THE PROJECT OF NATIONWIDE TELEVISION BROADCASTING NETWORK IN THAILAND

— FEASIBILITY REPORT —

JANUARY, 1967

OVERSEAS TECHNICAL
COOPERATION AGENCY
GOVERNMENT OF JAPAN

PREFACE

For the purpose of preparing a substantial plan to strengthen and enlarge the television broadcasting system in Thailand, the Government of Japan entrusted the Overseas Technical Cooperation Agency to conduct the survey.

Our agency, therefore, dispatched a survey team consisting of eight experts headed by Mr. H. Saito to the Thailand. The survey team arrived in Thailand on May 23, 1966. The team was immediately divided into two groups: the economic group and the technical group. These two groups promptly conducted on-the-spot investigation, collected data and conducted analytical study of the findings in their respective fields. In particular, the technical group conducted a nationwide on-the-spot investigation in order to prepare a construction plan for a nationwide television broadcasting network. It was fortunate that the on-the-spot investigation was smoothly carried out. The economic group and the technical group completed their on-the-spot investigation without mishap on July 15, 1966 and August 30, 1966 respectively.

The survey team made study from technical and economic angles on the data obtained through the on-the-spot investigation after its return to Japan. As a result, this report has been prepared.

It will be an unexpected pleasure for us if this report turns out to be beneficial in strengthening the broadcasting system and enlarging the broadcasting network in Thailand and in helping to promote the friendly relationship between Japan and Thailand by contributing to the progress of its education and culture.

In conclusion, our agency takes this opportunity to express its hearty thanks for the kind cooperation and assistance extended to our team by Public Relations Department of Thailand which was most cooperative during the entire period of investigation. It also wishes to express its deep gratitude to the people of the Thai Television Comapny Ltd., the Royal Thai Army Television Station, the Telecommunication Project Administration Office, the Telephone Organization of Thailand, the Post and Telegraph Department, the National Economic Development Board, the Department of Technical and Economic Cooperation, all who cooperated willingly with us during the period of investigation.

Shinichi Shibusawa
Director General
Overseas Technical Cooperation Agency

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SUMMARY AND RECOMMENDATIONS

1. A minimum of 8 channels are necessary for allocating 4 channel to Bangkok and 2 channels each to local stations, as this being the condition desired by Thailand in regard to a nationwide TV broadcasting network there.

2. It is recommendable that Band III channels of the International Radio Consultative Committee (No. 5- No. 12 channels) be used as the frequencies for these 8 channels.

3. The number of places for the installation of TV stations based on this project is totalling 36 spots in all, and 55 dB field strength area (design objective of the minimum field strength for which protection may be sought as recommended by the International Radio Consultative Committee), namely, good visual contour will cover 77 % of the total population in Thailand. It is considered that this will mean that population coverage in fair visual contour will amount to 90 % of whole population.

4. The system shall follow the International Radio Consultative Committee Report No. 185 (625 line monochrome system). In preparation for future color broadcasting, it is desirable to design transmitting facilities and relay links with color capability from the beginning.

5. The parallel operation of the 525 scanning line system and the 625 scanning line system, transmitting the same program, shall be conducted with the aid of standards-conversion equipment. About 5 years may be the proper period of parallel operation in Bangkok in view of the reconstruction period or life of the existing receivers. An immediate standards switching, without a parallel operation period, may be better for local central stations.

6. Each station shall purchase electric power for constant use from the Provincial Electric Power Authority and shall be equipped with an engine-generator for emergency use. In consideration of the frequency variation in the power source, the broadcasting facilities shall be capable of operating independently of the power supply frequency.

7. The program relay shall be mostly through the microwave radio relay links. It is desirable to use the links of the Telecommunication Project Administration Office.

The programs of each broadcasting station lying along the microwave radio relay links can be connected through the microwave radio links (7 Gc/s band). Translator technique for program transmission should be restricted to use only at places where a radio relay links are not available

8. The Microwave radio relay links may be leased from the Telecommunication Project Administration Office. Radio link areas which must be eatablished newly by the Telecommunication Project Administration Office are as follows:

Section	Frequency band to be used
Between Bangkok-Si Racha	7 Gc/s
Between Sara Buri-Nakhon Ratchasima	4 Gc or 6 Gc/s
Between Nakhon Ratchasima-Udon Thani	4 Gc or 6 Gc/s
Between Nakhon Ratchasima-Ubon Ratcha thani	4 Gc or 6 Gc/s
Between Haad Yai-Yala	4 Gc or 6 Gc/s

9. The broadcasting enterprise for the nationwide TV network shall be a single enterprise covering the entire country. It shall be operated with the income from receiver license fee.

It will be proper to establish a new public corporation as the enterprise body.

10. The receiver license fee shall be collected from the sixth year when this project is completed. It is proper that the broadcasting system comprises the first national program for public broadcasting and the second national program for commercial broadcasting.

11. It is expected that the number of receivers will reach about 1,030,000 in the final year of the five-year program when this project is to be completed.

12. The first national program service (public broadcasting) may cover about 70 hours a week, which is to be divided into the following percentages: news programs, 20 %; educational programs, 20 %; cultural programs, 23 %; entertainment programs, 30 %; and special programs, 7 %. It is proper that the local program covers about 7 hours a week, or about 10 %. It will require 30,000,000 Bahts (1,500,000 dollars) for preparing programs for public broadcasting.

13. Completion of this project will require 5 years. The estimated total construction cost is shown in the table below. However, the construction cost for the radio link connecting the microwave relay link and the TV broadcasting stations is included in the cost for the TV stations in this table.

(Unit: 1,000 Bahts)

	TV broadcasting station			Microwave relay link			Grand Total
	Facilities	Roads and buildings	Total	Facilities	Roads and buildings	Total	
1st national program service	179,150	68,686	247,836	54,390	8,050	62,440	310,276
2nd national program service	72,866	—	72,866	24,500	—	24,500	97,366
Total	252,016	68,686	320,702	78,890	8,050	86,940	407,642

Overall Table Showing Yearly Construction Expenses

(Unit: million Bahts)

Construction Plan			1st year	2nd year	3rd year	4th year	5th year
			Bangkok Central Station construction				
			Construction Work of Southern Region Stations for the 1st national program service			Construction Work of Southern Region Stations for the 2nd national program service	
			Construction Work of Northern Region Stations for the 1st national program Service			Construction Work of Northern Region Stations for the 2nd national program service	
					Construction Work of Northeastern Region Stations for the 1st national program service		Construction Work of Northeastern Region Stations for the 2nd national program service
					Construction Work of Southeastern Region Stations for the 1st national program service		Construction Work of Southeastern Region Stations for the 2nd national program service
Construction expenses by region	Bangkok Central Broadcasting Station	Facilities	48.5	—	—	—	—
		Roads and buildings	24.0	—	—	—	—
	Southern region	Facilities	—	38.2	—	28.5	—
		Roads and buildings	21.5	—	—	—	—
	Northern region	Facilities	—	45.5	—	29.7	—
		Roads and buildings	17.2	—	—	—	—
	Northeastern region	Facilities	—	—	—	88.1	32.4
		Roads and buildings	—	—	8.3	—	—
	Southeastern region	Facilities	—	—	13.2	—	6.8
		Roads and buildings	—	—	5.8	—	—
	Total	Facilities	48.5	83.7	13.2	146.3	39.2
		Roads and buildings	62.7	—	14.1	—	—
		Total	111.2	83.7	27.3	146.3	39.2
						Grand Total	407.7

INTRODUCTION

The Government of Japan decided to send a TV Broadcasting Network Construction Project Survey Team to the Kingdom of Thailand in 1966. The purpose of this survey team was to render to the Government of Thailand assistance in formulating a concrete plan for construction of a nationwide broadcasting network in Thailand by conducting an on-the-spot survey to cover the entire country of Thailand.

Earlier, the Government of Thailand decided at the cabinet meeting held on May 26, 1965 to change the television broadcasting standards from the existing 525-line 60-field system to the 625-line 50-field system within several years. It has also been envisaged that a nationwide television network would be set up on the new standard.

Thailand has had 11 years of experience in television broadcasting. It was in 1955 that the Thai Television Company, which was controlled by the Public Relations Department as its principal shareholder, started broadcast in Bangkok using a 525-line 60-field system on channel No. 4, F.C.C.. Two years later, another TV broadcasting station operated by the Royal Thai Army started to work in Bangkok on channel No. 7, F.C.C..

As for local cities, regional centre broadcasting stations are being operated directly by the Public Relations Department in the three cities of Lampang, Khon Kaen and Haad Yai. They use channels No. 8, No. 5 and No. 9, F.C.C. respectively. These regional centre broadcasting stations have several translator stations in operation. Since a nationwide program transmitting system has not been completed yet, the program materials are being supplied to these stations by video tapes or 16mm films.

The activities of the nationwide TV broadcasting network survey team were executed, giving due consideration to the existing broadcasting enterprises in Thailand, in order to prepare a detailed proposal for completion of a nationwide TV broadcasting network in Thailand.

1. Composition of the survey team

Leader . . . . . Hiroshi Saito

Specialist sent for a long period

In charge of overall supervision

Assistant leader. . . Masami Hattori

A technical official of the Ministry of Posts and Telecommunications

Sent for 100 days

In charge of the overall planning and channel planning

Member . . . . . Seibu Kinomoto

Japan Broadcasting Corporation (NHK) engineer

Sent for 100 days

In charge of broadcasting facilities planning

Member . . . . . Naohiro Ohta

Telephone and Telegraph Public Corporation engineer

Sent for 100 days

In charge of program switching and relay network planning

Member . . . . . Shingo Kan

Economic specialist of Japan Broadcasting Corporation (NHK)

Sent for 54 days

In charge of program preparation and required personnel planning

Member . . . . . Tetsuro Tomita

Official of the Ministry of Posts and Telecommunications

Sent for 54 days

In charge of broadcasting enterprise form and popularization planning

Member . . . . . Takashi Matsubara

Japan Broadcasting Corporation (NHK) engineer

Sent for 100 days

In charge of broadcasting network planning

Member . . . . . Moriyoshi Minowa

Consultant of Overseas Technical Cooperation Agency

Sent for 54 days

In charge of liaison and coordination

2. Scope of the survey

On May 31st, a meeting was held at the Public Relations Department between the representative of the Public Relations Department and the Survey Team which was accompanied by Mr. T. Oyake, second secretary of the Japanese Embassy. At this meeting, the terms of reference, itinerary and scope of the survey were discussed.

This discussion was conducted according to two temporary documents, namely, "Draft Plan of operation" submitted from the Japanese side and " Suggested work schedule for Mr. Saito and the survey team" submitted from the Thai side.

In principle, both sides came to an agreement on these documents. However, several problematical points were questioned by both sides and as a result of discussion, the following points concerning the scope of the survey were agreed upon or made clear by the Thai side.

Concerning the scope of the technical survey

(1) Channel assignment plan in the nationwide TV stations establishment plan.

These channels must be selected out of the C.C.I.R. 625-line system 7 Mc/s separation channel series. The available channels are either 8 channels from No. 3 to No. 10 or 8 channels from No. 5 to No. 12.

Each local station shall be assigned 2 channels, and the Bangkok Central Station 4 channels.

(2) Nationwide broadcasting network planning.

This planning shall cover the details of the station sites, transmitting power, height of antenna, gain and directivity of antenna, service area of each station, and estimated population in each area.

(3) Broadcasting facilities planning

This planning includes an outline of specifications concerning transmitting facilities, antenna, antenna support, power source, studio facilities, connecting link, station buildings (with accessory facilities), access road and required land for each station covered by the nationwide broadcasting network planning, including the Bangkok Central Broadcasting Station.

(4) Construction expenses and maintenance operation expenses

These expenses are to be calculated for each station and be broken down into facility expenses, building expenses, site preparation expenses, operation maintenance expenses, etc.

(5) Relay link planning

Nationwide relay programs must be transmitted from the switching center in Bangkok, mostly through the microwave relay link. Since the microwave relay link is constructed and operated by the Telecommunication Project Administration Office, the Public Relations Department must lease it from the Telecommunication Project Administration Office. Therefore, this survey will include the views and findings of this survey team concerning the nationwide relay link system, the program switching system, the drop and insert system, the connecting system between the microwave terminal stations and the broadcasting stations, etc.

(6) Order of priority in construction, order of execution, steps to be taken for standards switching, etc.

It is understood that the priority in construction of the TV broadcasting network will be in the following order: the Bangkok Central Area, the Southern Region, the Northern Region, the Northeastern Region and the Southeastern Region.

This order of priority is closely connected with the order in construction and the time of completion of the microwave relay link by the Telecommunication Project Administration Office.

The Public Relations Department is considering parallel operation of the 525-line system and the 625-line system for a certain period of times as a transitory measure for changing the standards of TV broadcasting. Therefore, the proper length of the transitory period and estimation of the expenses for the parallel operation shall be investigated.

Scope of the economic survey

(1) Analysis of statistical data, such as population census, economic activities, revenue of the national treasury, etc.

(2) Enterprise analysis of TV broadcasting

Recommendations concerning the form of broadcast enterprise, namely, whether it is to be public body or private body, the enterprise scales, namely, whether it is to be regional or nationwide, the relation between educational broadcasting, public broadcasting, etc., and the receiver license fee system, as well as the most efficient operation of the TV broadcasting network in Thailand shall be included in this survey.

(3) Popularization plan for TV Broadcasting

(4) Economic analysis of standards switching

(5) Program production plan

(6) Model income and expense balance sheet for the TV broadcasting station

(7) Overall income and expense plan for this project

(8) Opinions concerning supervisory legislations for radio broadcasting and TV broadcasting

3. Survey procedure and itinerary

Survey itinerary performed by the technical group

The technical group included 5 persons, namely, Saito, Hattori, Kinomoto, Ohta and Matsubara. This survey team brought many survey instruments including transmitters, receivers and various measuring instrument from Japan. The spot survey was conducted using 3 Land Rovers loaded with these instruments.

From May 23rd to June 2nd, the technical group stayed in Bangkok and was engaged in receiving and adjusting instruments and materials needed for the survey, procurement of products to be purchased locally as well as preparatory consultations with the staff of the Public Relations Department.

From June 3rd to June 21st, the technical group conducted an on-the-spot survey of the Southern Region and explored the prospective sites for stations in the cities of Phet Buri, Huahin, Prachuap, Chumphon, Phuket, Nakhon Si Thamarat, Trang, Haad Yai, Pattani and Yala. The onward trip was by automobile and the return journey was by train. On our way back we made a stop-over and explored Surat Thani. From June 22nd to July 3rd, the technical group stayed in Bangkok and was engaged in analytical study of the survey results in the Southern Region and consultations with the staff of the Public Relations Department .

From 4th to July 11th, the technical group conducted an on-the-spot survey of the Southeastern Region, using automobiles, and explored the prospective station sites in the cities of Chon Buri, Si Racha, Sttahip, Rayong and Chanthaburi.

From July 12th to July 17th, the technical group stayed in Bangkok and was engaged in analytical study of the survey results of the Southeastern Region and consultations with the staff of the Public Relations Department.

From July 18th to July 24th, the technical group conducted an on-the-spot survey of the Northeastern Region and explored prospective station sites visiting

Nakhon Ratchasima, Khon Kaen and Udon Thani by automobile and Surin and Ubon Ratchathani by train.

From July 25th to August 2nd, the technical group stayed in Bangkok and conducted analytical study of the survey results of the Northeastern Region and consultations with the staff of the Public Relations Department.

From August 3rd to August 16th, the technical group conducted an on-the-spot survey of the Northern Region and explored prospective station sites, visiting the cities of Sara Buri, Lop Buri, Nakhon Sawan, Pitsanulok, Uttaradit, Lampang and Chiang Mai. The onward trip was by automobile and the return trip by airplane.

From August 17th to August 30th, the technical group stayed in Bangkok and was engaged in analytical study of the survey results of the Northern Region and consultations with the staff of the Public Relations Department. At this time, packing and returning procedures for the survey instruments were conducted.

On August 30th, 1966, the technical group successfully completed its survey activities, which took a period of 100 days. All of the members of the group, except Saito, returned to Japan. Saito is still staying in Bangkok and following this project as an advisor to the Public Relations Department.

Survey itinerary performed by the economic group

The economic survey was conducted by 2 persons, Kan and Tomita. The survey consisted mostly of collection of materials in Bangkok, inspection of Thai Television Company, hearing of circumstances from concerned people, exchange of opinions with them, and TV program and market survey by means of random sampling. In the meantime, 3 trips were made for the purpose of investigating the operation of local TV stations, dissemination of receivers, actual situations in local cities and farm villages as follows:

June 4 - 8 Haad Yai, Songkla

June 18 - 22 Lampang, Chiang Mai

July 2 - 5 Khon Kaen, Nong Khai

Considerable results have been achieved in collecting materials and other activities in Bangkok inspite of the limited time, thanks to the cooperation rendered by concerned people.

As a result of the program and market survey conducted at 10 places in the city

of Bangkok from June 12th to 16th, a total of 431 samples have been obtained. Eight persons were used for the survey. They were divided into two 4-member groups, and one group spent 5 days for 5 places. The survey method included door-to-door interview and 2-step random sampling per area. In other words, depending on the population statistics per Tampol in the city of Bangkok. Tampols were numbered in 100 serial numbers weighting by the population, and 210 Tampols were picked according to the table of random numbers.

In one picked Tampol the each investigator visited and interviewed 10 households on the average, from among the households having been picked according to the random table, along the streets designated. Questionaries (330) entered by High School Students at Haad Yai, Khon Kaen and Lampang were likewise classified and computed as materials supplementary to the survey in Bangkok.

Thus, on July 15th, 1966, economic group successfully completed its survey activities covering 54 days, and 3 members, namely, Kan, Tomita and Minowa returned to Japan.

4. Acknowledgement

This survey was conducted throughout under the cooperation of the Public Relations Department. A vacant studio of the shortwave broadcasting station in Bangkok was provided as our office room, during the survey period. Three Land Rovers with drivers were furnished for the local survey and also several staffs of the Public Relations Department accompanied. In conducting on-the-spot survey, we visited the Provincial Government first of all and asked the governor for help. Each governor was so nice as to support us in obtaining road guides to the survey spots, employment of laborers, permission to enter off-limit areas and introduction to Electric Power Company and other related agencies. We were most worried during the survey about whether we could accomplish the itinerary or not. However, we were able to complete the itinerary as scheduled. This is largely attributable to the kind cooperation of the staffs of the central and local Public Relations Department offices and related Thai people in addition to the fortunate weather conditions.

CHAPTER I OVERALL PLANNING–GENERAL

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1.1 Channel Assignment Plan

1.1.1. Table 1.1 shows the frequenies of F.C.C. channel series of the 525-line system currently in operation in Thailand and C.C.I.R. channel series of the 625-line system which will be adopted in the near future.

Table 1.1

frequency band classification	F.C.C. 525-line system		C.C.I.R. 625-line system			
	channel number	frequency band (M c/s)	channel number	frequency band (M c/s)	video frequency (M c/s)	audio frequency (M c/s)
Band I	1	44 - 50				
	2	54 - 60	2	47 - 54	48.25	53.75
	3	60 - 66	3	54 - 61	55.25	60.75
	4	66 - 72	4	61 - 68	62.25	67.75
	5	76 - 82				
	6	82 - 88				
Band III	7	174 - 180	5	174 - 181	175.25	180.75
	8	180 - 186	6	181 - 188	182.25	187.75
	9	186 -192	7	188 - 195	189.25	194.75
	10	192 - 198	8	195 - 202	196.25	201.75
	11	198 - 204	9	202 - 209	203.25	208.75
	12	204 - 210	10	209 - 216	210.25	215.75
	13	210 - 216	11	216 - 223	217.25	222.75
			12	223 - 230	224.25	229.75

The nationwide TV broadcasting network will operate on the C.C.I.R. channel series of the 625-line system. For allocating 4 channels to the Bangkok Central and 2 channels each to local stations as wished by the Thai side, at least 8-channel frequency is required.

1.1.2 Talks were held with the Thai side over the selection of the 8 channels to be used. Proposals were two; one was to use the 8 channels ranging from channel No. 3

to channel No. 10 and the other was to use the 8 channels from channel No. 5 to channel No. 12. We hereby recommend to adopt the latter, namely, the 8 channels from channel No. 5 to channel No. 12 for the following reasons.

(1) It is the common sense in the field of radio frequency management that the frequency space of such limited width as 8 television channels require should not split in two separate bands like Band I and Band III. It is desirable that all the 8 channels lie in one band (Band III) as long as possible so as to insure the effective use of frequency band.

(2) There are only 2 channels adjacent to each other in Band I. Therefore, even if Band I is put to use, Band III is also needed at each station, because each local station requires 2 channels. When Band III only is used two channels assigned to each local station may share one transmitting antenna by means of duplicate feeding of two channels. However, in the mixed assignment of Band I and Band III to one station, sharing of one transmitting antenna is impossible.

(3) The weight and dimensions of the antenna for Band I is several times greater than those for Band III. Moreover, the experiences in Japan show that Band I in summer is subject to irregular propagation via sporadic E layer which sometimes create interferences over 1,000 - 2,000 km distance.

1.1.3. However, according to Article 5 of the Radio Regulations appended to the International Telecommunication Convention, the frequency band allocated for broadcasting service is limited up to 216 Mc/s in Region 3 where Thailand is located. It is therefore necessary to declare reservation in order to allocate from 216 Mc/s to 230 Mc/s to broadcasting service. In this case, the conflict with aeronautical radio navigation service will be a problem. However, in view of the fact that this band is not used for the en route service in Region 3 and the countries which allocate this band to broadcasting service in Region 3 include Japan, Indonesia, China and the Philippines, in addition to many countries in Region I, it may not be difficult to establish the reservation.

1.1.4 The channels to be assigned to each station was selected by taking the following matters into consideration.

(1) The service area of each station shall be free from harmful interference from other stations. In this case the protected desired signal field strength shall be

55 dB (1 μV/m is zero dB here). As protection ratio, 40 dB for co-channel and zero dB for adjacent channels were assumed.

(2) The possibility of harmful interference resulting from the conflict between the local oscillator frequency of a TV receiver which is receiving broadcast from one station and the transmitting frequency of other stations in the same city shall be avoided. In this case intermediate frequency of the receiver will be involved. Therefore, as a reference receiver, intermediate frequency is 38.9 Mc/s for video signal and 33.4 Mc/s for sound signal was considered referring to the C.C.I.R. Report No. 184. As a result, it was decided that neither the coupling of channel No. 5 and channel No. 10 nor that of channel No. 6 and channel No. 11 shall be assigned in the same city.

(3) In consideration of the selectivity of the receiver, no adjacent channel shall be allocated to the same city. However, in order to insure the common use of one transmitting antenna, the two channels to be allocated to each local station shall be those lying as close to each others as possible.

(4) Harmful interference from neighboring countries shall be avoided. In this connection it was decided that channel No. 5 and channel No. 8 which are being operated in Malaysia at present or expected to be operated in the future shall not be used in the vicinity of the southern border.

(5) As for translators, the assignment was made in such a way that the relationship between the receiving frequency and the transmitting frequency does not turn out to be the same or adjacent channel in order to avoid harmful interference inside own station, in addition to the above-mentioned principles.

1.1.5 Accordingly, the frequency assignment plan shown in Table 1.2 is recommended for each station under the nationwide broadcasting network.

1.2 Station Installation Planning

1.2.1 Station installation planning means to estimate the service area of each station and the population of that area by deciding such matters as proposed station sites to be installed, transmitting power, antenna height, gain, directivity, etc. However, in preparing a nationwide station installation plan, the first thing to be decided is what percentage of the population coverage should be the goal. In this case the population coverage can not be computed unless the minimum of the required field strength is

decided, because the greater the distance from the broadcasting station becomes, the broadcast wave becomes weaker and vision quality poorer.

Attention should be drawn to the fact that there are two kinds of required field strength. One is the required field strength used for deciding the required radiated power for the broadcasting station or deciding the area to be protected from interference by other stations. In other words, this is the required field strength for preparing the station installation plan. In ordinary cases, the service area is the contour enclosed in equifield strength curves of this value.

However, the actual visual area covers not only the service area but also the sourrounding fringe areas. In countries which adopt the license fee system - Japan is one of them - the license fee charging area extends to outside the service area. It is therefore reasonable to compute the popularation coverage in terms of the population inside the visual area instead of the population in the service area only.

This survey team has taken 90 % of the population coverage in the visual area as the goal in planning after consultation with the Thai side.

1.2.2. There is no international agreement concerning the method of estimation for vision quality of TV broadcasting. However, there is an overall rating for telephony in Table III of Appendix 14 of Radio Regulations appended to the International Telecommunications Convention. We considered it possible to use this for TV too. According to that Table, estimation of signals is classified into 5 degrees, namely, estimation 5 which is excellent, 4 good, 3 fair, 2 poor, and 1 unusable.

It is stipulated that 5 and 4 can be used commercially; 3 can be marginally commercial and 2 and 1 can not be used commercially.

It can be interpreted that the service area in the station installation planning is a good visual area where the TV reception quality is estimated at grade 4 or 5, and that the fair visual area is an area where the TV reception quality is grade 3 or above.

1.2.3. According to Recommendation No. 417 of C.C.I.R., it is provided that the minimum field strength for which protection may be sought against harmful interference from other stations in planning a TV broadcasting service shall never be lower than 55 dB in Band III. Therefore, throughout the entire planning of this station installation and computation of the service areas, the steps taken by this survey team was in comformity to this value .

Now we would like to analyze the relationship between this value and the 5-stage estimation, as well as the relationship to the objective value of the population coverage.

If the available receiving power is denoted by Pr, (dBm; 1 milliwatt is zero dB here.) the field strength at the position of receiving antenna by E (dB), the wavelength by λ (m), and the relative gain of receiving antenna by Gd (dB), the following general equation can be established.

$$P_r = E + 20 \log_{10} \lambda + Gd - 124.7$$

If the wavelength is 1.5m and the relative gain of receiving antenna is 6 dB, the above equation can be written as

$$E = P_r + 115.2$$

Hence, the receiving power corresponding to the field strength 55 dB is about -60 dBm.

On the other hand, if the receiving noise power is P_{rn} (dBm) and the effective overall noise band of the receiver is B (c/s) and the noise factor of the receiver is F (dB), the following general equation can be established.

$$P_{rn} = 10 \log_{10} B + F - 174$$

If the effective overall noise band of the receiver is 5 Mc/s and the noise factor is 12 dB, the above equation becomes

$$P_{rn} = 67 + 12 - 174 = -95$$

Thus, the reference value of the thermal noise power to a receiver of the 625-line system is estimated to be -95 dBm.

Therefore, signal to noise ratio corresponding to the field strength 55 dB will be

$$\text{SN ratio} = -60 + 95 = 35$$

SN ratio corresponding to estimation 4 can thus be assumed to be 35 dB.

1.2.4 As for signal to noise ratio corresponding to estimation 5, reference was made to the long distance transmission standards of TV signals in Recommendation No. 421 of C.C.I.R. According to this standards, required SN ratio of peak-to-peak amplitude of picture signal to r.m.s. amplitude of continuous random noise in the case of TV signal of the 625-line system is 52 dB in terms of psophometrically weighted value. Since theoretical insertion loss of weighting network is 8.5 dB,

SN ratio of non-weighted value becomes 43.5 dB which is 8.5 dB higher than SN ratio of estimation 4.

Since both eyes and ears have the same logarithmic sensitivity characteristics, it is considered that the relation between the 5-stage estimation value and SN ratio is almost logarithmically proportional. It can be concluded from these calculations that the required field strengthes corresponding to estimation 5, 4, and 3 is approximately 64 dB, 55 dB and 46 dB respectively.

1.2.5 However, since man-made noise caused by ignition plug of automobiles, etc, is not taken into consideration in the foregoing calculations, higher field strength is required for congested city areas.

Though there was no need to consider the height of the receiving antenna in the above calculations, it is necessary to assume this value in the actual computation of the service area.

In computing the service area, this survey team assumed the height of antenna to be 10m above ground level, and a field strength of 55 dB was taken as the service area.

Therefore, if a higher antenna is used even outside the service area, a receiving result of better quality can be obtained. If it is desired to receive a picture of good quality with simple antenna of 10m high in conjested city areas, the field strength requires to be over approximately 86 dB.

1.2.6 The layout shown in Table 1.2 is recommended for the nationwide TV broadcasting network. Please see Chapter II and later descriptions for the details of the station sites, required E.R.P. (Effective Radiated Power) by direction, population inside the service area, etc.

Fig. 1. 1 shows the outline of the nationwide broadcasting network and Fig 1. 2 shows the equifield strength area of 55 dB of each station in the nationwide network.

The number of places of station under this network is 36 in all. The population of each service area under the 55 dB field strength area covers 77 % of the total population. However, this rate is for the good visual area, and the population coverage in the fair visual area will reach the expected goal of 90 %.

1.2.7 According to the experiences in TV broadcasting network construction in Japan, a total of 49 stations were constructed and the number of households in the service area reached 78 % of the total number in Japan under the primary project.

In order to increase this percentage to 85 %, establishment of about 10 additional stations for each 1 % increase was necessary. In order to increase this percentage further 90 %, establishment of about 30 additional stations for each 1 % increase was necessary. In order to increase the percentage above 90 %, establishment of about 100 additional stations for each 1 % increase becomes necessary.

At present the network included 449 stations in all and the number of households in the service area amounts to about 93 % of all households in the country.

In view of these experiences, the limit to the nationwide TV network plan in Thailand which does not decrease the effect of the station distribution too much and is efficient has been considered in designing.

1.3 Broadcasting Station Facilities Planning

1.3.1 Thailand has decided by a Cabinet decision to construct a nationwide TV broadcasting network of the 625-line system.

It is understood that the decided system standards have the following characteristics with reference to Report No. 185 of C.C.I.R..

(1)	Number of lines per picture	625
(2)	Field frequency	50 fields/sec.
(3)	Interlace	2/1
(4)	Picture frequency	25 pictures/ sec.
(5)	Line frequency	15,625 c/s
(6)	Aspect ratio	4/3
(7)	Scanning sequence	
	Line: from left to right	
	field: from above to below	
(8)	Relation with power source frequency:	independent operation
(9)	Approximate gamma of picture signal:	0.5
(10)	Nominal video bandwidth:	5 Mc/s
(11)	Nominal width of vestigial sideband:	0.75 Mc/s
(12)	Type of emission and polarity of picture signal:	A5C negative modulation
(13)	Type of emission and characteristics of sound signal:	F3 frequency deviation ± 50 Kc/s pre-emphasis 50 μs

(14) Effective radiation power ratio between video signal and audio signal: 5/1

This system standard is for monochrome TV, and that for color TV in Thailand is not yet decided. The system standard for color TV is not yet internationally unified. On the other hand, since the NTSC system, the SECAM system and the PAL system now being proposed to C.C.I.R. are all compatible with monochrome system, additional investment for lighting apparatus, camera equipment, etc, will be enough when color broadcasting becomes necessary. However, it is desirable to complete the specifications and designs for the TV transmitters and the program relay links which are capable of performing transmission of color program from the beginning.

1.3.2. The transmitting facilities can be classified into 2 kinds, namely, the ordinary broadcasting station which is video-connected with the relay link and the translator station which simply receives the broadcast wave from the master station and then transmits it, after converting channel frequency.

In the case of the former, it is possible to transmit its own programs because it is equipped with modulation function and also to produce high-power output. However, a program relay link is needed and the transmitting facilities are costly in this case. In the case of the latter, there is no need for a relay link and the transmitting facilities are comparatively cheap. However, its ordinary transmitting output is limited to below 300 W and insertion of its own programs is difficult.

The nationwide TV broadcasting network in Thailand should principally adopt the microwave radio relay link for transmission of programs. Therefore, each station lying along the trunk lines should be a broadcasting station of video connection and the use of the translator stations should be strictly restricted to be simply auxiliaries only at places lying far from the trunk lines. If translator stations are used along the trunk lines in order to design economically, it will render the channel assignment for expanding the service area difficult and the picuture quality will be deteriorated as a result of multi-stage relaying.

In designing translator stations to be used as an auxiliary means, it is necessary to arrange that the field strength of the master station at the receiving antenna is over 60 dB at the least. (See 1.2.4.)

1.3.3 Most of the nationwide relay program shall be broadcast from Bangkok and be transmitted to local stations mostly through microwave relay link. Therefore, there is no need of expanding the local station studios other than the regional centre stations.

1.3.4 The parallel operation of the 525-line system and the 625-line system should be done through a method of transmitting the same program by using a standards-conversion equipment. It is considered that the proper period of parallel operation in Bangkok is about 5 years in consideration of the period of the remodeling or life span of the existing receivers.

As for regional centre stations, an immediate switching (into the new system) should be made instead of establishing the period of parallel operation in order to save the cost for the switching. This is because the majority of the existing receivers believed to be receiving signals from the Bangkok station.

1.3.5 In connection with the required personnel for maintenance, the broadcasting stations with video connection were designed to be attended stations and the translator stations to be unattended stations in this installation planning.

Attended stations shall be designed to be equipped with only one (normal use) set, and unattended stations shall be designed to have stand-by set in addition to the set for normal use.

1.3.6 Out of the 36 broadcasting stations designed with the objective of attaining 90 % of the total population in the visual area, 21 are video-connected stations and 15 are translator stations. However, since construction plan of a new station of the 625-line system has already been decided by the Thai Government for the Haad Yai broadcasting station, its designing has been omitted in this report. Therefore, the cost of construction has been estimated for 35 stations excluding the Haad Yai station. The designing of each station is described in Chapters II and III.

1.3.7 It is necessary to consider the following conditions in selecting the site of the transmitting station of the Bangkok Central Station.

(1) The area of the site is wide enough to accommodate the facilities.

(2) The field strength in Bangkok and Thonburi city area becomes more than 86 dB.

(3) Road conditions are good and preparation of the site may be easy.

(4) Supply of electric power can be obtained conveniently and laying of a link line to the Bangkok Toll Centre can be performed easily.

(5) The place does not constitute an obstacle to the arrival and departure of airplanes.

The condition in (1) is most closely related to the height and structure of the transmitting antenna. The condition in (2) has been made specially, because motor traffic is congested and man-made noise is also high in Bangkok and Thouburi area, and nevertheless reception with a simple receiving antenna must be possible.

As for the way of coverring Bangkok and its vicinity areas, two methods are conceivable. One is to build up the Bangkok Central Station comparatively small in scale and to establish translator stations in such peripheral areas as Phet Buri, Chon Buri, and Ayutthaya. The other is to build up to the Bangkok Central Station as large in scale as possible without establishing the satellite stations.

It is hereby recommended to adopt the latter method. If the former method is adopted when four channels have been assigned to Bangkok, it becomes extremely difficult to assign channels to the satellite stations.

Accordingly, it became necessary for the Bangkok Central Station to have a transmitting power of 25 kW and a 250-meter high antenna support. As for this antenna support, 2 kinds, namely, a self-supporting tower and a mast with stay wires are conceivable. It is recommendable to adopt the latter, namely, the mast with stay wires, for rendering the designing economical because the former will require a construction cost more than 3 times compared with the latter. Thus, the required area of site mentioned in the condition in (1) became considerable bigger, as it requires a minimum of 45,000 square meters.

As a place satisfying these conditions, the vicinity of the Asian Trade Fair site can be considered. It is possible to establish a radio relay link between this place and the Bangkok Toll Centre belonging to Telecommunication Project Administration Office.

1.3.8 All local stations were designed under the primary condition of obtaining the greatest population coverage with a minimum investment.

It is desirable to design the station buildings and antenna system in such a way as to be used commonly by 2 channels by adopting wide-band antenna, etc. In cases where the antenna hight is extremely low, self-supporting tower was adopted. However, in other cases it was designed to adopt masts with stay wires. Electric power for normal use for the stations shall be purchased from the Provincial Electric Power Authority, and the stations be equipped with engine generators for emergency use. However, it is necessary to make arrangement to stabilize the voltage of the power

source against fluctuations.

The broadcasting facilities shall be capable of operating independently of the power supply frequency against fluctuation of frequency at the power source.

There will be no need to increase studio at local stations. However, it is necessary to increase the studio facilities, such as outdoor broadcasting Vans, etc.

4 Program Relay Network Planning

1.4.1 It is recommended to adopt the transmission system through a microwave radio relay link for the national program relay network. According to the C.C.I.R. Recommendation No. 421, the transmission standard for this must be designed in such a way that the time, during which the ratio between the peak-to-peak amplitude of the picture signal and the effective value of nonperiodic random noise on the hypothetical reference circuit of 2,500 km long becomes less than 52 dB, is less than 1 % of any one month period, and the time during which the ratio goes down to less than 44 dB is less than 0.1 % of any one month period.

As for the frequency band, 4 G c/s band or 6 G c/s band shall be used in principle. Service channels including supervisory and omnibus telephone systems are recommended.

1.4.2 TV broadcasting programs consist of picture signal and sound signal. Generally speaking, these two signals are in most cases transmitted separately. However, it is recommended to adopt a simultaneous transmission system for the national program relay link so as to insure economical designing and conveniences in maintenance.

Sound signal is transmitted through the frequency modulation of sub-carrier established in the upper part of the baseband. In this case, the frequency of sub-carrier shall be 7.5 Mc/s and the r.m.s. value of frequency deviation of sub-carrier shall be $\pm$ 140 Kc/s according to the C.C.I.R. Recommendation No. 402.

1.4.3 As for the link connecting the microwave relay terminal station and the broadcasting station, there are two methods, namely, the method to use video-cable and the method to use radio relay link. It is desirable to use radio relay link in Thailand in principle, excepting cases where the distance is very short, in order to avoid flood hazards in the rainy season. Also in this radio relay links, video signal and audio signal must simultaneously be transmitted. It is recommended that radio relay links

use 7 Gc/s band as the frequency band to be used.

1.4.4 The microwave radio relay link for the program transmission toward the south and the north has already been designed by the Telecommunication Project Administration Office. However, since transmission to Yala station is not included in this designing, it is necessary to establish a microwave radio relay link newly between Haad Yai and Yala. It is possible to design this link in 2 spans.

As for Northeastern Region, it is necessary to establish a microwave radio relay link newly between Sara Buri and Nakhon Ratchasima. This link can be designed in 3 spans. As for the sections between Nakhon Ratchasima and Udon Thani and between Nakhon Ratchasima and Ubon Ratchathani, it is necessary to additionally establish TV program transmission facilities on the existing microwave link. Khon Kaen is the regional centre station in Northeastern Region in this case. Therefore, it is necessary for transmitting the programs of Khon Kaen to Ubon Ratchatani area to provided an up line between Khon Kaen and Nakorn Ratchasima.

In the Southeastern Region, it is also necessary to establish a microwave radio relay link newly between Bangkok and Si Racha, This can be designed in 2 spans. In this case, however, it is recommended to adopt 7 Gc/s band as frequency band so as to avoid harmful interference between the Earth Station for Space Communication to be established shortly at Bangpla. As for the construction expenses for these program relay networks, the expenses for the link between the microwave terminal station and the broadcasting station are included in the construction expenses for each broadcasting station. However, the construction expenses for the trunk lines are not included in it.

As for the construction expenses for the microwave radio relay trunk lines to be established newly, rough estimates of 62,440,000 Bahts are required for the 1st national program service, and 24,500,000 Bahts for the 2nd national program service. The breakdown of the 1st national program service is 54,390,000 Bahts for facilities, 6,000,000 Bahts for roads, 1,600,000 Bahts for station buildings and 450,000 Bahts for power transmission lines. Of course expenses for those which have already been designed by the Telecommunication Project Administration Office are not included. It is estimated that proper rental for microwave link may be somewhere around 9,200 Bahts/Year per 1 km for one national program transmission service. However, this is a value calculated on the premise that 2 national program transmission lines

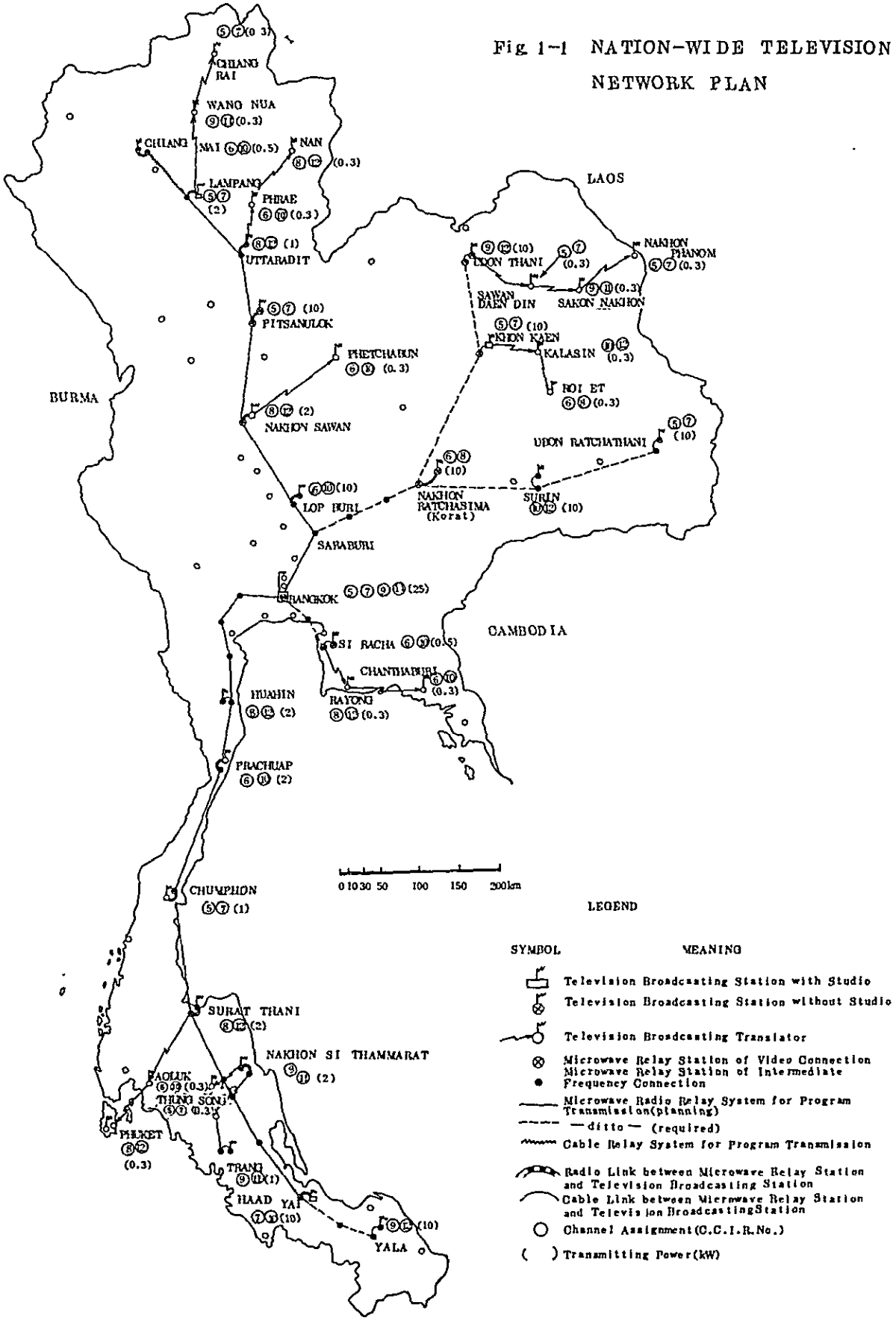
are to be rented.

