 119 m Guyed	1	
Power Room		
High Tension Transformer	1	250 kVA x 3, Outdoor type
Engine-Generator	1	175 kVA
VTR Editing Equipment	2	
ENG Equipment	4	2 sets are under repair
Radio Studio (A.B.C.D.)	4	
FM studio and Transmitter Room	1	
2.5 kW Transmitter HARRIS	1	89.9 MHz
Antenna Loop type 3 stacks	1	

5) Operation and Maintenance

Operation of transmitting equipment and maintenance of broadcasting equipment and facilities are conducted by Engineering Department, while program production in studio by Television Department.

For the program production of "FUN TIME" and "CONCERN", two camera men (for three cameras), together with a producer and an audio mixer, totally four persons are in charge. However, the number of staff is not big enough compared with 7 or 8 persons in other countries, which is closely connected with the quality of the produced program.

Since no engineering staff participates in program production, the control of equipment, grasp of facilities' condition can not be fully made, and without appropriate technical advices, the programs become low in quality and monotonous. Production work should be done by a good team-work of producer, camera man, light man, video engineer, mixer etc. Therefor, with lack of any staff program production can not success fully be done.

Maintenance and repair works are presently executed by the following members:

Equipment	Engineer	Technician	Trainee
TV Transmitter	1 (1)	3 (1)	1
TV Studio	1 (1)	4 (2)	
Radio Transmitter	1 (1)	3 (1)	1
Radio Studio		5 (1)	
Air Conditioner		2 (1)	
Power Supply		1	
Total	3 (3)	18 (6)	2
Grand Total	23		

The number in parenthesis denotes the number of staff who can engage in maintenance work.

(6) Training

Eight persons have already joined the "Managers Course" and "Engineering Course" held in Japan by the Ministry of the Posts and Telecommunications and JICA under the cooperation of NHK, and they are occupying important positions and taking active parts in LBS.

LBS desires participation of staff to the training courses of management, production, programming, and engineering which will be held in short, medium, and long term, from three months to several years. In 1983, three persons participated in the training course for two months in Egypt, while four persons, for three months in U.S.A. and others in Sierra Leone.

CHAPTER 3
CONTENTS OF THE PROJECT

CHAPTER 3 CONTENTS OF THE PROJECT

3-1 Objective of the Project

The objective of this project is to expand the TV network and improve the TV programs in terms of quality and quantity, and utilize the TV broadcasting service which appeals directly to the vision, to promote school education, health and hygienic education and agricultural technology effectively for the national development and improvement of living standards of the country of Liberia.

3-2 Expansion of TV Network

3-2-1 Expansion of TV Network

Of the requests proposed by the Republic of Liberia, the increase of transmitting power in Monrovia transmitting station and construction of three regional transmitting stations will be examined concretely in the following.

(1) Power-up of Monrovia Station

The coverage of the existing Monrovia station is insufficient. The ranging radius is about 25 km, and the receiving condition in the suburbs is poor. Firstly, the expansion of coverage in the metropolits is necessary. Besides, for the nation-wide network, the receiving condition of the Monrovia station at the proposed sites for some of the transposer stations are not good enough. Therefore, power-upping of Monrovia station is required to improve the picture quality of signal received at each transposer station under planning.

From a technical viewpoint, power-upping of the existing transmitter by modification is difficult, because the facility was manufactured in a foreign country other than Japan, and the broadcast service cannot be intermitted in the daily operation. Therefore, in this project, the existing antenna tower will only be used and other facilities such as transmitter, power supply equipment, antenna etc., will be newly installed. After

completion of the power-upping work LBS is considering the re-use of the existing transmitter for transmission of new media, or for movement in another area after improvement.

(2) Construction of Regional Transmitting Stations

To expand the TV network to the local areas, there are two ways, i.e., high-power transmission from a high mountain, and construction of a number of stations dispersed in plain areas. Topographically, the terrain of Liberia is comparatively flat, so the latter should be adopted. Generally, the coverage of a 10 kW transmitter station with an antenna height of 100 m in a plain site is about 50 km in radius. From this fact, a number of relay stations are necessary for covering the whole country. The following conditions are studied for the construction of local stations:

- . TV signal has to be sent from Monrovia to the regional stations. Generally, the transmission method of TV signal can be classified into two;
 - a) one is the use of TV microwave link operated by LTC, and
 - b) the other is the use of off-air relay.

Accordingly, if it is impossible to use the LTC microwave transmission link, the location of transposer stations shall be selected from the viewpoint of propagation and tandem connection of off-air relay.

- . Population density near the site shall be high enough and the service area shall include the important places in the region.
- . Geographically, the station shall have the possibility of connecting down-stream stations in the future expansion planning of the network.

Considering the above, the following proposed sites are selected for the local stations:

1) Gbarnga

Gbarnga, Liberia's second-largest city, is the center of Bong County and has a college. Situated in the north-east is Sanniquellie, the capital city of Nimba County, and Yekepa city where LAMCO, the country's largest iron ore mining company is located. Also, an important mining zone is spreading to the north. Gbarnga transmitting station will thus serve as one of the vital bases in the event of future network expansion work.

TV transmission line operated by LTC is presently available between Gbarnga and Monrobia. As the receiving condition at this site is satisfactory, it is possible to transmit TV program through the present transmission line.

2) Buchanan

Buchanan has an exporting port of iron ore, Liberia's major product, and holds an important position in the country.

Buchanan transmitting station is regarded as an upstream station for the future expansion to Greenville and Harper in the eastern region. Located at a rather remote distance of 80 km away from Monrovia, this site is in poor receiving condition. A better reception can however be expected by power-upping the Monrovia station and by improving the antenna. Hence, the off-air reception system will be adopted.

3) Bomi Hills

Bomi Hills is located to the north of Monrovia. Bomi Hills city and Robert Port city have a large population. The proposed site is capable of covering neighboring important cities, and three counties are included in the proposed service area.

The receiving condition at the site is satisfactory because of its high altitude. Hence, the off-air relay system will be adopted.

3-2-2 Determination of Transmission condition

To determine the capacity of transmitting facilities, it is necessary to assume the service area for the sites individually. The service areas should cover as many population as possible and include regional major cities, considering the future expansion plan and

interference to neighboring countries. Based on the service areas thereby determined, the transmitting conditions such as transmitting power, antenna height and type of antenna are computed and decided upon.

The field intensity for each receiving point is then computed by taking into account the respective transmitting conditions as well as the profile which was calculated and derived from the maps of 1/50,000 - 1/250,000 of the service areas covered between transmitting and receiving points.

Fig. 2 shows the service areas of Monrovia and three regional stations. The service area determined which is shown in fine lines is based on the field intensity of 55 dBu/m specified by C.C.I.R. recommendations (Comité Consultatif International de Radiodiffusion). In the area, the viewers will be able to receive TV signal by using an ordinary antenna, while the area where TV reception is practically possible will be more wider than that. The expanded service areas are estimated to increase the aggregate population coverage from the present 10% to about 45%.

LIBERIA

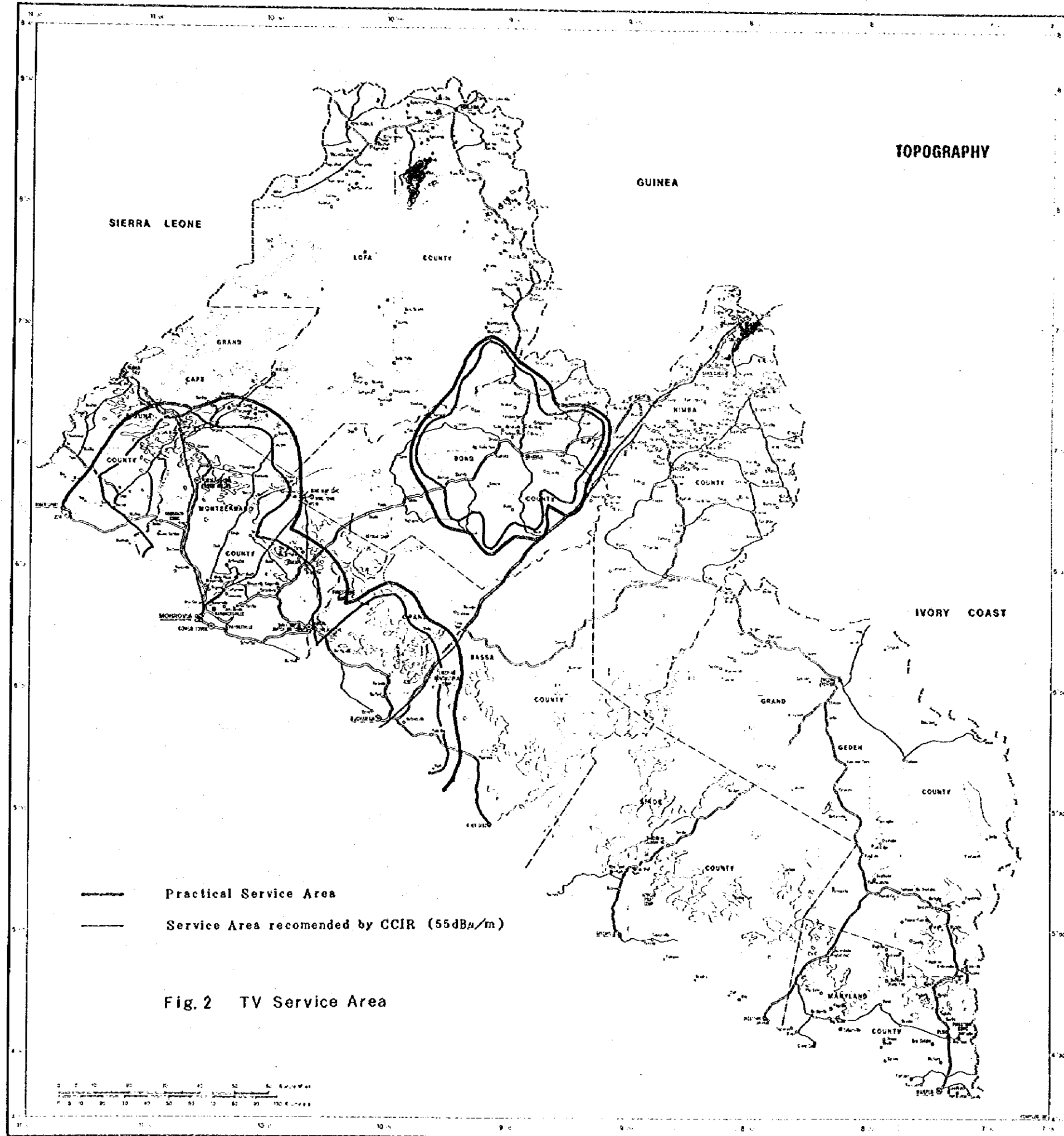


Table 4 Channel Plan

CH	Monrovia	Gbarnga	Buchanan	Bomi Hills	Voinjama	Sanniquellie	Greenville	Harper	Zwedru
5		●							
6	○								
7						⊙			
8	●								
9					○		○		
10				●					⊙
11			●					○	
12									

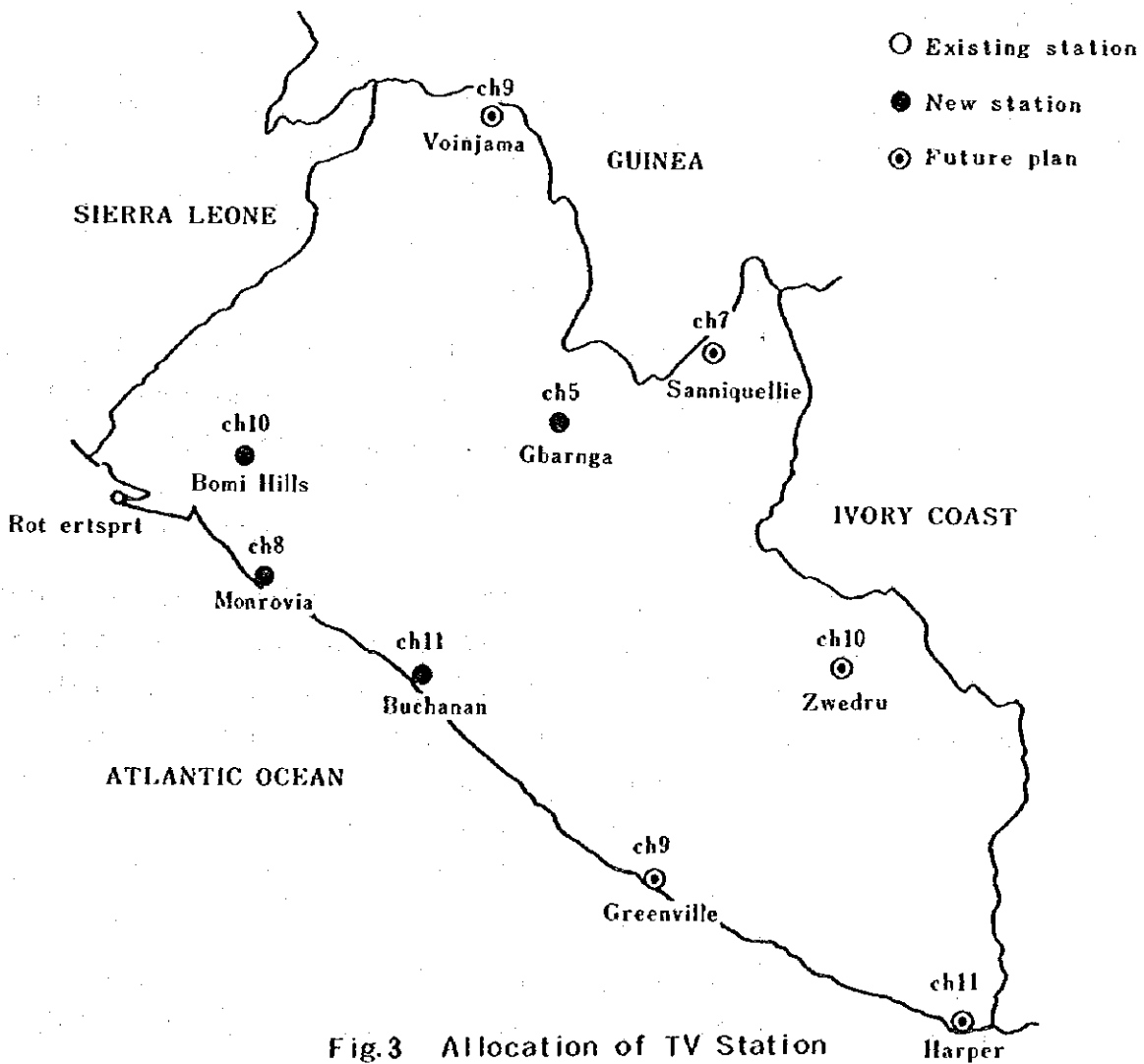


Fig.3 Allocation of TV Station

In the allocation of TV frequencies, various factors such as effective use of channels, condition of wave propagation are considered with the future expansion plan in mind:

- (1) According to the general principle of frequency allocation, the channel for each station is selected from the same frequency bands.
- (2) To avoid abnormal propagation and thus to reduce interference, a channel in band III is selected.
- (3) In the same region, the use of channels adjacent to the channels in use are not allocated.
- (4) Interference protection ratio of 45 dB for the co-channel, and 0 dB for the adjacent channel are used as the standard.

Based on the above conditions and the C.C.I.R. recommendation for channel allocation, the channel allocation plan was made as shown in Table 4 and fig. 3.

3-2-3 Transmitting Facilities

The transmitting facilities generally comprise a transmitter, a transmitting antenna, an antenna tower, program relay equipment, and an power generator, as well as a building to house these facilities.

(1) Transmitter and antenna tower

The transmitter, antenna and height of antenna tower, all of which are directly related to TV transmitting, are selected in accordance with the transmitting condition of each regional station as mentioned above. Transmitter system needs to composed of two sets, one for actual operation and the other for stand-by, considering the routine maintenance.

(2) Program Transmission Equipment

TV programs are to be sent from LBS Monrovia to the regional transmitting stations, entirely by the program transmission equipment.

(3) Power Supply Equipment

The existing 750 kVA power supply equipment installed in LBS Monrovia cannot cater to any incremental load. An additional power supply equipment is required to deal with the power demand caused by installing new equipment under this project.

Also, each of the regional transmitting stations needs to be equipped with power equipment enough for operating the new transmitting equipment.

In the dry seasons of Liberia, planned blackouts are enforced area by area, making it necessary to install an emergency engine generator to continue the broadcasting. In addition as the voltage fluctuates largely, an automatic voltage regulator will be installed.

(4) Communication Equipment

During the daily TV service, it is necessary to provide emergency communication between LBS headquarters and regional stations, in regard to changes in broadcasting time and interruption of broadcasting caused by equipment failure. As the condition of telephone in Monrovia is poor, it is difficult to use it for daily communications. Therefore, short-wave transceivers (SSB) will be equipped to each of the regional transmitting stations.

(5) Regional Station Buildings

Regional station buildings will be built to house the transmitting facilities mentioned above.

3-3 Improvement of Monrovia Studio

The number of TV studios are generally determined by the contents, scale and quantity of the programs the broadcasting station is expected to produce. To improve the TV programs in quantity and quality which is one of the major objectives of this project, it is necessary to improve the TV studios.