Generally speaking, construction expenses per station and program relay expenses per 1 km will become far cheaper in case a system by which 2 national programs are simultaneously operated is contemplated instead of designing a single national program service. The same can be said for the operation expenses.

Table 1.2 Nation-wide Television Network Plan

Site for installation	Classification of station	Channel assignment (C.C.I.R.No.)	Power (kW)	Antenna height(m)/max. E.R.P. (kW)	Construction expense (thousand Bahts)		
					equipment	road and building	Total
Central Area					48,492	24,000	72,492
Bangkok	Broadcasting st. with studio	5, 7, 9, 11	25	250/180	10,242	24,000	34,242
					38,250	—	38,250
South Region					32,408	20,360	52,768
Huahin	Broadcasting st.	8,12	2	30/35	3,654	1,500	5,154
Prachuap	do.	6,10	2	30/25	3,712	300	4,012
Chumphon	do.	5,7	1	100/15	4,470	310	4,780
Surat Thani	do.	8,12	2	30/20	4,126	350	4,476
Nakhon Si Thammarat	do.	9,11	2	30/50	3,922	3,800	7,722
Phuket	Translator	8,12	0.3	30/5	1,886	100	1,986
Trang	Broadcasting st.	9,11	1	30/15	3,066	400	3,466
Yala	do.	9,12	10	30/150	3,754	7,400	11,154
Thung Song	Translator	5,7	0.3	30/3	1,880	3,100	4,980
Ao Luk	do.	6,10	0.3	30/3	1,938	3,100	5,038
North Region					45,506	17,238	62,744
Lop Buri	Broadcast st.	6,10	10	100/150	5,127	414	5,541
Nakhon Sawan	do.	8,12	2	30/30	3,878	1,100	4,978
Phisanulok	do.	5,7	10	150/50	5,158	414	5,572
Uttaradit	do.	8,12	1	100/10	5,015	330	5,345
Lampang	Broadcasting st. with studio	5,7	2	30/25	4,070	1,800	5,870
					9,280	—	9,280
Chiang Mai	Broadcasting st.	6,10	0.5	30/6	3,567	280	3,847
Chiang Rai	Translator	5,7	0.3	30/3	2,060	5,100	7,160
Phetchabun	do.	6,10	0.3	30/3	1,916	1,100	3,016
Phrae	do.	6,10	0.3	30/5	1,919	100	2,019
Nan	do.	8,12	0.3	30/3	1,837	3,100	4,937
Wang Nua	do.	9,11	0.3	30/8	1,679	3,500	5,179
Northeast Region					46,140	3,508	49,648
Nakhon Ratchasima	Broadcasting st.	6,8	10	150/100	5,870	400	6,270
Khon Kaen	Broadcasting st. with studio	5,7	10	120/90	4,598	—	4,598
					8,350	—	8,350
Udon Thani	Broadcasting st.	9,12	10	100/90	4,666	400	5,066
Surin	do.	10,12	10	150/90	5,246	414	5,660
Ubon Ratchathani	do.	5,7	10	150/90	5,246	400	5,646
Kalasin	Translator	10,12	0.3	30/3	2,060	1,100	3,160
Roi Et	do.	6,8	0.3	75/3	2,486	200	2,686
Sawan Daen Din	do	5,7	0.3	75/3	2,570	300	2,870
Sakon Nakhon	do.	9,11	0.3	75/5	2,388	180	2,568
Nakhon Phanom	do.	5,7	0.3	75/4	2,660	114	2,774
Southeast Region					6,604	3,580	10,184
Si Racha	Broadcasting st.	6,10	0.5	30/5	2,538	1,780	4,318
Rayong	Translator	8,12	0.3	30/9	2,010	1,300	3,310
Chanthaburi	do.	6,10	0.3	30/3	2,056	500	2,556
				Total Expense	179,150	68,686	247,836

Fig 1-1 NATION-WIDE TELEVISION NETWORK PLAN



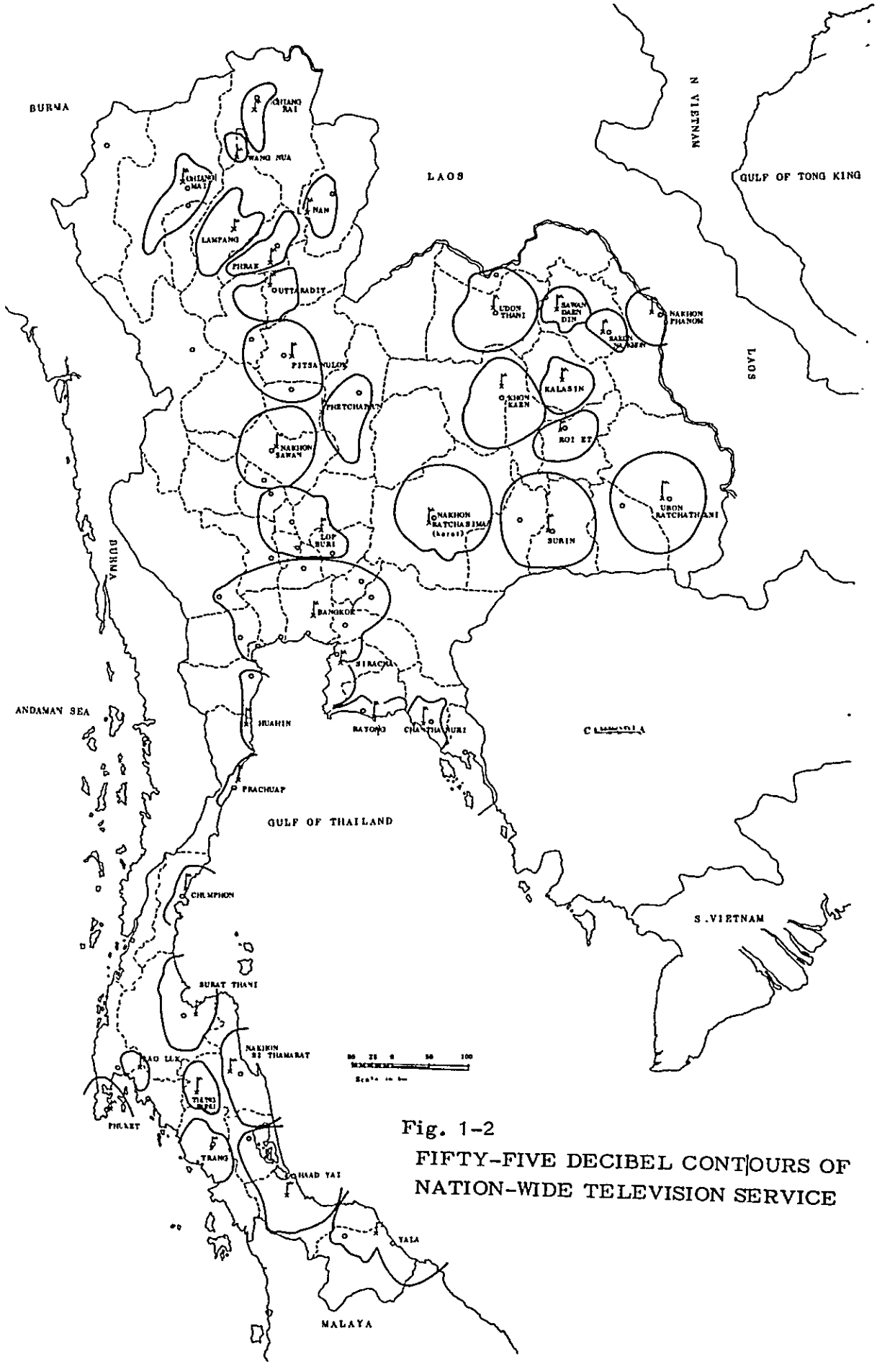


Fig. 1-2
FIFTY-FIVE DECIBEL CONTOURS OF NATION-WIDE TELEVISION SERVICE

1.5 Form of Television Broadcasting Enterprise and Popularization of Television.

1.5.1 Out of the 5 TV broadcasting stations currently in operation in Thailand, only 2 located in Bangkok are paying business. The 3 other local stations are under direct management of the Public Relations Department at present. They are being operated with a large amount of government funds, and there is no hope for their growing into independent and commercial enterprises even in the future.

There is a great difference in economic standard between the central area including Bangkok and other areas. It will be difficult to hope that the population of viewers in the latter may grow as rapidly as the central area even when broadcasting stations are opened. Moreover, since there is no city with a population of over 100,00 in local areas where the population density is low, the effect of the station installation is poor and, on top of that , considerable rentals for the microwave link for transmitting programs from Bangkok is needed. Thus, the construction expenses and operation expenses for TV broadcasting in local area are incomparably high compared with the central area if they are considered in terms of unit service population.

Therefore, the form and scale of the broadcasting enterprise must be designed to be suitable for overcoming those disadvantageous conditions facing local stations.

1.5.2 Direct function of broadcasting can be classified into 4, namely, public information function including government informations, educational function including adults' education and culture, entertainment function, and advertising medium function.

In Thailand importance of these functions is rated in the above-mentioned order. This survey team also considers it reasonable. However, since the management of the Thai TV stations is mainly supported by the income from advertisement broadcast at present, it can not be denied that a somewhat excessive emphasis is being placed on the advertisement medium function, the related entertainment function, and the volume of programs . It is evident that when the TV stations covering 90 % of the population are installed and a considerable increase in the number of viewers is attained as a result, the TV broadcasting business in Thailand will occupy an incomparably dominant position as mass-communication medium over other means, such as newspapers, magazines, films, etc. Therefore, greater importance must be attached to the public information function and the educational function, and the nationwide TV broadcasting network also must broadcast high quality programs worthy of its top position among the mass-communication media.

From this point of view, sufficient efforts even for functions of low advertisement value, and an eterprise form possessing such an intrinsic moment as to spend expenses willingly for the preparation of programs are called for.

1.5.3 Potential TV enterprise form is to be classified according to the types of its scheduled source of income. Needless to say, the potential form here is not necessarily synonymous with the type of finance in the strict sense of the term, as in the case of the Thai Television Company which is state-owned and at the same time is a commercial broadcasting enterprise. We will consider the form of TV broadcasting according to the financial classification from the viewpoints of whether its activities include the enterprise activities for economic purpose, and whether its broadcasting includes programs for advertising purpose.

There are usually three income sources for TV broadcasting enterprise, namely, advertisement broadcast receiver, license fee and government subsidies.

As for the foregoing government subsidies, there are many countries where an independent accounting system is established from the viewpoint that the broadcasting enterprise may not be a financial burden on the government and the viewpoint of fair sharing of liabilities, and the government expenditures are spent only for the cost of broadcasting programs based on government instructions as a means to help the finance. We think that Thailand should also adopt such an idea. Therefore, two types are conceivable for the enterprise form, namely, commercial broadcast depending on advertisement income and public broadcasting depending on receiver license fees.

1.5.4 In case it is presumed that 0.5 % of the national income is spent for all advertisement and the share of TV broadcast thereof is 35 %, an advertisement income amounting to some 180,000,000 Bahts per year can be expected after the completion of the nationwide broadcasting network.

On the other hand, in case it is presumed that a licence fee of 120 Bahts per year is collected and the number of viewers amounts to about 1,000,000 a net income of some 100,000,000 Bahts after deducting the expenses for collection can be expected.

Therefore, it is possible to have 2 types of enterprise form at the same time, namely, a public enterprise mostly engaged in broadcasting the Government's public information as well as educational and cultural programs and financed by the licence fee income, and several private enterprises financed by advertisement income.

Co-existence of these two different enterprises will contribute to the development of intrinsic moment for positively spending expenses for program preparation.

1.5.5 Next, we would like to comment on the most suitable scale for the broadcasting enterprise. Several backgrounds are necessary in order that a broadcasting enterprise can exist on a local scale. They include such facts as that the principle of local autonomy is adopted; that the principle of delegation of authorities to local governments is adopted: that local districts actually possess their own independent social and economic foundations, etc. It can not be said that none of such conditions exists in Thailand.

However, TV broadcasting enterprise requires a considerably higher cost compared with sound broadcasting enterprise. In consideration of its effects against expenses there is a natural tendency that TV broadcasting enterprise inevitably has to adopt the type of management as a nationwide broadcasting network. Accordingly, it is recommended that a TV broadcasting by nationwide broadcasting network be designed. This broadcasting is to be undertaken by a centralized single enterprise body so as to minimize the spendings in local areas. However, this does not mean to deny the necessity of localized programs.

In the Central Area, a broadcasting enterprise offering service only to the Central area exists separately from this broadcasting enterprise on the nationwide TV broadcasting network. It is possible that this kind of enterprise may continue to exist in the future.

1.5.6. The yearly construction planning for the nationwide TV broadcasting network as shown in Table 1.3 is hereby recommended. In preparing this planning, the new 5-year economic development plan in Thailand was taken into consideration.

It is recommended that the nationwide broadcasting network of the 625-line system be constructed by establishing a new State-invested public corporation and be managed as a non-commercial station for broadcasting general programs and educational programs. However, it is desirable to collect license fees from the 6th year. The public broadcasting network operated by the new public corporation provides the first national program service, for which the 1st channel of each station is to be utilized.

After completion of the 2nd channel for each station at the end of the 5th year,

operation of the second national program service becomes possible. The facilities for the second national program service belong to the new public corporation which maintains them. However, it is recommended to rent the facilities on this network to the commercial stations in Bangkok for the second national program service by commercial programs.

According to this plan, it is possible to view the dual broadcasting programs comprising one public broadcasting and one commercial broadcasting even in local cities.

It is no case a double investment to construct the nation wide broadcasting network composed of two types of programs. Through this means not only improvement in programs on account of the varieties in informations and competition for viewers' percentage can be expected but also the cost of construction for the second broadcasting network and its operation will be for cheaper compared with the first broadcasting network to be constructed first. It must be emphasized that as a whole the unit broadcasting cost for each station will have the effect of going down by operating two national networks.

1.5.7 Popularization of receivers amounting to about 1,030,000 units is expected in the final year of the 5-year plan when the nationwide broadcasting network will be completed. The breakdown of this figure is 620,000 units in the Bangkok Central Area and 410,000 units in local areas.

A bottleneck for popularization of receivers in provincial areas is the slow tempo of development of alternating electric power for home use. It may be difficult to reduce the domestic sales price of receivers by domestic production. However, it will be necessary to consider domestic production of a considerable scale in order to cope with a sharp increase in demands for receivers in the future in consideration of the facts that the production of TV receivers entails a great deal of processing, that expected increase in employment per unit investment is very great, and that it will contribute to the general improvement of electronic technics. The effect of killing two birds with one stone can also be expected from the fact that this will contribute to the saving in foreign exchange for importing receivers.

Table 1.3 Yearly Plan for the Construction and Operation of Nationwide Broadcasting Network

Item \ Year	1st year	2nd year	3rd year	4th year	5th year
Construction plan	Bangkok Central Station construction			Construction of South Region Stations for 2nd national program service	
	Construction of Southern Region Stations for 1st national program service			Construction of North Region Stations for 2nd national program service	
	Construction of Northern Region Stations for 1st national program service		Construction of Northeastern Region Stations for 1st national program service		Construction of Northeastern Region Stations for 2nd national program service
			Construction of Southeastern Region Station for 1st national program service		Construction of Southeastern Region Stations for 2nd national program service
Program service plan	Thai Television 525-line system				stop the service
	Royal Army Television 525-line system		Royal Army Television 625-line system		
		New Public Corporation 625-line system (Bangkok Central Station)			
			ditto Southern Region & Northern Region		
					ditto Southeastern Region
					ditto Northeastern Region

1.6 Program Producing Plan and Personnel Planning

1.6.1 Television is the most perfect among the mass communication media, and its influence on viewers is also very great.

The following are recommended in order to safeguard and improve the quality of programs.

(1) Creation of a program consultation committee.

This committee will be composed of prominent people in political, economic, scientific, art, and Buddhistic circles, and give advise to the Broadcasting Station on fundamental matters in program planning (such as broadcasting hours, percentage to be allocated to each type of program, contents of programs)

(2) Establishment of program standards

Through internal regulations of the broadcasting station, the general standards for the objective of broadcast and contents of programs will be clarified.

(3) Creation of an examination function

As an internal function of the broadcasting station, the contents of programs will be examined before broadcast according to the above-mentioned program standards.

(4) Sufficient expenses will be spent for program producing

1.6.2 It is recommended in connection with the composition of the broadcasting hours that the public broadcasting on the nationwide broadcasting network, namely, the national programs on the first network be about 70 hours per week, which include news programs 20 %, educational programs 20 %, cultural programs 23 %, entertainment programs 30 % and special program 7 %, and about 10 % (7 hours per week) out of the above be used for localized programs.

It is recommended to spend about 30,000,000 Bahts per year for producing of these programs for public broadcasting. By spending this fund, it is expected that the big social and cultural gap between Bangkok and local areas will be rectified and broadcasting programs with educational effect be prepared.

1.6.3 TV broadcasting enterprise is to be operated as an organic body composed of many different activities, such as technics, program producing, business, etc. Therefore, these departments must be specialized. In addition, even if one department, such as the program producing department, for example, it is necessary to

promote specialization of producers, writers, actor, etc.

It is desirable also that the over-all operation and management be based on the idea of line-and-staff system. The personnel required for the public enterprise body of nationwide broadcasting system, namely, the new public corporation, is estimated to number about 817, of which 696 persons are to be employed by the Bangkok Central Station, and the remaining 121 persons by local stations.

The breakdown of the required personnel in the Bangkok Central Station is as follows: production of programs, 198; technical field, 171 ; fee collection 120 ; clerical work 107: and other aids 100. About 2,000 Bahts is estimated as the average monthly wage per capita.

1.7 Required Construction Expenses

The estimated total construction expenses for the nationwide broadcasting network is shown in Tables 1.4 and 1.5. In these Tables, construction expenses for the link facilities connecting the microwave relay terminal stations and the broadcasting station are included in the column of TV broadcasting station.

Table 1.4 Expenses Required for the Construction of the Broadcasting Network for the 1st National Program Service

(Unit; million Bahts)

	TV Broadcasting station			Microwave relay link			Grand Total
	facilities	roads & buildings	total	facilities	roads & buildings	total	
Bangkok Central Broadcasting Station	transmitting 10.2 studio 38.3	24.0	72.5	—	—	—	72.5
Southern Region (broadcasting station 7, translator station 3)	32.4	20.4	52.8	5.8	1.1	6.9	59.7
Northern Region (broadcasting station 6, translator station 5)	45.5	17.2	62.7	—	—	—	62.7
Northeastern Region (broadcasting station 5, translator stations 5)	46.1	3.5	49.6	42.0	4.8	46.8	96.4
Southeastern Region (broadcasting stations 1, translator stations 2)	6.6	3.6	10.2	6.6	2.2	8.8	19.0
Total	179.1	68.7	247.8	54.4	8.1	62.5	310.3

Table 1.5 Expenses Required for the Construction of the Broadcasting Network for the 2nd National Program Service

(Unit; million Bahts)

	TV Broadcasting station			Microwave relay link			Gran Total
	facilities	roads & buildings	total	facilities	roads & buildings	total	
Bangkok Central Broadcasting Station	—	—	—	—	—	—	—
Southern Region (broadcasting stations 7, translator stations 3)	19.0	—	19.0	9.5	—	9.5	28.5
Northern Region (broadcasting stations 6, translator stations 5)	24.3	—	24.3	5.4	—	5.4	29.7
Northeastern Region (broadcasting stations 5, translator stations 5)	24.3	—	24.3	8.1	—	8.1	32.4
Southeastern Region (broadcasting stations 1, translator stations 2)	5.3	—	5.3	1.5	—	1.5	6.8
Total	72.9	—	72.9	24.5	—	24.5	97.4

CHAPTER Ⅱ BANGKOK CENTRAL STATION

CHAPTER II BANGKOK CENTRAL STATION

2.1 Matters considered during the Survey

The survey concerning the preparation of the plan for the Bangkok Central Station which is expected to be the central station for the nationwide TV broadcasting network was conducted while taking the following matters into consideration.

(1) Frequency band to be used will be Band III of C.C.I.R.. The 625 scanning line system will be adopted, and parallel operation with the 525 scanning line system will be continued for about 5 years.

(2) 4 chanels will be assigned to the city of Bangkok.

(3) The new Bangkok Central Station will prepare more than 90% of the nationwide broadcasting programs.

(4) Switching function for the 2nd national programs will be considered.

(5) Future color broadcasting will be considered.

(6) Studios and the broadcasting station will be located in the same place.

(7) The site will be either in the city of Bangkok or its suburbs where transportation is convenient, roads are good, and sufficient space is available.

(8) Commercial electric power and water supply are easily available.

(9) It will not constitute an obstacle to air routes

2.2 Results of Survey

The results of the survey which was conducted while considering the foregoing matters are as follows:

2.2.1 Sites

The city of Bangkok is located in the center of a great plane extending along the northern coast of the Bay of Siam. It is necessary to serve an area extending from the south of Uttradit in the north and extending more than 100km from east to west. Accordingly, it is desirable to have an antenna tower of 250 meters high. From an economic viewpoint, it is desirable to have a mast with stay wires as antenna support. For this purpose a space covering the minimum area of 45,000 m^2 is required.

The Public Relations Department has already obtained a lot as site for the new broadcasting station on the north side of the New Petburi Road. However, it is too narrow for the Central Station of the nationwide broadcasting network.

It was considered that the vicinity of Hua Mak which was used as the site for the Asian International Trade Fair and the Asian Games would be one of the proper sites.

2.2.2 Facilities for the Bangkok Central Broadcasting Station

(1) Outline of layout

(a) Studio

6 studio rooms are considered. Out of these rooms 3 will be used for the production of large type programs, such as dramas, musicals, etc. In addition, 3 rooms will be assigned respectively to interviews, dubbing, and news, etc. Auditorium will be considered as a future enlargement.

The floor space of each studio will be as follows:

Studio A	540 m^2
Studio B	180 m^2
Studio C	315 m^2
Studio D	42 m^2 (interview)
Studio E	24 m^2 (announce)
Studio F	48 m^2 (dubbing)

(b) Master Control room, Tele-cine room, Magnetic video recording room, equipment room, development room.

These rooms will be located on the 1st floor in consideration of the relationship with the studios, and flow of work among these rooms.

(c) Transmitter Room

Transmitter Room will be on the 1st floor. Ventilator Room will be on the ground floor.

(d) Visitors

Movement of visitors will be considered.

(2) Video system

(a) The video room system will be adopted for the video system of studios. In other words, a room called Video Room will be prepared, and C.C.U. change-over switches used in each studio, etc. will be concentrated here.

(b) Synchronous video signal will be used for transmitting signals from the studios to the master control room.

(c) The signal distribution to the tele-cine equipment will be made through the pre-set panel, and to the studios by means of video signals .

(d) Signals of magnetic video recording system are recorded, reproduced, and connected, to studios and the master control room through the pre-set panel, and all transmitting and receiving other than transmission to the studio mixing amplifier are done by means of synchronous video signal.

(3) Audio system

(a) The concentrated installation system is not adopted for the audio system because of its qualitative difference from the video system. Required equipments are installed in each room, and their relation between rooms will be done according to a level prepared in advance, and then matching will be applied.

(b) Distribution of signals to Tele-cine Room and Magnetic Video Recording Room will be made through the pre-set panel as in the case of the video system and will be interlocked with the video system.

(4) Synchronous system

(a) Distribution of signals to single equipments will be made through the pre-set panel.

(b) Phase adjustment will be made by synchronous delay.

(5) Remote control

(a) The tele-cine system and the magnetic video recording system will be remote-controled from the master control room or studios through the pre-set panel and the video and audio systems will be interlocked.

(b) Receiving facilities for O.B. Van (Microwave) will be remote-controlled from the master control room.

(6) Communicating telephones

General intercommunication telephones will be installed for communication use between each room and local intercommunication telephones will be installed for communication use between the single equipment and pre-set panel rooms. Local Intercom-Telephones will be interlocked with the pre-set panel for video and audio systems.

(7) Illumination facilities

(a) Three studios where drama, musicals, etc, are prepared will have illumination control facilities under the S.C.R. system.

(b) Two studios to be used for interview, announcing, etc, will be illuminated by illuminating facilities fixed to the ceiling, and light stands will be used for suplementary illumination.

(8) Developing facilities

Facilities for developing, printing and preparation of chemicals for 16 mm films will be assorted in a complete set.

(9) Tele-cine facilities

(a) 16 mm films will be used for preparing films inside the station. A35 mm projector will be installed in consideration of the films loaned from outside.

(b) Magnetic sound reproducer will be installed for changing into foreign languages.

(10) Power facilities

(a) General equipments will be operated by commercial electric power. For equipments which require stabilized electric power (of constant voltage and constant frequency), it will be supplied from the constant-voltage and constant-frequency power source in the power source room.

(b) Emergency power generating facilities will be installed.

(11) Facilities for O.B. Van

(a) An automobile for outside relay use equipped with 2 sets of I.O. Camera and one set of microwave transmitting facilities for outside relay use will be prepare.

(b) Facilities which can be inserted in the microwave radio link for the nationwide TV program transmission will be added.

(12) Standards-conversion equipment

(a) During the parallel operating of the 525-line system and the 625-line system, a simple standards-conversion equipment will be installed for transmitting programs from the new public corporation to Thai TV Company.

(b) This conversion will be performed inside Thai TV station.

(13) Program switching function

(a) A switching function making it possible to select programs of other 3 channel TV stations in Bangkok for the sake of second national programs will be established.

(b) Along with the possible opening of international microwave radio

link network and establishment of space communication station exchange of programs and information with foreign countries may become a reality. This eventuality is taken into consideration.

TABLE C-1-1 Main Specifications of Bangkok Central Station

Name of Station		Bangkok
Type of Station		TV Broadcasting Station
Transmitting Site	Site	Ref. to Fig. C-1-1
	Position	——
	Altitude	——
	Access Road	——
Transmitting Channel No.		5, 7, 9, 11
Transmitting Antenna	Height of Mast	250 m Ref. to Fig. C-1-28
	Polarization	Horizontal
	Required E.R.P.	Max. 180 kW Ref. to Fig. C-1-2
Output Power of Transmitter		25 kW
Service Area	Area	Samut Prakon, Samut Songkhom,Samut Sakhon, Nakhon Nayok, Nakhon Pathon, Nonthaburi, ThonBuri, Bangkok, Chachoengsas, Ratchaburi, Pathum Thani and Prachun Buri entire part for all provinces listed above. Kanchanaburi, Phra Nakhon Si Ayuttaya, Chon Buri, greater part of each province listed above. Phetchaburi, Saraburi, Suphan Buri, some part of province listed above.
	Population Covered	5,688,000 persons
Studio	Building	Ref. to Fig. C-1-2 & C-1-3
	Facilities	Ref. to Table C-1-2 & Fig. C-1-5~26
Receiving Station	Name	——
	Site	——
Master Station		——
Station Building		Ref. to Fig. C-1-2, C-1-3 & C-1-4
(Thousand Bahts) Construction Cost (1st Channel)	Equipment	10,242 + 38,250 (Studio)
	Building	24,000
	Total	34,242 + 38,250 (Studio)

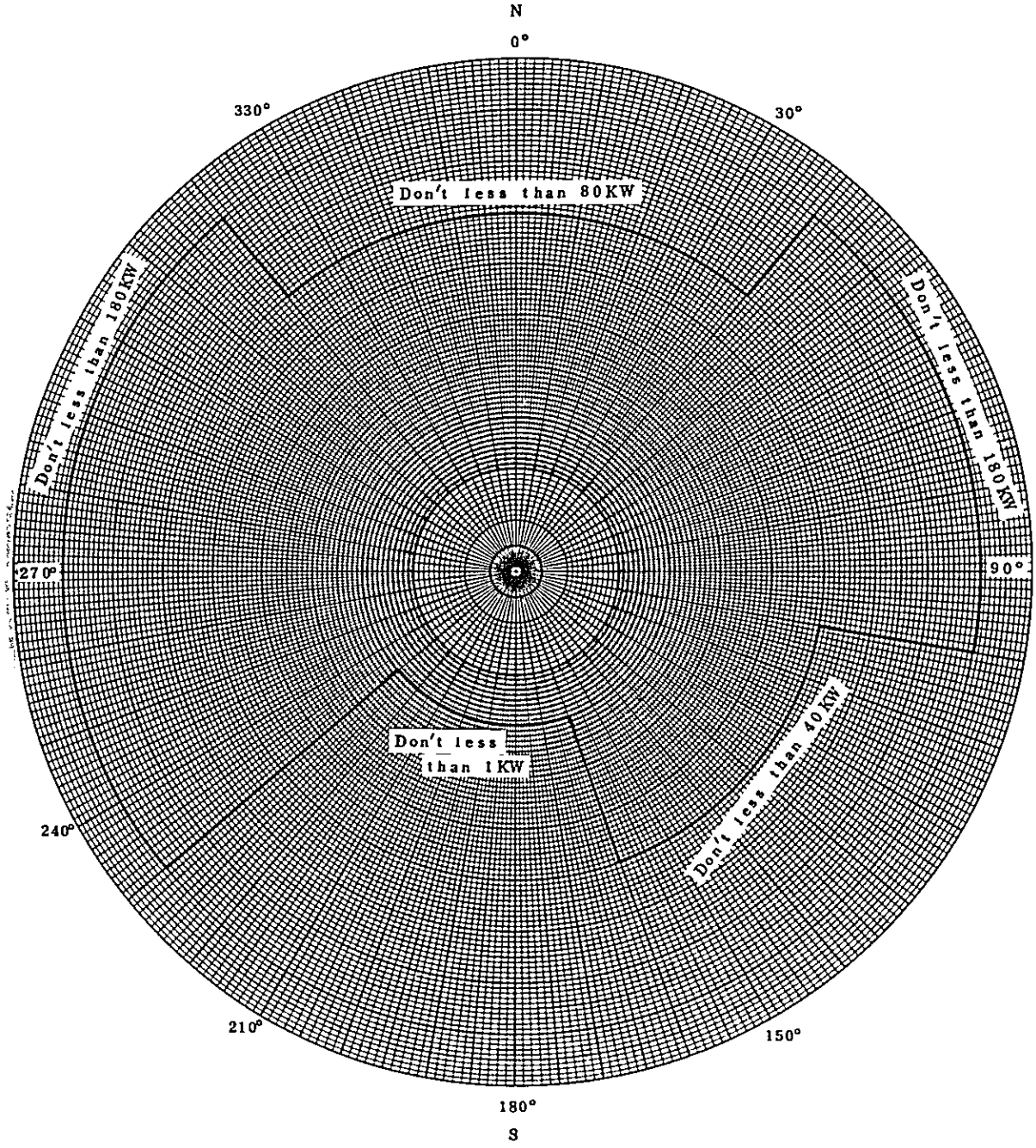


Fig. C-1-1 HORIZONTAL PATTERN OF REQUIRED E.R.P. (BANGKOK STATION)

TABLE C-1-2 LIST OF TV STUDIO FACILITIES

1. STUDIO A

Item	Description	Q'ty.
1.	4-$\frac{1}{2}$" Image orthicon camera chain	4 sets
2.	Spring balanced camera pedestal	4 sets
3.	Picture monitors	1 lot
4.	Microphone and microphone boom stands	1 lot
5.	Studio lighting equipment	1 lot
6.	Master monitor (Picture and waveform monitor)	1 set
7.	Video control console	1 set
8.	Audio control console	1 set
9.	Monitor speakers	1 lot
10.	Turntable (disc reproducer)	1 set
11.	Tape recorder and reproducer	1 set
12.	Rear screen and projector	1 set

2. STUDIO B

1.	4-$\frac{1}{2}$" Image orthicon camera chain	3 sets
2.	Spring balanced camera pedestal	3 sets
3.	Picture monitors	1 lot
4.	Microphone and microphone boom stands	1 lot
5.	Studio lighting equipment	1 lot
6.	Master monitor	1 set
7.	Video control console	1 set
8.	Audio control console	1 set
9.	Monitor speakers	1 lot
10.	Turn table (disc reproducer)	1 set
11.	Tape recorder and reproducer	1 set

3. STUDIO C

1.	4-$\frac{1}{2}$" Image orthicon camera chain	3 sets
2.	Spring balanced camera pedestal	3 sets
3	Picture monitors	1 lot
4.	Microphone and microphone boom stands	1 lot

Item	Description	Q'ty
5.	Studio lighting equipment	1 lot
6.	Master monitor (picture and waveform monitor)	1 set
7.	Video control console	1 set
8.	Audio control console	1 set
9.	Monitor speakers	1 lot
10.	Turn table (disc reproducer)	1 set
11.	Tape recorder and reproducer	1 set

4. INTERVIEW STUDIO

1.	Studio vidicon camera chain	2 sets
2.	Picture monitors	1 lot
3.	Microphone and microphone boom stands	1 lot
4.	Studio lighting equipment	1 lot
5.	Master monitor (Picture and waveform monitor)	1 set
6.	Video control console	1 set
7.	Audio control console	1 set
8.	Monitor speakers	1 lot
9.	Turn table (disc reproducer)	1 set
10.	Tape recorder and reproducer	1 set

5. ANNOUNCE STUDIO

1.	Studio vidicon camera chain	1 set
2.	Picture monitors	1 lot
3.	Microphone and microphone boom stands	1 lot
4.	Studio lighting equipment	1 lot
5.	Master monitor (picture and waveform monitor)	1 set
6.	Video control console	1 set
7.	Audio control console	1 set
8.	Monitor speakers	1 lot
9.	Turn table (disc reproducer)	1 set
10.	Tape recorder and reproducer	1 set

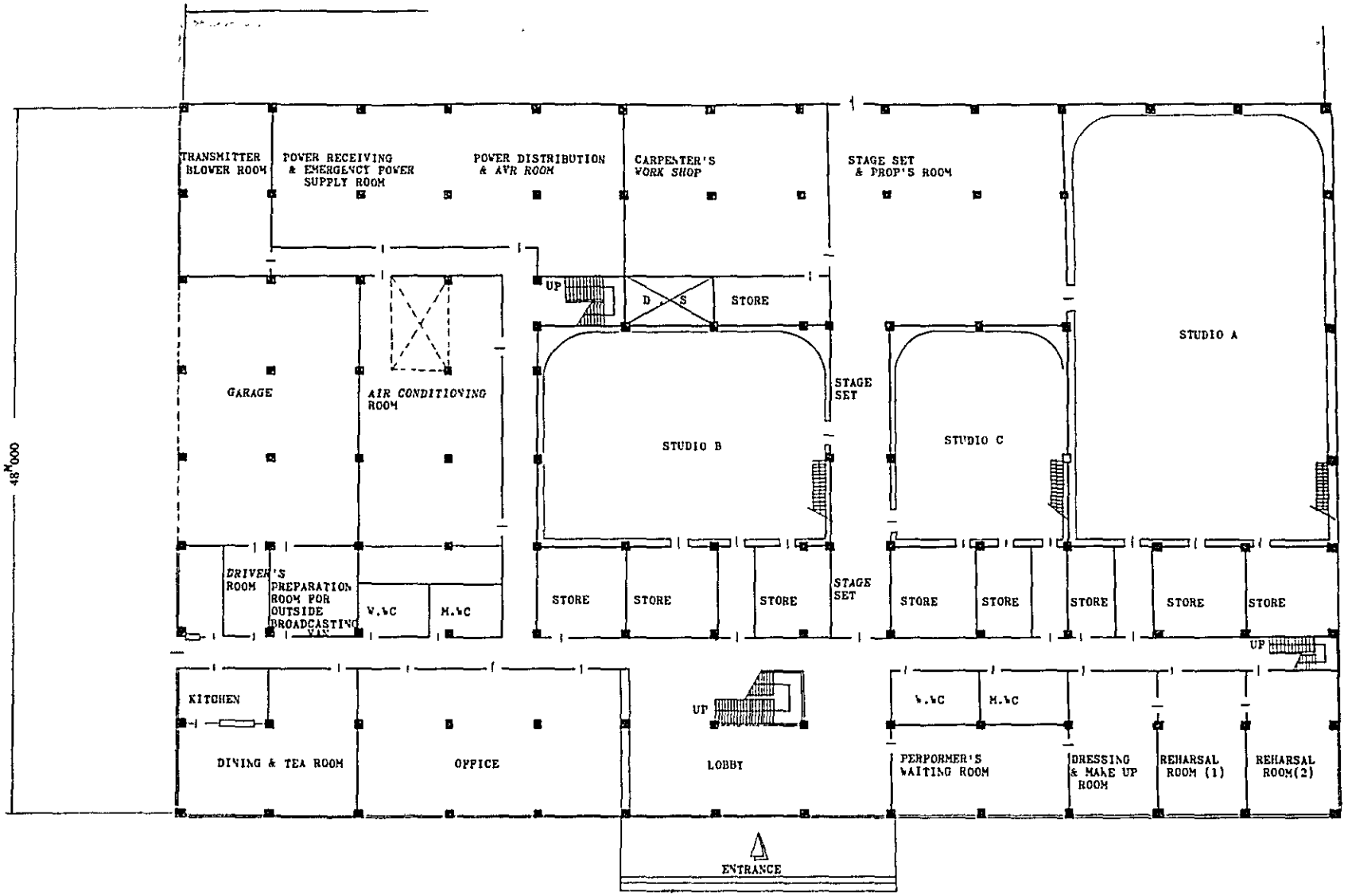
Item	Description	Q'ty
6.	DUBBING STUDIO	
1.	16mm Film Projector	2 sets
2.	16mm Magnetic Film Recorder	2 sets
3.	Audio Control Console	1 set
4.	Microphones and Microphone Stands	1 lot
5.	Audio Monitor Speakers	1 lot
6.	Turn Table (Disc reproducer)	1 set
7.	Tape Recorder	1 set
7.	MASTER CONTROL ROOM	
1.	Picture monitors	1 lot
2.	Master monitor (picture and waveform monitor)	3 sets
3.	Master control console	1 set
4.	Monitor speakers	1 lot
5.	Opaque scanner	1 set
6.	Turn table (disc reproducer)	1 set
7.	Tape recorder and reproducer	1 set
8.	Camera control console	1 set
8.	TELECINE AND VTR ROOM	
1.	Vidicon film camera	5 sets
2.	Opaque scanner	1 set
3.	16mm film projector	5 sets
4.	35mm film projector	1 set
5.	Slide projector	2 sets
6.	Opaque projector	2 sets
7.	Automatic slide projector	1 set
8.	Three input direct projection type optical multiplexer	3 sets
9.	Telecine distribution switcher	1 set
10.	Picture monitors	1 lot
11.	Video distribution amplifiers	1 lot
12.	Video tape recorder	4 sets
13.	VTR distribution switcher	1 set
14.	16mm Magnetic Film Reproducer	2 sets