There are two TV studios in Monrovia, but, Studio B is not in use due to defective equipment.

Accordingly, the majority of the TV programs are therefore forced to be made in Studio A, with insufficient production hours and it will be difficult to improve the program quality or enrich the educational program. Under this situation, the increase of the number of studios and rehabilitation of studio equipment, will be taken into consideration.

3-3-1 The Number of Studios

As already mentioned, at present the time allowed for program production at LBS is very short; a 30-minute program is being produced within one hour or so, leaving hardly enough time not only for rehearsal but also for previewing the recorded programs.

Generally speaking, the number of studios can be determined by using the Studio Utilization Factor (= studio occupancy hour for program production/program transmission hours) which is related to the complexity of program contents, the number of studio sceneries, maneuverability of studio equipment and technical level for program production.

Studio utilization factor is shown in the following.

<u>Kinds of program</u>	<u>Studio Utilization factor</u>	<u>Remarks</u>
News	1.5	Live program
News commentary	2.0	"
Talk	4.0	Recorded program
Discussion	5.0	"
Education program	8.0	"
Quiz	8.0	"
Classic	10.0	"
Children Program	15.0	"
Musical Show	10.0	"
Dance	15.0	"
Drama	20.0	"

With the current LBS-produced programs mostly consisting of talking and discussions, assuming the studio utilization factor is 5, then production of each 30-minute program will require two hours and thirty minutes, which means a total of about 10 hours are required to produce 4 programs a day, as is shown in Table 3 (the program schedule of LBS). In addition, as studio A is also being used for the routine

program transmission) from 18:00 to midnight (from 14:00 on Saturdays and Sundays), it will conflict with the program production.

Accordingly, it is an urgent requirement to increase the number of studios to relieve the above restriction and to grade-up the program contents.

TV studios may be divided into three: large-sized studio for producing dramas and musical shows; medium-sized one for discussion and educational programs; and small-sized for news and talk. In the face of the existing LBS' TV program schedule as well as its future plan, it is necessary to have both of small-sized and medium-sized studios at the minimum. The studio A in operating is 190 m² in area, qualified for a medium-sized studio, and will continue to be used for producing educational programs and other general programs.

Meanwhile, the real-time transmission is regarded as vital to news, compared to other kinds of programs. Therefore it is advisable to provide an independent studio to permit news program transmission when the need arises, in addition to the studio for producing other programs.

Studio B, which is now out of use, has a floor area of about 80 m², qualified for a small-sized studio, and will be renovated into a multi-purpose studio which is meant largely for news production, along with talk and discussion, as well as for program transmission.

3-3-2 Rehabilitation of Studio B

The rehabilitation of Studio B needs to be carried out, taking into consideration the requirements set out in item 3-3-1 above and also the present status of studio as mentioned in item 2-5.

The present status of Studio B is as follows:

- | | |
|------------------------------|---|
| o Studio interior | Good |
| o Video and audio equipment | Defective |
| o Lighting equipment | Uncompleted and not fit for use in the studio |
| o Air-conditioning equipment | Antiquated and short of major components |

- o Air-conditioning duct, and sound-proof door Noise insulation is insufficient (External noise will degrade the program quality)
- o Staircase Not provided (Inconvenient for program production)
- o Studio floor surface Partly damaged, making difficult the camera movement

Studio B will therefore be improved as follows:

- o The video and audio equipments need to be totally renewed. PAL B system of C.C.I.R. is retained as TV standards.
- o Suspension grid will be installed under the ceiling to hang the lighting equipment, thereby helping producing simple programs.
- o The air conditioning equipment will be renewed, air duct and sound-proof doors improved in terms of noise insulation, staircase provided, and studio floor surface repaired.

3-4 Conclusion

As regards the project requested by the Liberian government, the results of the study are summarized as follows:

(1) Increase of transmitting output power at Monrovia Transmitting Station

Increased transmitting output power will greatly improve the receiving condition at the suburban areas of Monrovia, and also enhance the reception sensitivity at regional stations. To meet such needs, transmitter and antenna will be renewed except antenna tower and an additional power supply equipments installed. Buildings will be built to house the transmitter and power supply equipments respectively.

(2) Construction of regional TV transmitting stations

New TV transmitting stations will be constructed at Gbarnga, Buchanan, and Bomi hills, allowing the reception of radiated signal in major city of the respective counties. The entire facility such as transmitter, antenna with tower, power equipments

are newly installed, and buildings to house transmitter and power equipment are built up.

(3) Rehabilitation of Studio B in Monrobia

The broadcasting equipment will be renewed and the studio facility rehabilitated, allowing it to produce simple programs such as news, talk and live ones.

CHAPTER 4
OUTLINE OF PROJECT SITES

CHAPTER 4 OUTLINES OF PROJECT SITES

4-1 Project Sites

Sites related to this project are the following four, including LBS Main Building in Monrovia:

- (1) Monrovia: LBS Head Office,
Lat. $6^{\circ}51'52''$ N, Long. $10^{\circ}42'08''$ W

Liberia Telecommunications Corporation (LTC) Head Office
- (2) Gbarnga: Proposed site,
Lat. $7^{\circ}00'50''$ N, Long. $9^{\circ}28'58''$ W
- (3) Buchanan: Proposed site,
Lat. $6^{\circ}04'03''$ N, Long. $10^{\circ}01'30''$ W
- (4) Bomi Hills: Proposed site,
Lat. $6^{\circ}53'39''$ N, Long. $10^{\circ}40'41''$ W

4-2 LBS Head Office

(1) LBS Head Office

Installation and rehabilitation work of the project related to the expansion of TV network is being executed at the existing TV transmitter room, power room, TV tower and peripheral facilities at the LBS Head Office and the work related to TV studio and peripheral facilities is also being conducted at the existing TV studio in the LBS main building.

The site of LBS is facing a trunk route connecting the city center and the airport. The traffic is convenient.

(2) LTC Head Office

It is located in the center of Monrovia City, and separated about 15 km away from LBS Head Office.

Installation work of the project is being executed at the 3rd floor of the equipment room and existing parabolic antenna tower and micro-wave receiver to relay program from LBS to Gbarnga will be installed. The permission of the installation by the LTC has been already obtained.

4-3 Regional Transmitter Stations

Considering the following items, the most appropriate sites for the project were selected:

- 1) Program relay from LTC to the site is possible.
- 2) Acquisition of the site area is easy.
- 3) The site is in the higher location, that will be expected to give wide TV service coverage.
- 4) LBS's payment for the construction of access road and receiving electricity shall be the smallest as possible.

(1) Gbarnga

1) Site location

The proposed site is on a hill top of 262 m high, in the western suburb of Gbarnga city and the land belongs to the Government. The area is about 15,000 m² and wide enough for constructing a guyed antenna mast of 100 m in height. The foundation of the ground is relatively good.

However, a housing complex for army personnel are existing nearby and some appropriate arrangement will be necessary.

2) Transportation

The site is located in about three hours' drive from Monrovia, and all the road are paved. The access road of 500 m length from the main road to the site is good on the surface although it is unpaved.

3) Gbarnga Microwave Terminal Station (LTC)

It is located in the city and the distance from the proposed site is about 3 km. The places related to the project are the existing tower for parabolic antenna and equipment room in the house, where the microwave transmitter for the transmission of TV program to Gbarnga station will be installed.

The agreement for the installation of the microwave link has been obtained.

4) Power Supply

Electric power lines have been installed to the site.

5) Water supply and drainage

These are not provided on the site at present, however the construction work will be completed under LBS by the start of project construction work.

(2) Buchanan

- 1) The proposed site is located on the top of rocky hill of the height of 90 m (above the sea level), about 20 km north from Buchanan city.

The area is about 1,000 m² and wide enough for constructing a self-supported tower of 50 m in height.

The surface of the ground is covered with rock bed and bearing capacity of the ground is enough, although some technical device are necessary in the foundation work of tower and earthing works for electricity.

2) Transportation

The site is situated near the paved trunk road from Monrovia to Buchanan city. It is necessary to construct an access road of several hundred meters to the site. The site is placed at about two and half hours' drive from Monrovia.

3) Power Supply

Along the trunk road near the site, power lines have already been installed.

4) Water supply and drainage

Same as Gbarnga.

(3) Bomi Hills

1) Proposed Site

The site is located on the hill of the height of 170 m (above the sea level) where iron ore mining used to be in the past, at about 60 km north from Monrovia.

The site is placed at a little lower portion from the top and yet relatively flat with the area of about 2,500 m². Near the site, there is a lake. As the boundary of the site towards the lake is fragile, the construction place is selected as far as possible from the steep.

2) Transportation

A paved road connects from Monrovia to the foot of the hill. From the foot of the hill up to the site, there is a non paved access road with about 1 km. Some work for its pavement is required by the LBS. The site is about one and half hour drive from Monrovia.