Item	Description	Q'ty
9.	EQUIPMENT ROOM	
1.	Video switcher for studio A	1 set
2.	Video switcher for studio B and C	2 sets
3.	Video switcher for interview studio and announce studio	2 sets
4.	Video mixing amplifier	5 sets
5.	Special effects amplifier	1 set
6.	Video distribution amplifiers	1 lot
7.	Master switcher (semi-automatic controled)	1 set
8.	Audio line amplifiers	1 lot
9.	Picture monitors	1 lot
10.	Sync. signal generator	2 sets
11.	Sync. signal changeover switcher	1 set
12.	Sync. signal distribution switcher	1 set
13.	Sync. distribution amplifiers	1 lot
14.	Equipment mounting racks	1 lot
15.	Off air chack receiver	1 set
10.	OFFICE ROOM AND INTER-STATION MONITOR	
1.	Picture monitors	1 lot
2.	Monitor speakers	1 lot
11.	TEST EQUIPMENT	
1.	Test equipment	1 lot
12.	FILM EDITING AND PROCESSING EQUIPMENT	
1.	Film editing equipment	1 lot
2.	Film processing equipment	1 lot
13.	STANDARD CLOCK SYSTEM	
1.	Standard clock system	1 lot
14.	TV OUTSIDE BROADCASTING SYSTEM	
1.	TV outside broadcasting van with image orthicon camera chain and microwave equipment	1 set

Item	Description	Q'ty
15.	TV RELAY EQUIPMENT ROOM	
	1. TV relay equipment	1 lot
16.	AUTOMATIC VOLTAGE REGULATOR AND POWER DISTRIBUTION EQUIPMENT	1 lot
17.	EMERGENCY POWER SUPPLY	1 lot
18.	CVCF	1 set
19.	SPARE PARTS	1 lot
20.	INSTALLATION MATERIALS	1 lot
21.	SYSTEM CONVERSION EQUIPMENT	1 lot

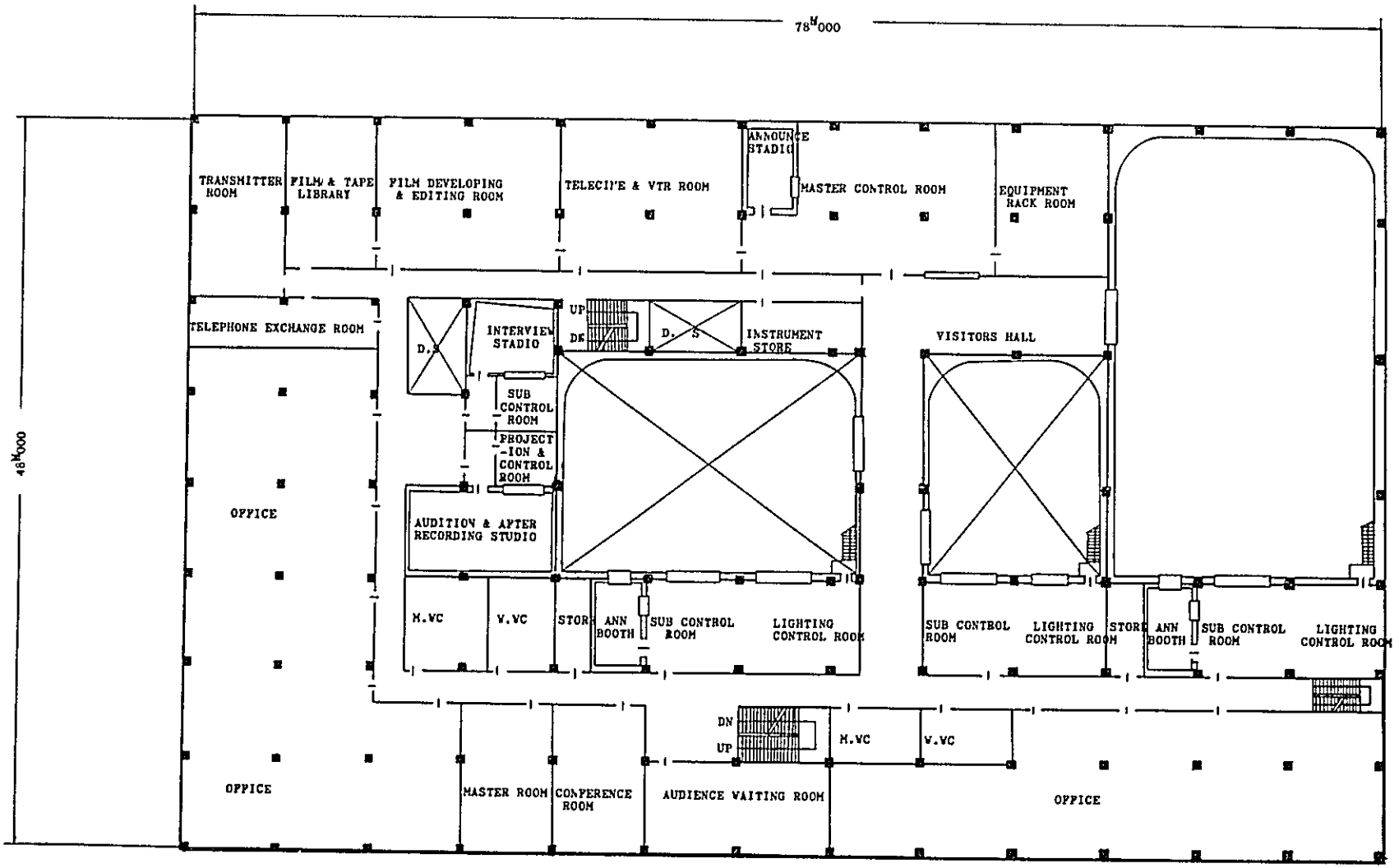
TABLE C-1-3 List of TV Transmitting Facilities (Bankok Station, 1st Channel)

Item	Description	Q'ty
1.	12.5 KW TV Transmitter (Including Transmitter Cooling Equipment and Transmitter Parallel Running Equipment)	2 sets
2.	Output Coaxial Equipment (Including Air Cooled Test Load)	1 set
3.	Transmitting Antenna	1 set
4.	Transmitting Feeder System	1 set
5.	250 Meters Antenna Mast	1 set
6.	Transmitter Input and Monitoring Equipment	1 set
7.	Measuring Instrument	1 set
8.	Installation Materials	1 set
9.	Minor Spare Parts	1 set



GROUND FLOOR

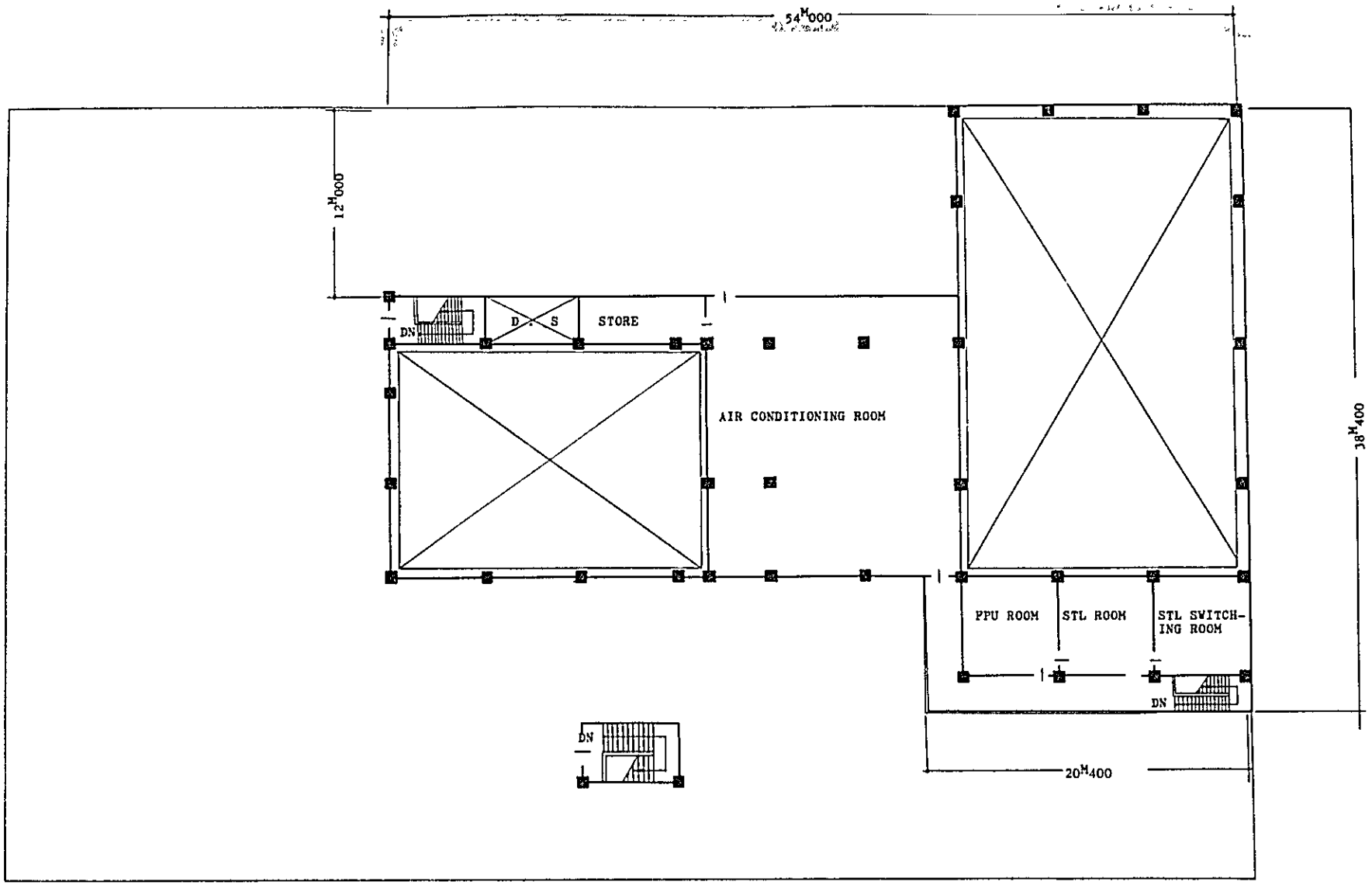
Fig. C-1-2 FLOOR LAYOUT OF BANGKOK CENTRAL STATION



1st FLOOR

Fig. C-1-3 FLOOR LAYOUT OF BANGKOK CENTRAL STATION

Fig. C-1-3 FLOOR LAYOUT OF BANGKOK CENTRAL STATION



2nd FLOOR

Fig. C-1-4 FLOOR LAYOUT OF BANGKOK CENTRAL STATION

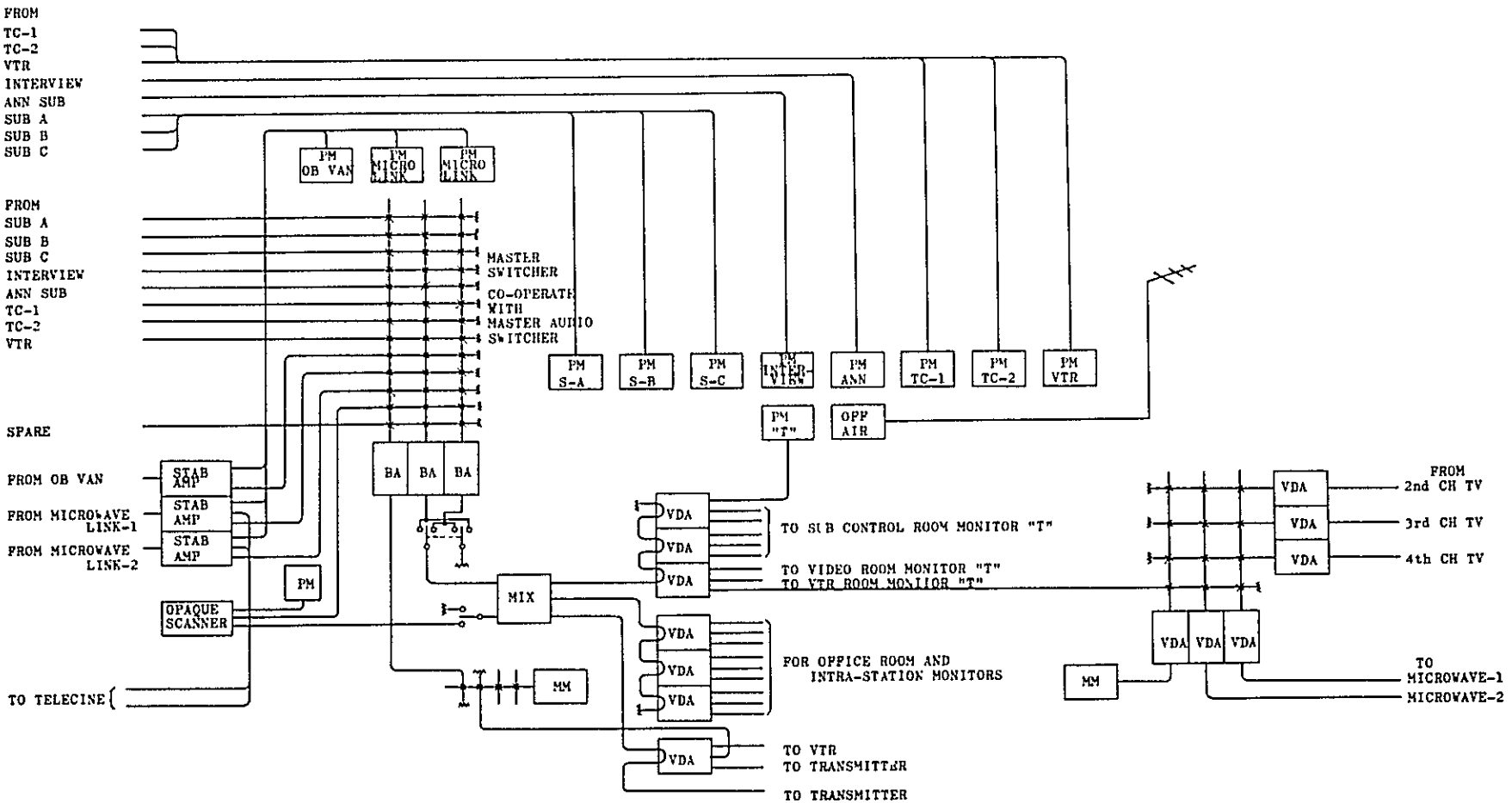


Fig. C-1-5 VIDEO BLOCK DIAGRAM OF MASTER CONTROL ROOM

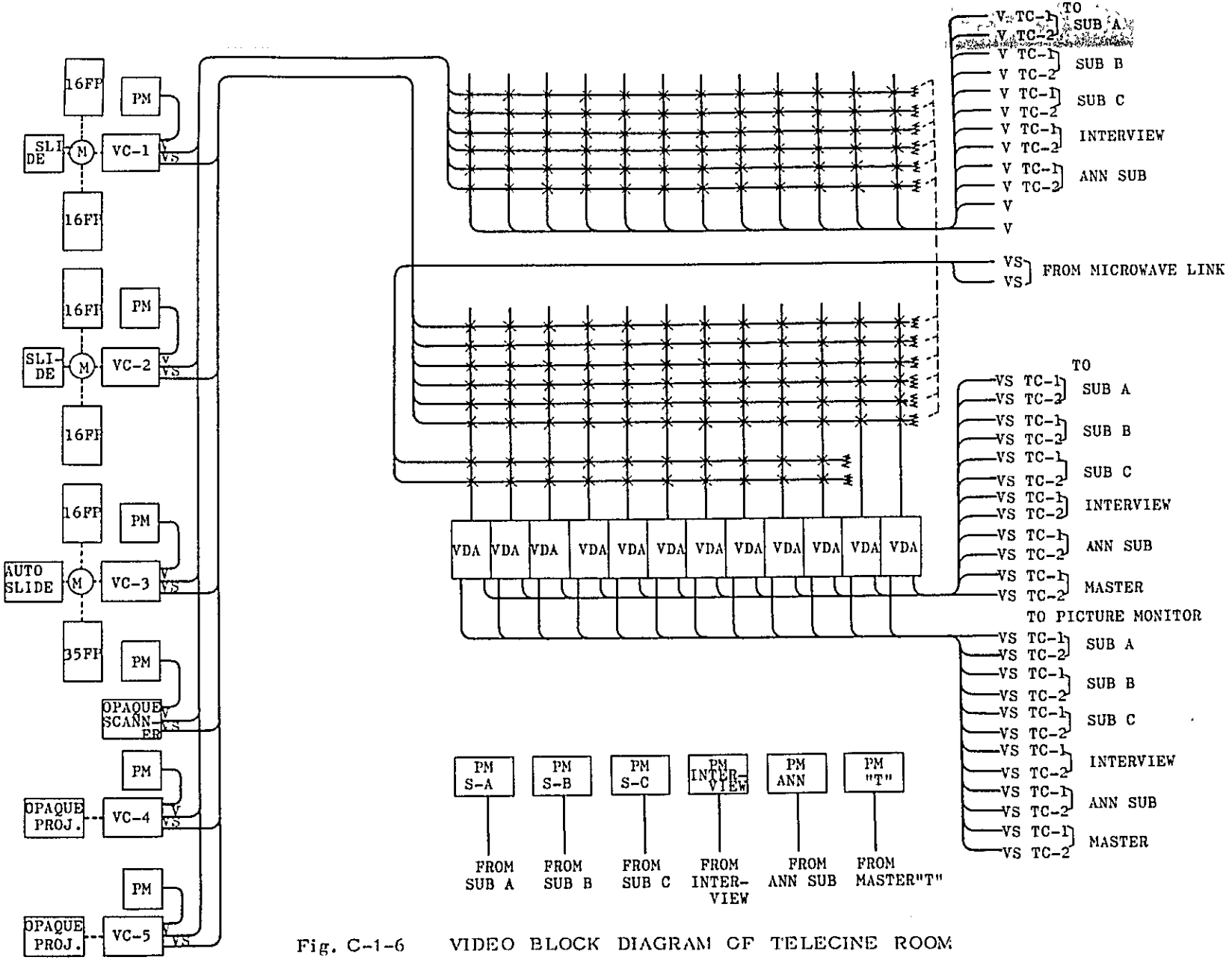
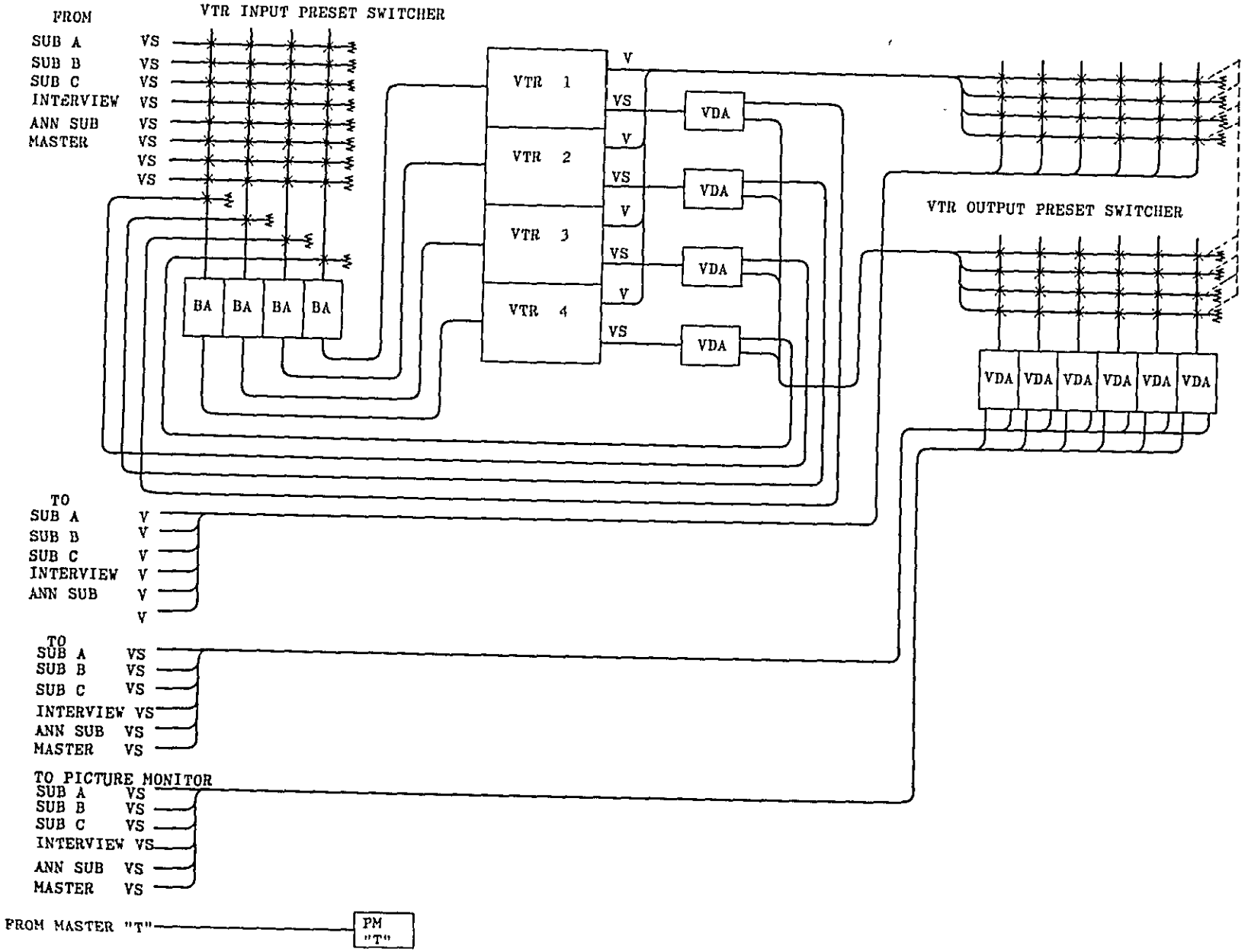


Fig. C-1-6 VIDEO BLOCK DIAGRAM OF TELECINE ROOM


FROM
VTR INPUT PRESET SWITCHER
SUB A VS
SUB B VS
SUB C VS
INTERVIEW VS
ANN SUB VS
MASTER VS
VS
VS
BA
BA
BA
BA
VTR 1
VTR 2
VTR 3
VTR 4
V
VS
V
VS
V
VS
VDA
VDA
VDA
VDA
VTR OUTPUT PRESET SWITCHER
VDA
VDA
VDA
VDA
VDA
VDA
TO
SUB A V
SUB B V
SUB C V
INTERVIEW V
ANN SUB V
V
TO
SUB A VS
SUB B VS
SUB C VS
INTERVIEW VS
ANN SUB VS
MASTER VS
TO PICTURE MONITOR
SUB A VS
SUB B VS
SUB C VS
INTERVIEW VS
ANN SUB VS
MASTER VS
FROM MASTER "T"
PM
"T"

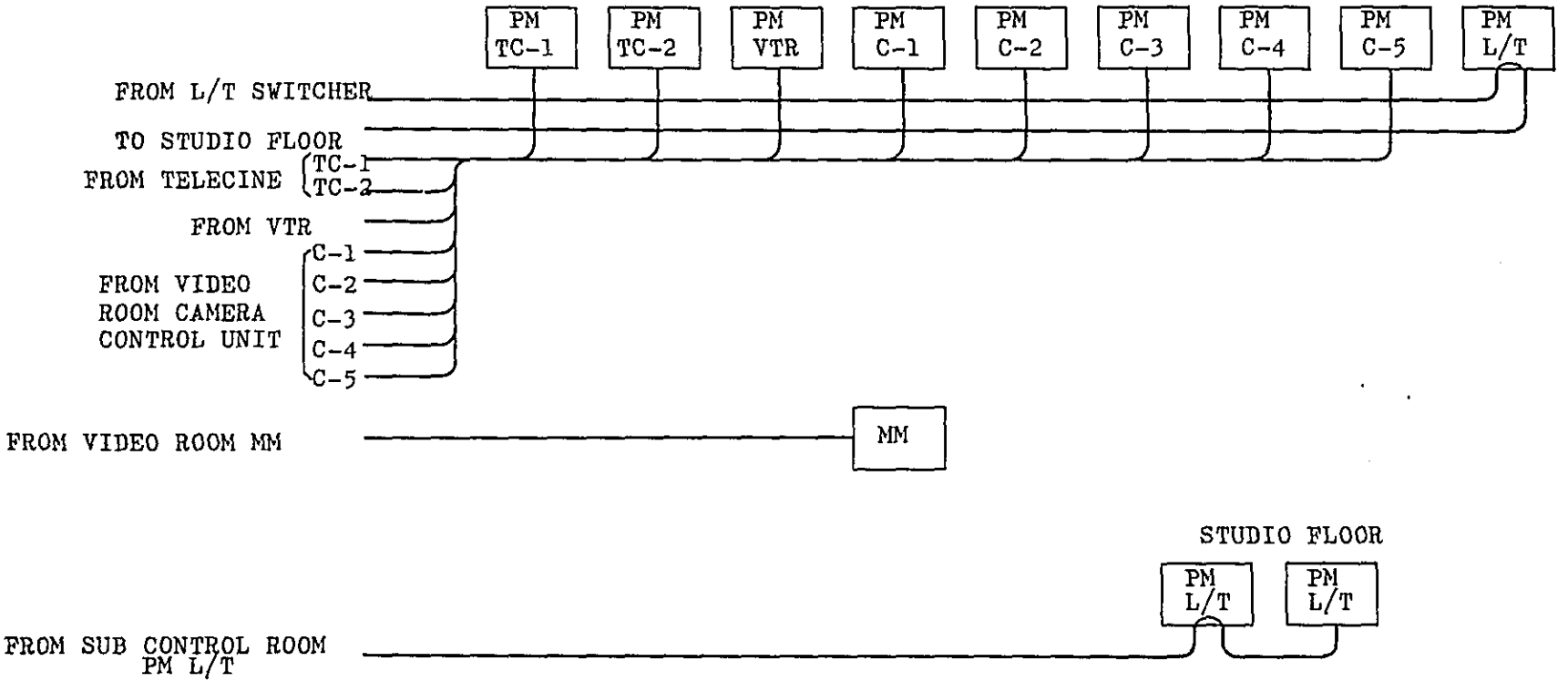
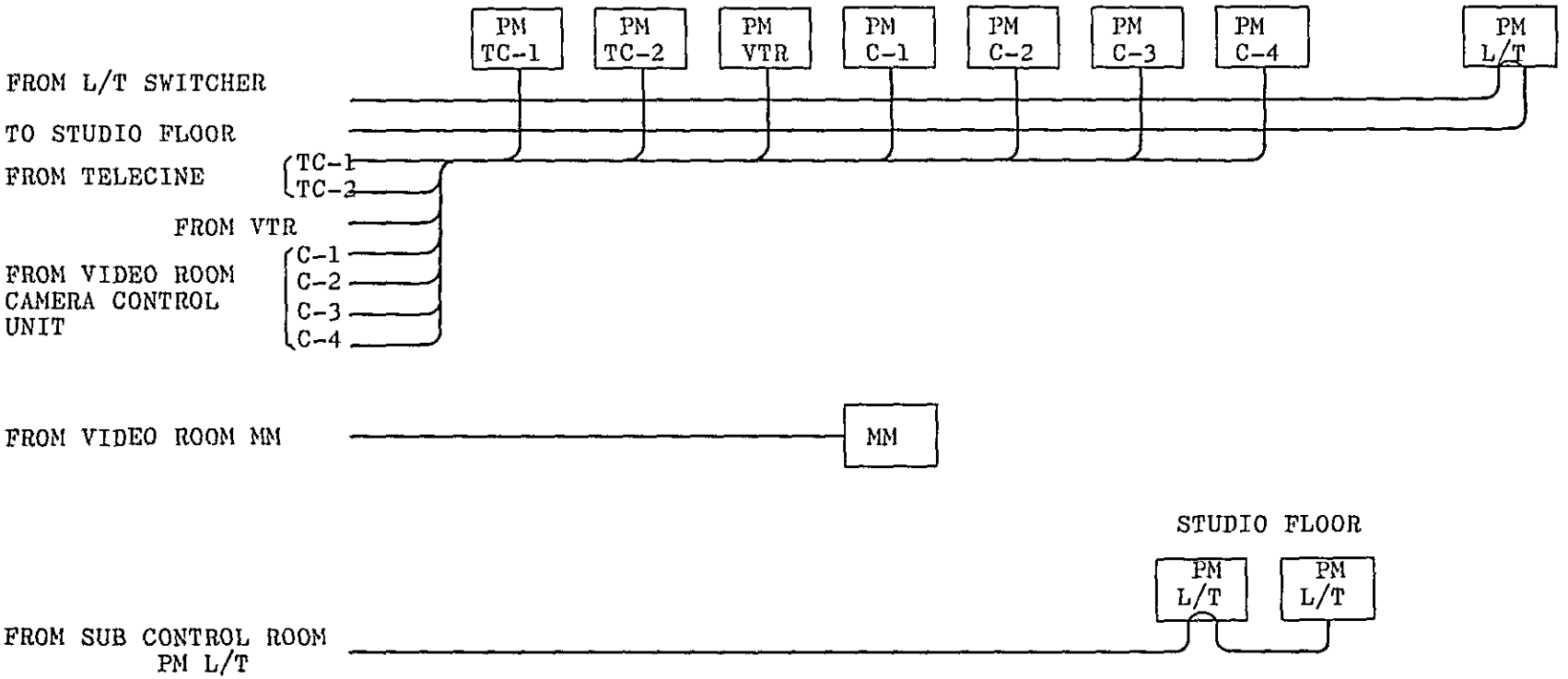


Fig. C-1-8 VIDEO BLOCK DIAGRAM OF STUDIO A


PM TC-1
PM TC-2
PM VTR
PM C-1
PM C-2
PM C-3
PM C-4
PM L/T
FROM L/T SWITCHER
TO STUDIO FLOOR
FROM TELECINE
TC-1
TC-2
FROM VTR
FROM VIDEO ROOM CAMERA CONTROL UNIT
C-1
C-2
C-3
C-4
FROM VIDEO ROOM MM
MM
STUDIO FLOOR
PM L/T
PM L/T
FROM SUB CONTROL ROOM PM L/T

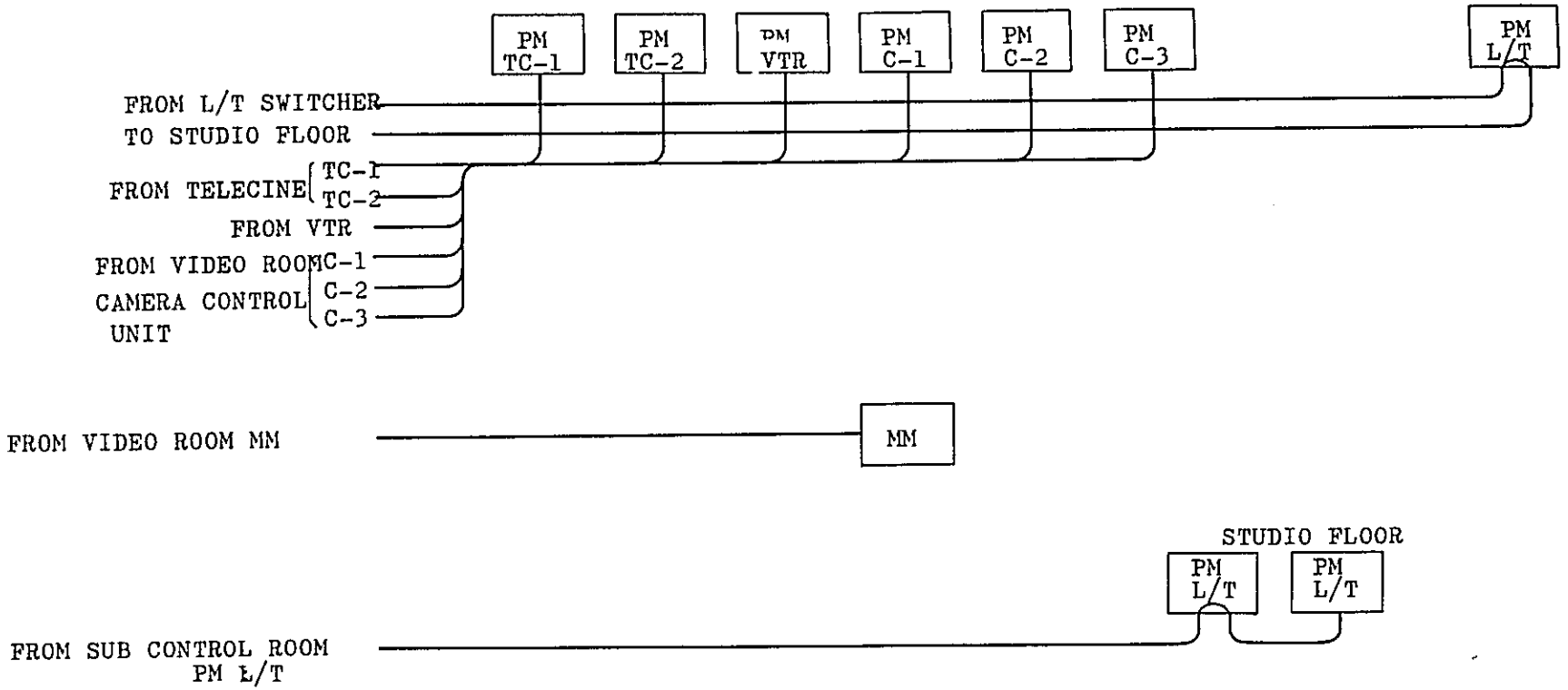


Fig. C-1-10 VIDEO BLOCK DIAGRAM OF STUDIO C

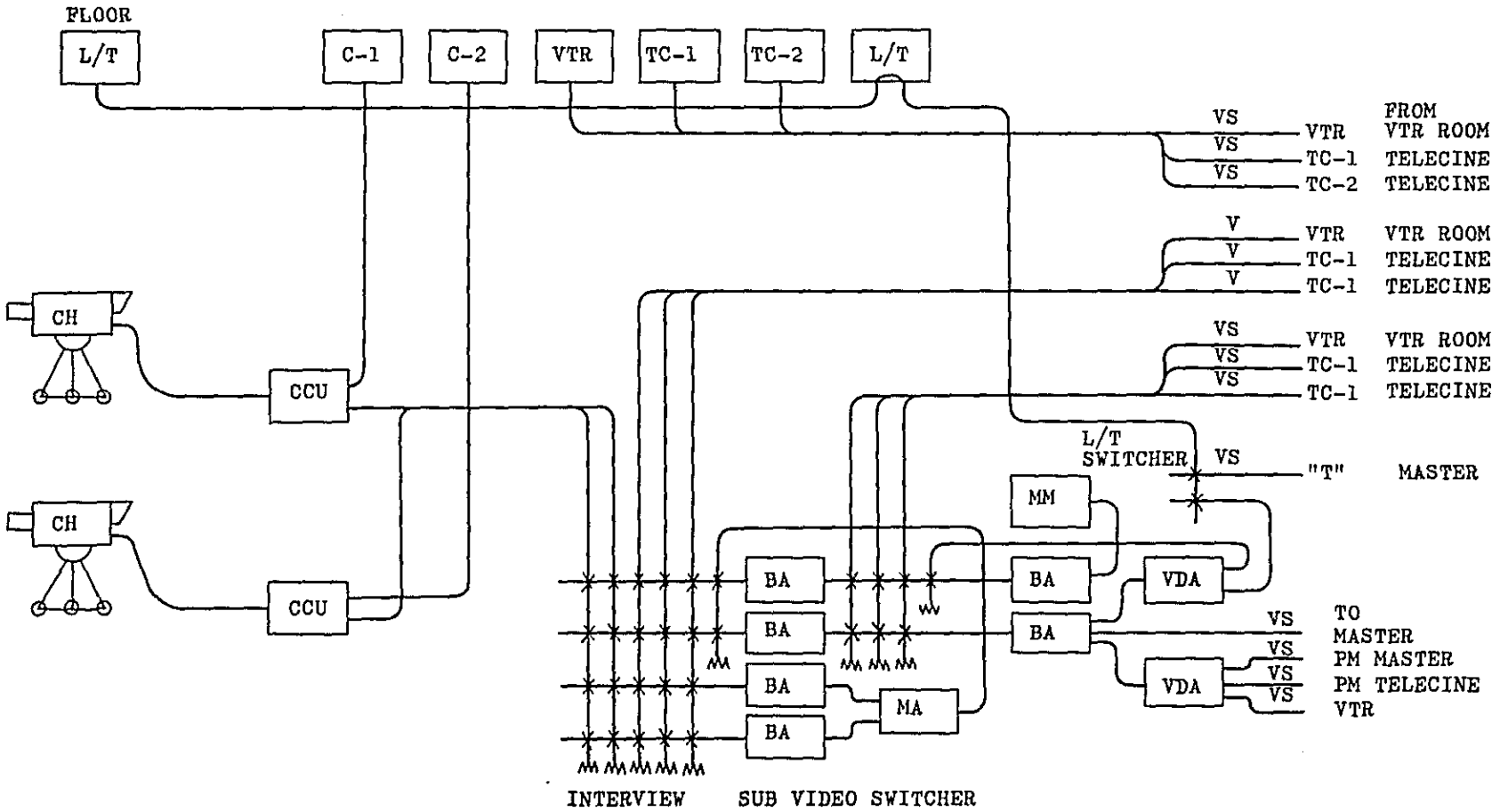


Fig. C-1-11 VIDEO BLOCK DIAGRAM OF INTERVIEW STUDIO

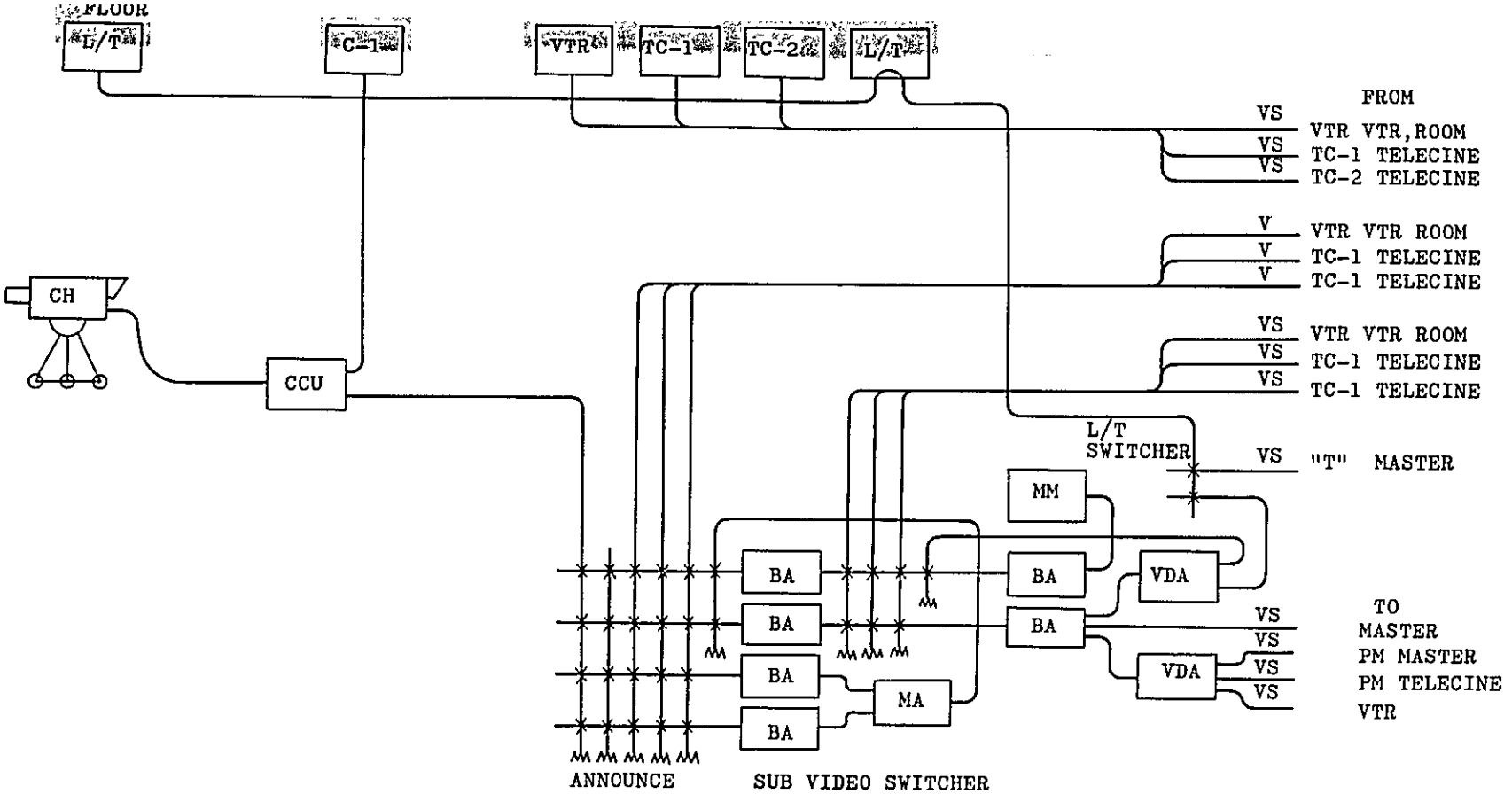
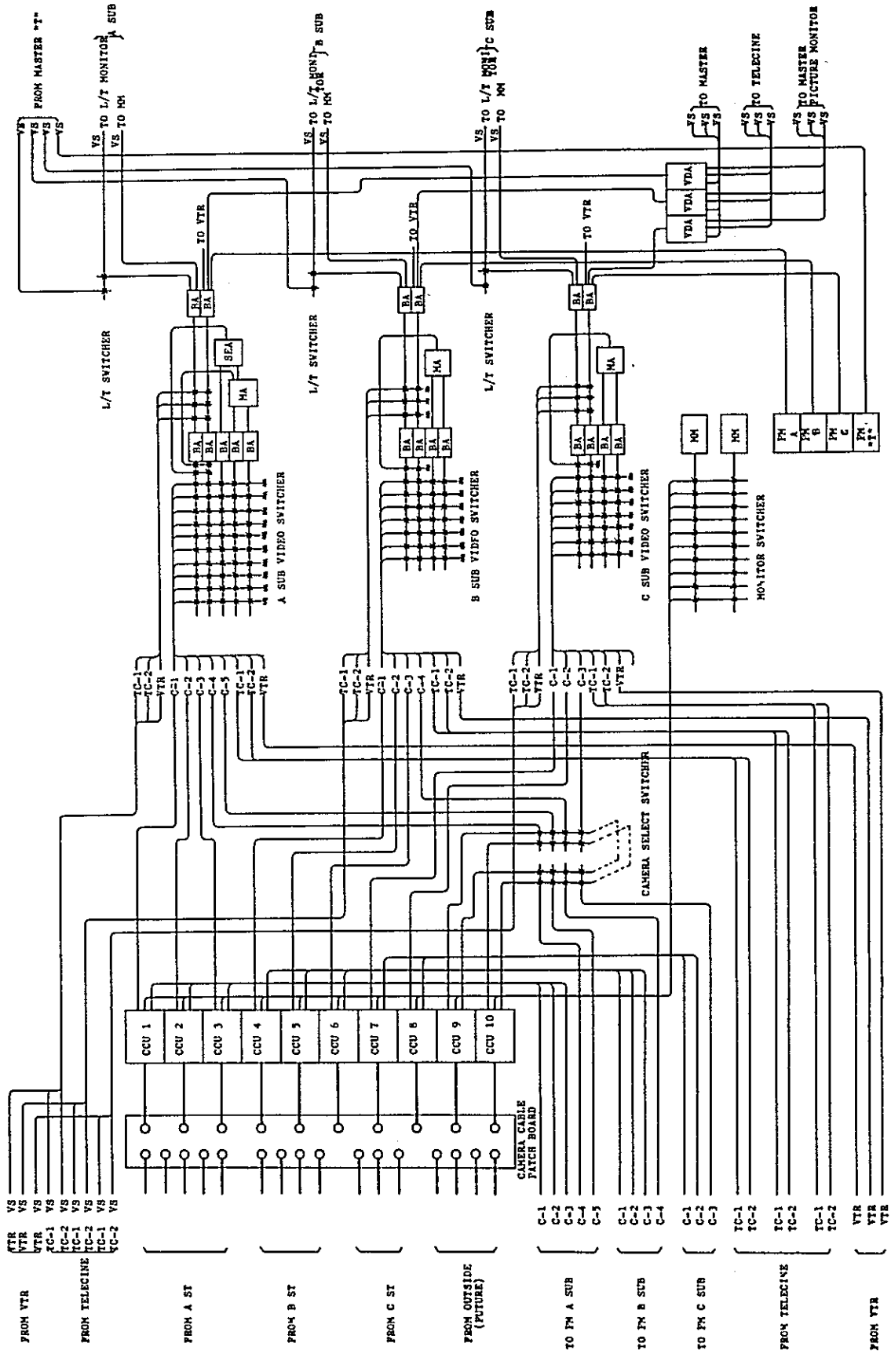