3) Power Supply

Power distribution lines have been installed to the LTC micro-wave relay station which is placed at about 200 m away from the site.

4) Water Supply and drainage

Same as Gbarnga.

5) Others

In the premise of LTC micro-wave relay station, three parabolic antennas are mounted at three sides of the existing tower. As the proposed site is located on the back and sides of these antennas, no interference is expected.

4-4 Circumstances of Construction

(1) Architectural Techniques

Although five to ten storied buildings are often seen in the capital city, the most popular architectural structures in the country are one or two-storied house of concrete block. However, pillars, beams, slab of 2nd floor are of ferro-concrete rahmen, and roof is covered predominantly of aluminum bend plate or corrugated zinc galvanized iron plate over the wooden structure. Finish of wall is painted mortar. Ceiling is made of wooden grid with veneer board and painting. Window is of jalousie type with aluminum sash.

(2) Architectural Materials

The materials produced in the country and reliable in quality are cement, sand (frequently sea-sand and water washing is inevitable to eliminate salt), stones from quarry, concrete block, timber, wooden furniture and aluminum sash for general use etc.

As reinforcing bars are in short and the sizes are not so many, it should be brought from Japan.

The following materials or units should be also manufactured in Japan and transported; grid for studio lighting, iron staircase between sub-control and studio floor, air conditioner for studio, steel plate for making air duct, sound insulating materials, cooling fan for transmitter, air conditioner for transmitter room, wiring ladder, steel member for tower etc.

(3) Price of architectural material

The price of concrete material produced in this country is nearly the same as in Japan, while imported materials, especially industrial products are very expensive.

(4) Transportation of Materials

Unloading at Port Monrovia and transportation of materials necessary for the project to Gbarnga, Buchanan and Bomi Hills are readily possible. However, even the paved trunk road, it might be flooded or damaged partially in rainy season.

CHAPTER 5
BASIC DESIGN

CHAPTER 5 BASIC DESIGN

5-1 Basic Design I Broadcasting Facilities

5-1-1 Design Policies

In the basic design, the basic policies are as follows:

- (1) To arrange the broadcasting facilities efficiently which are most suitable for the objective of the project.
- (2) To select materials and construction methods most suitable for the objective of the use of facilities and also the limited construction term.
- (3) To aim at high reliability and lower electric power consumption, as well as to take the operability, maintainability and economy of facilities in consideration.
- (4) Specifications for the equipment are to be in compliance with the C.C.I.R technical standards. In the design of equipment and facilities, security, durability and rigidity are to be taken into consideration as well as future expansibility of facilities.
- (5) Regarding spare parts, in principle, they should be composed of main parts and units which the quantities are computed on the basis of the present broadcasting hours (approximately 7 hours per day), considering an operation period of two years.

5-1-2 Basic Design

(1) Monrovia Transmitting Station

In the project of rehabilitation and new installation, the transmitting channel is to be changed, as well as the transmitting power is to be increased, under the new frequency allocation plan mentioned in Chapter 3-2.

In the Monrovia Transmitting Station, as a transmitter, a transmitting antenna and power supply equipment are still in operation, it is quite necessary to re-use these equipment and facilities, in the rehabilitation plan.

1) Transmitter

In general, transmitters are manufactured and assembled in accordance with international technical standards such as the recommendations of C.C.I.R., but their system compositions are of self original form of each manufacture. Consequently, it is quite difficult to rehabilitate these equipment manufactured by different makers. The existing transmitter in Monrovia Station is made and assembled by some foreign manufacturer, not Japanese one. It is, therefore, very difficult to increase the transmitting power and change the transmitting channel, merely by addition of Japanese-made parts and facilities.

Furthermore, it is quite impossible to suspend the operation of the existing transmitter for the rehabilitation work. Under these situations, a transmitter is to be newly installed.

2) Transmitting Antenna

The existing transmitting antenna is installed in two directions. In the rehabilitation plan, it is necessary to add one more direction to expand the broadcasting areas.

However, the same model as the used in existing transmitting antenna is not fabricated in Japan.

If two different transmitting antennas are combined together, as the electrical characteristics will differ from each other, it will be very difficult to secure the projected broadcasting service areas from technical points by combining the electric wave radiated from both antennas effectively.

Furthermore, it is quite impossible to keep the existing transmitting antenna out of operation for the antenna

rehabilitation. Three-direction transmitting antennas are, therefore, to be newly installed.

3) Antenna Tower

The existing antenna tower, which is not superannuated and is confirmed to be quite durable against the load of newly installed antennas, will be re-used.

4) Power Supply Unit equipment

Since the capacity of the existing power supply equipment is not enough to supply electric power for the newly installed facilities, power supply equipment and an emergency engine generator are to be newly installed.

5) Program Transmitting Equipment

For transmission of TV programs to Gbarnga Station which is to be newly constructed, microwave program transmitting equipment using micro-wave will be newly installed to connect LBS headquarters and LTC headquarters.

6) Main Equipment and Facilities

Shown in Table 5.

7) Arrangements of Broadcasting Equipment and Facilities (Refer to Figure 4)

a) Basic policies for arrangements of equipment and facilities in the studio are as follows:

. Two sets of transmitter are to be arranged in the center of building in one line, so as to be given easier access to their monitoring and maintenance.

. The program input equipment and program transmission equipment are to be also arranged so that they will face the above-mentioned transmitters, for easier monitoring and maintenance.

Table 5 Composition of Transmitting Facilities (Monrovia)

Facilities	Remarks	Spare parts
• TV Transmitter transmitter	10 kW, 8 CH, Including standby	o
• Transmitting Antenna	2 stacks, 3 phases 119 m, Existing Tower is used	
• Program Transmission equipment	Micro-wave link (Receiver is installed at LTC)	o
• Program Input Equipment and Monitor	1 set	o
• Receiving Power Equipment	300 kVA Transformer, AVR,	o
• Engine Generator	150 kVA Diesel Engine Generator is installed at the existing house	o
• Measuring Equipment	Oscilloscope, TV signal generator, Vector Scope, Audio Measuring Equipment etc.	
• Intercommunication Link	SSB Transmitter and Receiver	o
• Building	Prefabricated transmitting house 6m x 9m Prefabricated power supply house 7m x 5m	

Note: o mark shows the spare parts attached on each equipment

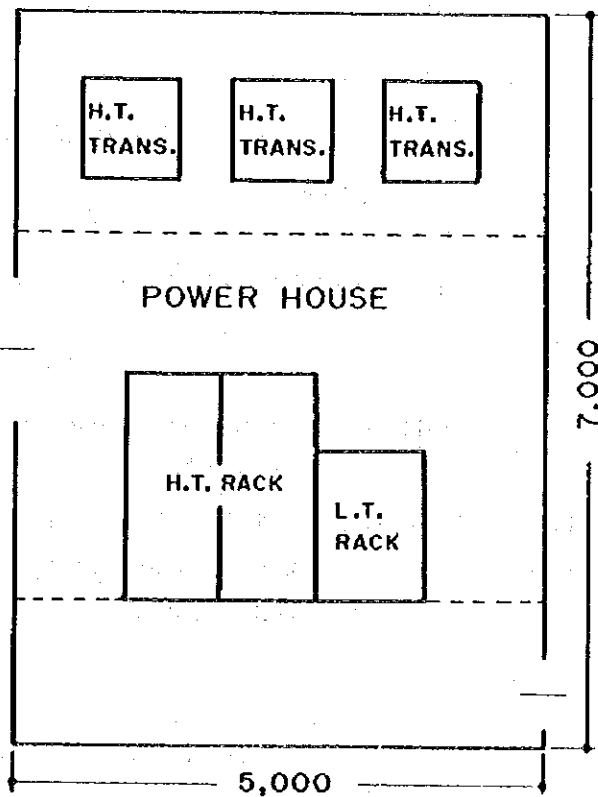
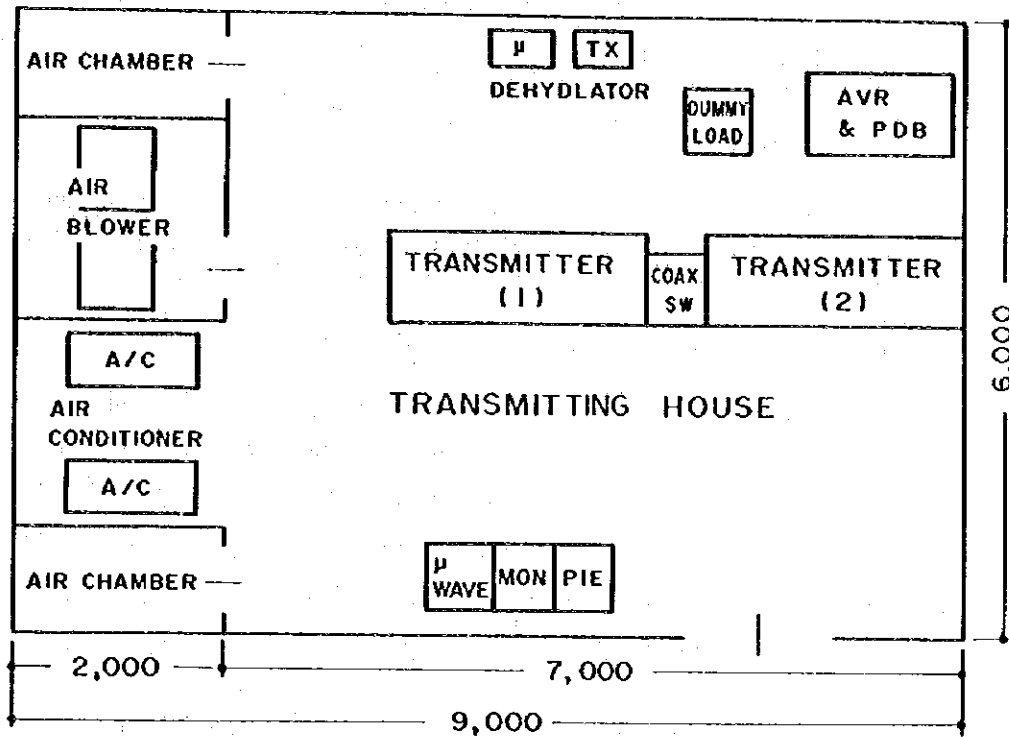


Fig.4 Layout of Transmitting house and Power house (Monrovia.)

. The automatic voltage regulator, distribution rack and dummy load device are installed behind the transmitters to make enough space for their maintenance.

o Air conditioning facilities

The air chamber, cooling fans of transmitters and air conditioners, are to be installed in one corner of the house.

o Working space for monitoring and maintenance

The working space is to be laid out in the front of transmitters. While the transmitters are under operation, two staffs are, as a general, to be due conducted with technical checking of picture and sound quality, by receiving TV broadcasting wave of the transmitter, as well as front-face monitoring of the equipment.

Furthermore, when maintenance work and repair are executed, a spacious working area is necessary for arrangement of measuring equipments and repairing and adjustment of equipment.

In addition to these, some space for storing spare parts and entrances are to be considered.

b) Basic policies for equipment arrangement in power house are mentioned below.

o High tension voltage rack and low tension voltage rack

High tension voltage rack and low tension voltage rack are to be set in one line in the center of the house, so as to have easier access to their monitoring and maintenance.

o High tension voltage transformer

The high tension voltage transformer is installed behind the above-mentioned high tension voltage rack and low tension voltage rack allowing enough space for its maintenance work.

(2) Regional Transmitting Stations

The transmitting power and channel in the regional transmitting stations, based on the conditions provided in the expansion plan of broadcasting net-works afore-mentioned in Chapter 3-2, are to be made as follows:

Besides, in regards to continuous use of facilities for TV test broadcasting which are still being used at Gbarnga station, it is impossible to rehabilitate them as in the case of the re-use of equipment and facilities in Monrovia station. All of equipments and facilities necessary for the regional stations are to be newly installed.

1) Transmitter

In compliance with aforementioned broadcasting conditions such as transmitting power and channel, transmitters are to be installed.

2) Transmitting antennas

In order to cover up projected broadcasting service areas, four directional high efficient antennas are to be mounted onto the transmitting antenna tower.

3) Program transmission facilities

To send TV program from Monrovia, following sets of facilities are to be installed:

a) Gbarnga

In order to utilize the existing LTC transmission live (line system), microwave program transmission facilities will be installed, from Gbarnga LTC terminal station towards Gbarnga transmitting station.

b) Buchanan and Bomi Hills

To receive broadcasting wave (off-air relay system) directly from the mother station in Monrovia, TV program receiving equipment is to be installed in each station of Buchanan and Bomi Hills.

4) Power supply equipment

To supply electric power to transmitting equipments, power supply equipments and an emergency engine generator are to be newly installed.

5) List of main equipment and facilities

Shown in Table 6.

6) Arrangements of Transmitting Facilities (Refer to figure 5)

a) Basic policies for arrangements of equipments in the transmitting house are as follows:

o Transmitter and other equipments

. Two sets of transmitter are to be arranged in one line in the center of the house, so as to be given easier access to their monitoring and maintenance.

. A program input equipment and a program transmission equipment are arranged to face the above mentioned transmitters, for easier monitoring and maintenance.

. An automatic voltage regulator, power distribution racks and a dummy load are so arranged in the back side of the transmitters as to have space enough for their maintenance.

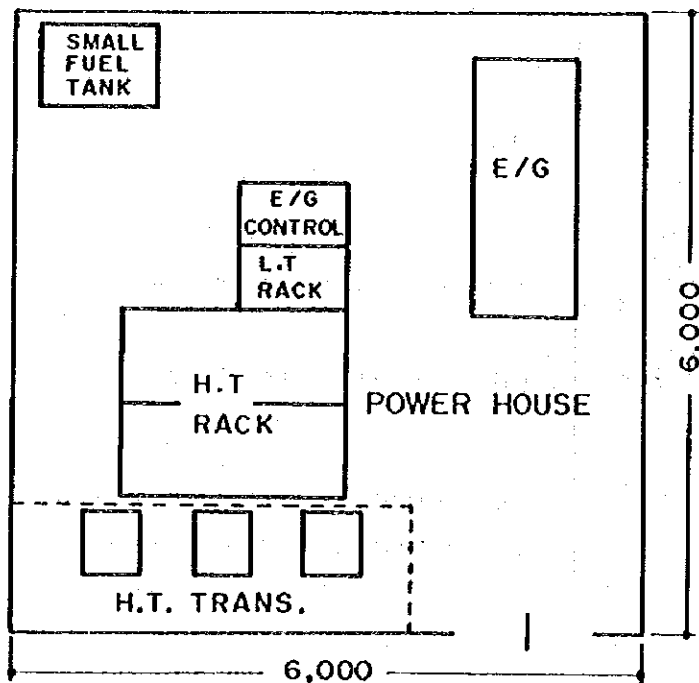
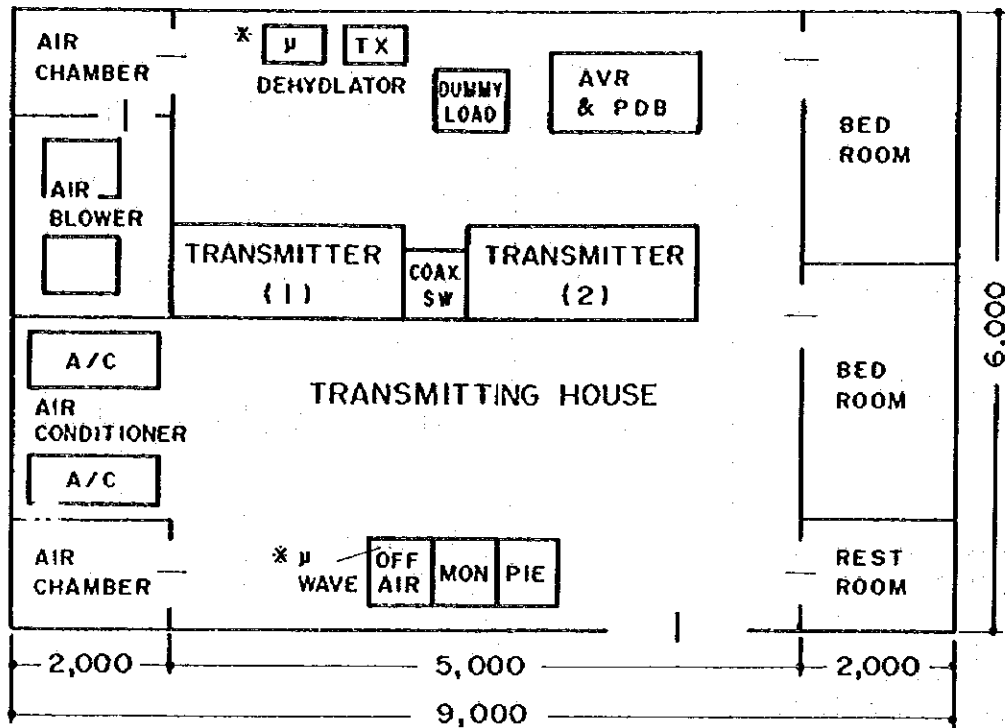
o Air conditioning facilities

Air chamber, cooling fans for the transmitters and air conditioners in the house and other facilities, are to be installed at one corner of the house.