Fig. C-1-12 VIDEO BLOCK DIAGRAM OF ANNOUNCE STUDIO


FROM MASTER "T"
TO L/T MONITOR A SUB
TO MM
TO L/T MONITOR B SUB
TO MM
TO L/T MONITOR C SUB
TO MM
TO MASTER
TO TELECINE
TO MASTER PICTURE MONITOR
TO VTR
L/T SWITCHER
A SUB VIDEO SWITCHER
B SUB VIDEO SWITCHER
C SUB VIDEO SWITCHER
MONITOR SWITCHER
CAMERA SELECT SWITCHER
CAMERA CABLE PATCH BOARD
CCU 1
CCU 2
CCU 3
CCU 4
CCU 5
CCU 6
CCU 7
CCU 8
CCU 9
CCU 10
FROM VTR
FROM TELECINE
FROM A ST
FROM B ST
FROM C ST
FROM OUTSIDE (FUTURE)
TO FM A SUB
TO FM B SUB
TO FM C SUB
FROM TELECINE
FROM VTR

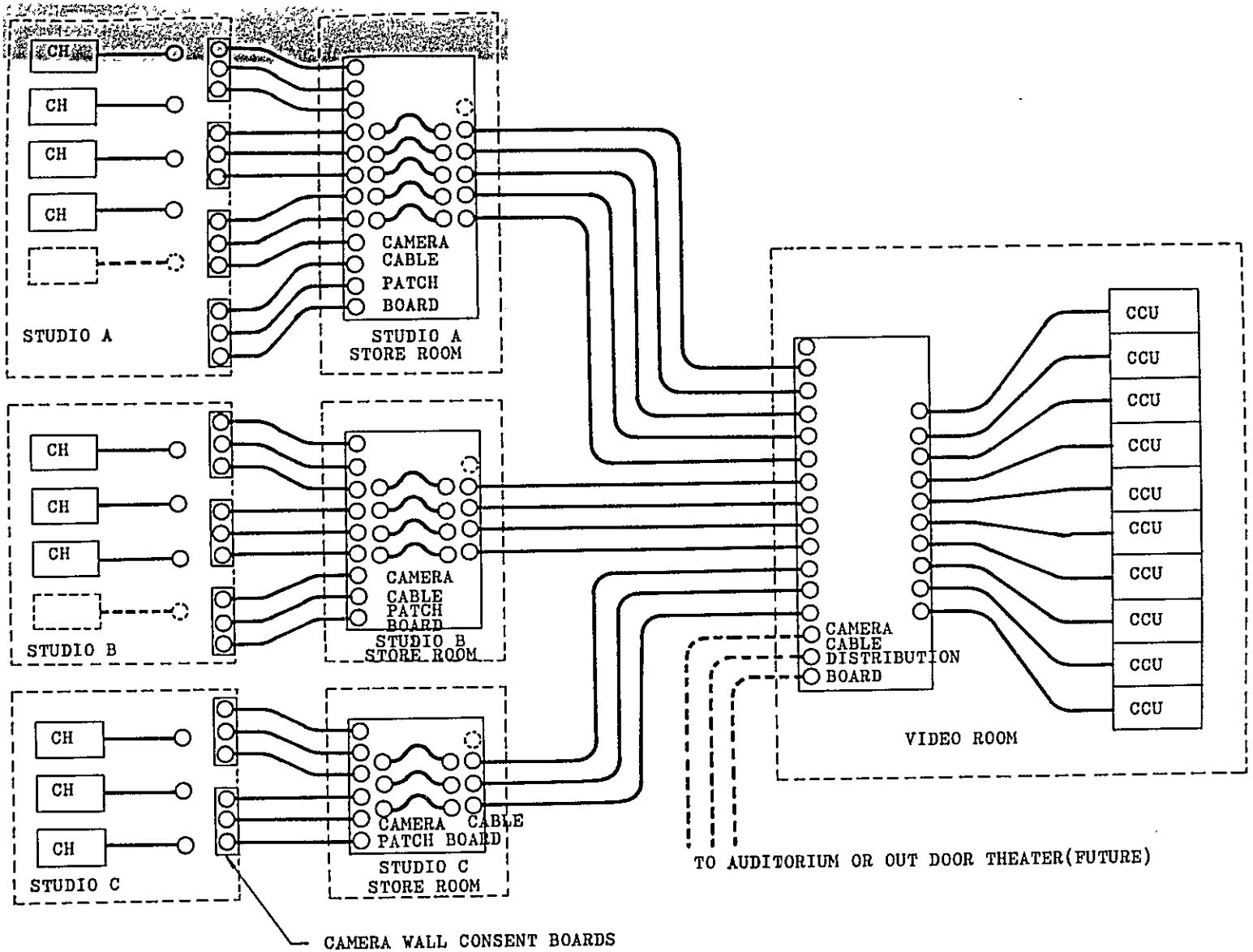


Fig. C-1-14 VIDEO BLOCK DIAGRAM OF VIDEO ROOM SYSTEM

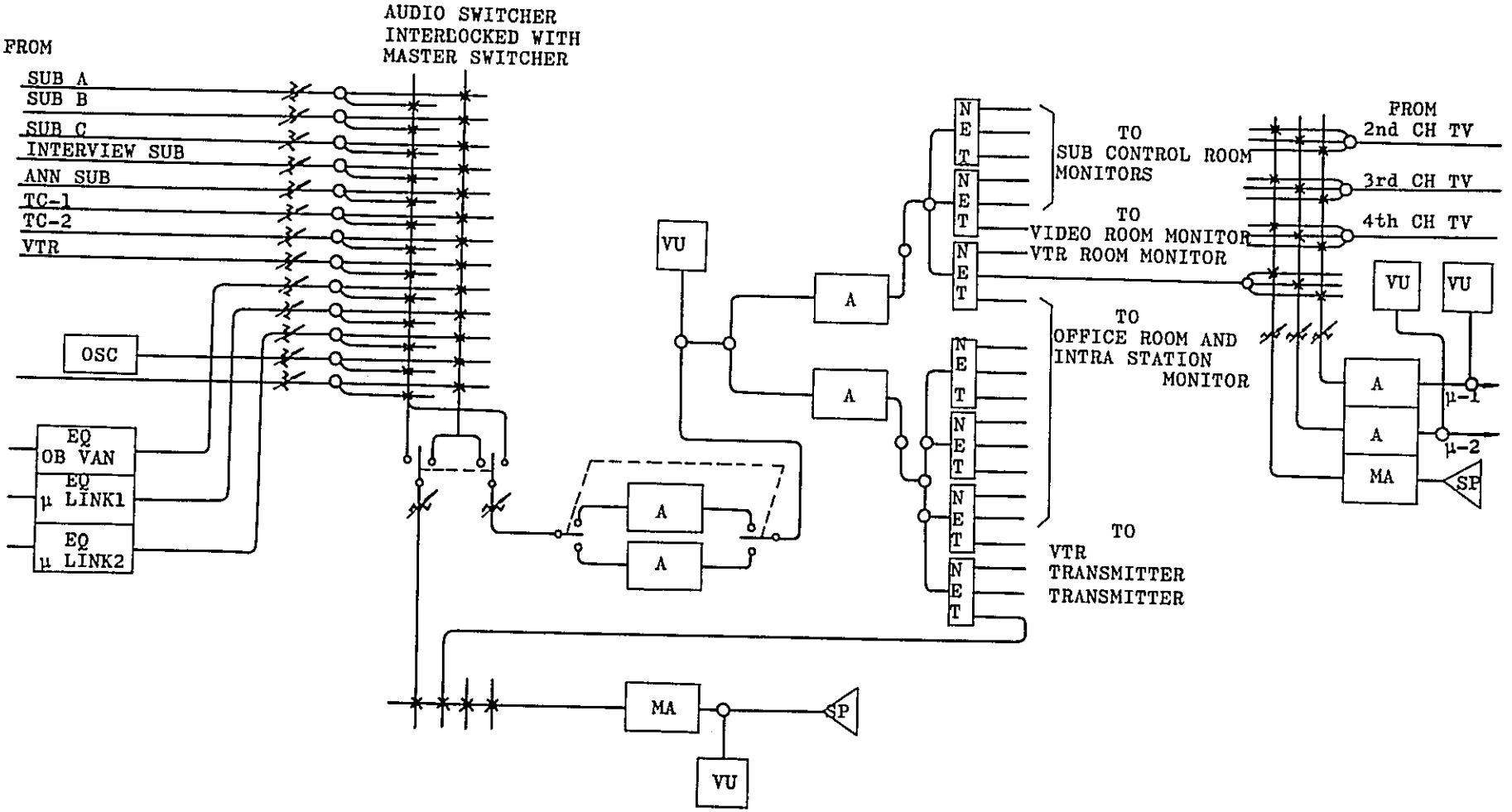


Fig. C-1-15 AUDIO BLOCK DIAGRAM OF MASTER CONTROL ROOM

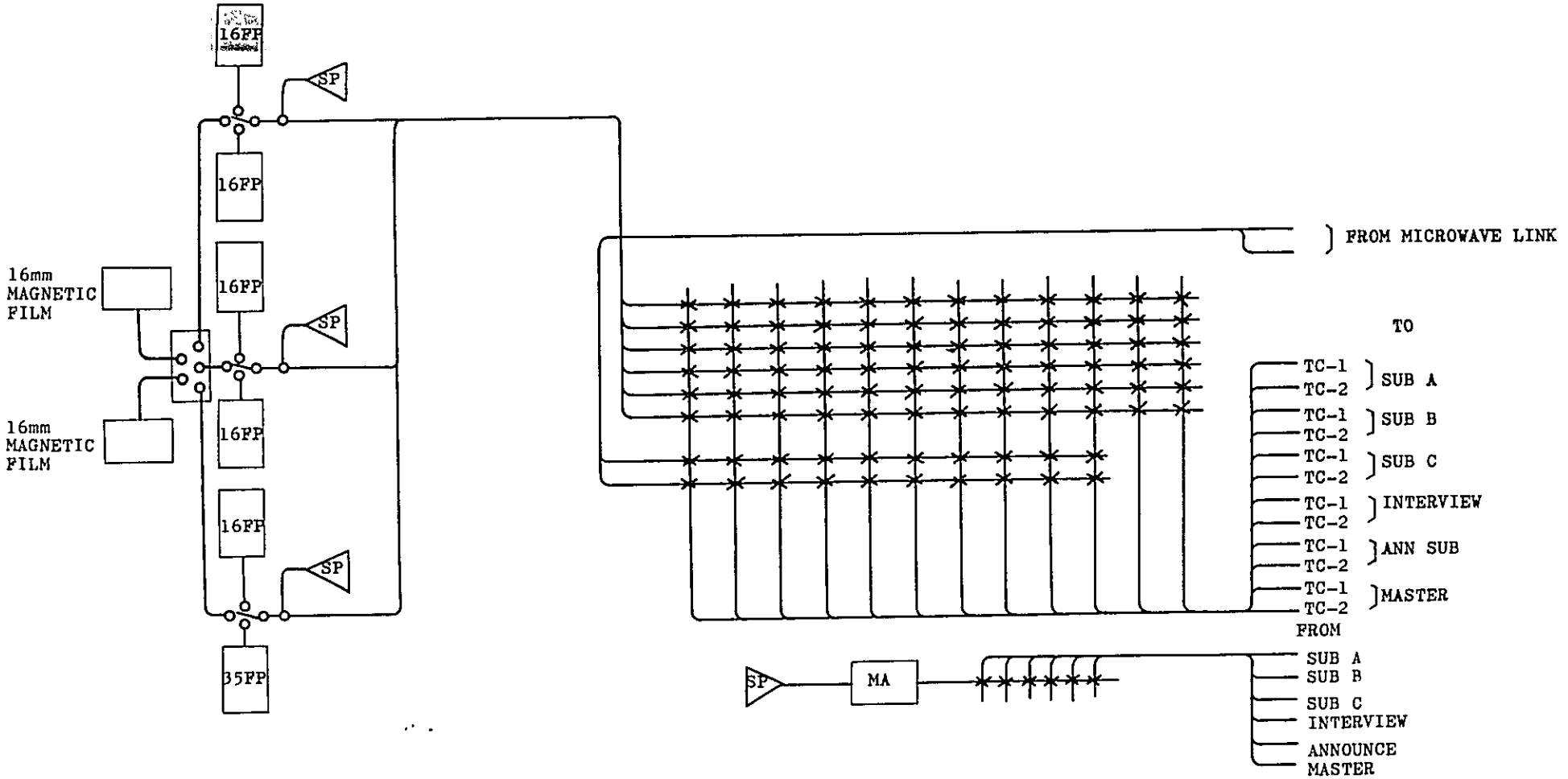
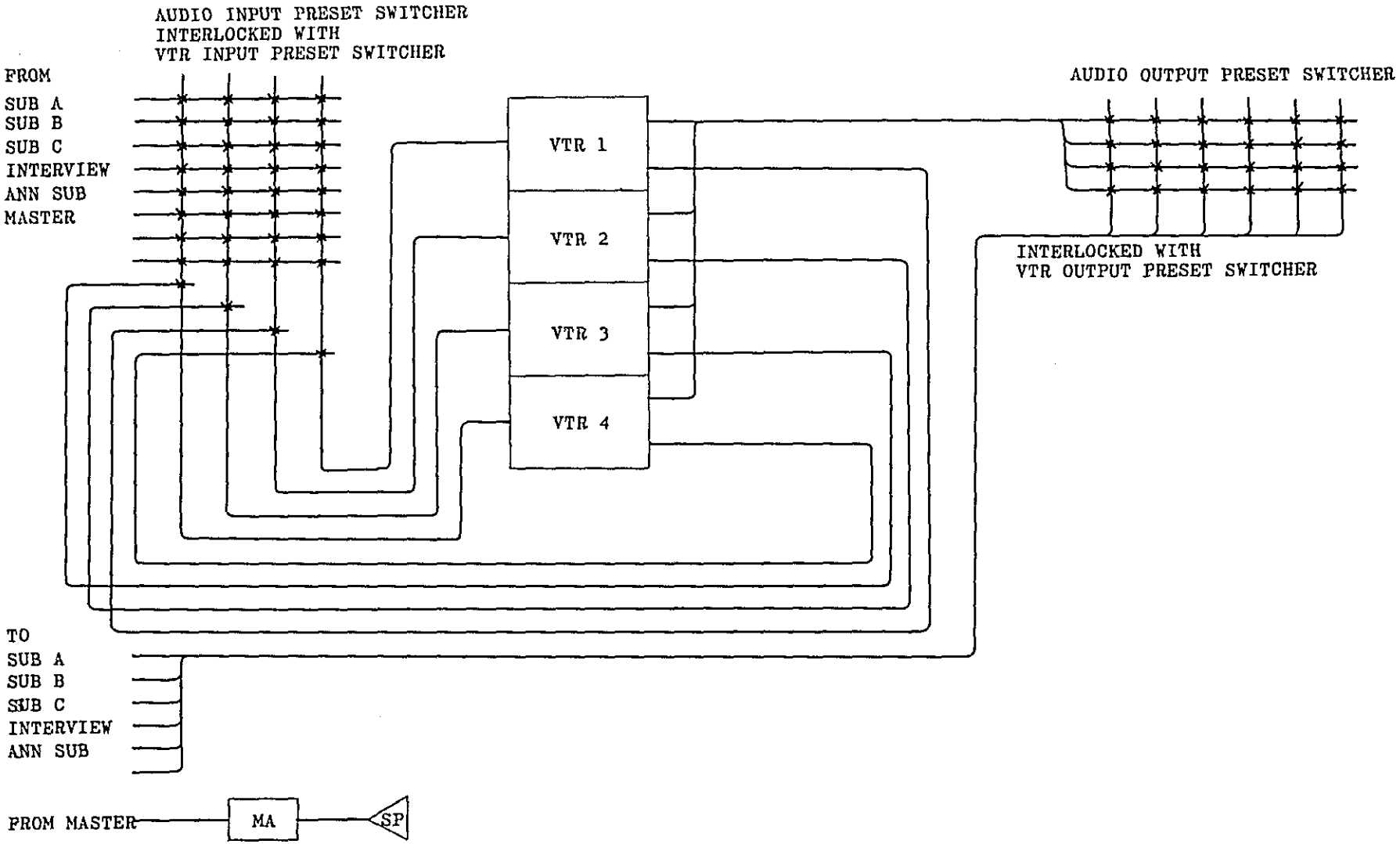


Fig. C-1-16 AUDIO BLOCK DIAGRAM OF TELECINE ROOM


AUDIO INPUT PRESET SWITCHER
INTERLOCKED WITH
VTR INPUT PRESET SWITCHER
FROM
SUB A
SUB B
SUB C
INTERVIEW
ANN SUB
MASTER
VTR 1
VTR 2
VTR 3
VTR 4
AUDIO OUTPUT PRESET SWITCHER
INTERLOCKED WITH
VTR OUTPUT PRESET SWITCHER
TO
SUB A
SUB B
SUB C
INTERVIEW
ANN SUB
FROM MASTER
MA
SP

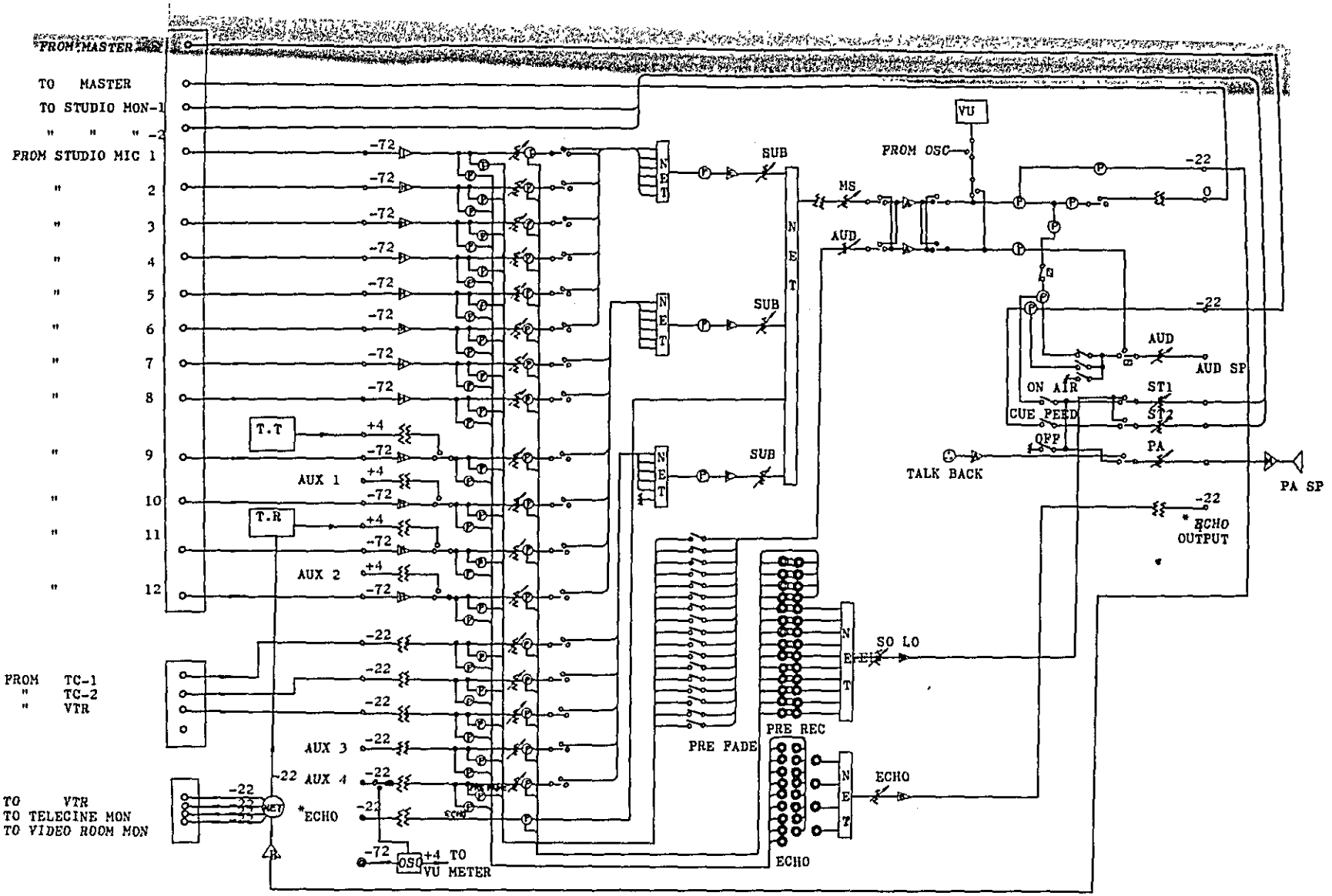


Fig. C-1-18 AUDIO BLOCK DIAGRAM OF STUDIO A

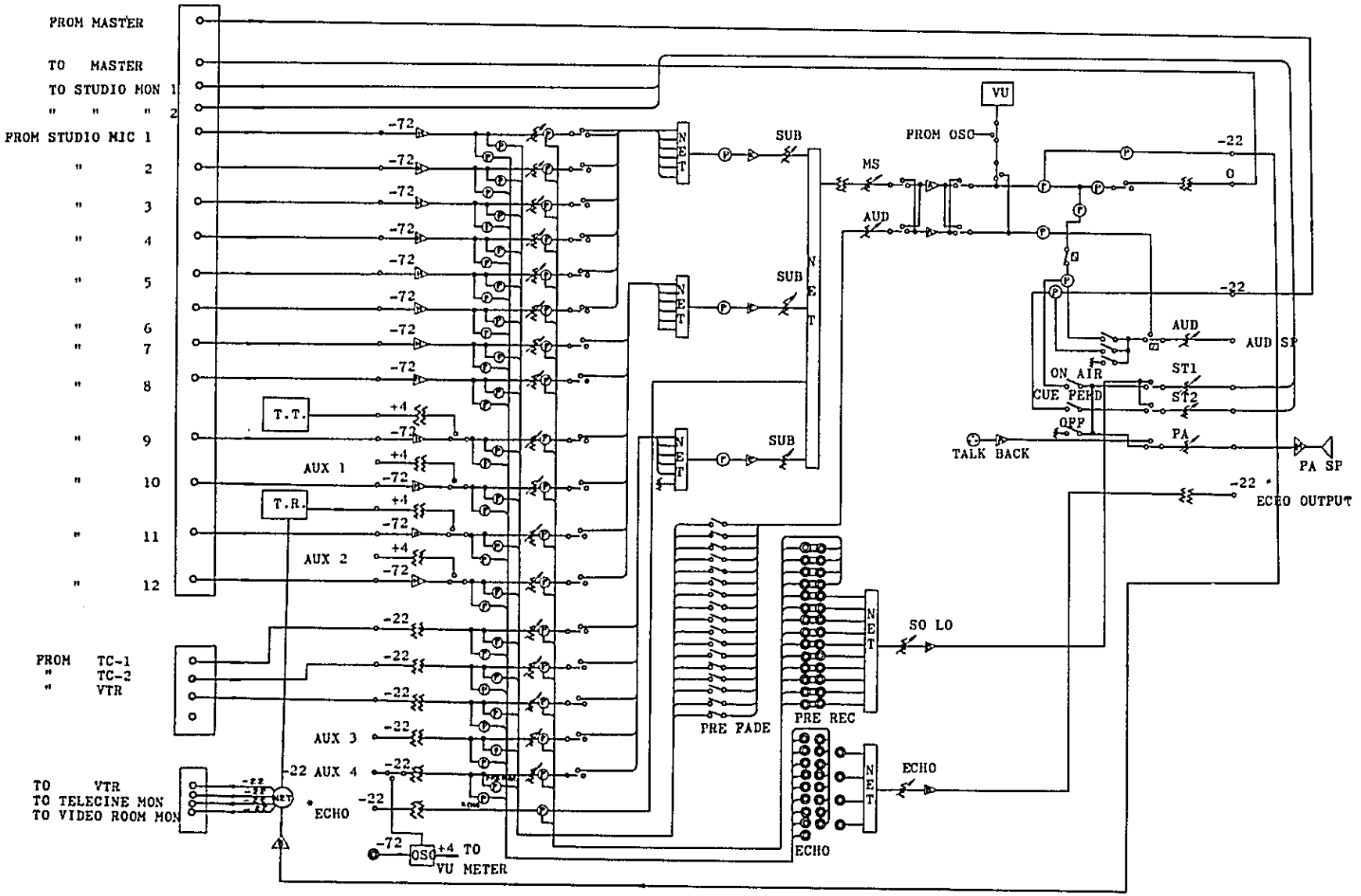


Fig. C-1-19 AUDIO BLOCK DIAGRAM OF STUDIO B

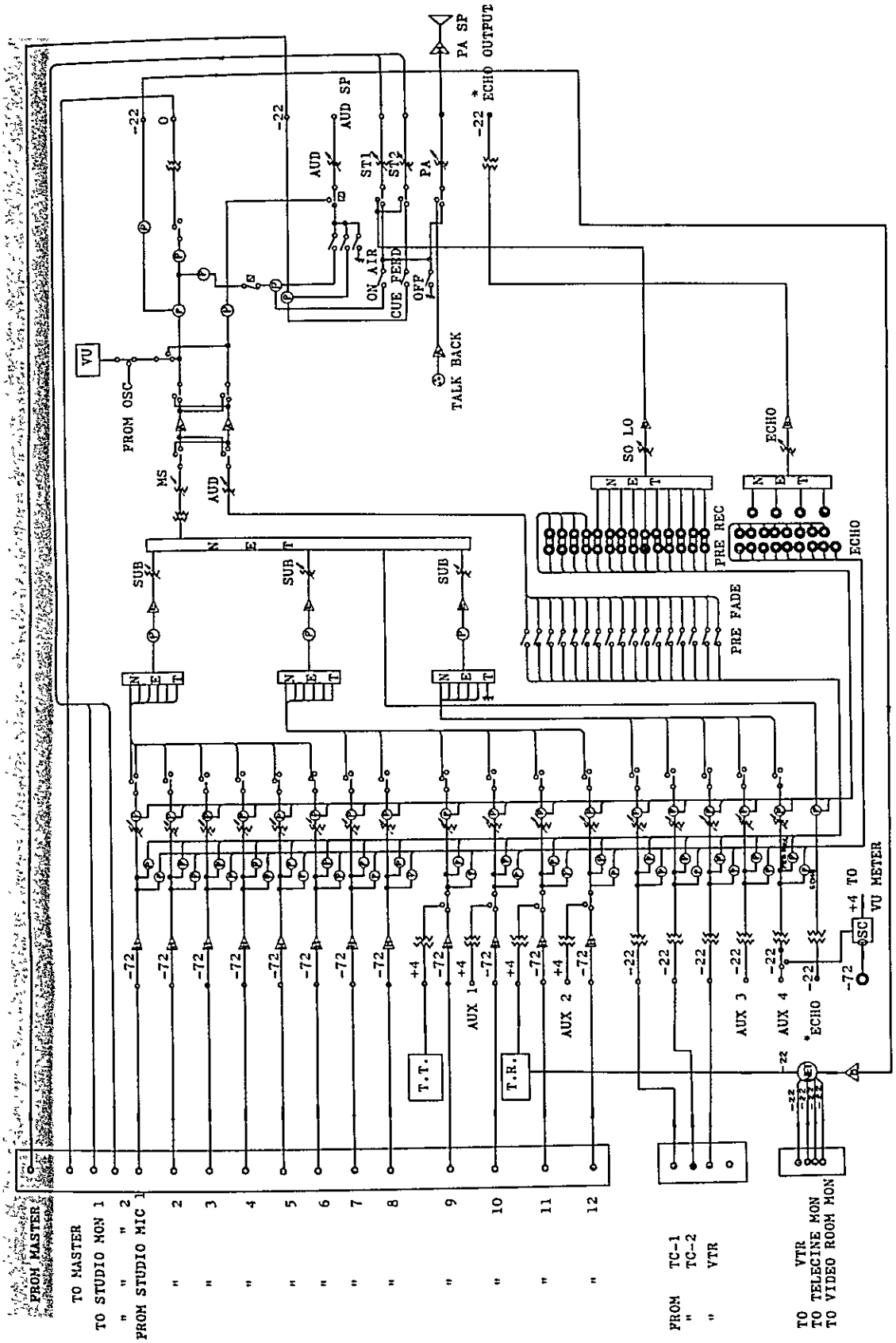
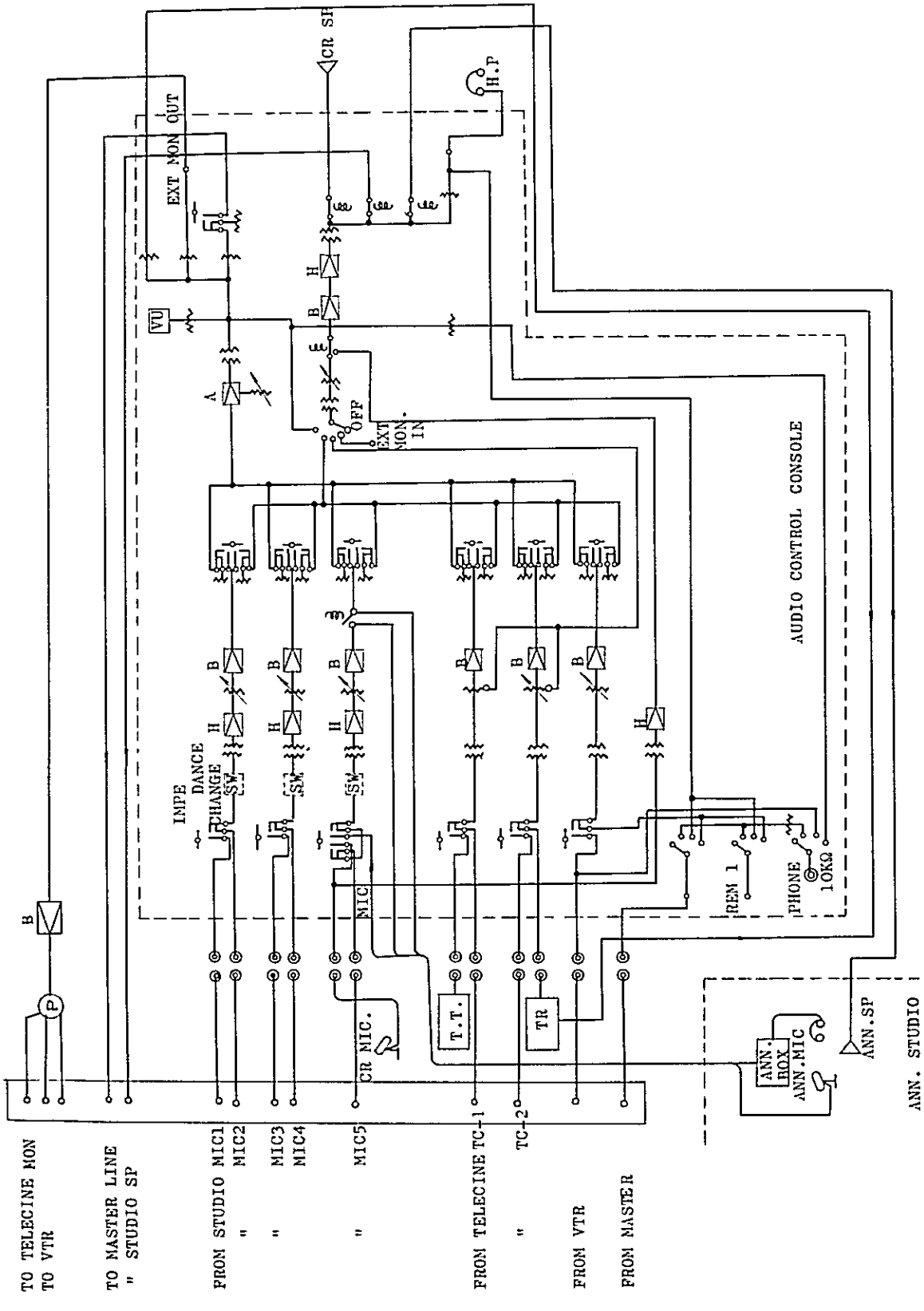


Fig. C-1-20 AUDIO BLOCK DIAGRAM OF STUDIO C


AUDIO CONTROL CONSOLE
EXT MON OUT
CR SP
H.P
VU
OFF
EXT MON. IN
IMPEDANCE CHANGE SW
MIC
CR MIC.
T.T.
TR
REM 1
PHONE
10KΩ
ANN. BOX
ANN.MIC
ANN.SP
ANN. STUDIO
TO TELECINE MON
TO VTR
TO MASTER LINE
" STUDIO SP
FROM STUDIO MIC1
MIC2
MIC3
MIC4
MIC5
FROM TELECINE TC-1
TC-2
FROM VTR
FROM MASTER

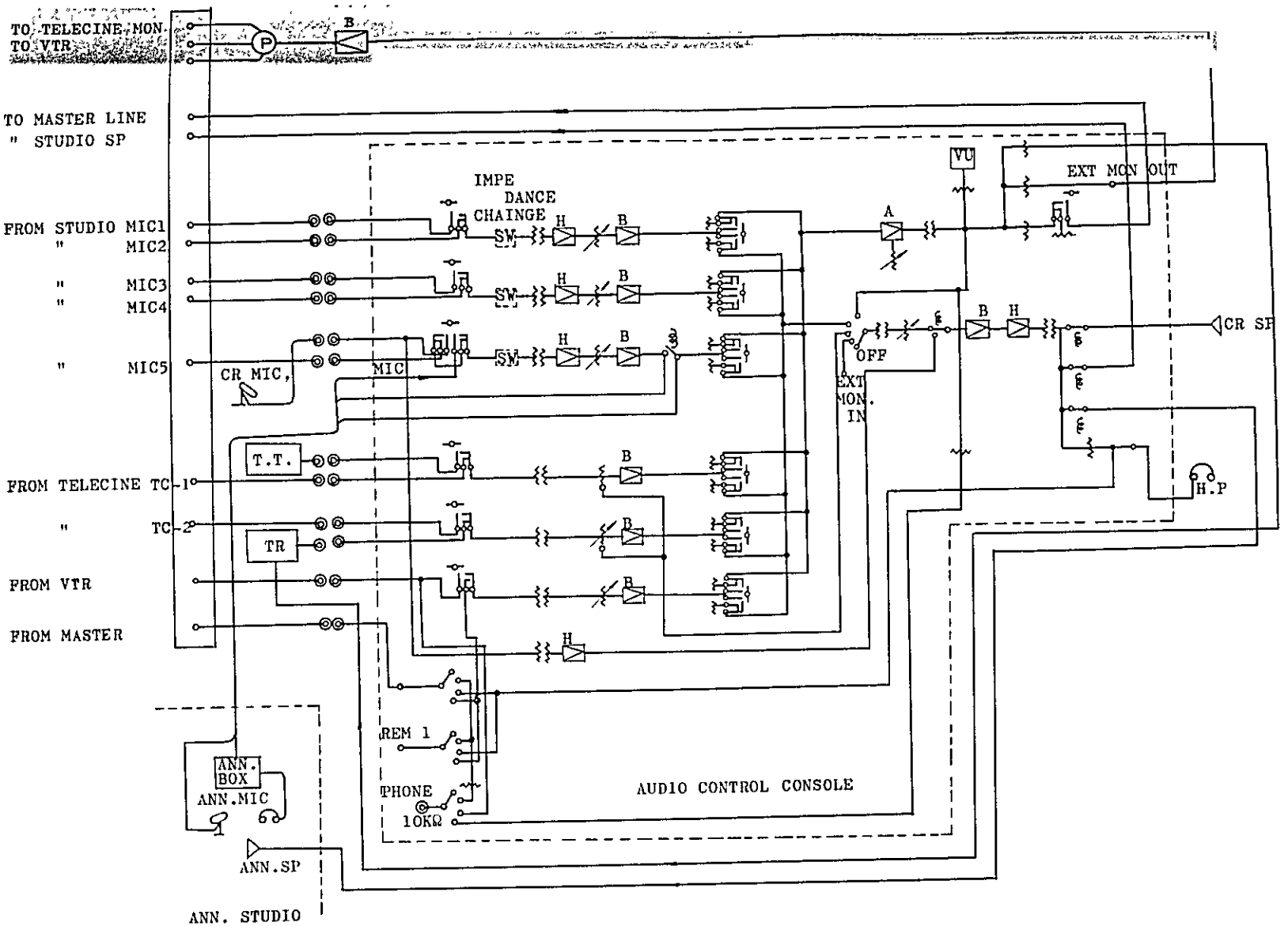


Fig. C-1-22 AUDIO BLOCK DIAGRAM OF ANNOUNCE STUDIO

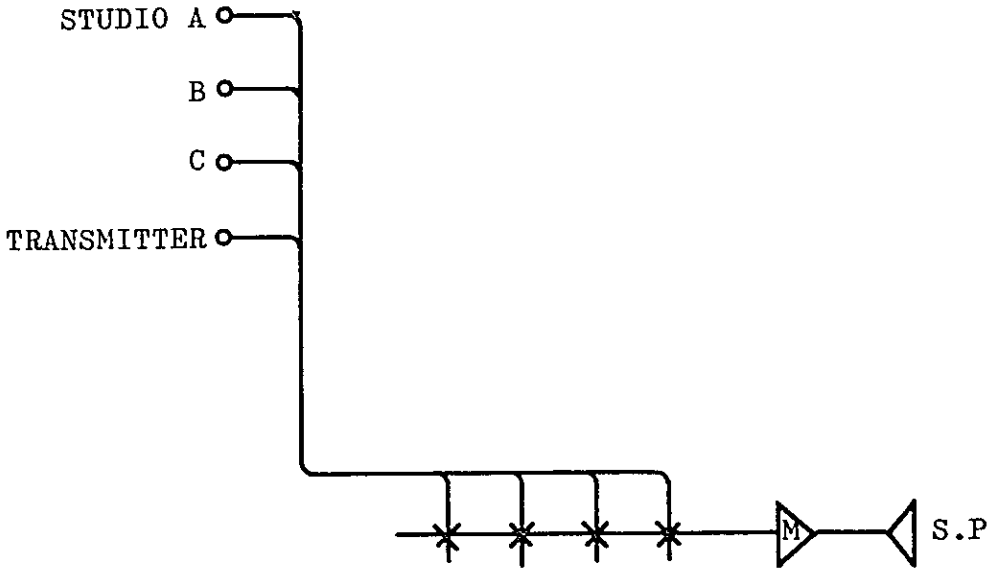


Fig. C-1-23 AUDIO BLOCK DIAGRAM OF VIDEO ROOM

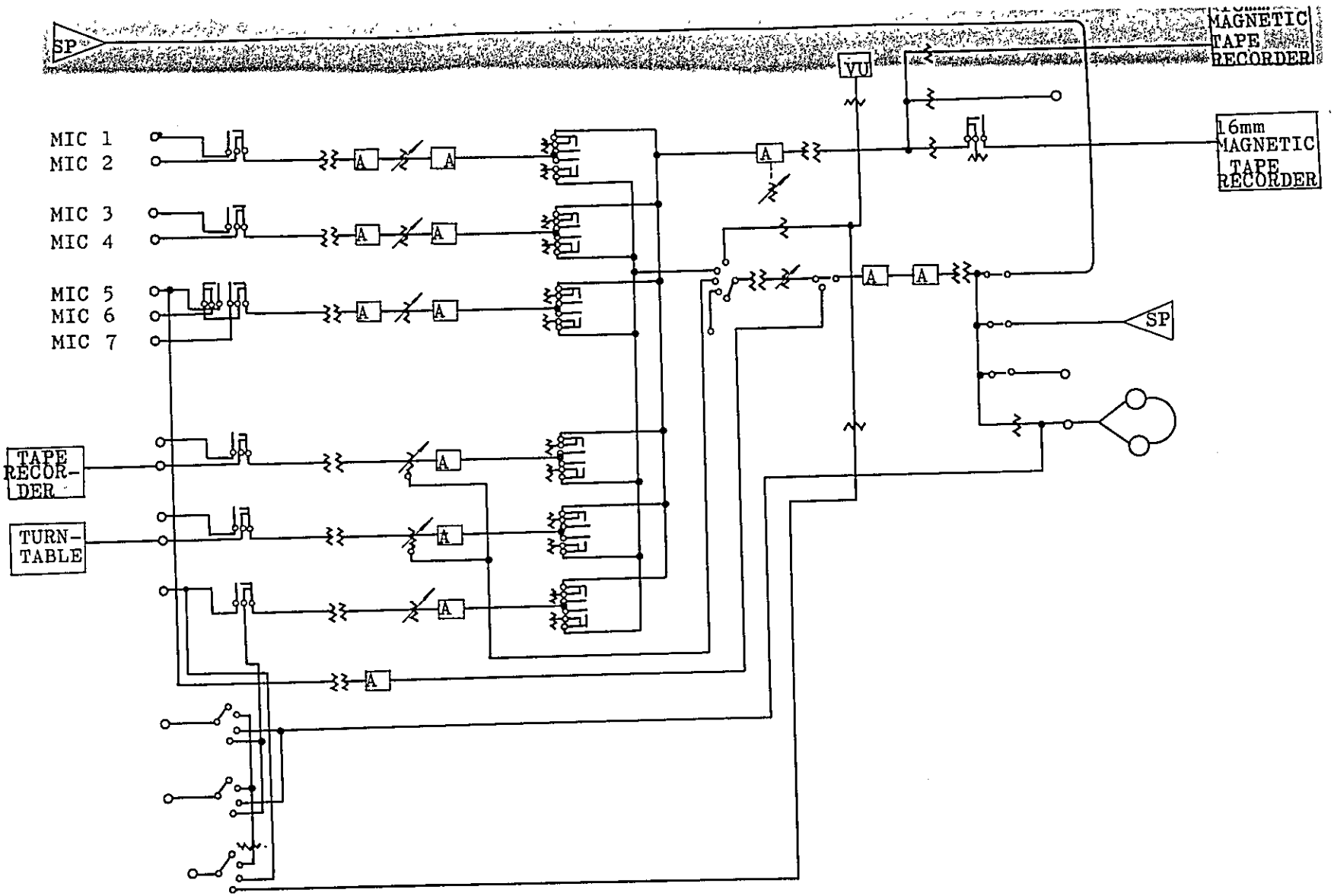
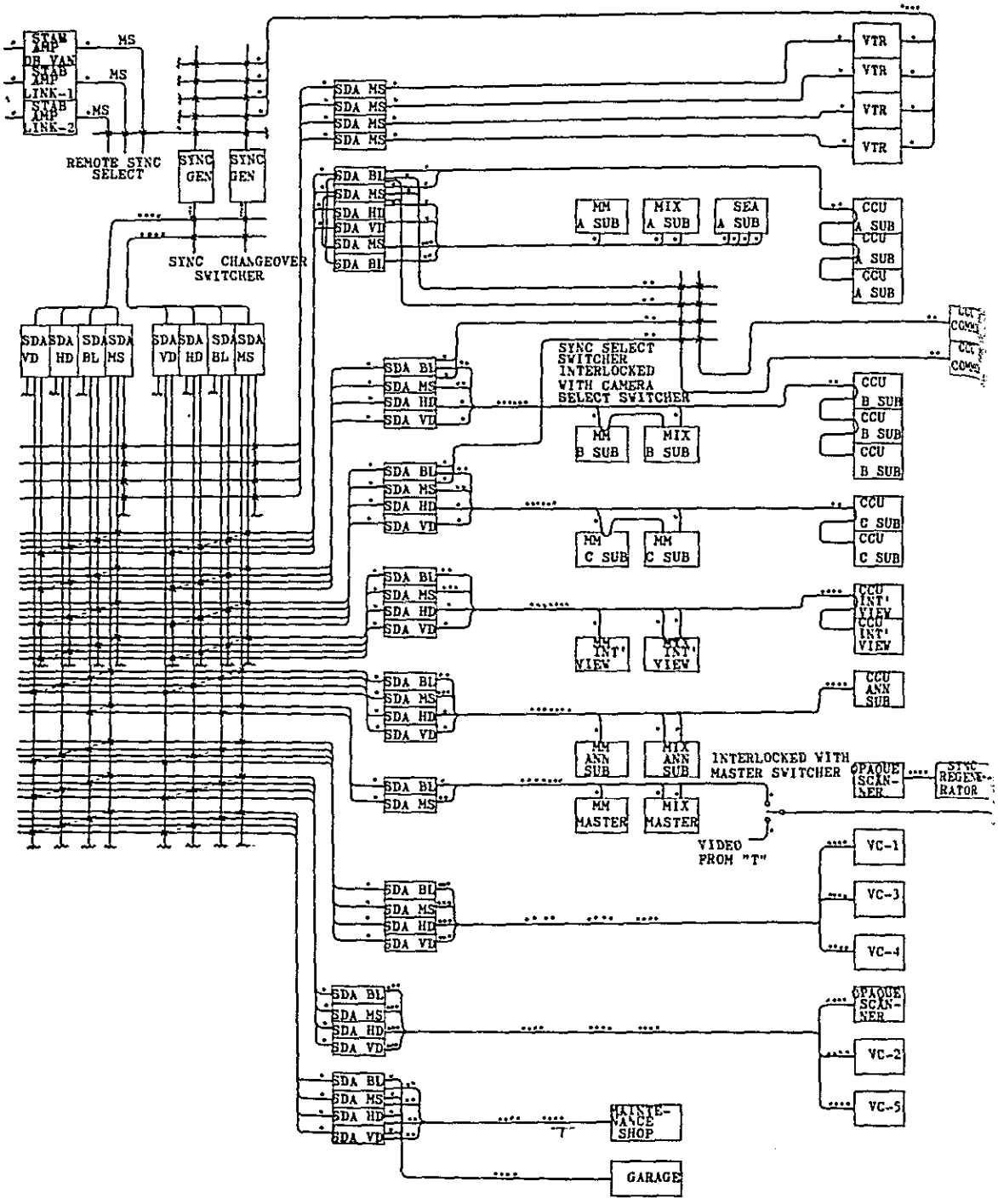


Fig. C-1-24 AUDIO BLOCK DIAGRAM OF DUBBING ROOM



NOTE DOTS INDICATES NUMBER OF CABLE

Fig. C-1-25 BLOCK DIAGRAM OF SYNC. DISTRIBUTION SYSTEM

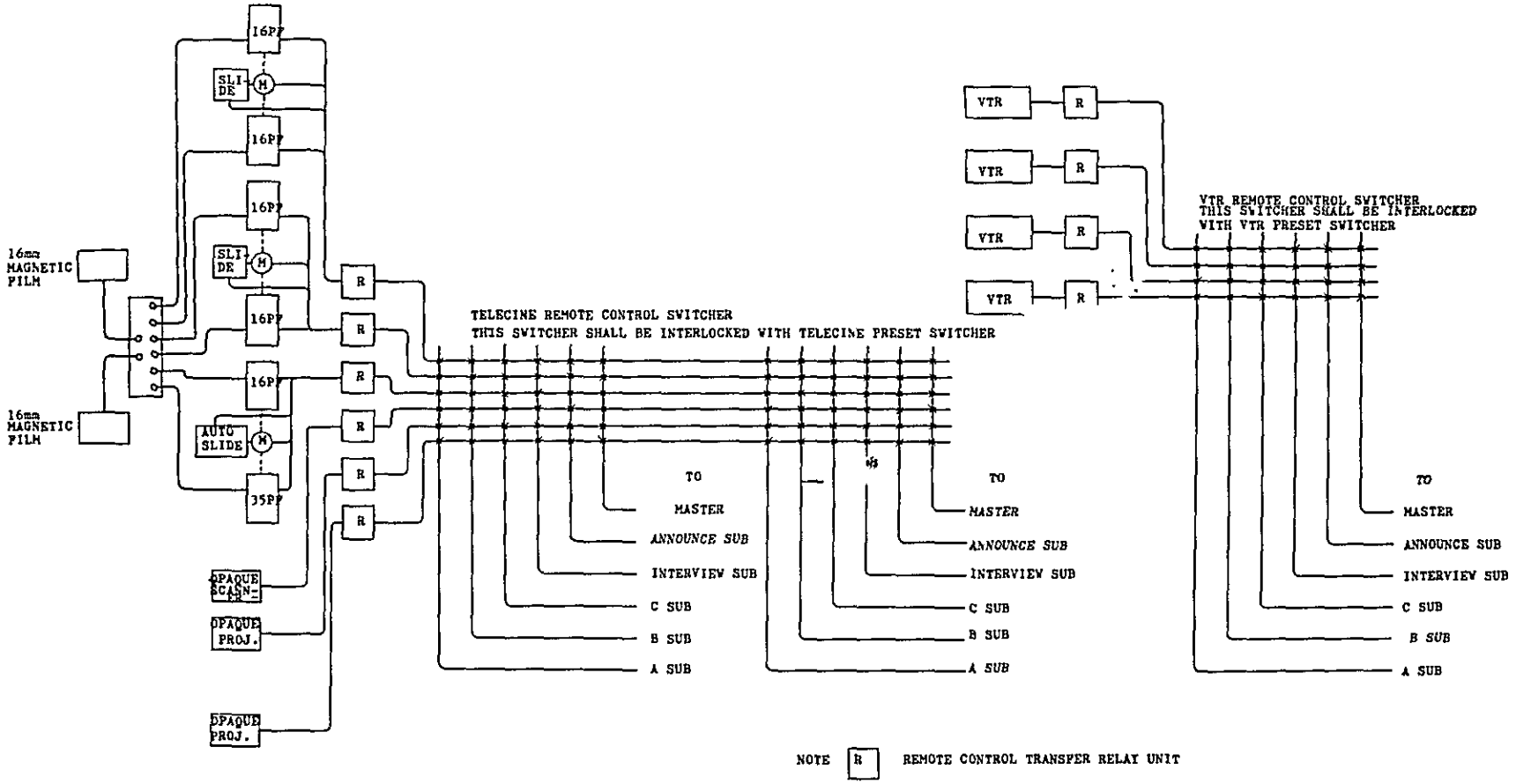
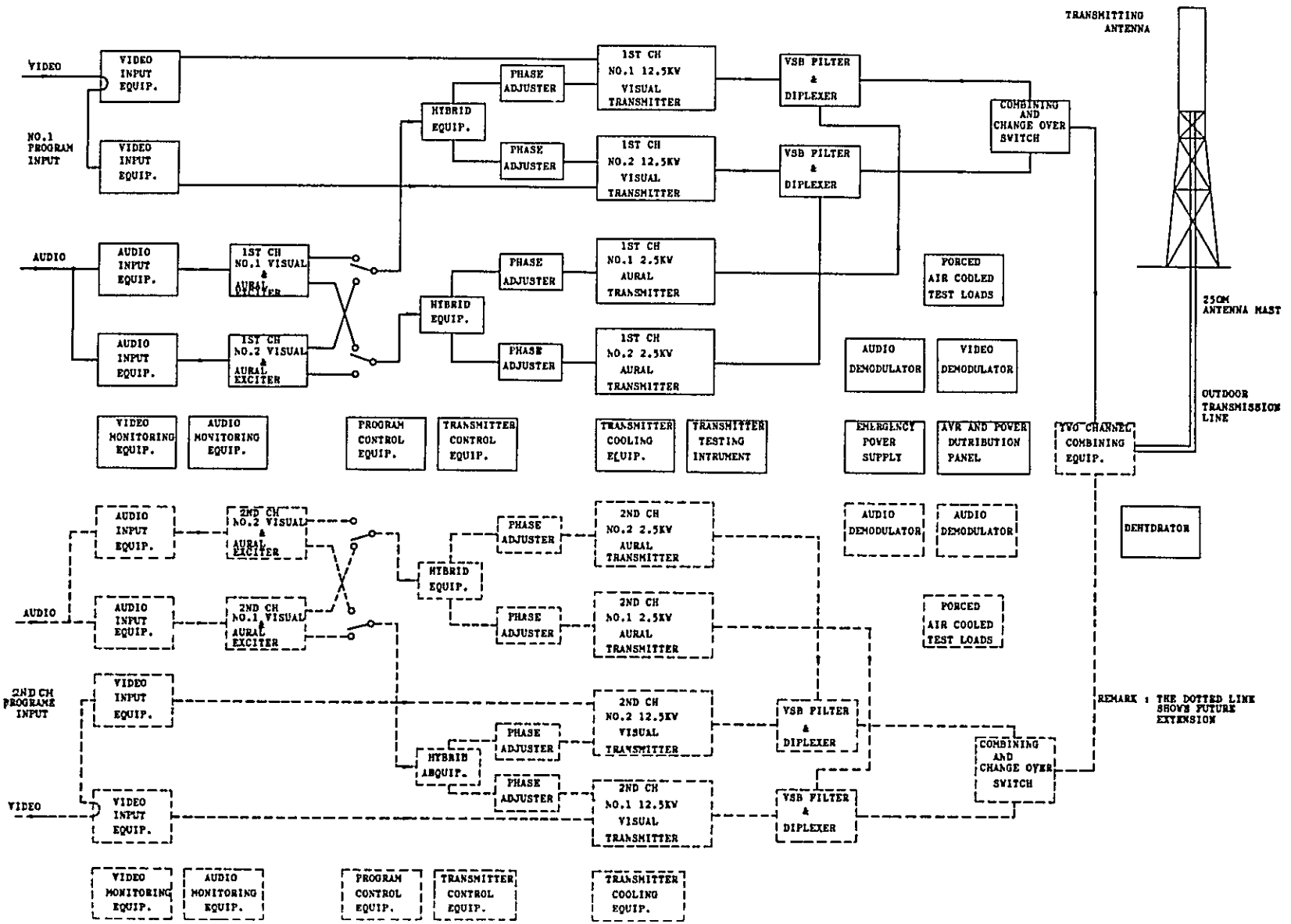
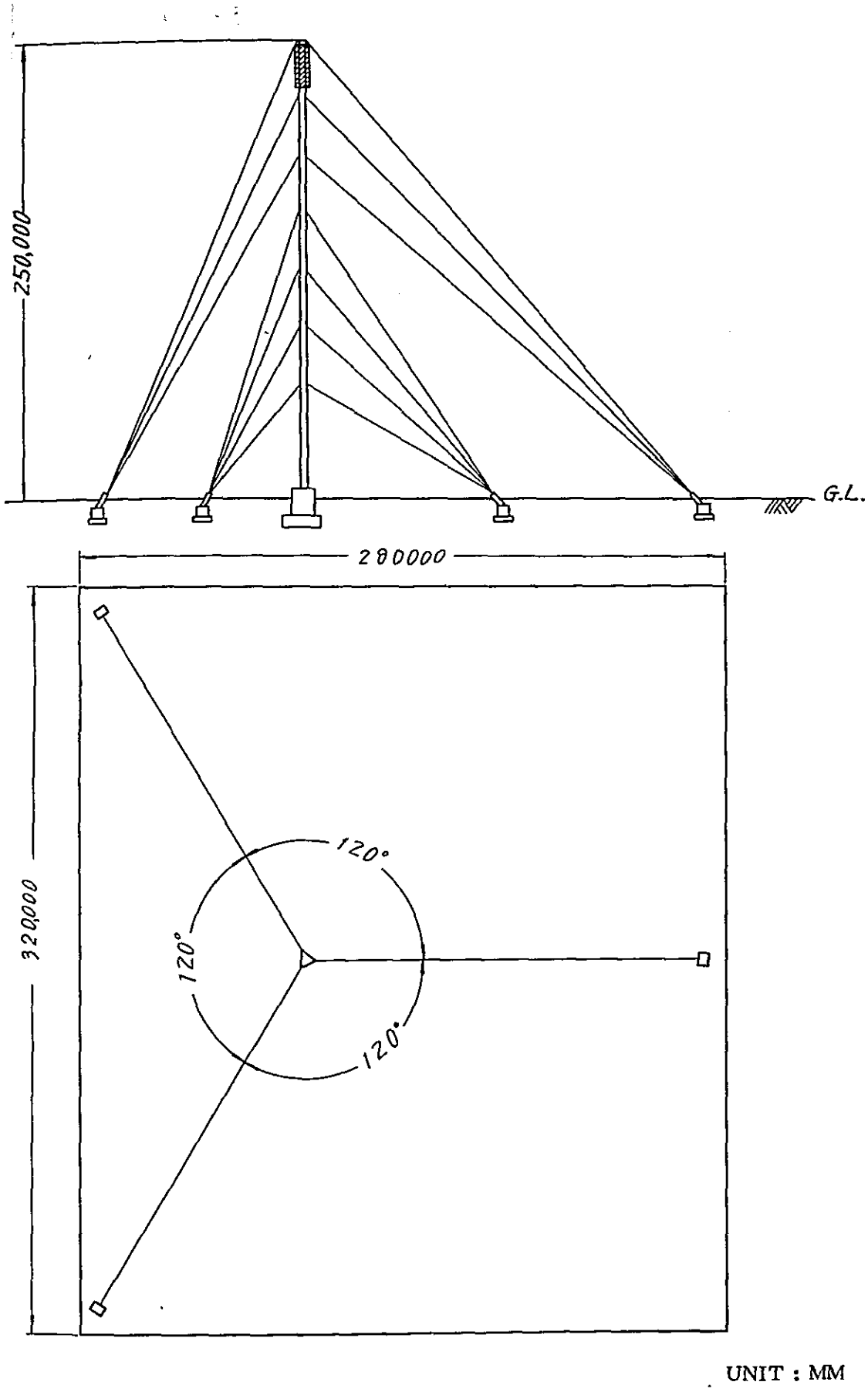


Fig. C-1-26 BLOCK DIAGRAM OF REMOTE CONTROL SYSTEM


TRANSMITTING ANTENNA
VIDEO
NO.1 PROGRAM INPUT
AUDIO
2ND CH PROGRAME INPUT
VIDEO
VIDEO INPUT EQUIP.
AUDIO INPUT EQUIP.
HYBRID EQUIP.
PHASE ADJUSTER
1ST CH NO.1 12.5KW VISUAL TRANSMITTER
1ST CH NO.2 12.5KW VISUAL TRANSMITTER
1ST CH NO.1 VISUAL & AURAL EXCITER
1ST CH NO.2 VISUAL & AURAL EXCITER
1ST CH NO.1 2.5KW AURAL TRANSMITTER
1ST CH NO.2 2.5KW AURAL TRANSMITTER
VSB FILTER & DIPLEXER
COMBINING AND CHANGE OVER SWITCH
FORCED AIR COOLED TEST LOADS
AUDIO DEMODULATOR
VIDEO DEMODULATOR
250M ANTENNA MAST
OUTDOOR TRANSMISSION LINE
VIDEO MONITORING EQUIP.
AUDIO MONITORING EQUIP.
PROGRAM CONTROL EQUIP.
TRANSMITTER CONTROL EQUIP.
TRANSMITTER COOLING EQUIP.
TRANSMITTER TESTING INTRUMENT
EMERGENCY POWER SUPPLY
AVR AND POWER DUTRIBUTION PANEL
TWO CHANNEL COMBINING EQUIP.
2ND CH NO.2 VISUAL & AURAL EXCITER
2ND CH NO.1 VISUAL & AURAL EXCITER
2ND CH NO.2 2.5KW AURAL TRANSMITTER
2ND CH NO.1 2.5KW AURAL TRANSMITTER
2ND CH NO.2 12.5KW VISUAL TRANSMITTER
2ND CH NO.1 12.5KW VISUAL TRANSMITTER
DEHIDRATOR
REMARK : THE DOTTED LINE SHOWS FUTURE EXTENSION



UNIT : MM

Fig. C-1-28 250M HEIGHT GUIED MAST, BANGKOK STATION

CHAPTER Ⅲ LOCAL BROADCASTING STATION

CHAPTER Ⅲ LOCAL BROADCASTING STATION

3.1 Matters taken into consideration during the Survey

In connection with the construction of local broadcasting stations, the following matters have been taken into consideration during the survey.

(1) So long as the conditions for installing stations are met, local stations will be established at the same sites with those of microwave radio link.

(2) So long as the conditions for installing stations are met, maintenance and living requirements will be taken into consideration.

(3) In principle, unpaved roads with a width of 3 - 4 m and passable by automobiles will be constructed.

(4) Buildings will be of a size wide enough for accomodating the facilities for 2 systems.

(5) Antenna mast will be jointly used by the 2 systems.

(6) Masts with stay wires will be adopted as much as possible except in the case of low antenna height.

(7) Translator stations will be unattended stations with stand-by equipments. Other stations will be attended stations without stand-by equipments.

(8) In principle, power will be received from ordinary commercial electric power source.

(9) Electric power generator for emergency use will be installed.

(10) Antenna supports, station buildings, facilities inside translator stations, etc, will be standardized as much as possible. All these drawings are shown collectively in Fig. 3.1

3.2 Result of the Survey

The results of the survey conducted while taking the conditions in paragraph 3.1 into consideration are as follows. They are described for each region and station. The number of stations is mentioned in Table 3.1.1.

Present studio facilities in two local stations of Khon Kaen and Lampang are considered to be sufficient. However, they need to be renewed. On the other hand, it is considered proper to allocate a set of O.B. Van with attachments to each Region of the South, North and Northeast for boosting the mobile capacity in producing programs.

As for this O.B. Van, it will be better to consider those which are capable of relaying to microwave radio link in addition to the general functions of O.B. vans. It will be proper to allocate the van to each of the 3 stations of Haad Yai, Khon Kaen and Lampang.

As for Haad Yai Station, an agreement has already been concluded with Pye company concerning the transmitting station and studio facilities of the C.C.I.R. system. In this survey, therefore, it is included in the already established C.C.I.R. system station.

Table 3.2.1 Number of TV Stations by Region

classification / region	broadcasting station	translator station	Total
Southern Region	8 *	3	11
Northern Region	6	5	11
Northeastern Region	5	5	10
Southeastern Region	1	2	3
Total	20	15	35

* including Haad Yai Station

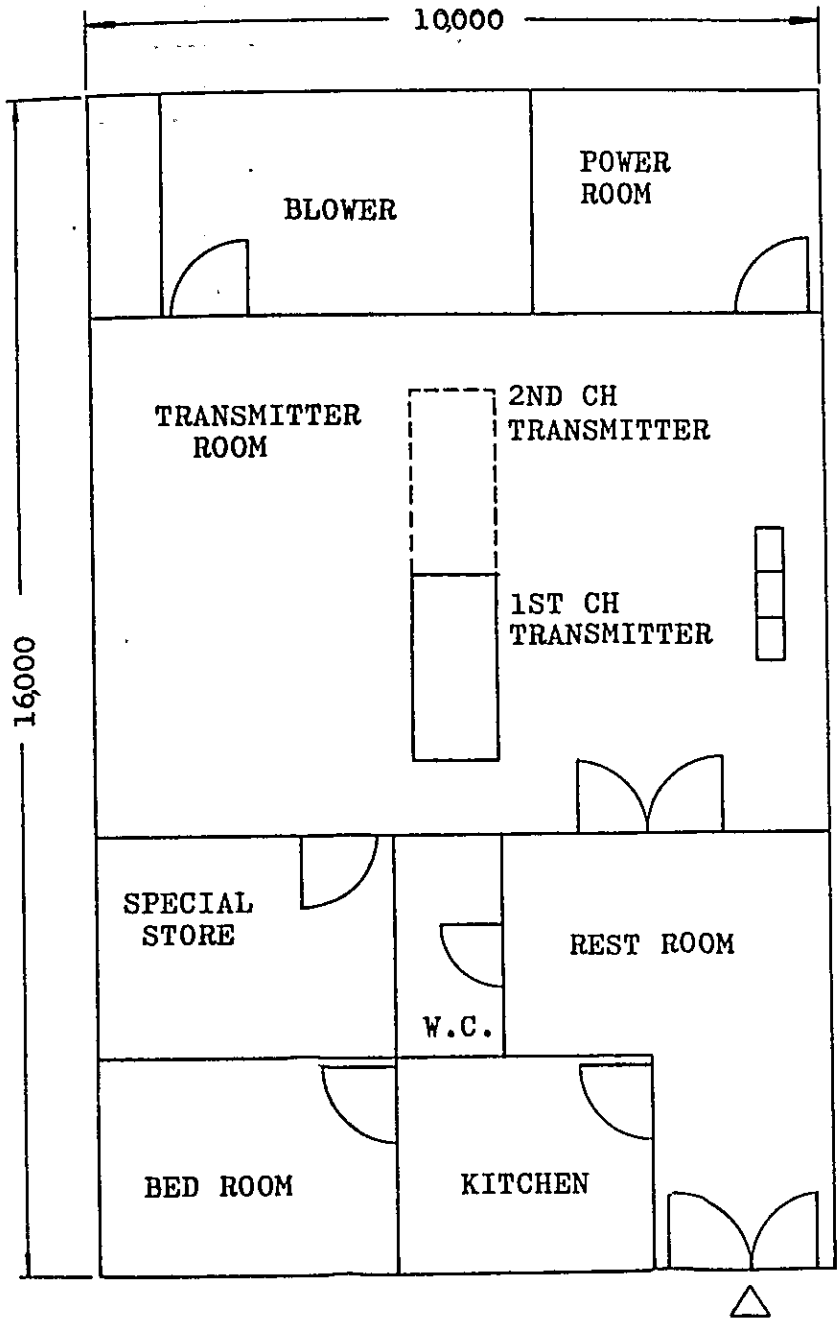
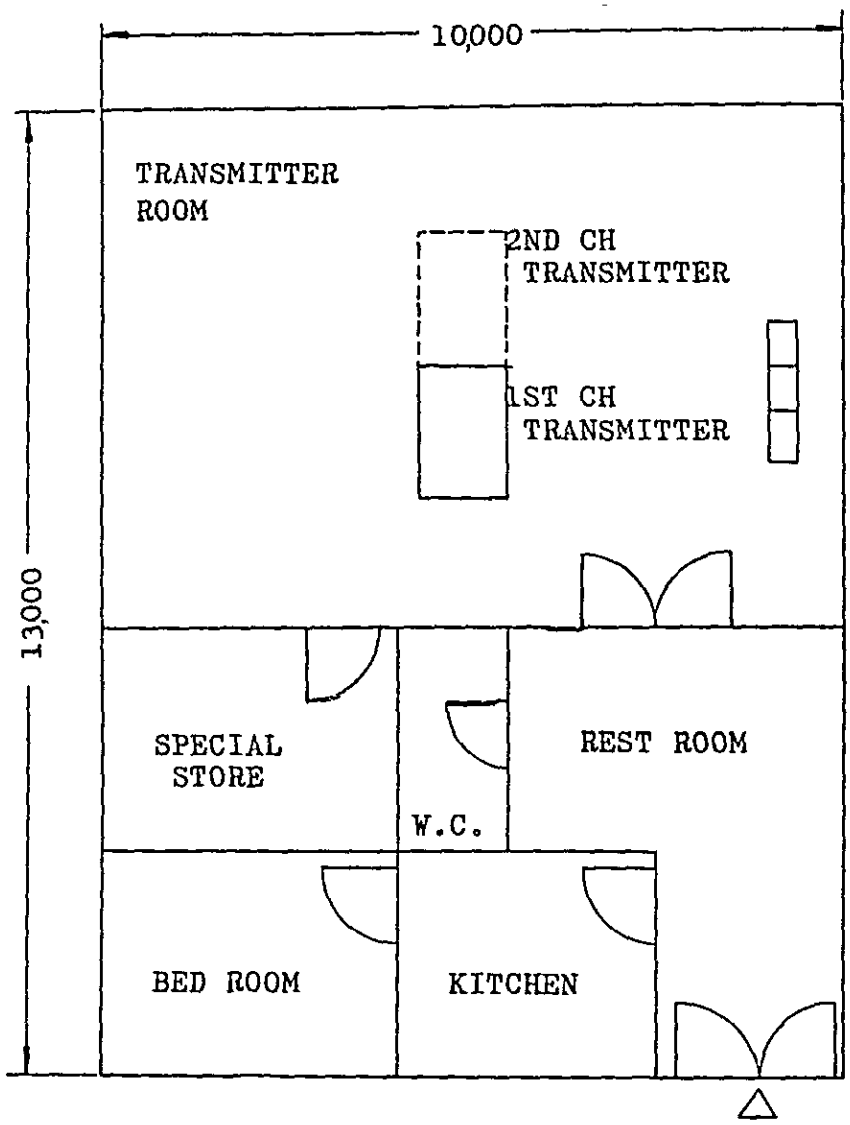


Fig. 3-1-1 TYPICAL FLOOR LAYOUT FOR TV TRANSMITTING, (10KW x 2) STATION



UNIT : MM

Fig. 3-1-2 TYPICAL FLOOR LAYOUT FOR TV TRANSMITTING, (2KW x 2 & 1KW x STATION

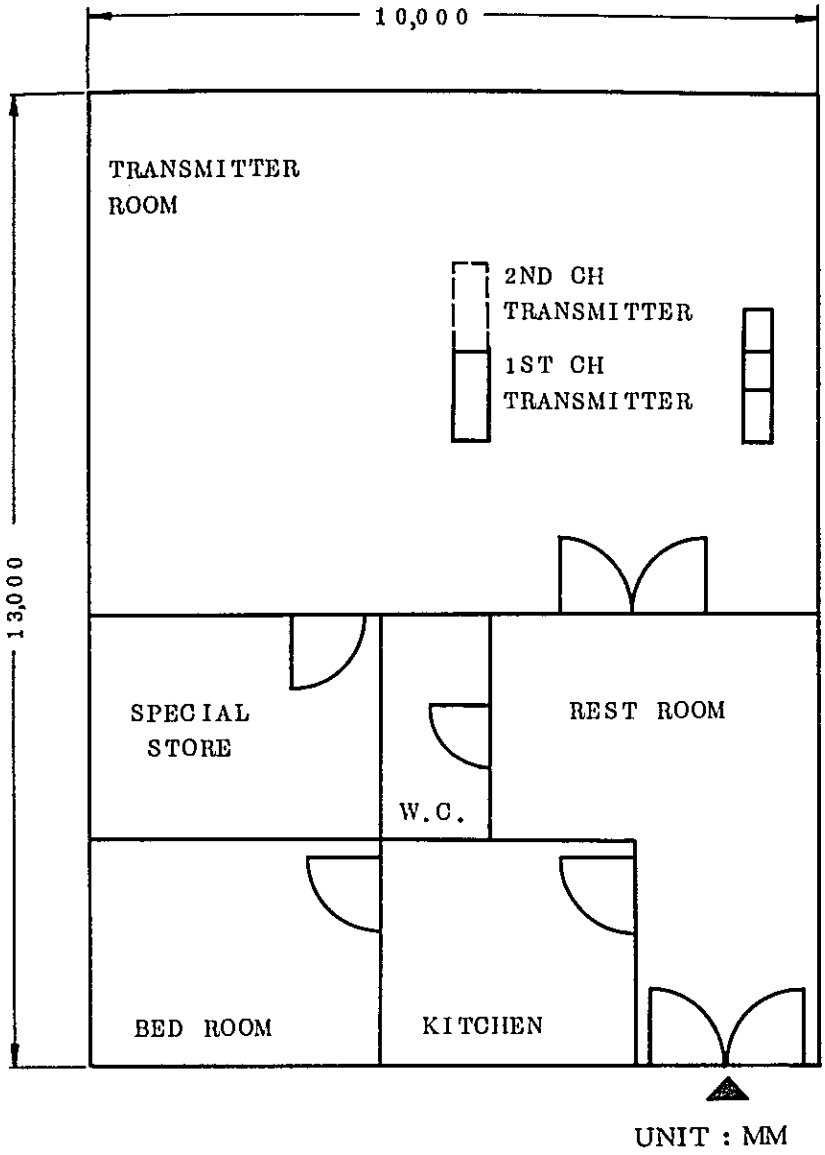


Fig. 3-1-3 TYPICAL FLOOR LAYOUT FOR TV TRANSMITTING, (500W x 2) STATION

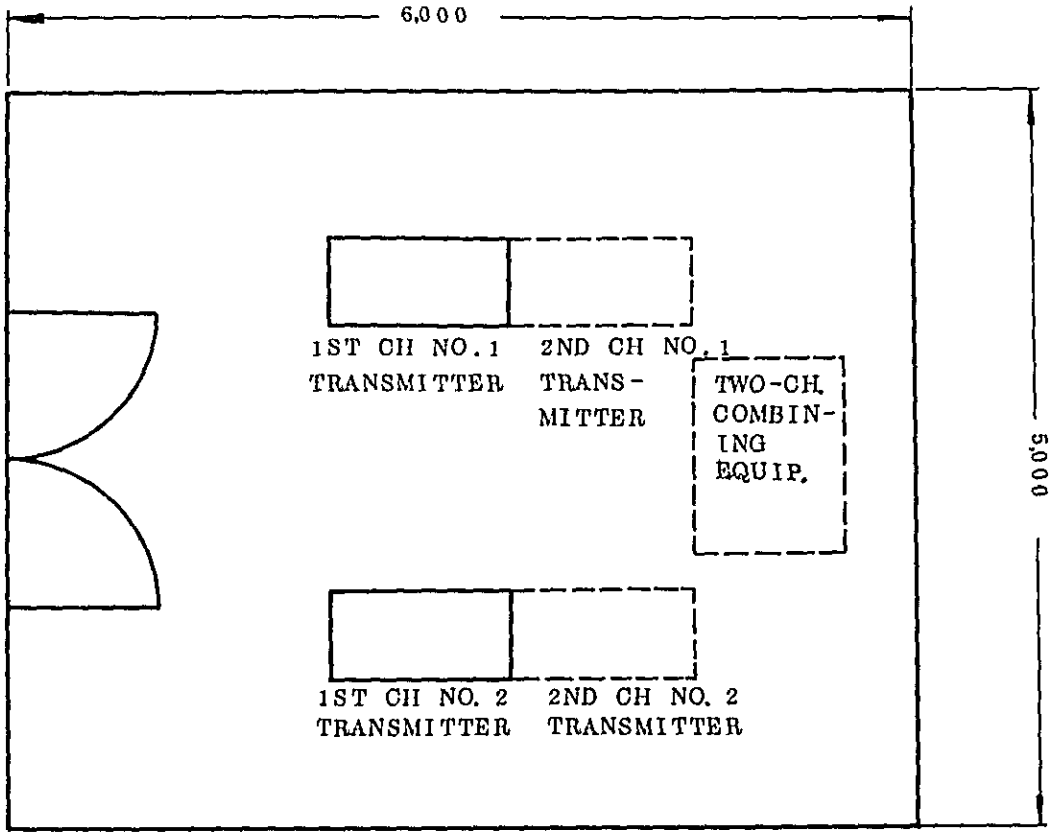
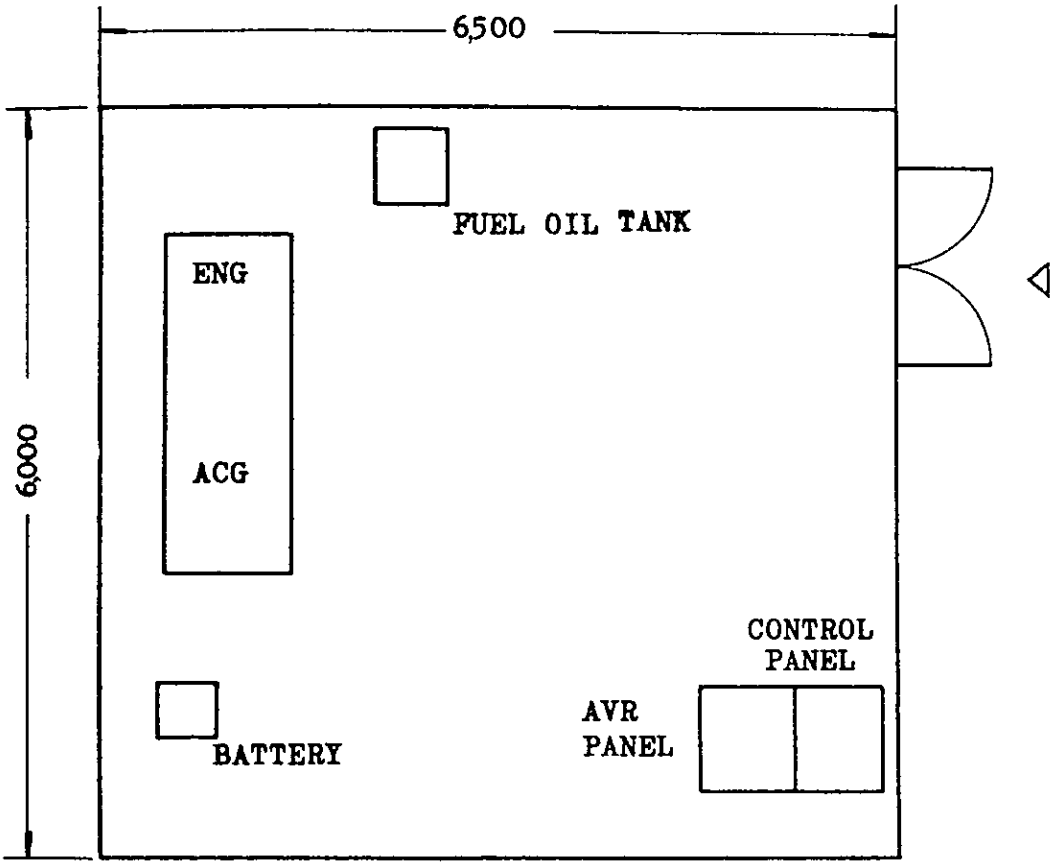


Fig. 3-1-4 TYPICAL FLOOR LAYOUT FOR TRANSLATOR, (300W x 2) STATION



UNIT : MM

Fig. 3-1-5 TYPICAL FLOOR LAYOUT OF EMERGENCY POWER SUPPLY FOR TV TRANSMITTING, (10KW x 2) STATION

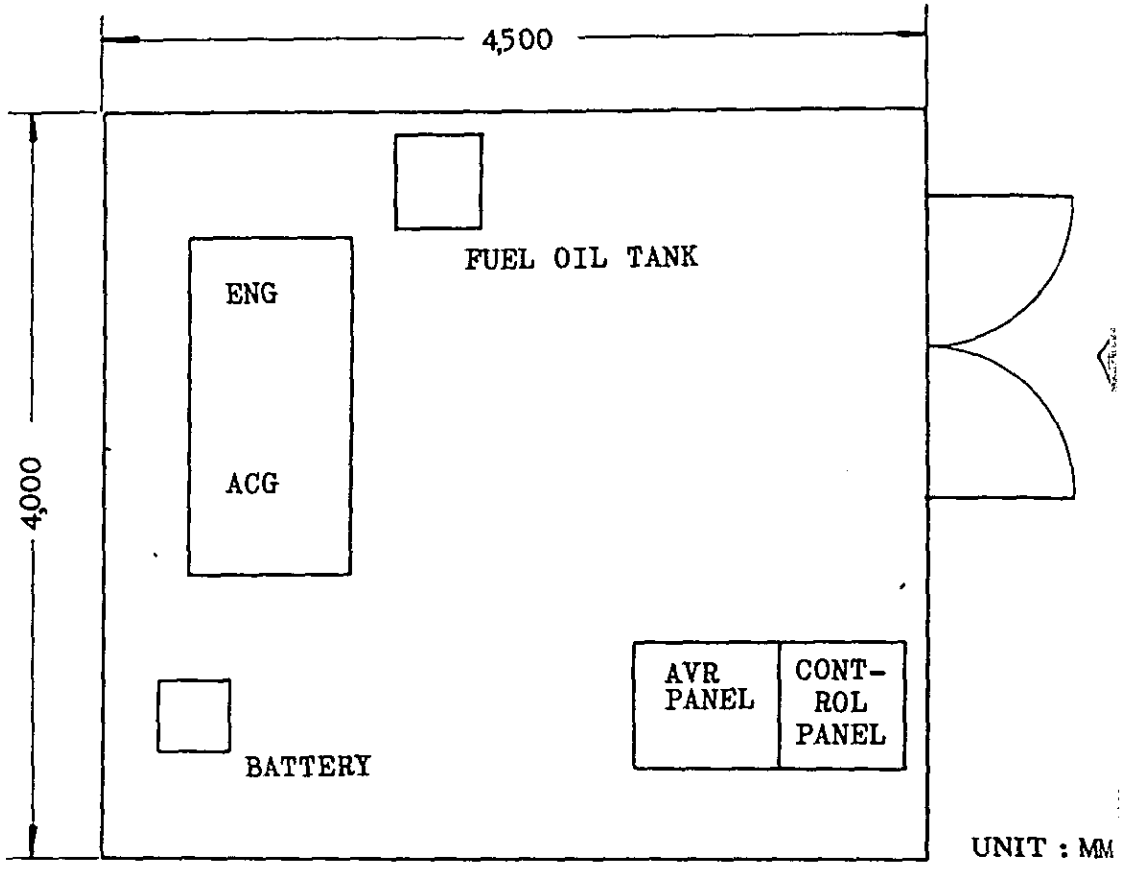


Fig. 3-1-6 TYPICAL FLOOR LAYOUT OF EMERGENCY POWER SUPPLY FOR TV (2KW x 2 & 1KW x 2 TV TRANSMITTING, 300W x 2 TRANSLATOR STATION