Table 6 Transmitting Facilities for Regional Transmitting Station

Facilities	Gbarnga	Buchanan	Bomi Hills	Spare parts
TV Transmitter	5 kW, 7 CH	2 kW, 11 CH	5 kW, 10 CH	o
Transmitting Antenna	2 stacks, 4 phases	1 - 2 stacks, 4 phases	2 stacks, 4 phases	
Antenna Tower and Mast	100 m guyed mast	50 m self supported tower	50 m self supported tower	
Program Transmission Equipment	Micro-wave Link	Off Air Receiver	Off Air Receiver	o
Program Input Equipment and Monitor	1 set			o
Receiving Power Equipment	90 kVA Transformer and AVR			o
Engine Generator	50 kVA			o
Measuring Equipment	Video Signal Generator, Oscilloscope, Vectorscope, Audio Measuring Equipment etc.			
Inter communication Link	SSB Transmitter and Receiver			
Building	Prefabricated transmitting house 6m x 9m Prefabricated power supply house 7m x 5m			

Note: o mark whows the spare parts attached on each equipment



* Gbarunga

Fig.5 Layout of Transmitting house and Power house.
(Gbarunga. Buchanan. Bomi-hills.)

o Working space for monitoring and maintenance

The working space is to be in the front of transmitters, covering a floor area of about three meters from it.

While the transmitters are under operation, two staffs are, as a general rule, to be due with technical checking of picture and sound quality, by receiving TV broadcasting waves of the transmitter, as well as front-face monitoring of the equipment.

Furthermore, when maintenance works and repairing are executed, spacious working areas is necessary for arrangement of measuring equipments, and repairing and adjustment of equipment.

In addition to these, some space for store of spare parts and entrances are to be considered.

o Space for emergency case and bed accommodation, etc.

Ample space is to be arranged in opposite side of air-conditioning facilities, for emergency cases.

b) Basic policies for equipment arrangement in power house are mentioned below.

o High tension voltage rack and low tension voltage rack

These electric equipment are so positioned in one line in the center of house as to acquire easy monitoring and maintenance works.

o High tension voltage transformer.

The transformer is installed in a corner of the power house with ample maintenance space around.

- o Emergency engine generator

The engine generator is to be positioned in parallel line with high tension voltage rack and low tension voltage rack, with ample space for its maintenance.

(3) Improvement Work for Monrovia Studio B

As aforementioned in the rehabilitation work of Monrovia TV Studio, Chapter 3-3, Studio B is to be so rehabilitated and improved to be small sized and multi-purpose studio for producing mainly news, talk and interview program, as well for program transmission.

In order to cope with the functions, equipments such as video, audio and lighting system are to be provided with Studio B at the least..

- o Video equipments

These are equipments for producing the video signal of TV program. They are mainly composed of TV cameras and telecine camera, VTRs to record these signal, and video switcher for switching, mixing these video signals and adding special effects.

- o Audio equipments

These are for producing the audio signal of TV program. They are mainly composed of tape recorder, disc player, microphone, and audio mixer for mixing audio signals hermonized with the picture scene.

- o Lighting equipment

The lighting equipment are for illuminating the subject to be taken by TV cameras, so it will appear most suitably on the TV picture. The lighting apparatuses are equipped with in candescent electric bulbs and a control panel to turn on/off the bulbs whenever necessary and vary brightness of illumination.

On the other hand, the existing equipments such as TV camera, video switcher, audio equipment and monitors which were provided with Studio B, are now out of operation, because inner parts and components of these equipments were already consumed out as spares for equipment and facilities installed in Studio A. Consequently, it is quite impossible to rehabilitate these equipment and facilities.

In addition, as the lighting equipments of studio B are not in perfect condition, and the initial system is difficult to be completed from now on. Therefore, other system are to be considered.

Under these situations, in the rehabilitation plan of Studio B, all equipments necessary for Tv broadcasting are to be newly installed.

Follows are essential points in the new broadcasting equipments at Studio B:

(1) Video equipment

Generally speaking, in production of TV programs, various pictures taken by TV cameras (different in sizes, position and angle of camera) are switched by switching equipment and then made into a continuous video picture.

For this reason, at least two cameras are needed. For studio B, another one for taking titles of TV programs and still pictures is to be provided in addition to the two cameras.

Two 3/4 inch VTR same as the existing one, are to be provided with studio B for recording and playing-back of stocked tape produced by LBS.

A video switcher, with inputs corresponding to numbers of TV cameras, VTR and telecine camera for production of programs is to be provided with the Studio B.

(2) Audio equipment

Microphones, compact and not conspicuous in TV pictures, are to be adopted. Tape recording and playing-back equipments, 6 mm tape type which is widely used in ordinary broadcast stations and compacted cassette type, each one set are to be adopted. One set of cartridge type recorder is to be also procured, for repeating same program such as short information and commercial messages.

Audio mixers with inputs sufficient for the necessary number of, microphones, tape recorders and play-back equipments to use should be procured for Studio B.

(3) Lighting equipment

As the floor area of Studio B is small, the number of lighting equipment will be less and capacity of lighting adjustment will be also small.

As news which is mainly produced in the Studio B is supposed to be a routine and long run, a simple lighting system suspended from ceiling grids is to be adopted.

Composition list of main studio facilities for Studio B is shown in Table 7.

All of these new equipments and facilities are, in principle, to be installed in the same arrangement ways of the existing facilities, after they are removed.

5-1-3 Basic Design Drawing

Schematic Diagrams of Broadcasting Facilities are shown in Fig. 6 to 10.

Fig. 6	Schematic Diagram of Transmitter (Monrovia)
Fig. 7	" " Power Supply (Monrovia)
Fig. 8	" " Transmitter (Gbarnga)
Fig. 9	" " Transmitter (Buchanan, Bomi Hills)
Fig. 10	" " Studio B (Monrovia)

Table 7 Studio Facilities for Studio B

Facilities	Q'ty	Remarks	Spare parts
Video Equipment			
Video Switcher	1		o
Color Portable Camera	3	x 10, Zoom Lens	o
3/4 inch VTR	2		o
Time Base Corrector	1		o
Character Generator	1	English letter	o
Telecine Camera	1		o
16 mm Film Projector	1		o
Audio Equipment			
Audio Mixer	1		o
6 mm Tape Recorder	1		o
Disc Player	1		o
Compact Cassette Recorder	1		o
Cartridge Recorder	1		o
Cartridge Player	1	5 channel	o
Microphone	1 lot		o
Lighting Equipment			
Dimmer Box	1	Mounted on the studio wall	o
Lighting Apparatus	1	Hunging from the grid	o
Monitor			
Video Monitor	1 lot		o
Audio Monitor	1 lot		o
Others			