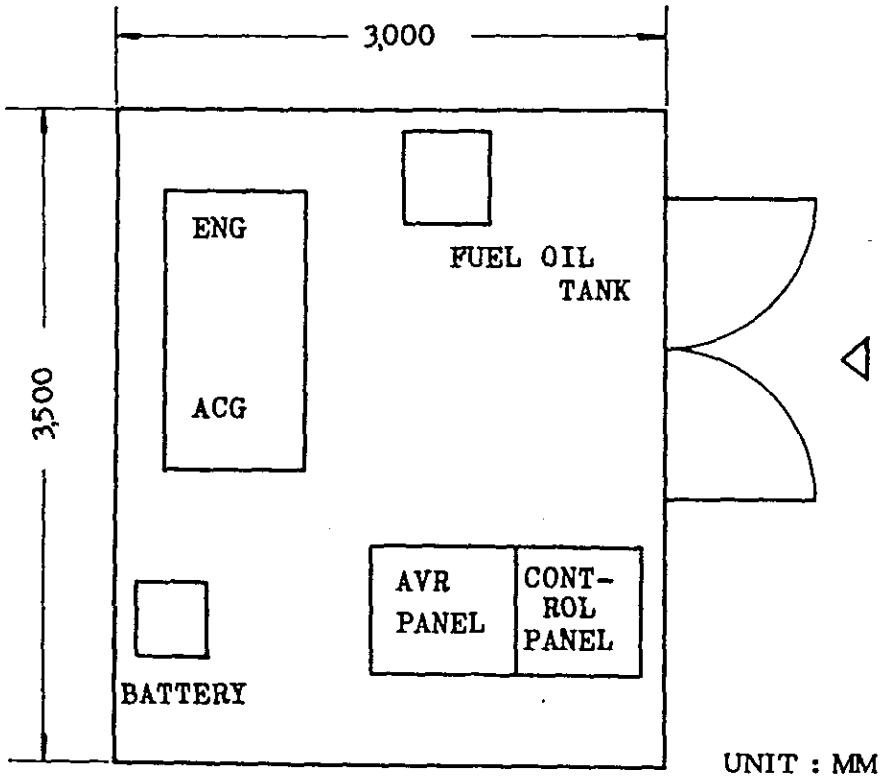


Fig. 3-1-7 TYPICAL FLOOR LAYOUT OF EMERGENCY POWER SUPPLY TV TRANSMITTING, (500W x 2) STATION

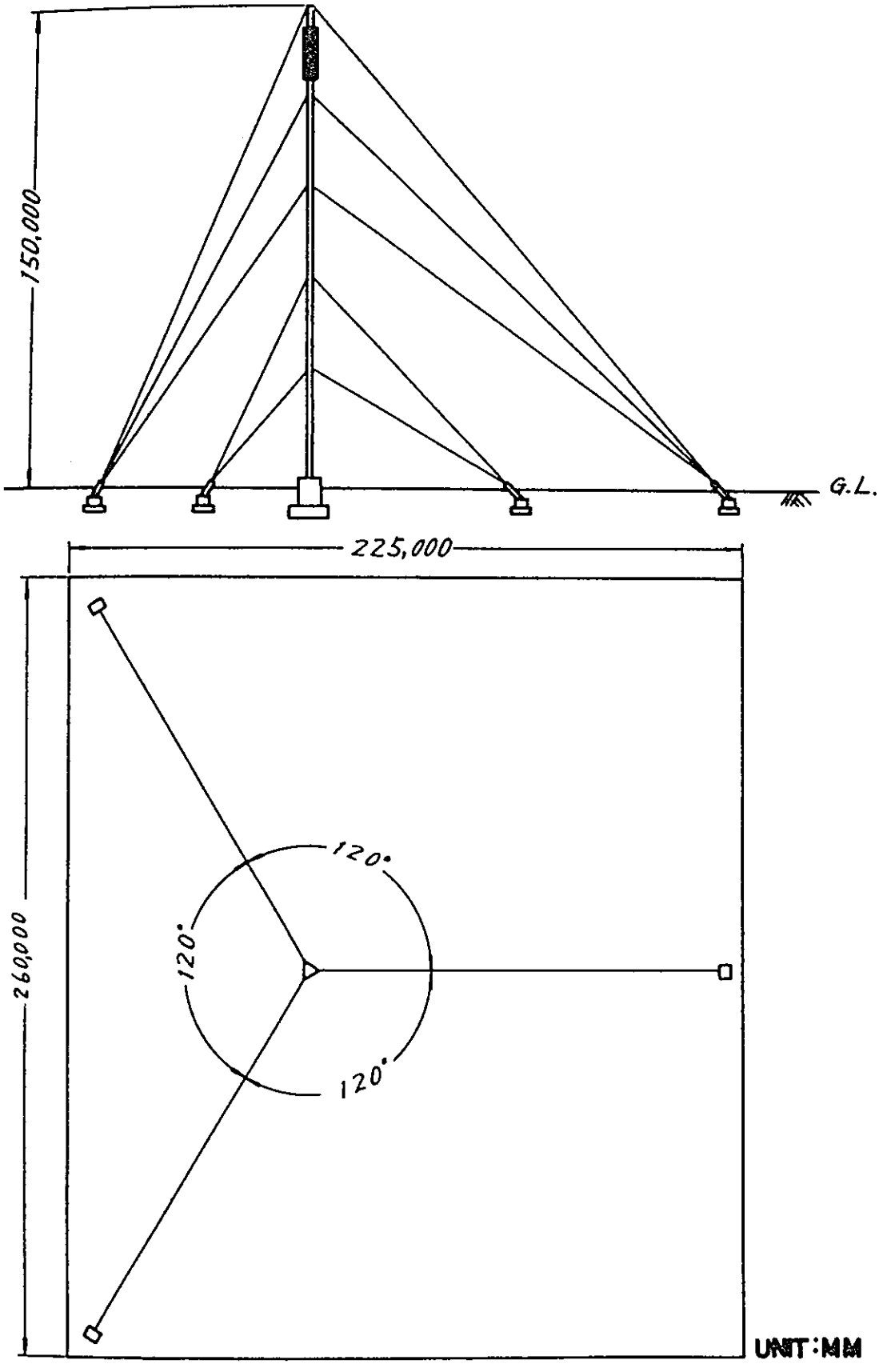


Fig. 3-1-8 150M HEIGHT GUIED MAST

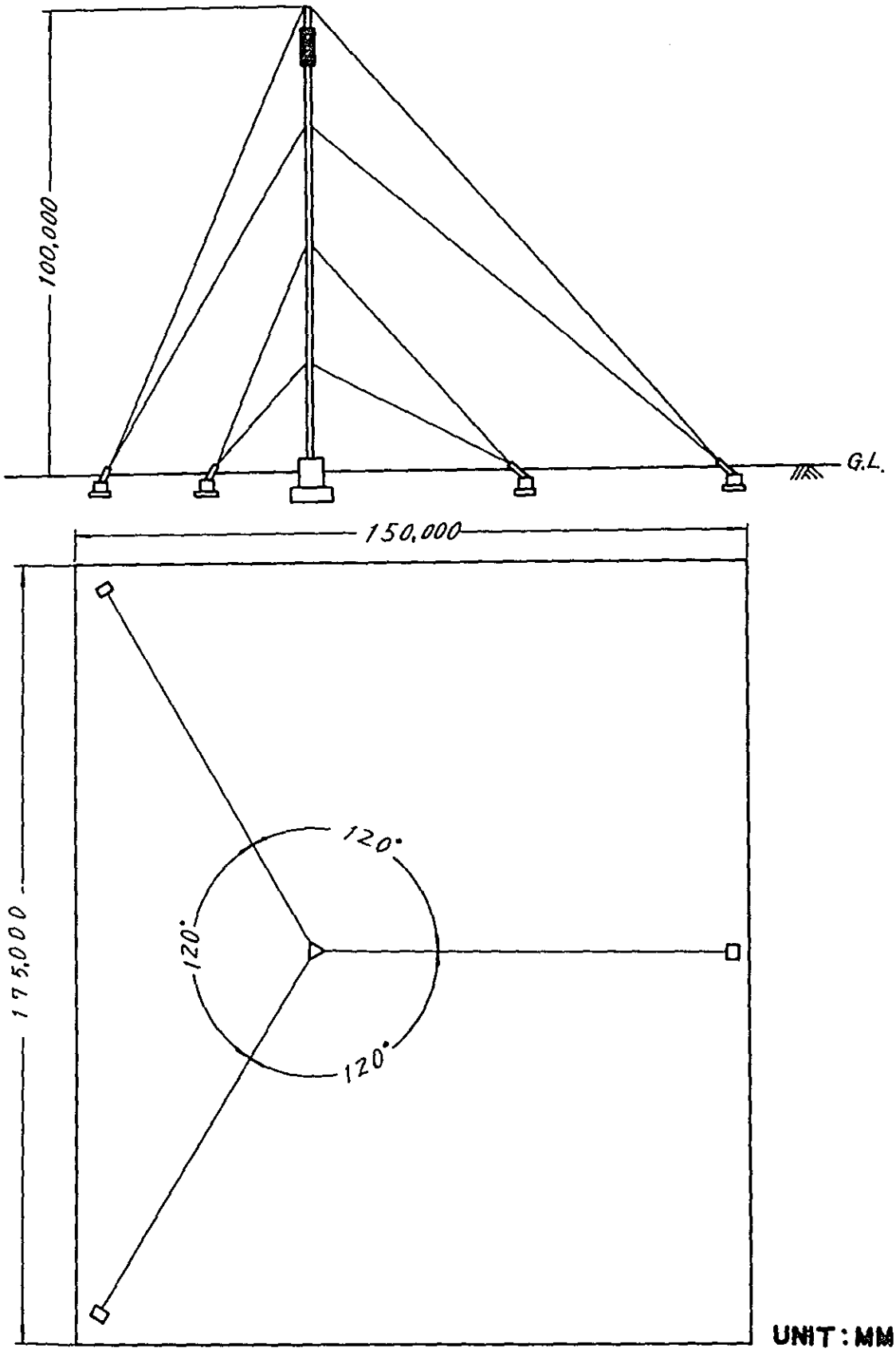


Fig. 3-1-9 100M HEIGHT GUIED MAST

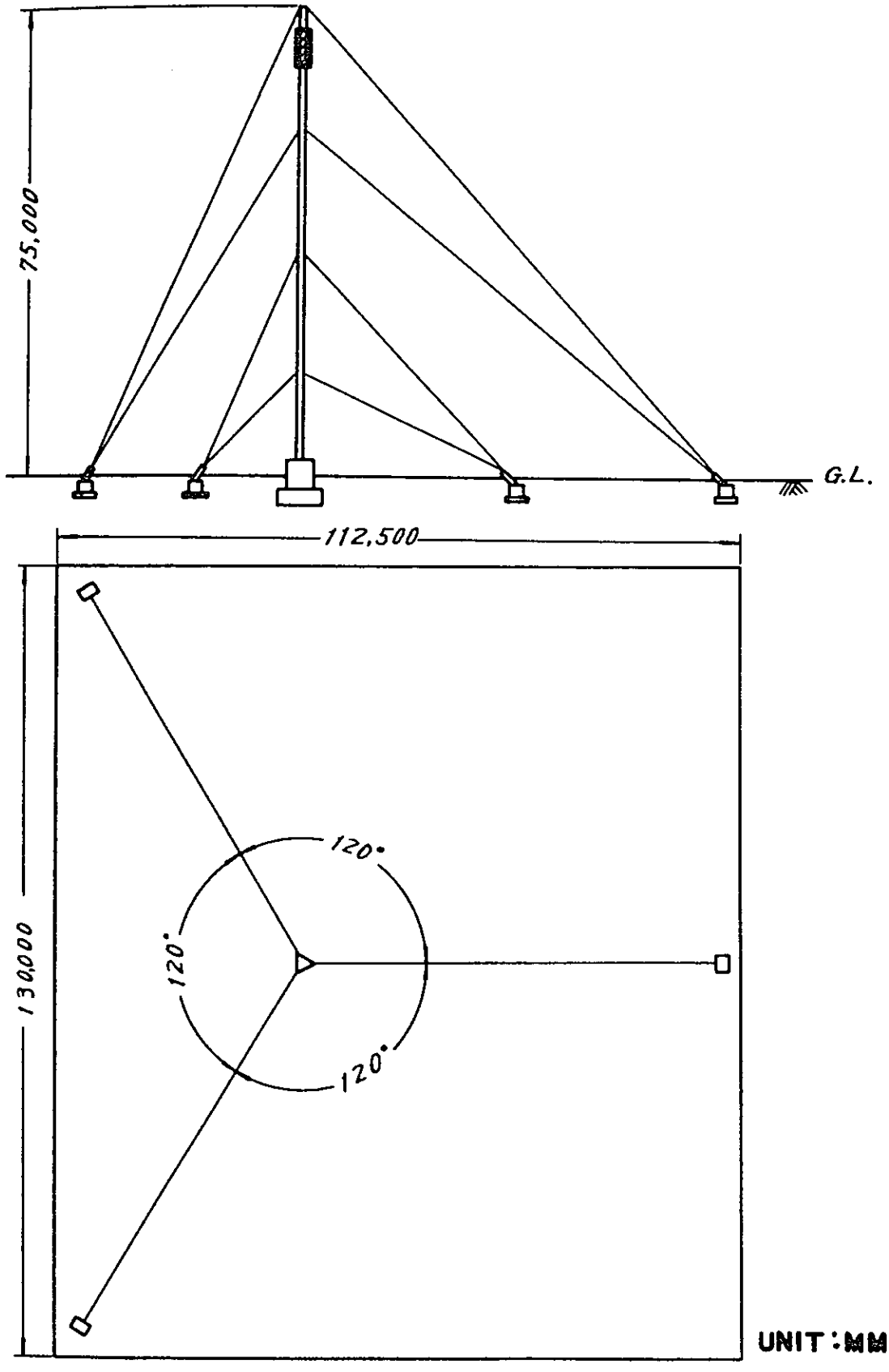


Fig. 3-1-10 75M HEIGHT GUIED MAST

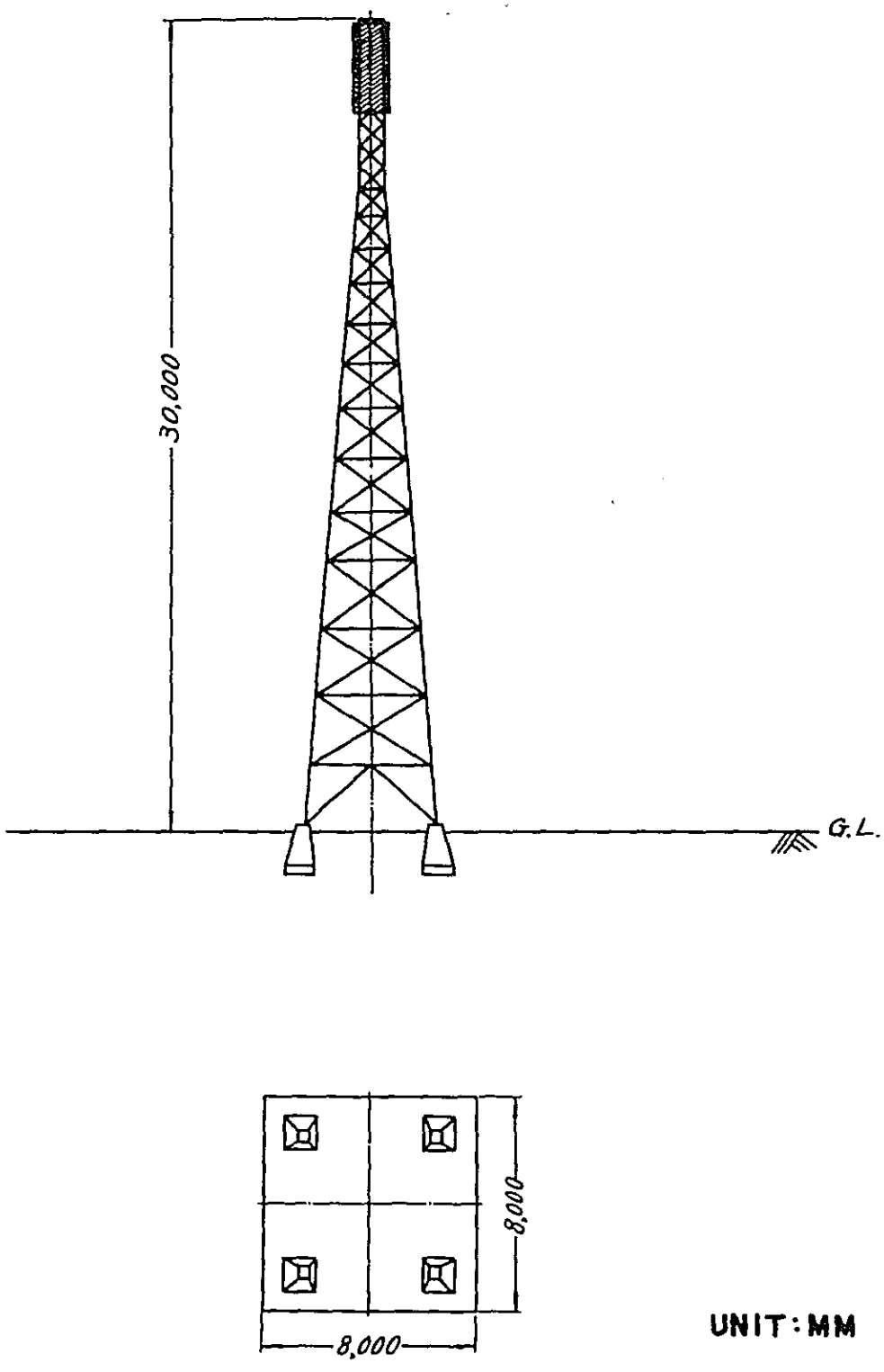


Fig. 3-1-11 30M SELF SUPPORTING TOWER.

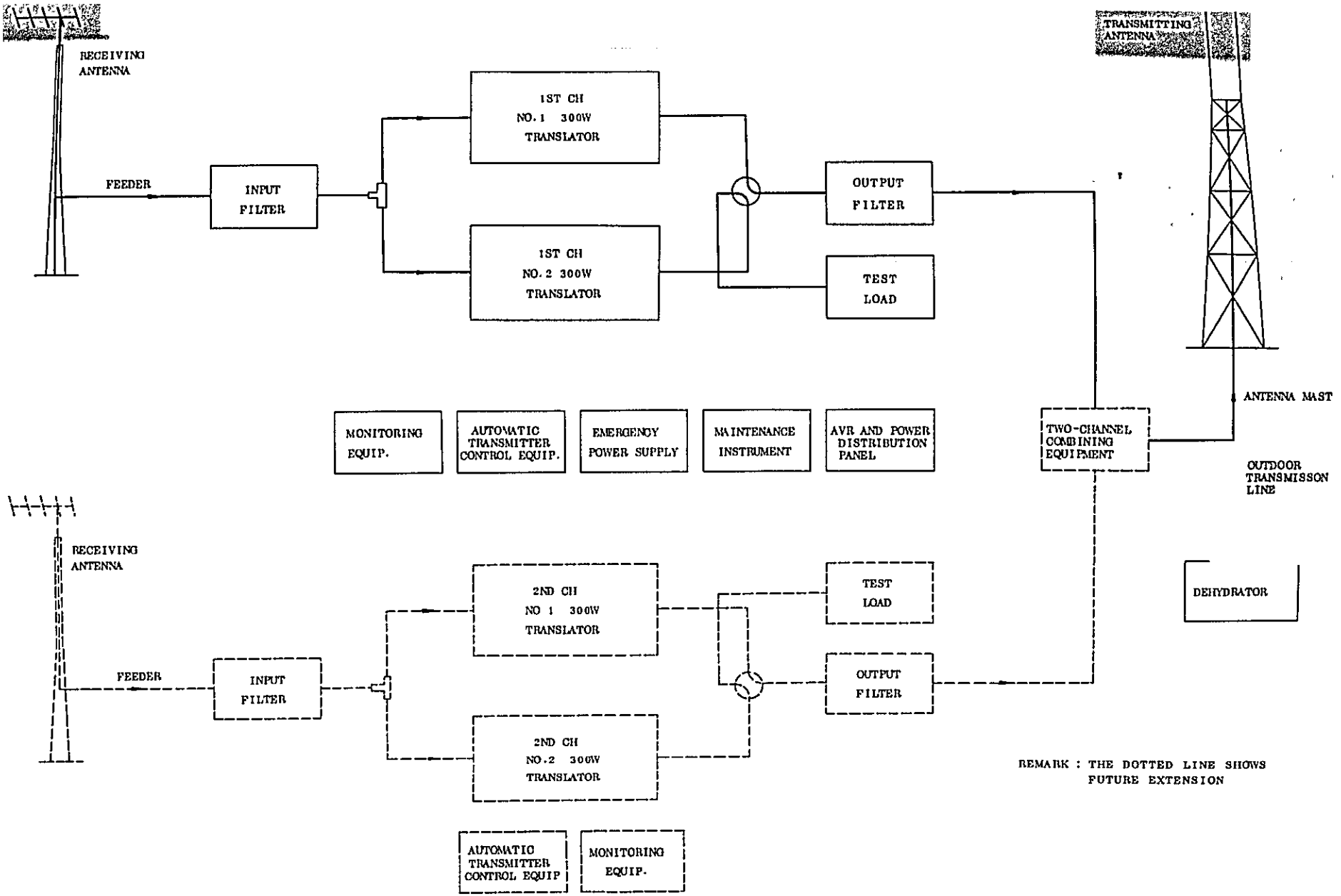


Fig. 3-1-12 SCHEMATIC DIAGRAM OF TLANSLATOR STATION

3.2.1 Southern Region

(1) Outline

This region is located in the penninsula. The area extending from Nakhon Si Thammarat to the northern part of Haad Yai is a plain. The rest of the Region is mountainous and the plain is narrow and long. The population is distributed in this narrow long area along the sea coast and its number is considerably small.

In view of these circumstances, it is advantageous to install stations with comparatively small transmitting power, taking advantage of these mountains as much as possible. However, in two areas of Haad Yai and Nakhon Si Thammarat, comparatively large transmitting power is required because of the extensive service areas.

On the other hand, programs will be transmitted mostly through microwave radio links.

(2) Facilities per station

S-1 Huahin

Huahin is a local city in Prachuap Province. It is located at a distance of about 90 Km from Prachuap city. Because of the mountains in between, a direct service from the vicinity of Prachuap will result in inefficiency.

The population in this district is small. However, because it is an important area as a summer resort near Bangkok, it will be served together with Phet Buri Province.

As the transmitting point, 2 or 3 mountains can be considered. However, in view of the fact that road conditions are good; having the proximity to the town, being convenient for operation and maintenance, and offering good visibility for the whole area, etc, Khao Sawan Kop accessible from Huahin Station is most suitable. This station can be made as a translator station with Prachuap Station as the master station. However, there is a difficulty in assigning channels. In addition, since this station is near Huahin microwave relay station, it will be made as a broadcasting station which receives programs from the microwave radio relay station through a cable system.

TABLE S-1-1 Main Specifications of Huahin Station

Name of Station		Huahin
Type of Station		TV Broadcasting Station
Transmitting Site	Site	Khao Sanam Kop, Ref. to Fig. S-1-1
	Latitude and Longitude	12°33'53" N. 99°56'55" E.
	Altitude	171 m
	Access Road	1.5 km
Transmitting Channel No.		8, 12
Transmitting Antenna	Height of Tower	30 m, Ref. to Fig. 3-1-11
	Polarization	Horizontal
	Required E.R.P.	35 kW, Ref. to Fig. S-1-2
Output Power of Transmitter		2 kW, Ref. to Fig. S-1-3 & Table S-1-2
Service Area	Area	Greater part of Phetchaburi province. Northern part of Prachuap province
	Population Covered	232,000 persons
Studio	Building	—
	Facilities	—
Receiving Station	Name	—
	Site	—
Master Station		—
Station Building		148 m^2, Ref. to Fig. 3-1-2 & Fig. 3-1-6
(Thousand Bahts) Construction Cost (1st Channel)	Equipment	3,654
	Building, Road, etc.	1,500
	Total	5,154

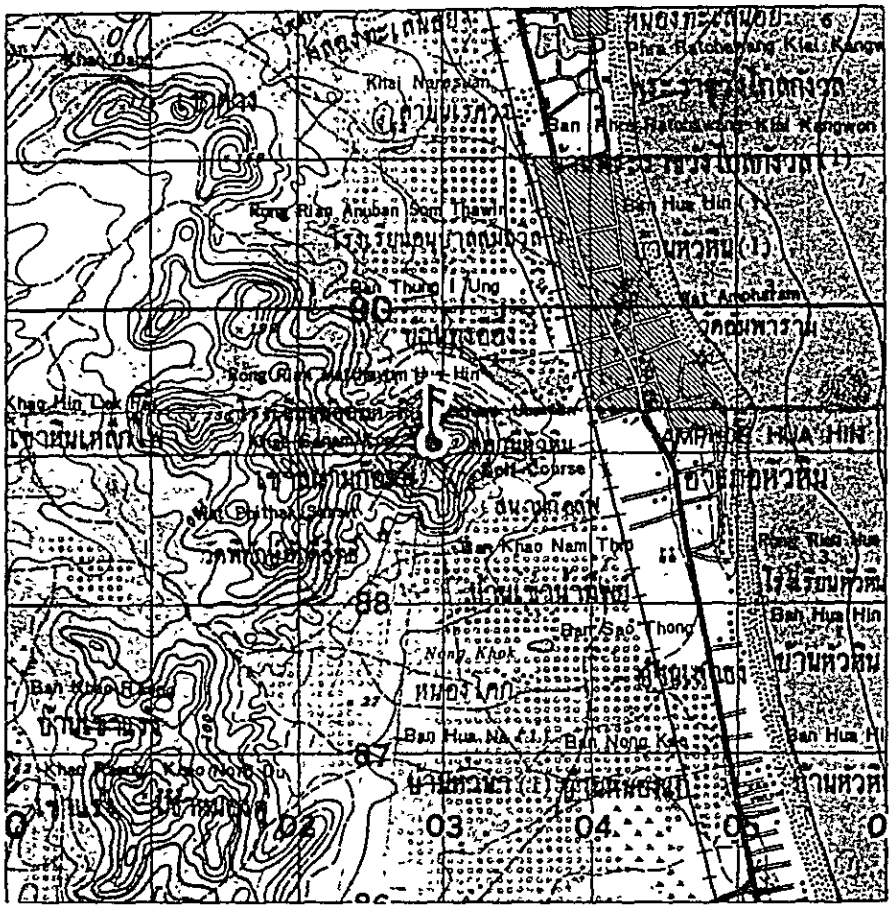


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Fig. S-1-1 LOCATION OF TRANSMITTING SITE (HUAHIN STATION)

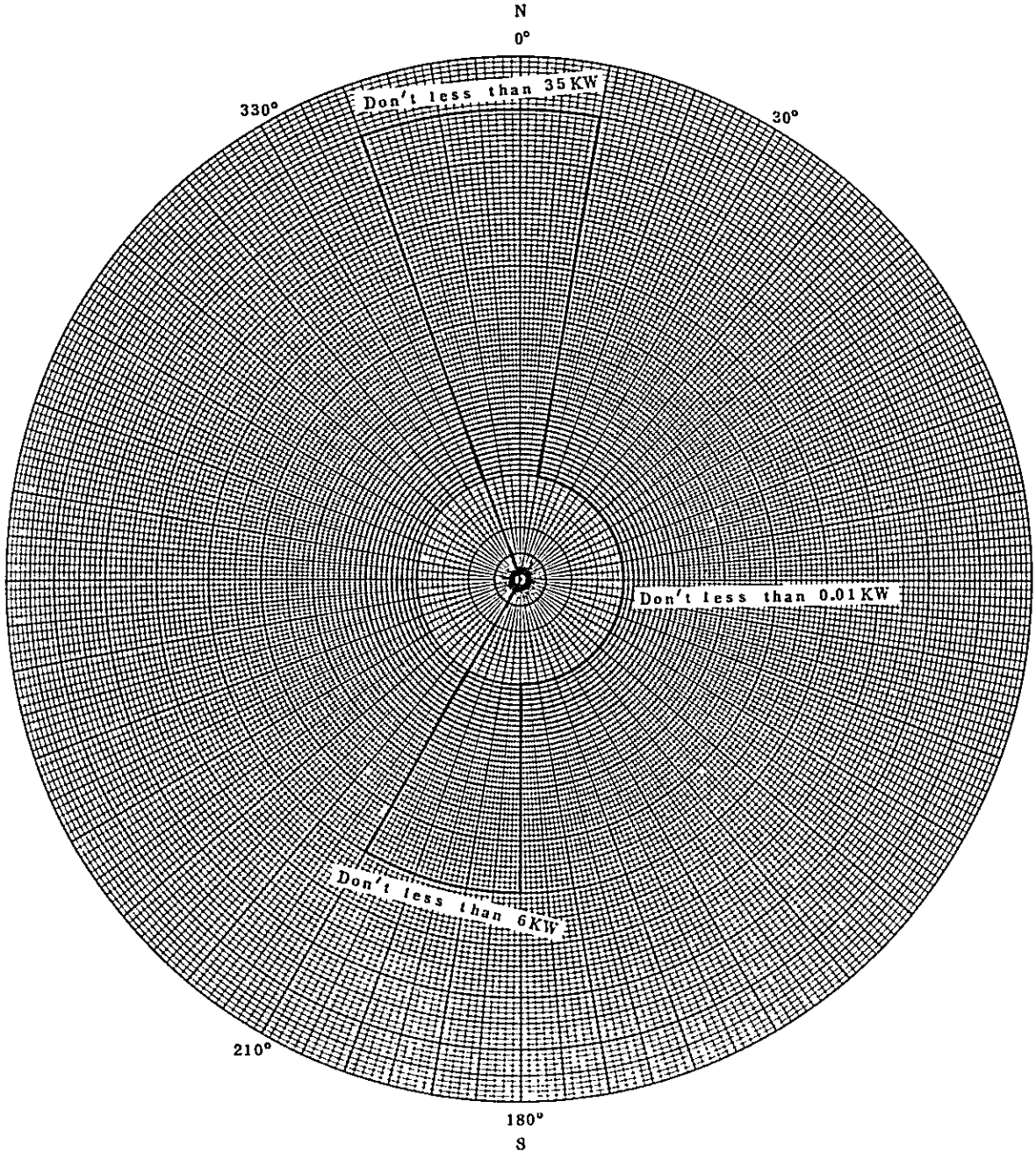

Fig. S-1-2 HORIZONTAL PATTERN OF REQUIRED E.R.P. (HUAHIN STATION)

TABLE S-1-2 List of TV Transmitting Facilities

Hua Hin Station, 1st Channel

Item	Description	Q'ty
(A)	TV Transmitting Facilities	1 set
1.	2 KW TV Transmitter	1 set
2.	Output Coaxial Equipment (Including Air Cooled Test Load)	1 set
3.	Transmitting Antenna	1 set
4.	Transmitting Feeder System	1 set
5.	30 Meters Antenna Tower	1 set
6.	Transmitter Input and Monitoring Equipment	1 set
7.	Measuring Instruments	1 set
8.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
9.	Emergency Power Supply	1 set
(B)	Cable Link Equipment	1 set
1.	Video and Audio Terminal Equipment	1 set
2.	Transmission Line	1 set
3.	Microwave IF Demodulator	1 set
4.	Monitoring Equipment	1 set
5.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
6.	Emergency Power Supply	1 set
(C)	Installation Materials	1 set
(D)	Minor Spare Parts	1 set

Hua Hin Station, 2nd Channel (Future Extension)

Item	Description	Q'ty
(A)	TV Transmitting Facilities	1 set
1.	2 KW TV Transmitter	1 set
2.	Output Coaxial Equipment (Including Two-channel Combining Equipment)	1 set
3.	Transmitter Input and Monitoring Equipment	1 set
4.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
5.	Emergency Power Supply	1 set
(B)	Cable Link Equipment	1 set
1.	Video and Audio Terminal Equipment	1 set
2.	Microwave IF Demodulator	1 set
3.	Monitoring Equipment	1 set
4.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
5.	Emergency Power Supply	1 set
(C)	Installation Materials	1 set
(D)	Minor Spare Parts	1 set

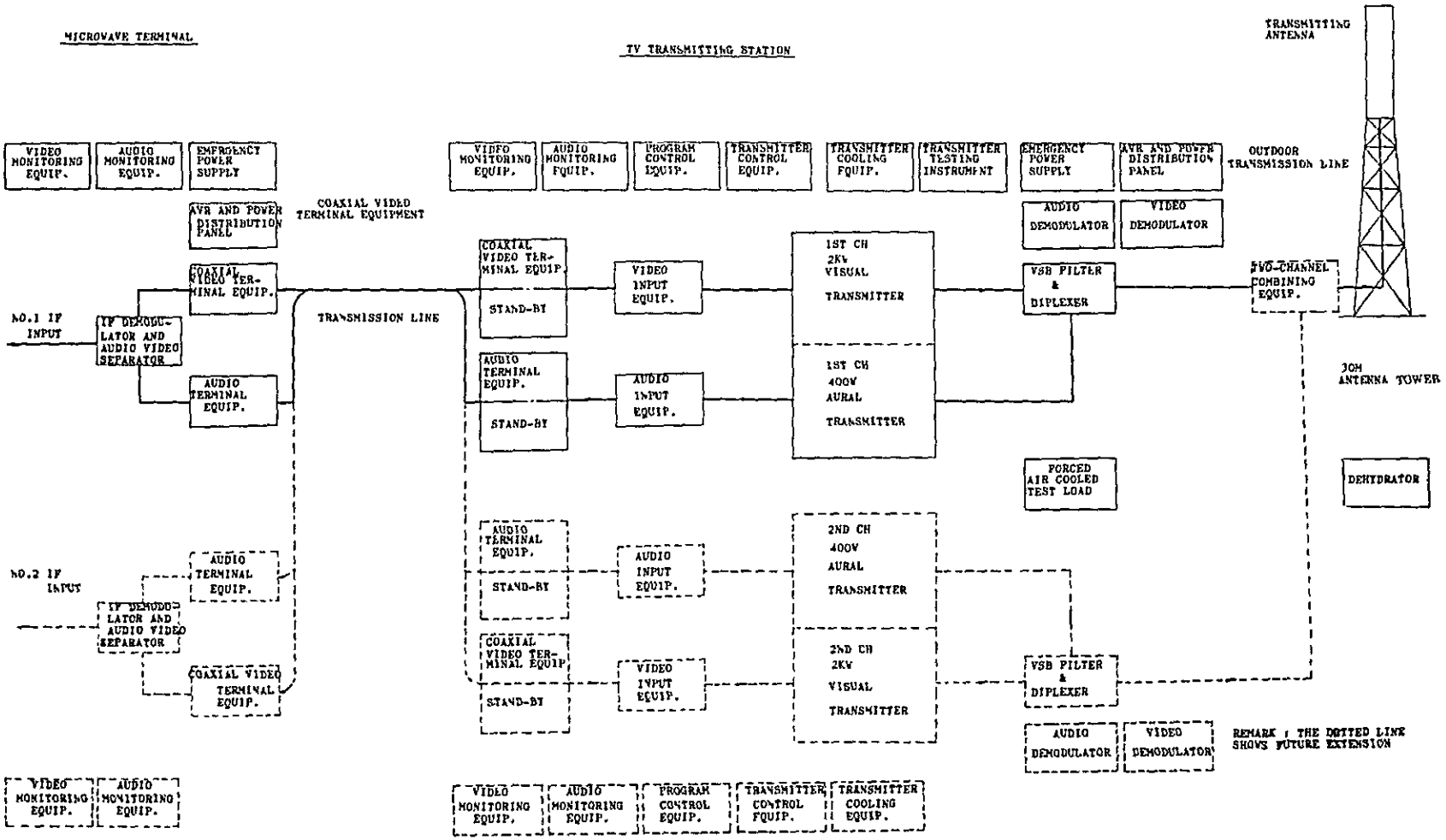

Fig. 8-1-3 SCHEMATIC DIAGRAM OF TV TRANSMITTING FACILITIES FOR

S-2 Prachuap

The northern part of Prachuap Province is almost covered up by Huahin TV Station. A range of mountains 200 - 300 m high extends north of Prachuap city.

Therefore, it will be all right if the service area of Prachuap TV Station cover mostly the southern area, including Prachuap city.

As for the station site, it will be advantageous if the hill with roads (steps) lying behind the Provincial Government Office can be used. However, the method of construction will require sufficient study because a pagoda stands on the hill and the place is narrow.

Broadcasting programs will be supplied from the microwave terminal station to the broadcasting station on the hill through STL (radio).

TABLE S-2-1 Main Specifications of Prachuap Khiri Station

Name of Station		Prachuap Khiri Khan
Type of Station		TV Broadcasting Station
Transmitting Site	Site	Ref. to Fig. S-2-1
	Latitude and Longitude	11°44'27" N. 99°48'2" E.
	Altitude	100 m
	Access Road	—
Transmitting Channel No.		6, 10
Transmitting Antenna	Height of Tower	30 m Ref. to Fig. 3-1-11
	Polarization	Horizontal
	Required E.R.P.	Max. 25 kW Ref. to Fig. S-2-2
Output Power of Transmitter		2 kW Ref. to Fig. S-2-3 & Table S-2-2
Service Area	Area	Southern part of Phrachuap Khiri Khan province
	Population Covered	54,000 persons
Studio	Building	—
	Facilities	—
Receiving Station	Name	—
	Site	—
Master Station		—
Station Building		148 m^2, Ref. to Fig. 3-1-2 & Fig. 3-1-6
(Thousand Bahts) Construction Cost (1st Channel)	Equipment	3,712
	Building, Road, etc.	300
	Total	4,012

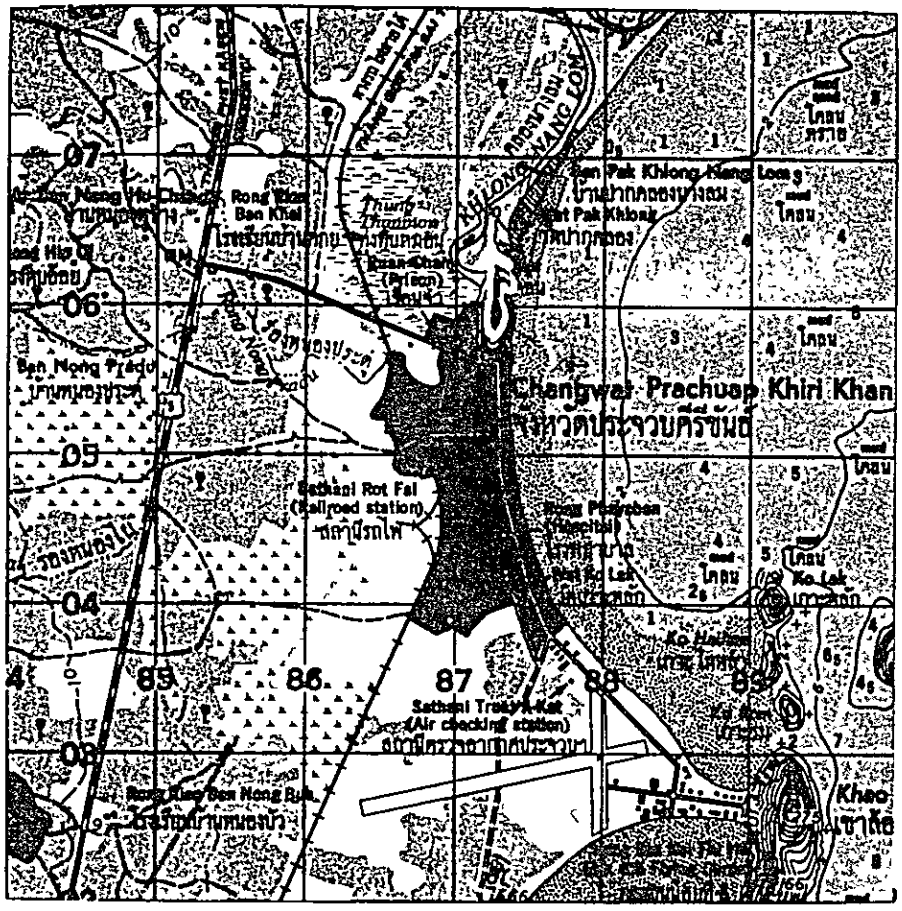

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Fig. S-2-1 LOCATION OF TRANSMITTING SITE (PRACHUAP STATION)

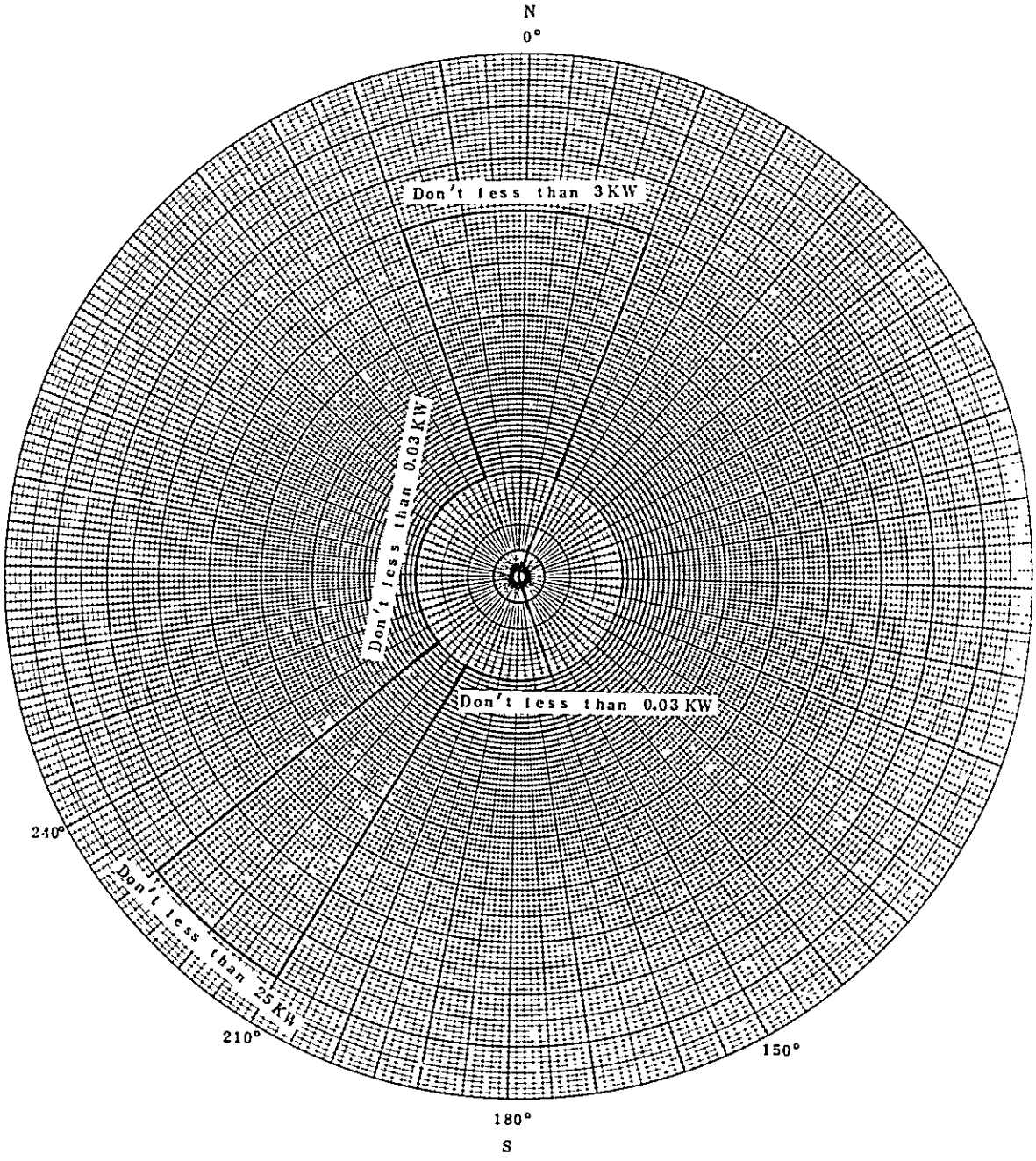

Fig. S-2-2 HORIZONTAL PATTERN OF REQUIRED E.R.P. (PRACHUAP STATION)

TABLE S-2-2 List of TV Transmitting Facilities

Prachuap Station, 1st Channel

Item	Description	Q'ty
(A)	TV Transmitting Facilities	1 set
1.	2 KW TV Transmitter	1 set
2.	Output Coaxial Equipment (Including Air Cooled Test Load)	1 set
3.	Transmitting Antenna	1 set
4.	Transmitting Feeder System	1 set
5.	30 Meters Antenna Tower	1 set
6.	Transmitter Input and Monitoring Equipment	1 set
7.	Measuring Instrument	1 set
8.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
9.	Emergency Power Supply	1 set
(B)	Microwave ST-Link Equipment	1 set
1.	Microwave Television Relay Equipment	1 set
2.	Program Input and Monitoring Equipment	1 set
3.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
4.	Emergency Power Supply	1 set
(C)	Installation Materials	1 set
(D)	Minor Spare Parts	1 set

Prachuap Station, 2nd Channel (Future Extension)

Item	Description	Q'ty
(A)	TV Transmitting Facilities	1 set
1.	2 KW TV Transmitter	1 set
2.	Output Coaxial Equipment (Including Two-channel Combining Equipment)	1 set
3.	Transmitter Input and Monitoring Equipment	1 set
4.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
5.	Emergency Power Supply	1 set
(B)	Microwave ST-Link Equipment	1 set
1.	Microwave Television Relay Equipment	1 set
2.	Program Input and Monitoring Equipment	1 set
3.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
4.	Emergency Power Supply	1 set
(C)	Installation Materials	1 set
(D)	Minor Spare Parts	1 set

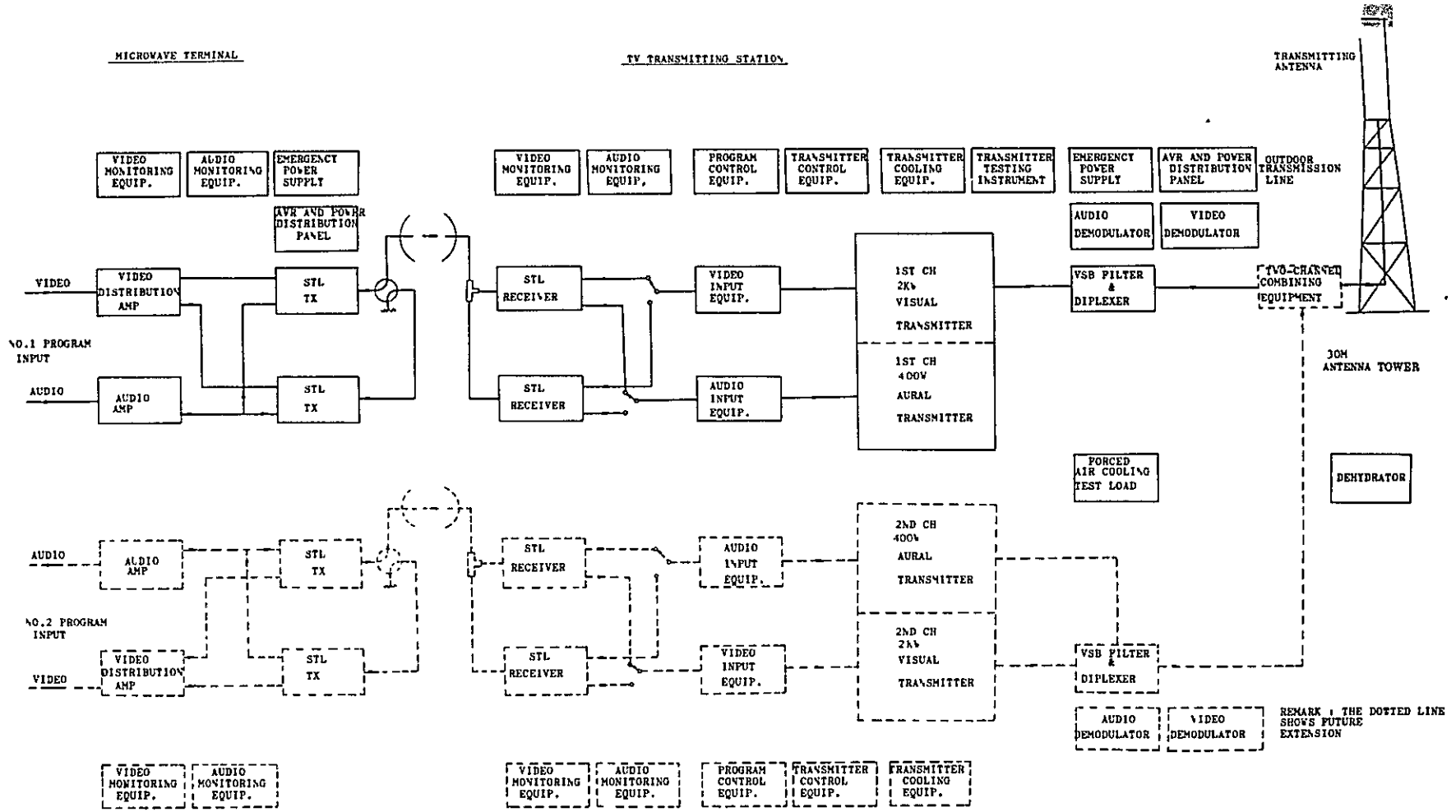

Fig. S-2-3 SCHEMATIC DIAGRAM OF TV TRANSMITTING FACILITIES FOR PRACHUAP STATION

S-3 Chumphon

The northern region of Chumphon Province is covered by jungle with a comparatively small population.

In the same way as Prachuap Province, a comparatively flat land extends to the south along the sea coast in this Province.

Because of the lack of proper mountains to cover this topography, an iron mast 100 m high will be installed on a hill 40 m high on the north side of Chumphon city in order to extend the broadcasting wave sufficiently to the southern direction.

Broadcasting programs will be supplied from the microwave terminal station in Chumphon city through STL (radio).

TABLE S-3-1 Main Specifications of Chumphon Station

Name of Station		Chumphon
Type of Station		TV Broadcasting Station
Transmitting Site	Site	Ban San Khaeo, Ref. to Fig. S-3-1
	Latitude and Longitude	10°31'15" N. 99°11'10" E.
	Altitude	40 m
	Access Road	100 m
Transmitting Channel No.		5, 7
Transmitting Antenna	Height of Mast	100 m, Ref. to 3-1-9
	Polarization	Horizontal
	Required E.R.P.	Max. 15 kW Ref. to Fig. S-3-2
Output Power of Transmitter		1 kW Ref. to Fig. S-3-3 & Table S-3-2
Service Area	Area	Greater part of Chumphon province
	Population Covered	131,223 persons
Studio	Building	—
	Facilities	—
Receiving Station	Name	—
	Site	—
Master Station		—
Station Building		148 m^2, Ref. to Fig. 3-1-2 & Fig. 3-1-6
Construction Cost (Thousand Bahts) (1st Channel)	Equipment	4,470
	Building, Road, etc.	310
	Total	4,780

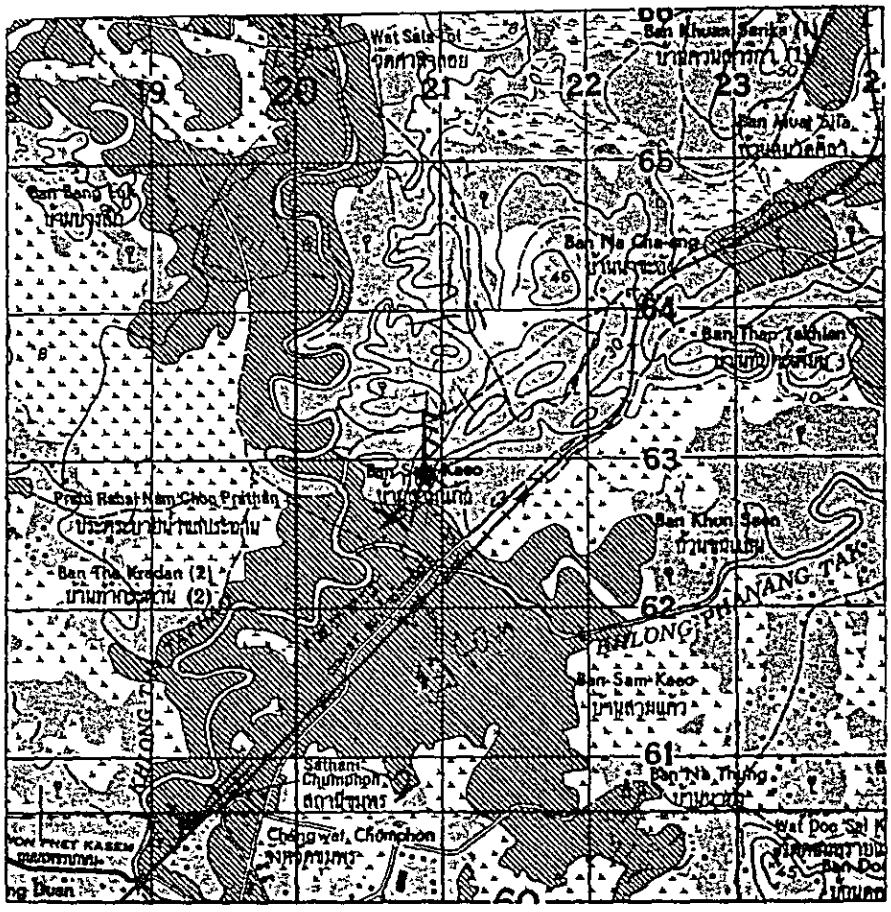

Fig. S-3-1 LOCATION OF TRANSMITTING SITE (CHUMPHON STATION)

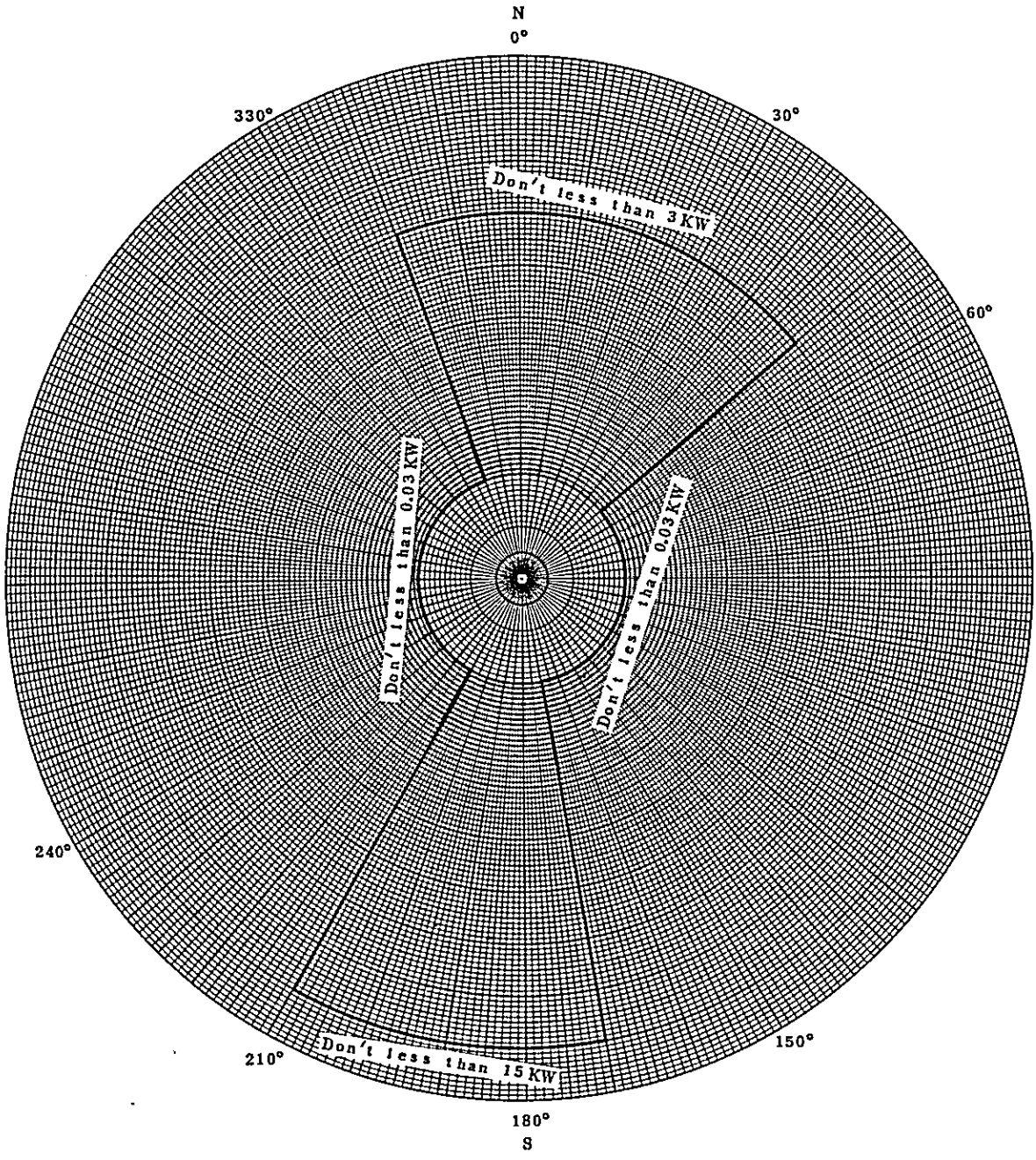

Fig. S-3-2 HORIZONTAL PATTERN OF REQUIRED E.R.P. (CHUMPHON STATION)

TABLE S-3-2 List of TV Transmitting Facilities

Chumphon Station, 1st Channel

Item		Description	Q'ty
(A)	TV Transmitting Facilities		1 set
	1.	1 KW TV Transmitter	1 set
	2.	Output Coaxial Equipment (Including Air Cooled Test Load)	1 set
	3.	Transmitting Antenna	1 set
	4.	Transmitting Feeder System	1 set
	5.	100 Meters Antenna Mast	1 set
	6.	Transmitter Input and Monitoring Equipment	1 set
	7.	Measuring Instrument	1 set
	8.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
	9.	Emergency Power Supply	1 set
(B)	Microwave ST-Link Equipment		1 set
	1.	Microwave Television Relay Equipment	1 set
	2.	Program Input and Monitoring Equipment	1 set
	3.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
	4.	Emergency Power Supply	1 set
(C)	Installation Materials		1 set
(D)	Minor Spare Parts		1 set

Chumphon Station, 2nd Channel (Future Extension)

Item	Description	Q'ty
(A)	TV Transmitting Facilities	1 set
1.	1 KW TV Transmitter	1 set
2.	Output Coaxial Equipment (Including Two-channel Combining Equipment)	1 set
3.	Transmitter Input and Monitoring Equipment	1 set
4.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
5.	Emergency Power Supply	1 set
(B)	Microwave ST-Link Equipment	1 set
1.	Microwave Television Relay Equipment	1 set
2.	Program Input and Monitoring Equipment	1 set
3.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
4.	Emergency Power Supply	1 set
(C)	Installation Materials	1 set
(D)	Minor Spare Parts	1 set

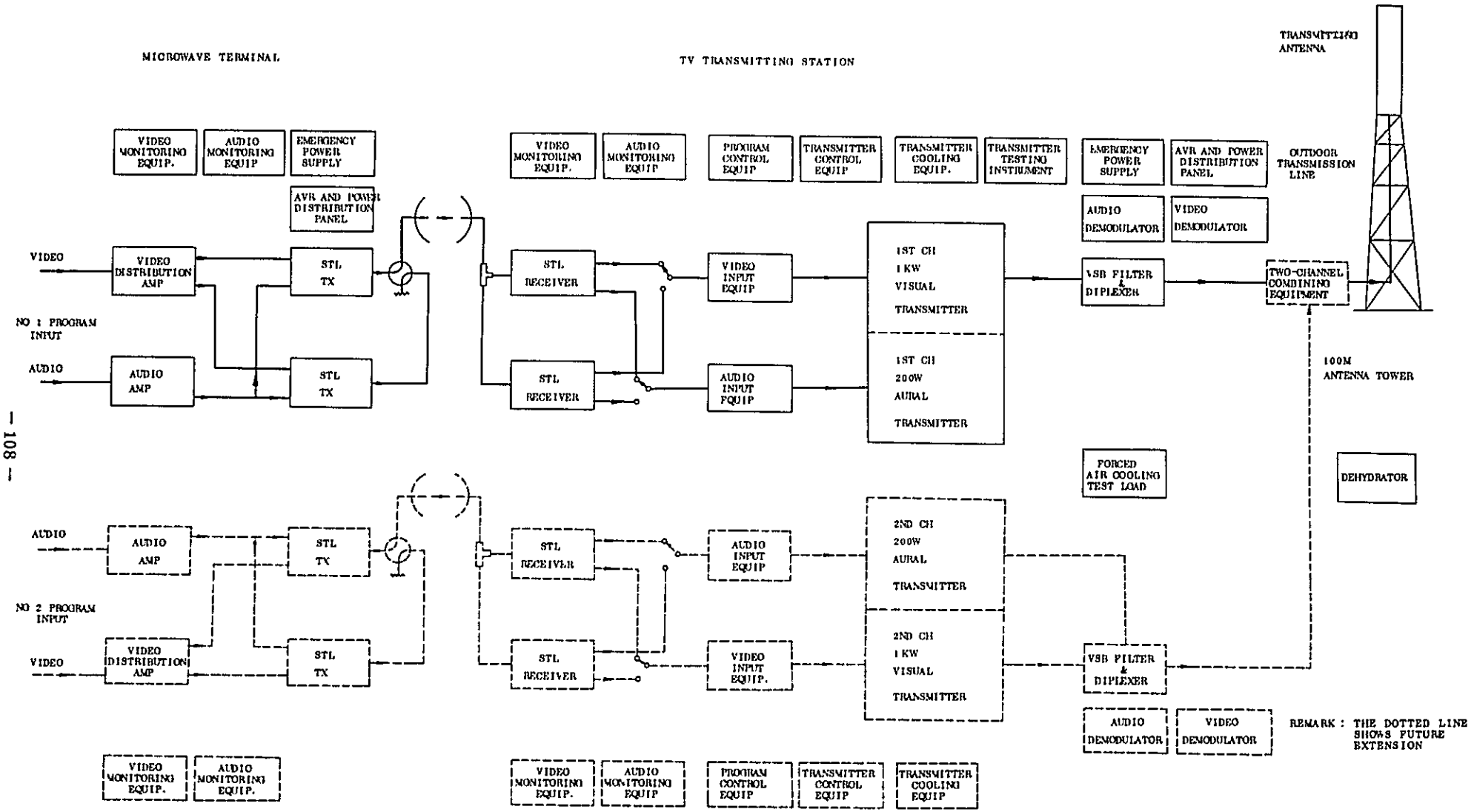

Fig. S-3-3 SCHEMATIC DIAGRAM OF TV TRANSMITTING FACILITIES FOR CHUMPHON STATION

S-4 Surat Thani

It is possible to consider 2 or 3 mountains near Surat Thani City in order to cover the province of Surat Thani. However, in consideration of such advantages as the site has sufficient area, there are roads available, it is near PRD Division, etc., Khao Tha Phet Noi (210 m) was selected.

Broadcasting programs will be supplied from the microwave terminal station near Phun Phin City through STL (radio).

TABLE S-4-1 Main Specifications of Surat Thani Station

Name of Station		Surat Thani
Type of Station		TV Broadcasting Station
Transmitting Site	Site	Khao Tha Phet Noi, Ref. to Fig. S-4-1
	Latitude and Longitude	9°05'49" N. 99°21'16" E.
	Altitude	210 m
	Access Road	—
Transmitting Channel No.		8, 12
Transmitting Antenna	Height of Tower	30 m , Ref. to 3-1-11
	Polarization	Horizontal
	Required E.R.P.	Max. 20 kW , Ref. to Fig. S-4-2
Output Power of Transmitter		2 kW, Ref. to Fig. S-4-3 & Table S-4-2
Service Area	Area	Greater part of Surat Thani province
	Population Covered	263,000 persons
Studio	Building	—
	Facilities	—
Receiving Station	Name	—
	Site	—
Master Station		—
Station Building		148 m^2, Ref. to Fig. 3-1-2 & Fig. 3-1-6
(Thousand Bahts) Construction Cost (1st Channel)	Equipment	4,126
	Building, Road, etc.	350
	Total	4,476

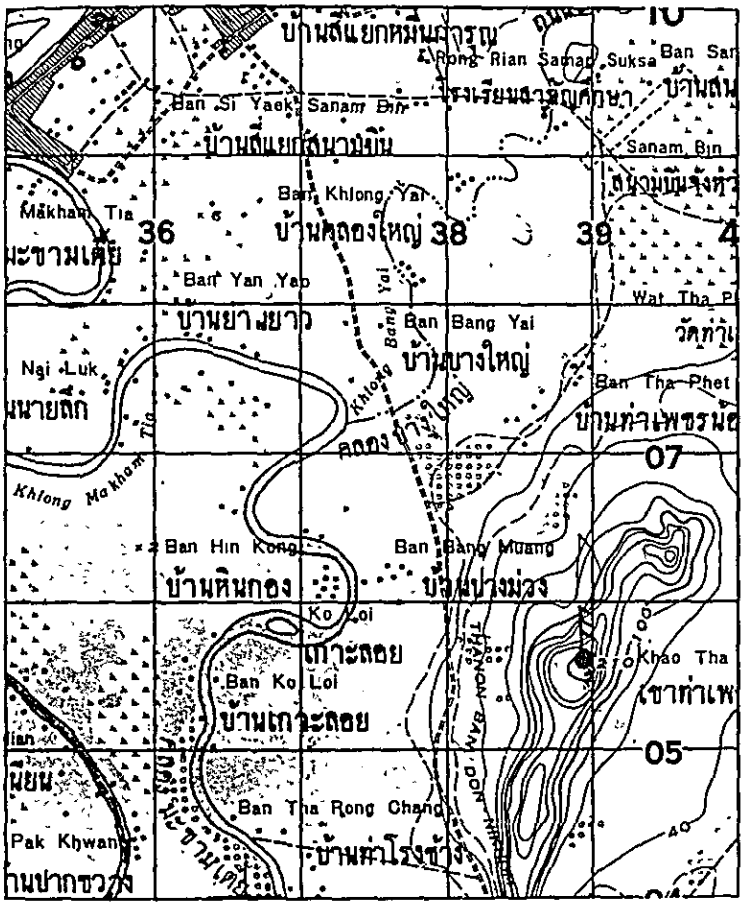

Fig. S-4-1 LOCATION OF TRANSMITTING SITE (SURAT THANI STATION)

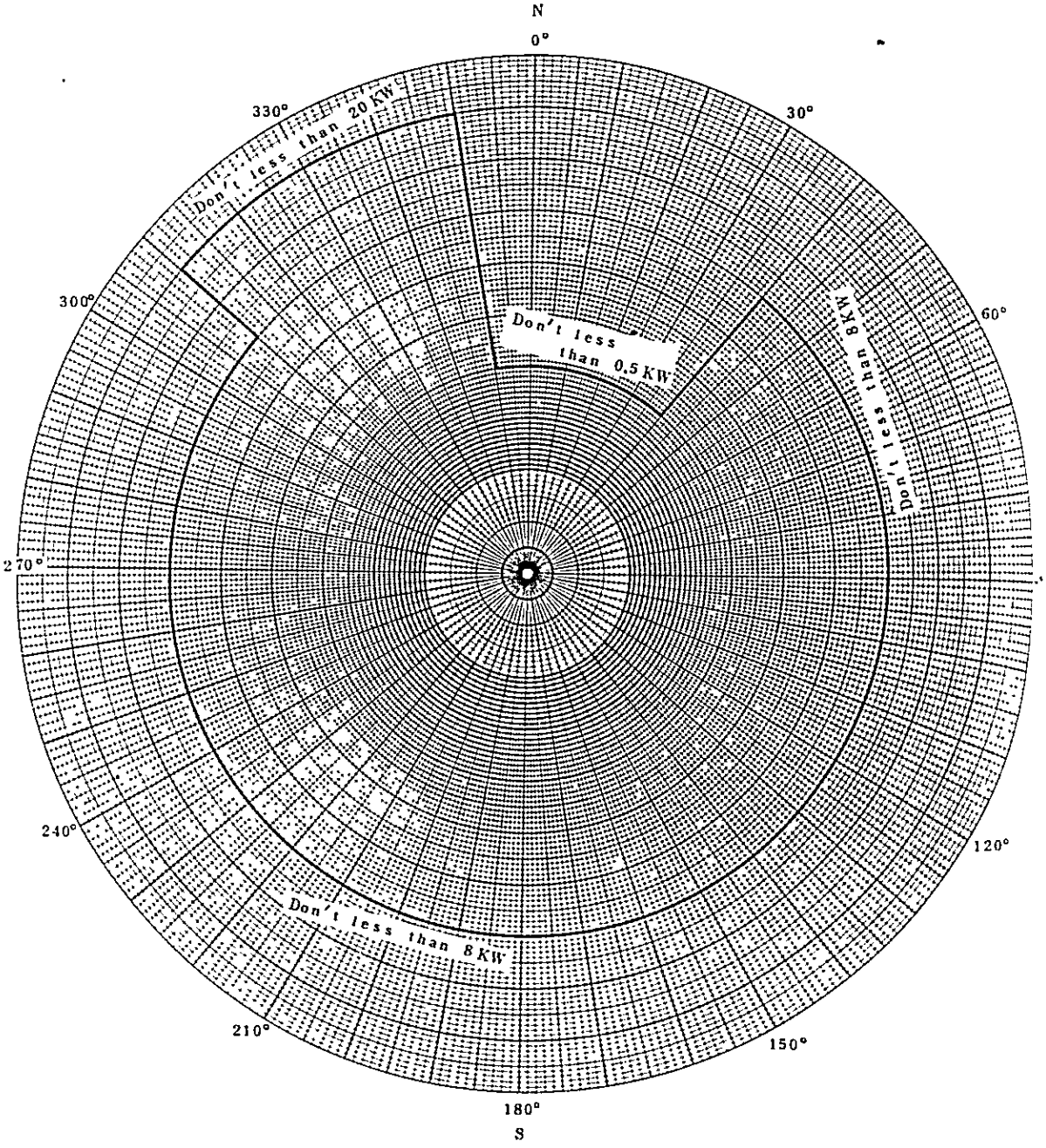

Fig. S-4-2 HORIZONTAL PATTERN OF REQUIRED E.R.P. (SURAT THANI STATION)

TABLE S-4-2 List of TV Transmitting Facilities

Surat Thani Station, 1st Channel

Item	Description	Q'ty
(A)	TV Transmitting Facilities	1 set
1.	2 KW TV Transmitter	1 set
2.	Output Coaxial Equipment (Including Air Cooled Test Load)	1 set
3.	Transmitting Antenna	1 set
4.	Transmitting Feeder System	1 set
5.	30 Meters Antenna Tower	1 set
6.	Transmitter Input and Monitoring Equipment	1 set
7.	Measuring Instrument	1 set
8.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
9.	Emergency Power Supply	1 set
(B)	Microwave ST-Link Equipment	1 set
1.	Microwave Television Relay Equipment	1 set
2.	Program Input and Monitoring Equipment	1 set
3.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
4.	Emergency Power Supply	1 set
(C)	Installation Materials	1 set
(D)	Minor Spare Parts	1 set

Surat Thani Station, 2nd Channel (Future Extension)

Item	Description	Q'ty
(A)	TV Transmitting Facilities	1 set
1.	2 KW TV Transmitter	1 set
2.	Output Coaxial Equipment (Including Two-channel Combining Equipment)	1 set
3.	Transmitter Input and Monitoring Equipment	1 set
4.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
5.	Emergency Power Supply	1 set
(B)	Microwave ST-Link Equipment	1 set
1.	Microwave Television Relay Equipment	1 set
2.	Program Input and Monitoring Equipment	1 set
3.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
4.	Emergency Power Supply	1 set
(C)	Installation Materials	1 set
(D)	Minor Spare Parts	1 set

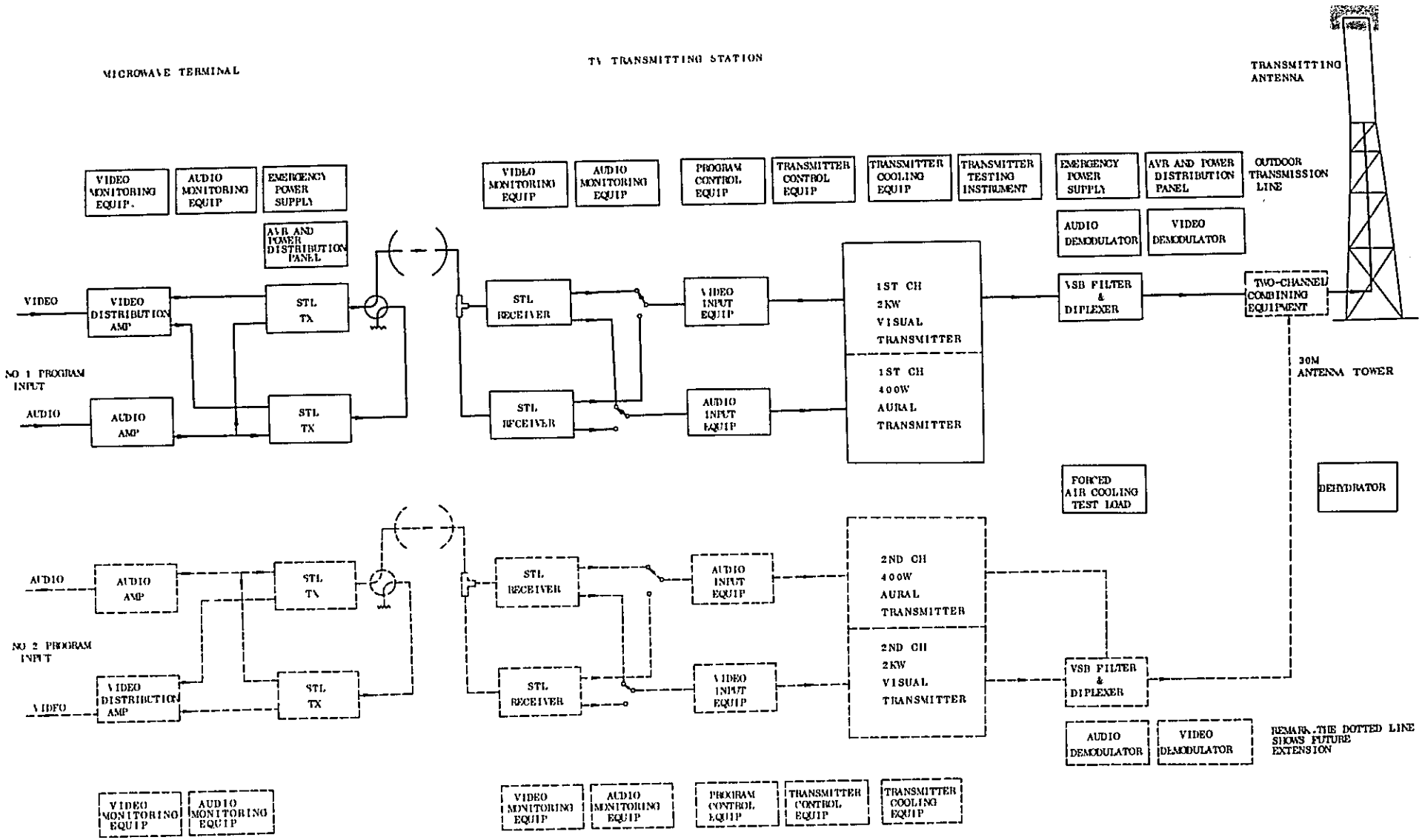

Fig. S-4-3 SCHEMATIC DIAGRAM OF TV TRANSMITTING FACILITIES FOR SURAT THANI STATION

S-5 Nakhon Si Thammarat

This is a province in the South Region of Thailand and has the broadest plain. This plain extends to Songkhla Province. It is therefore advantageous to use a mountain as high as possible in order to obtain a wide service area. Accordingly, a hill 343 meters high and located in the west of Nakhon Si Thammarat City will be used, because it will render the construction easy, it is near the city, and the service area is large.

Broadcasting programs will be supplied from the microwave terminal station inside the city through STL (radio).