Note: o mark shows the spare parts attached on each equipment

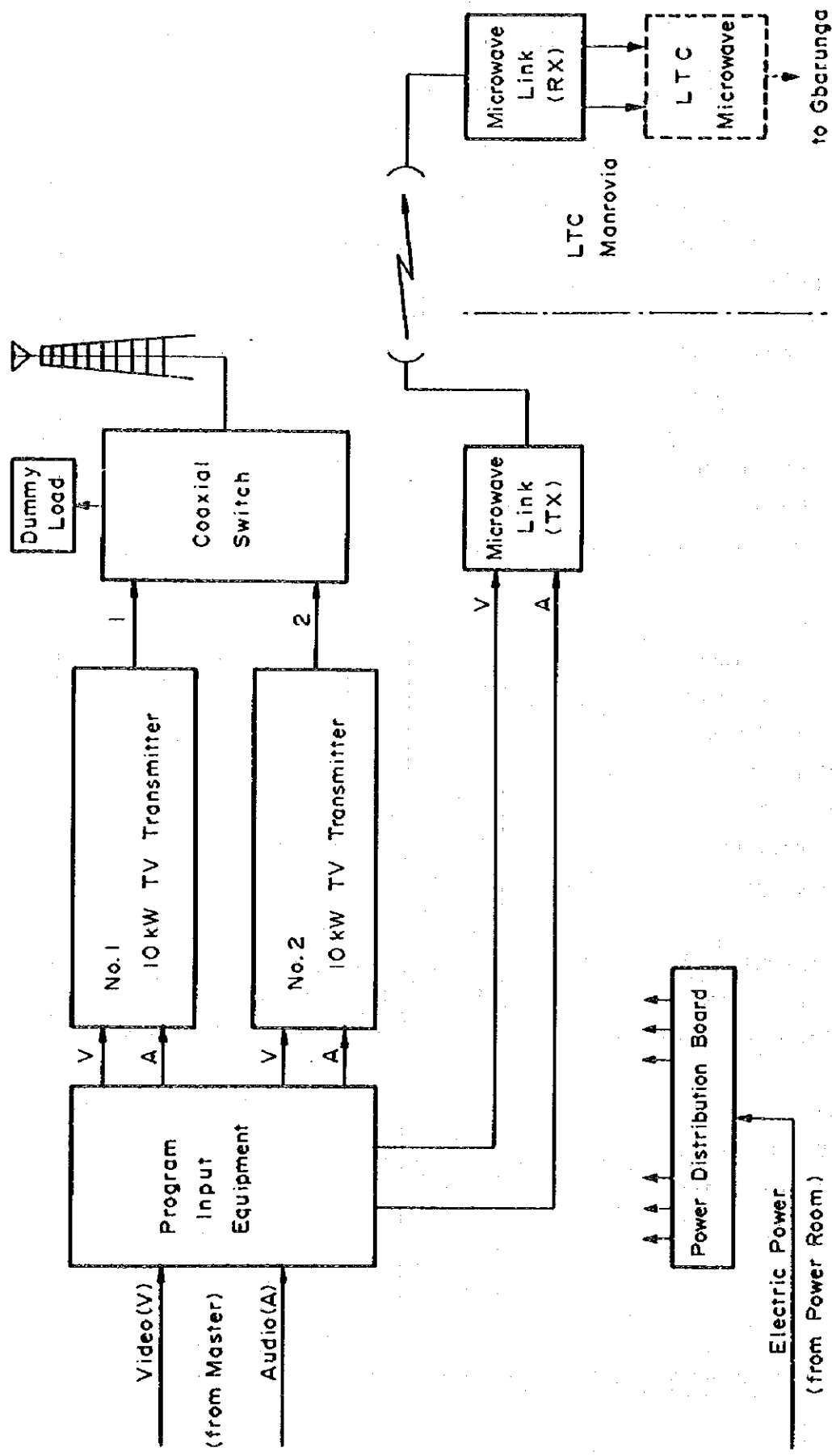


Fig. 6 Schematic Diagram of Transmitter (Monrovia)

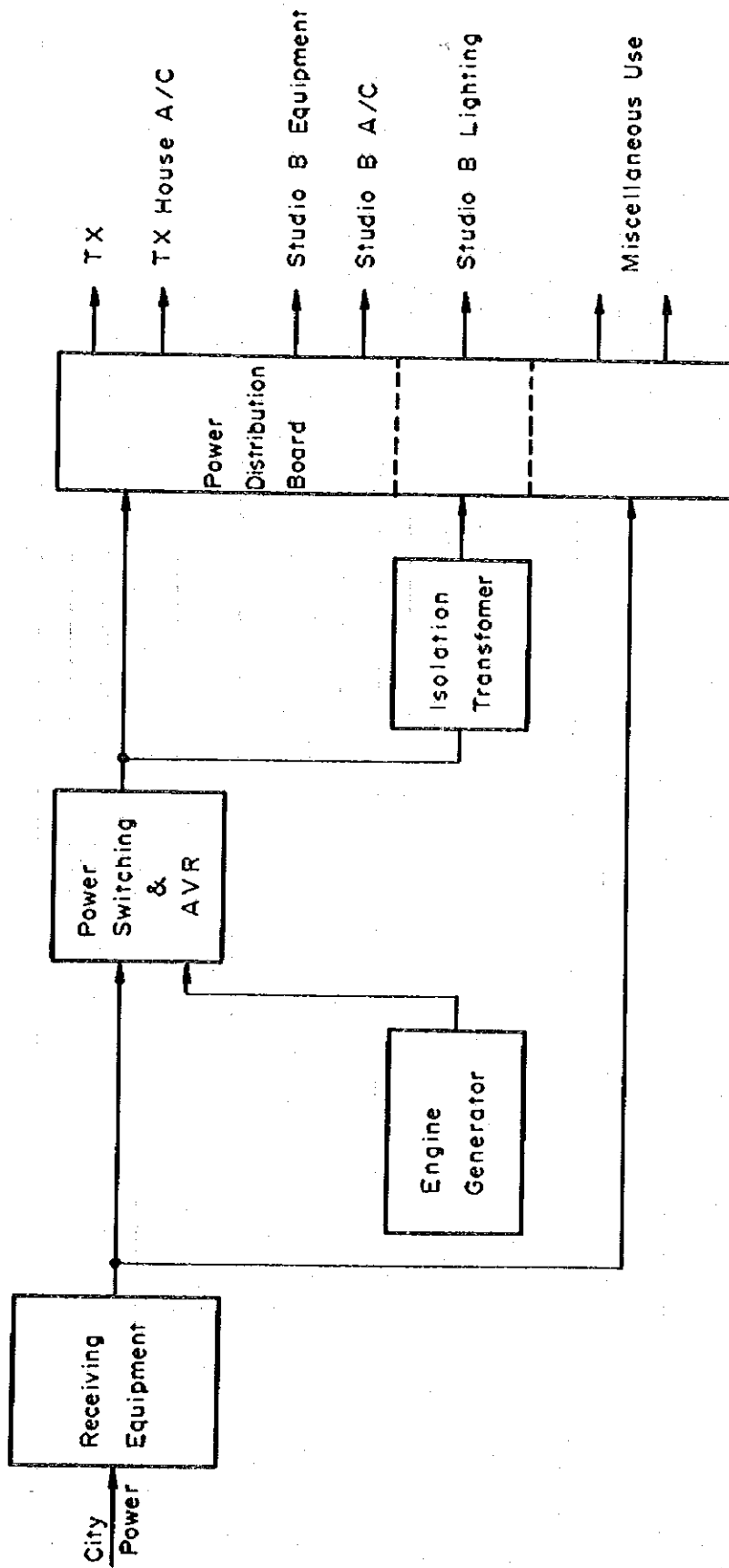


Fig. 7 Schematic Diagram of Power Supply (Monrovia)

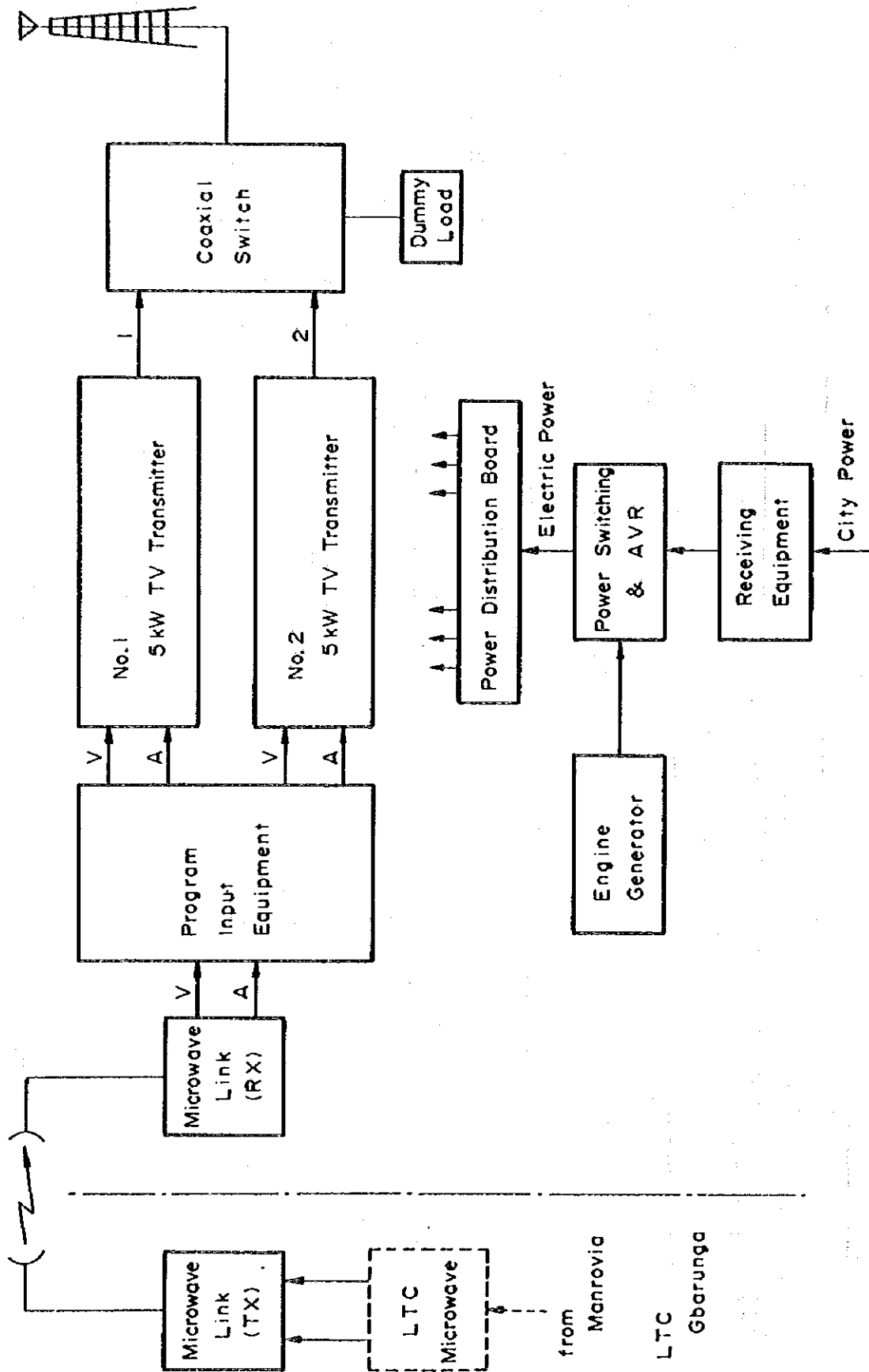


Fig. 8 Schematic Diagram of Transmitter (Gbarnga)

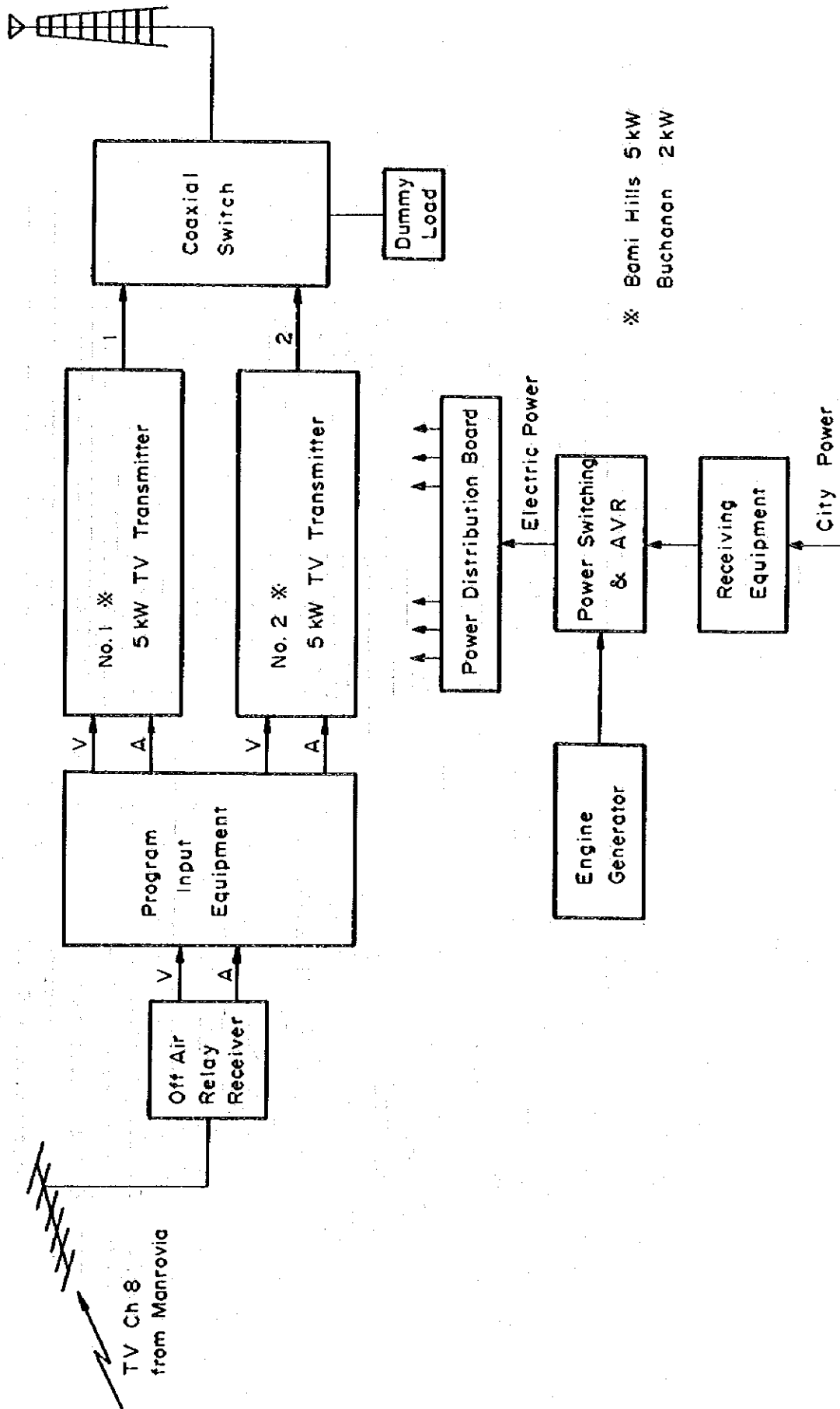


Fig. 9 Schematic Diagram of Transmitter (Buchanan, Bomi Hills)

EXISTING
STUDIO A
&
MASTER

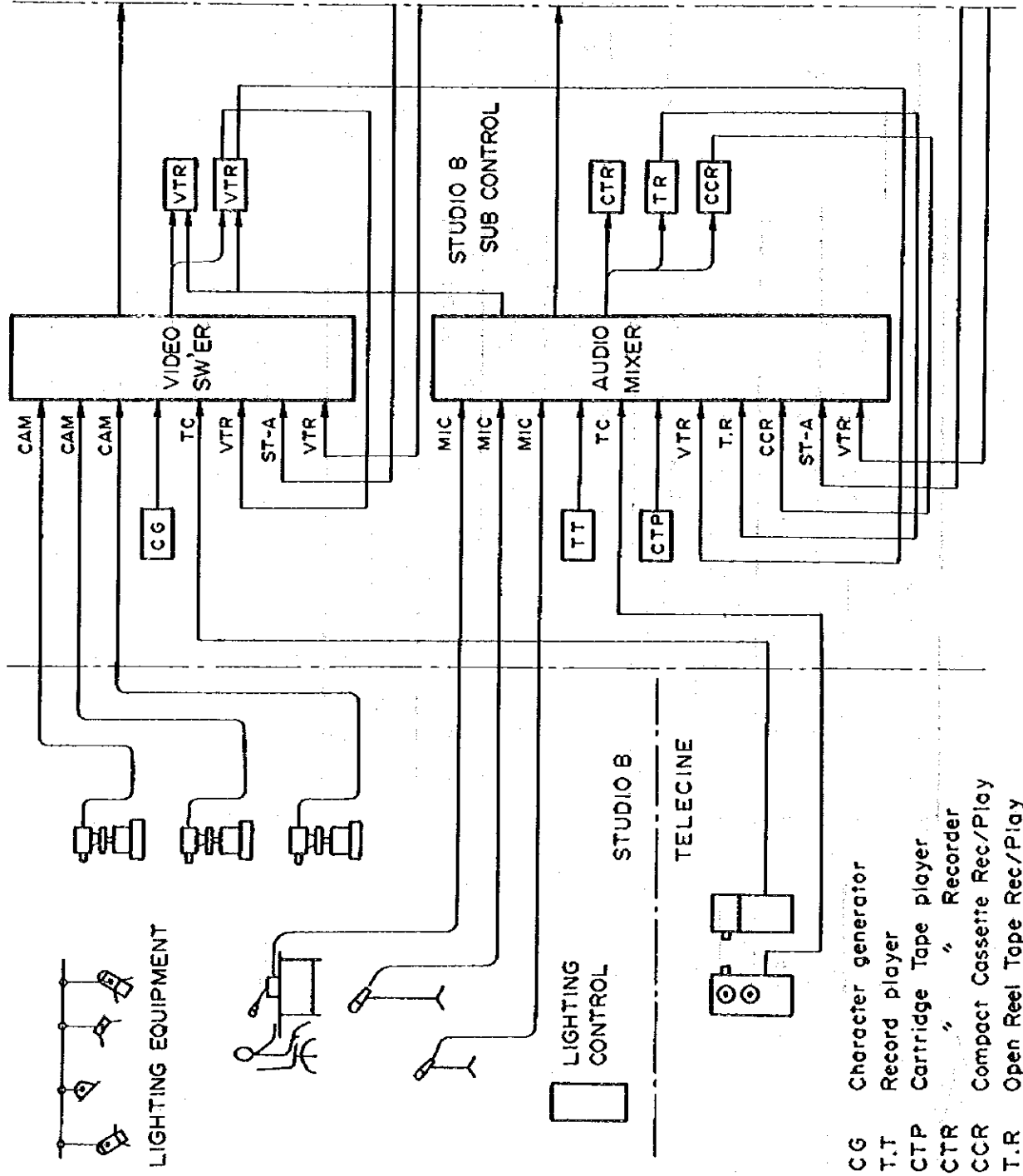


Fig. 10 Schematic Diagram of Studio B (Monrovia)