TABLE S-5-1 Main Specifications of Nakhon Si Thammarat Station

Name of Station		Nakhon Si Thammarat
Type of Station		TV Broadcasting Station
Transmitting Site	Site	Rong Rian Fuk Hat Khru, Ref.to Fig.S-5-1
	Latitude and Longitude	$8^{o}27'17"$ N. $99^{o}51'19"$ E.
	Altitude	346 m
	Access Road	6 km
Transmitting Channel No.		9, 11
Transmitting Antenna	Height of Tower	30 m ,Ref. to Fig. 3-1-11
	Polarization	Horizontal
	Required E.R.P.	Max.50 kW, Ref. to Fig. S-5-2
Output Power of Transmitter		2 kW, Ref. to Fig. S-5-3 & Table S-5-2
Service Area	Area	Nakhon Si Thammarat province. Northern part of Phatlerung province.
	Population Covered	538,000 persons
Studio	Building	—
	Facilities	—
Receiving Station	Name	—
	Site	—
Master Station		—
Station Building		148 m^2, Ref. to Fig. 3-1-2 & Fig. 3-1-6
Construction Cost (Thousand Bahts) (1st Channel)	Equipment	3,922
	Building, Road, etc.	3,800
	Total	7,722

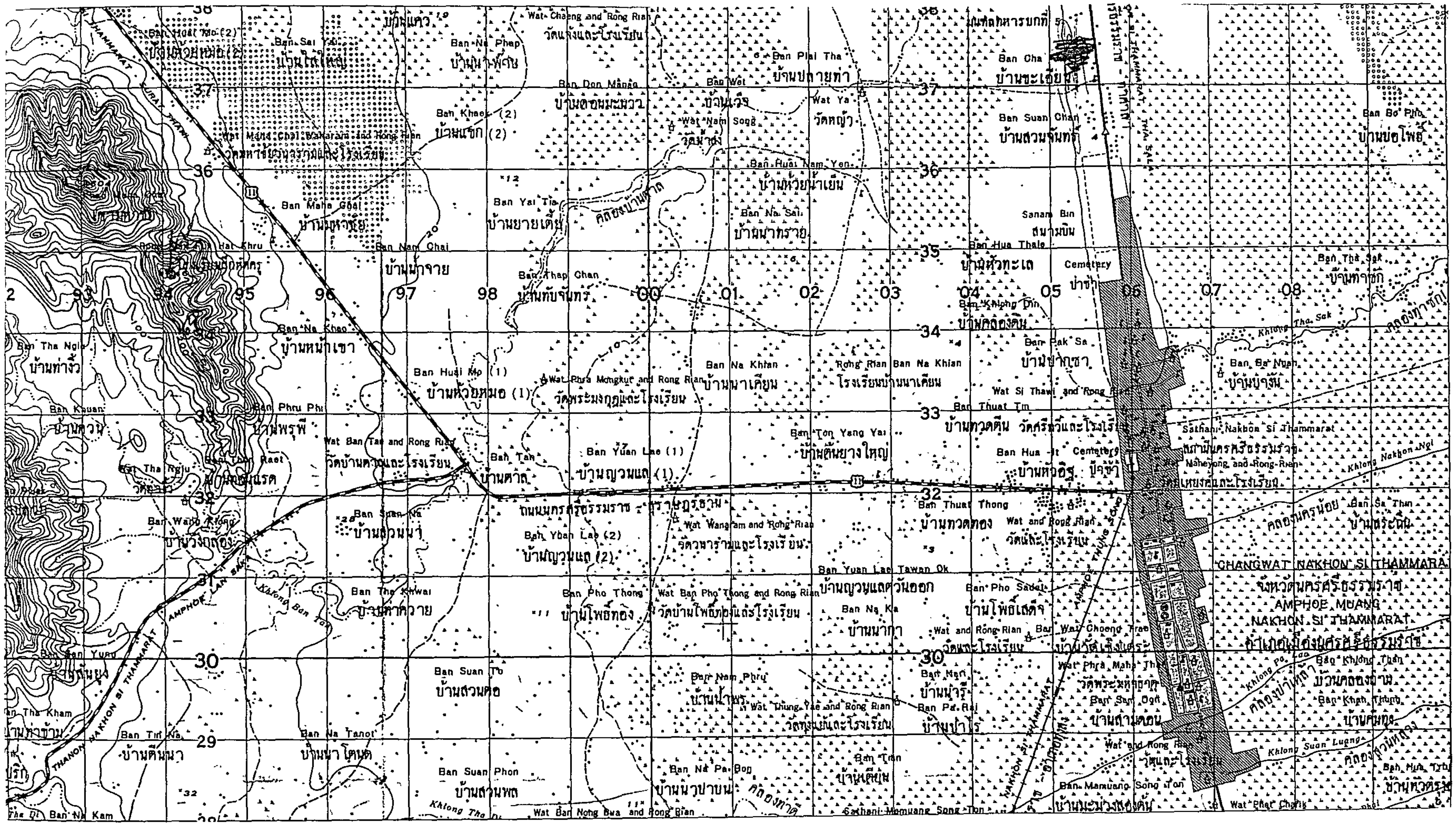

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Fig. S-5-1 LOCATION OF TRANSMITTING SITE (NAKHON SI THAMMARAT STATION)

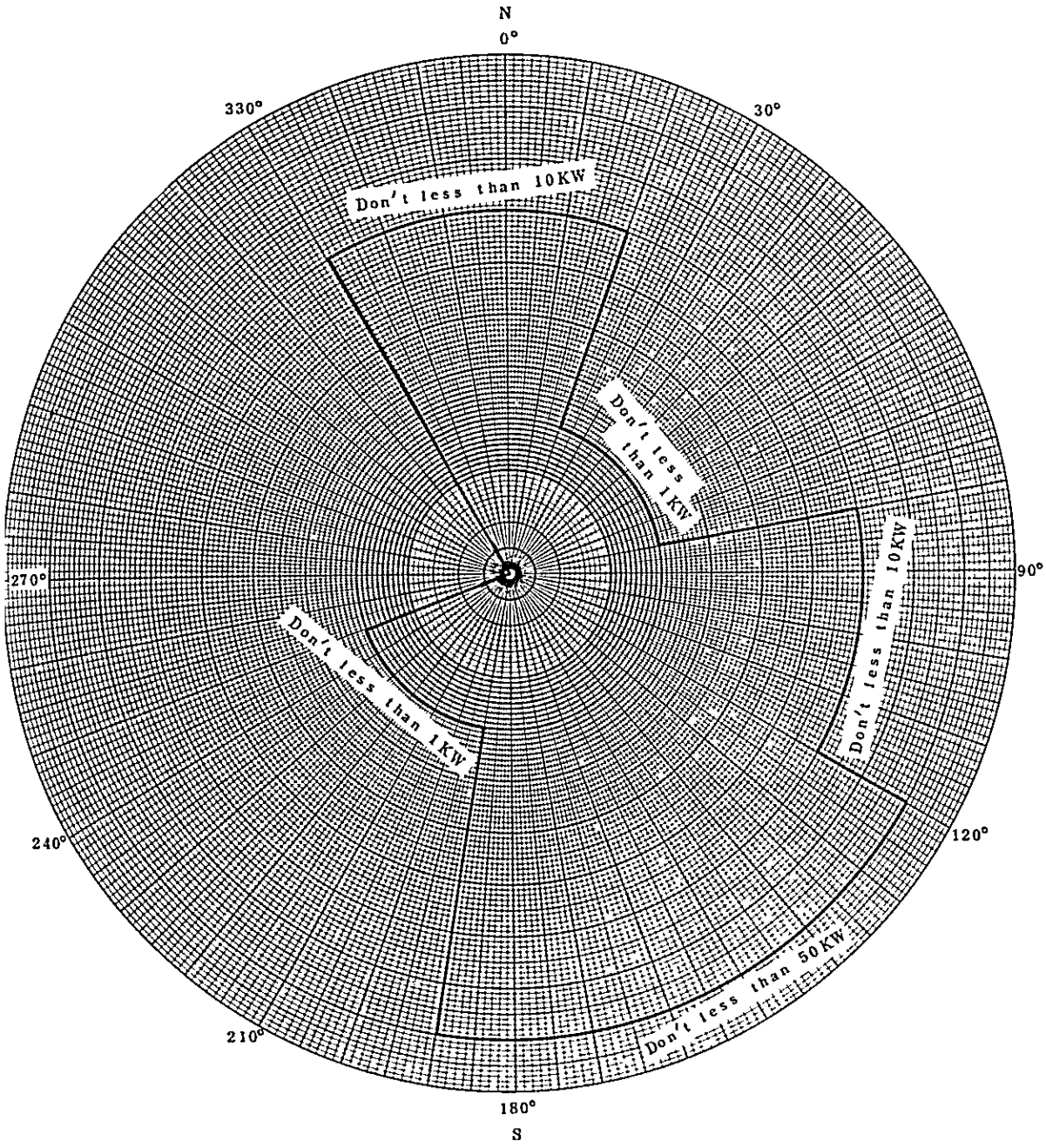

Fig. S-5-2 HORIZONTAL PATTERN OF REQUIRED E.R.P. (NAKHON SI THAMMARAT STATION)

TABLE S-5-2 List of TV Transmitting Facilities

Nakhon Si Thammarat Station, 1st Channel

Item	Description	Q'ty
(A)	TV Transmitting Facilities	1 set
1.	2 KW TV Transmitter	1 set
2.	Output Coaxial Equipment (Including Air Cooled Test Load)	1 set
3.	Transmitting Antenna	1 set
4.	Transmitting Feeder System	1 set
5.	30 Meters Antenna Tower	1 set
6.	Transmitter Input and Monitoring Equipment	1 set
7.	Measuring Instruments	1 set
8.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
9.	Emergency Power Supply	1 set
(B)	Microwave ST-Link Equipment	1 set
1.	Microwave Television Relay Equipment	1 set
2.	Program Input and Monitoring Equipment	1 set
3.	Microwave IF Demodulator	1 set
4.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
5.	Emergency Power Supply	1 set
(C)	Installation Materials	1 set
(D)	Minor Spare Parts	1 set

Nakhon Si Thammarat Station, 2nd Channel (Future Extension)

Item	Description	Q'ty
(A)	TV Transmitting Facilities	1 set
1.	2 KW TV Transmitter	1 set
2.	Output Coaxial Equipment (Including Two-channel Combining Equipment)	1 set
3.	Transmitter Input and Monitoring Equipment	1 set
4.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
5.	Emergency Power Supply	1 set
(B)	Microwave ST-Link Equipment	1 set
1.	Microwave Television Relay Equipment	1 set
2.	Program Input and Monitoring Equipment	1 set
3.	Microwave IF Demodulator	1 set
4.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
5.	Emergency Power Supply	1 set
(C)	Installation Materials	1 set
(D)	Minor Spare Parts	1 set

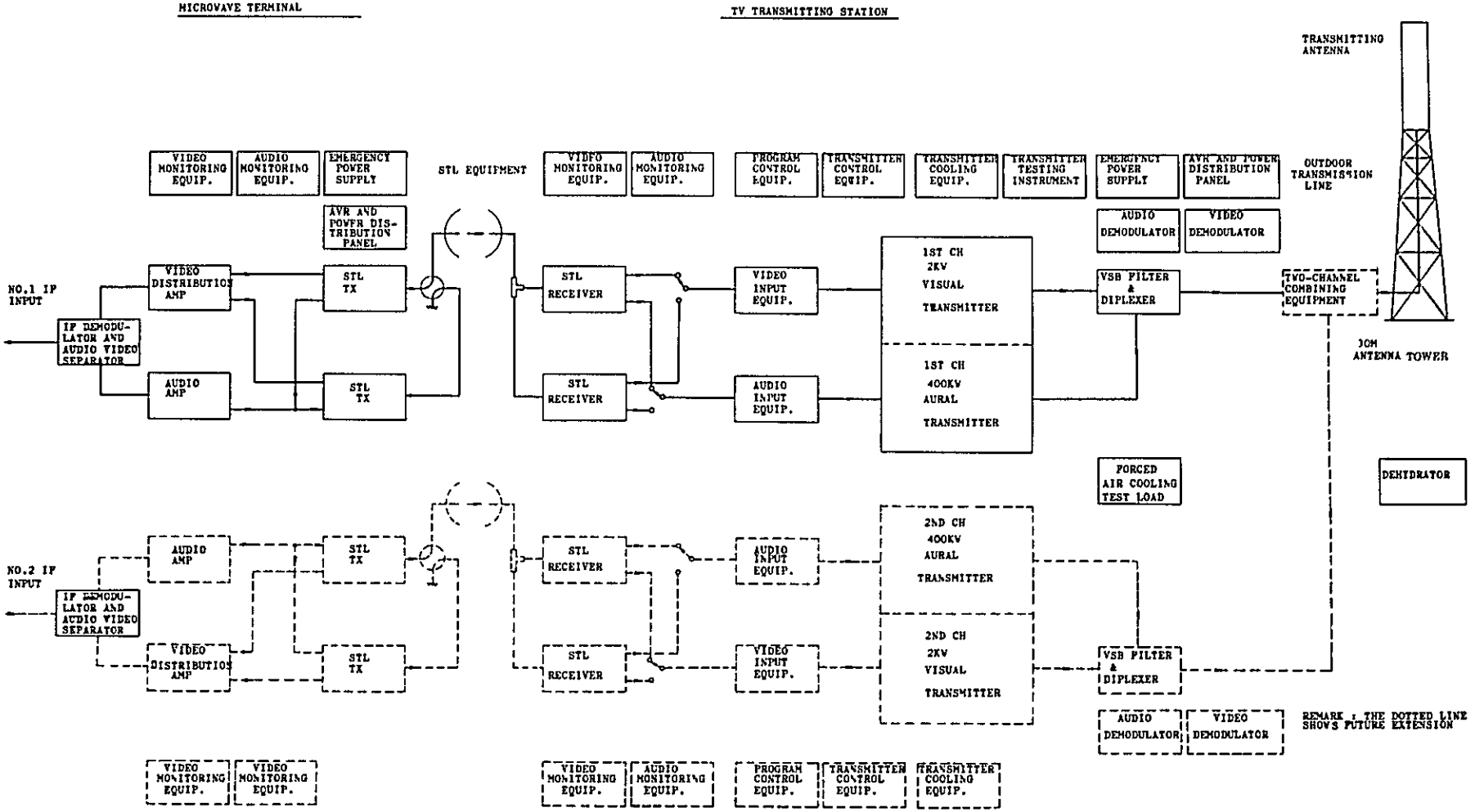

Fig. S-5-3 SCHEMATIC DIAGRAM OF TV TRANSMITTING FACILITIES FOR NAKHON SI THAMMARAT STATION

S-6 Phuket

A good line-of-sight distance to the city of Phuket can be obtained from the mountain, east of the city. The site is suitable for covering the remaining principal part of Phuket Island. Besides, roads are under construction at present.

Broadcasting programs will be supplied by receiving the signals from the translator (Ao Luk) station which is received the signals from Surat Thani Station.

TABLE S-6-1 Main Specifications of Phuket Station

Name of Station		Phuket
Type of Station		Translator
Transmitting Site	Site	Ref. to Fig. S-6-1
	Latitude and Longitude	7°53'48" N. 98°24'2" E.
	Altitude	285 m
	Access Road	—
Transmitting Channel No.		8, 12
Transmitting Antenna	Height of Tower	30 m, Ref. to Fig. 3-1-11
	Polarization	Horizontal
	Required E.R.P.	Max. 5 kW, Ref. to Fig. S-6-2
Output Power of Transmitter		300 W, Ref. to Fig. 3-1-12 & Table S-6-2
Service Area	Area	Greater part of Phuket province
	Population Covered	67,000 persons
Studio	Building	—
	Facilities	—
Receiving Station	Name	Phuket
	Site	Same as the transmitting site
Master Station		Ao Luk Translator
Station Building		48 m^2, Ref. to Fig. 3-1-4 & Fig. 3-1-6
(Thousand Bahts) Construction Cost (1st Channel)	Equipment	1,886
	Building, Road, etc.	100
	Total	1,986

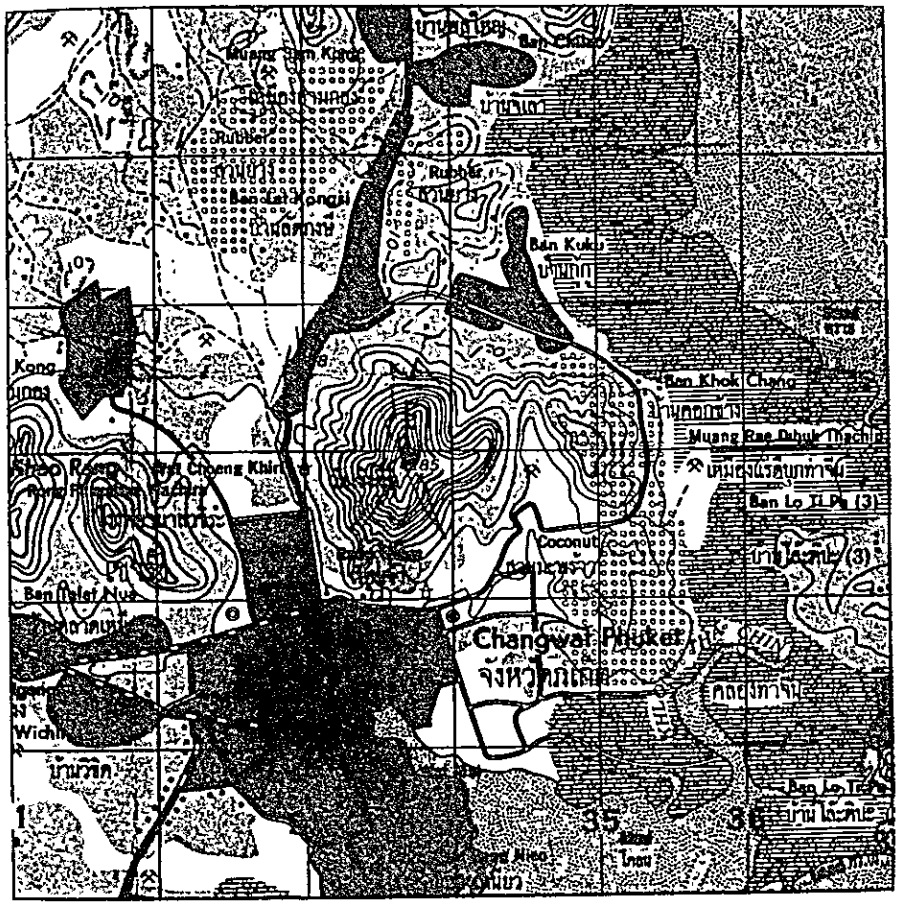

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Fig. S-6-1 LOCATION OF TRANSMITTING SITE (PHUKET STATION)

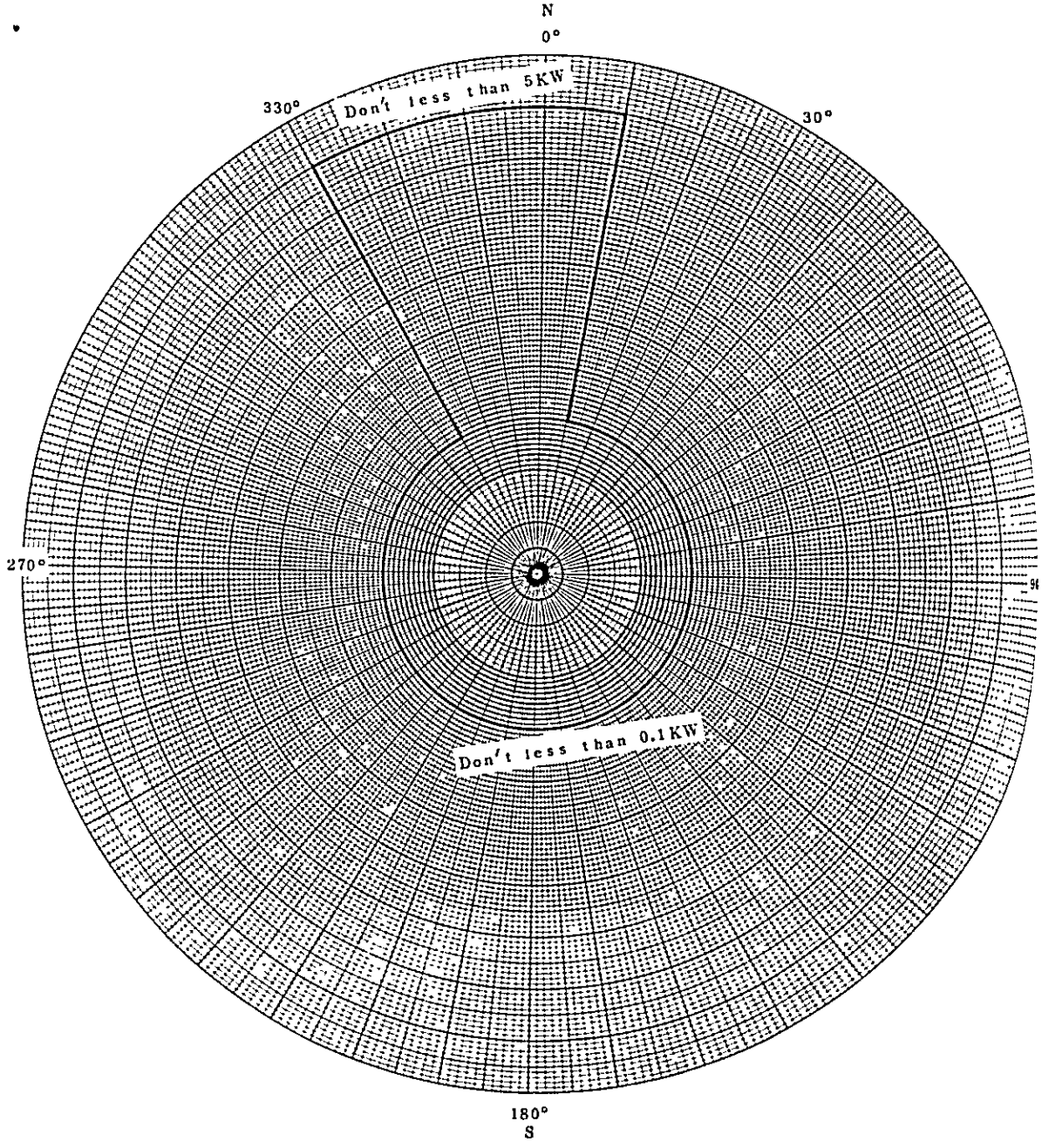

Fig. S-6-2 HORIZONTAL PATTERN OF REQUIRED E.R.P. (PHUKET STATION)

TABLE S-6-2 List of TV Transmitting Facilities

Phuket Translator Station, 1st Channel

Item	Description	Q'ty
1.	300 W TV Translator	2 sets
2.	Coaxial Equipment (Including Air Cooled Test Load, Input Filter and Output Filter, etc.)	1 set
3.	Transmitting Antenna	1 set
4.	Transmitting Feeder System	1 set
5.	30 Meters Antenna Tower	1 set
6.	Monitoring Equipment	1 set
7.	Receiving Antenna and Feeder System	1 set
8.	Maintenance Instrument	1 set
9.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
10.	Emergency Power Supply	1 set
11.	Installation Materials	1 set
12.	Minor Spare Parts	1 set

Phuket Translator Station, 2nd Channel (Future Extension)

Item	Description	Q'ty
1.	300 W TV Translator	2 sets
2.	Coaxial Equipment (Including Air Cooled Test Load, Input and Output Filter, and Two-channel Combining Equipment, etc.)	1 set
3.	Monitoring Equipment	1 set
4.	Receiving Antenna and Feeder System	1 set
5.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
6.	Emergency Power Supply	1 set
7.	Installation Materials	1 set
8.	Minor Spare Parts	1 set

S-7 Trang

Trang City is situated in the center of the Province. Accordingly, a hill (75 meter) located in the southernpart of the city will be used.

Programs will be supplied from the microwave terminal station, to be established on the same hill, through the cable system.

TABLE S-7-1 Main Specifications of Trang Station

Name of Station		Trang
Type of Station		TV Broadcasting Station
Transmitting Site	Site	Khao Pleo, Ref. to Fig. S-7-1
	Latitude and Longitude	7°32'53" N. 99°36'03" E.
	Altitude	75 m
	Access Road	1 km
Transmitting Channel No.		9, 11
Transmitting Antenna	Height of Tower	30 m, Ref. to Fig. 3-1-11
	Polarization	Horizontal
	Required E.R.P.	Max. 15 kW, Ref. to Fig. S-7-2
Output Power of Transmitter		1 kW, Ref.to Fig. S-7-3 & Table S-7-2
Service Area	Area	Greater part of Trang province
	Population Covered	205,000 persons
Studio	Building	—
	Facilities	—
Receiving Station	Name	—
	Site	—
Master Station		—
Station Building		148 m^2, Ref. to Fig. 3-1-2 Fig. 3-1-6
Construction Cost (Thousand Bahts) (1st Channel)	Equipment	3,066
	Building, Road, etc.	400
	Total	3,466

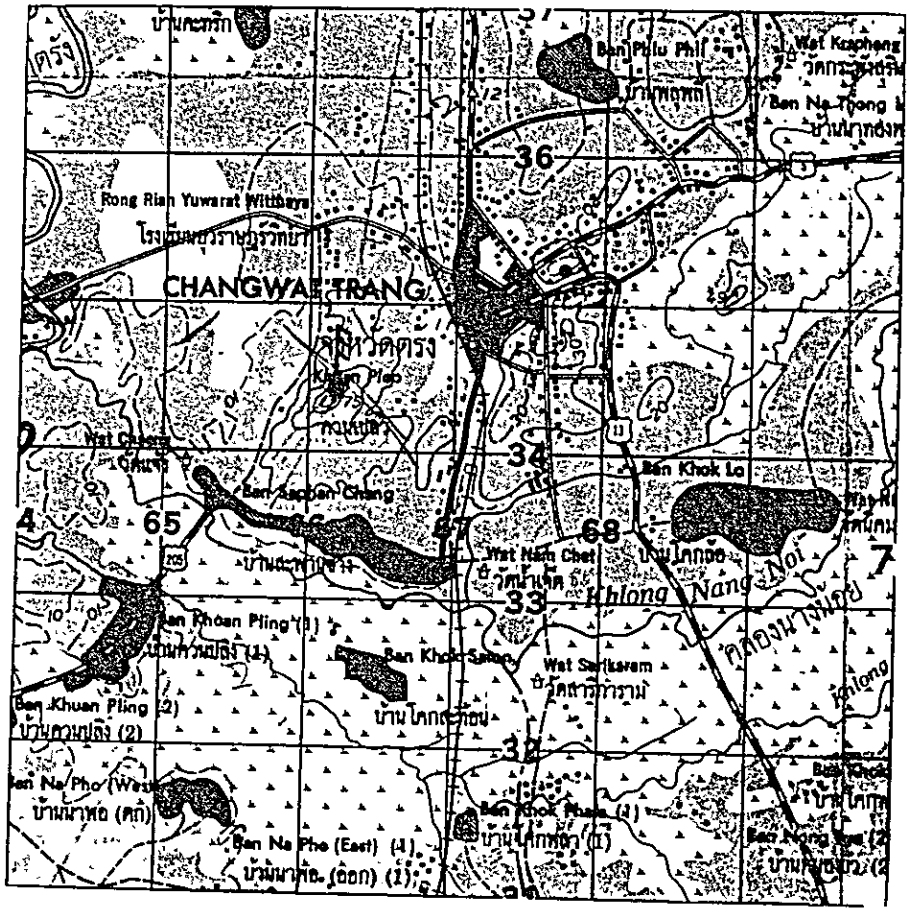

Fig. S-7-1 LOCATION OF TRANSMITTING SITE (TRANG STATION)

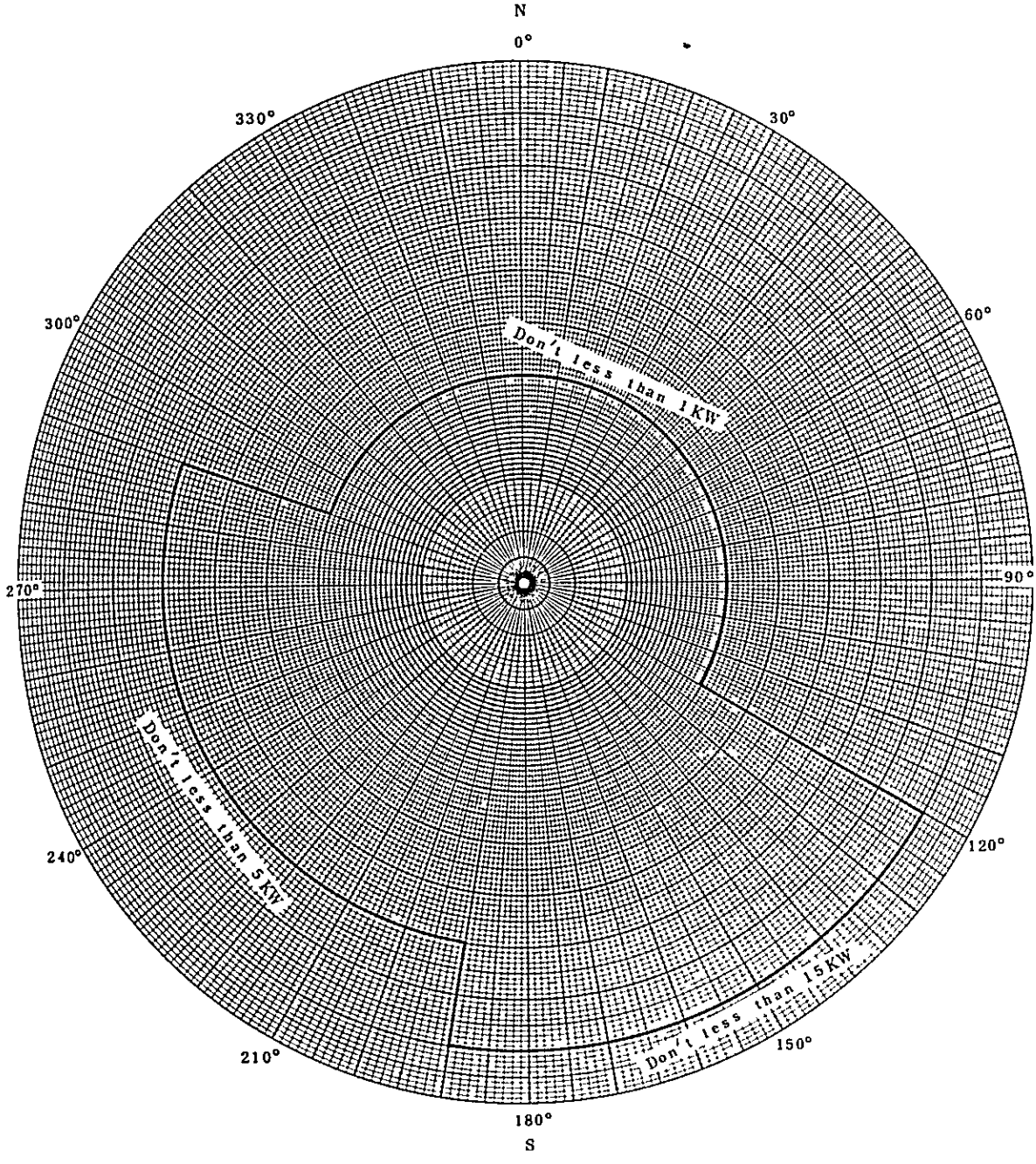

Fig. S-7-2 HORIZONTAL PATTERN OF REQUIRED E.R.P. (TRANG STATION)

TABLE S-7-2 List of TV Transmitting Facilities

Trang Station, 1st Channel

Item	Description	Q'ty
(A)	TV Transmitting Facilities	1 set
1.	1 KW TV Transmitter	1 set
2.	Output Coaxial Equipment (Including Air Cooled Test Load)	1 set
3.	Transmitting Antenna	1 set
4.	Transmitting Feeder System	1 set
5.	30 Meters Antenna Tower	1 set
6.	Transmitter Input and Monitoring Equipement	1 set
7.	Measuring Instruments	1 set
8.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
9.	Emergency Power Supply	1 set
(B)	Cable Link Equipment	1 set
1.	Video and Audio Terminal Equipment	1 set
2.	Transmission Line	1 set
3.	Microwave IF Demodulator	1 set
4.	Monitoring Equipment	1 set
5.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
6.	Emergency Power Supply	1 set
(C)	Installation Materials	1 set
(D)	Minor Spare Parts	1 set

Trang Station, 2nd Channel (Future Extension)

Item	Description	Q'ty
(A)	TV Transmitting Facilities	1 set
1.	1 KW TV Transmitter	1 set
2.	Output Coaxial Equipment (Including Two-channel Combining Equipment)	1 set
3.	Transmitter Input and Monitoring Equipment	1 set
4.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
5.	Emergency Power Supply	1 set
(B)	Cable Link Equipment	1 set
1.	Video and Audio Terminal Equipment	1 set
2.	Microwave IF Demodulator	1 set
3.	Monitoring Equipment	1 set
4.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
5.	Emergency Power Supply	1 set
(C)	Installation Material	1 set
(D)	Minor Spare Parts	1 set

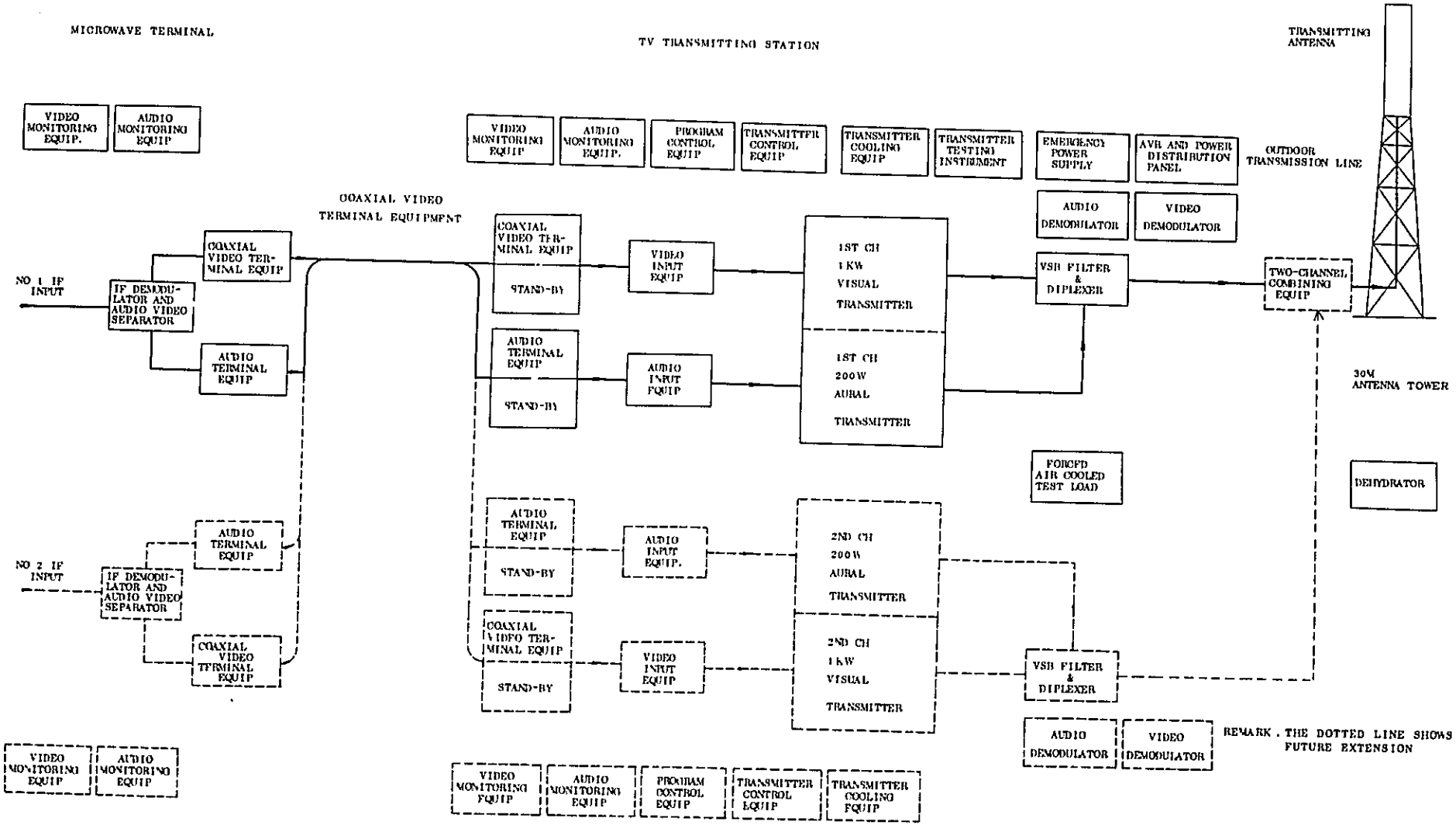

Fig. S-7-3 SCHEMATIC DIAGRAM OF TV TRANSMITTING FACILITIES FOR TRANG STATION

S-8 Yala

Provinces which are situated close to the border of Malaysia and where service from Haad Yai Station is difficult, are Yala, Pattani, and Na Ra Thi Wat. They occupy comparatively extensive areas and have many mountains. It is necessary to prepare against the probable interference, because TV broadcasting waves from Malaysia may reach here.

As for the method of service, establishment of several translator stations are conceivable. However, in view of the above situation, the number of stations should be curtailed as few as possible. It is more advantageous to cover the whole area by one station from a mountain as high as possible and with big power because there are many mountains. For these reasons Khan Nam Kang was selected. In this case, it is impossible to use a big power under the translator system. Therefore, ordinary system was adopted, and broadcasting programs will be supplied through microwave transmission system.

TABLE S-8-1 Main Specifications of Yala Station

Name of Station		Yala
Type of Station		TV Broadcasting Station
Transmitting Site	Site	Khao Nam Kang, Ref. to Fig. S-8-1
	Latitude and Longitude	6°31'16" N. 102°31'57" E.
	Altitude	767 m
	Access Road	10 km
Transmitting Channel No.		9,12
Transmitting Antenna	Height of Tower	30 m, Ref. to Fig. 3-1-11
	Polarization	Horizontal
	Required E.R.P.	Max. 150 kW, Ref. to Fig. S-8-2
Output Power of Transmitter		10 kW, Ref. to Fig. S-8-3 & Table S-8-2
Service Area	Area	Greater part of Yala, Pattani and Na Ra Thi Wat province
	Population Covered	566,000 persons
Studio	Building	—
	Facilities	—
Receiving Station	Name	—
	Site	—
Master Station		—
Station Building		199 m^2, Ref. to Fig. 3-1-1 & Fig. 3-1-5
(Thousand Bahts) Construction Cost (1st Channel)	Equipment	3,754
	Building, Road, etc.	7,400
	Total	11,154

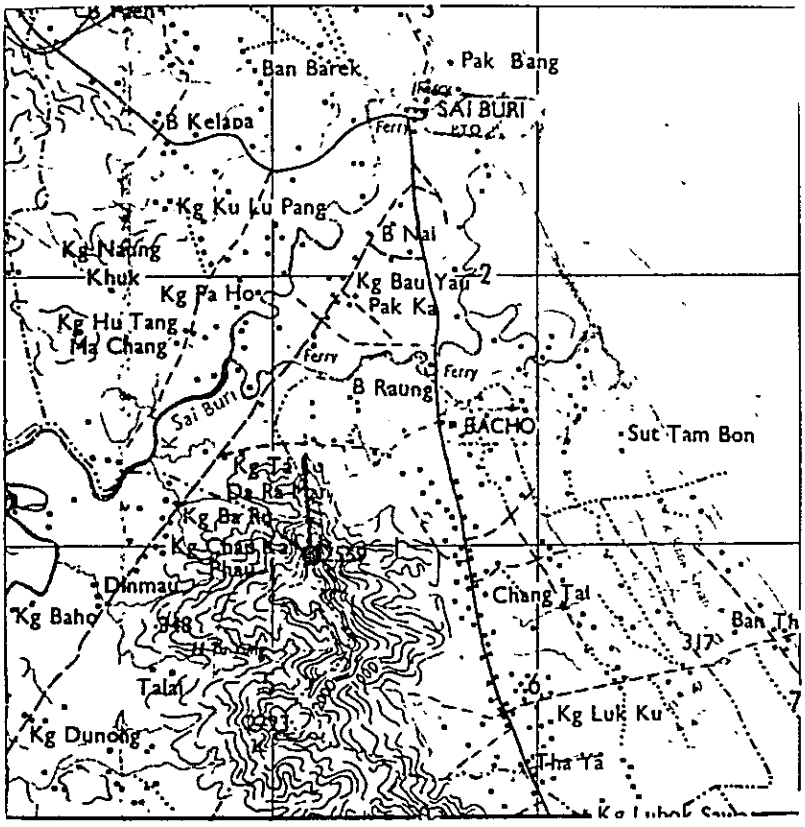

Fig. S-8-1 LOCATION OF TRANSMITTING SITE (YALA STATION)

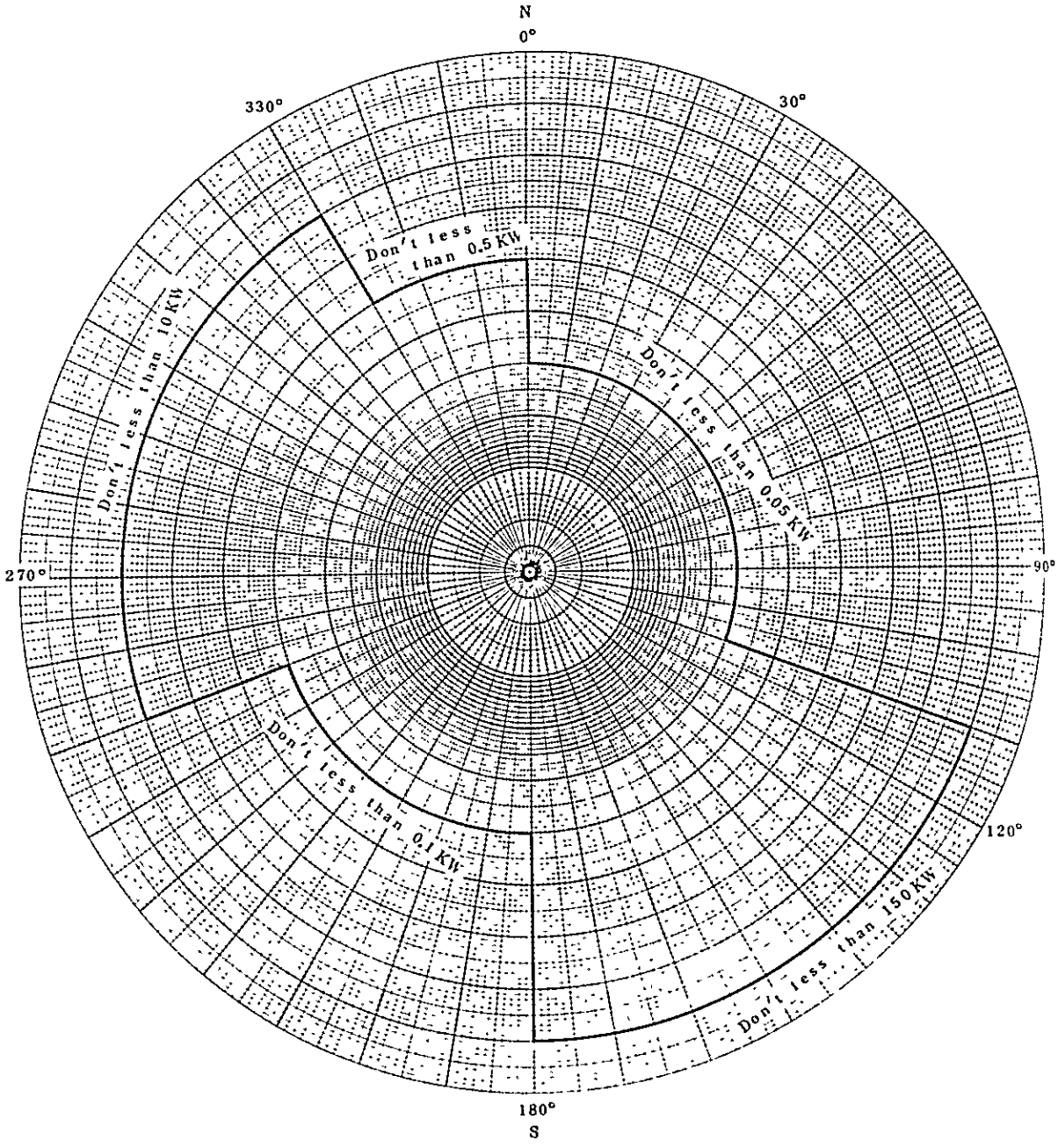

Fig. S-8-2 HORIZONTAL PATTERN OF REQUIRED E.R.P. (YALA STATION)

TABLE S-8-2 List of TV Transmitting Facilities

Yala Station, 1st Channel

Item	Description	Q'ty
(A)	TV Transmitting Facilities	1 set
1.	10 KW TV Transmitter	1 set
2.	Output Coaxial Equipment (Including Air Cooled Test Load)	1 set
3.	Transmitting Antenna	1 set
4.	Transmitting Feeder System	1 set
5.	30 Meters Antenna Tower	1 set
6.	Transmitter Input and Monitoring Equipment	1 set
7.	Measuring Instruments	1 set
8.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
9.	Emergency Power Supply	1 set
(B)	Cable Link Equipment	1 set
1.	Video and Audio Terminal Equipment	1 set
2.	Transmission Line	1 set
(C)	Installation Materials	1 set
(D)	Minor Spare Parts	1 set

Yala Station, 2nd Channel (Future Extension)

Item	Description	Q'ty
(A)	TV Transmitting Facilities	1 set
1.	10 KW TV Transmitter	1 set
2.	Output Coaxial Equipment (Including Air Cooled Test Load and Two-channel Combining Equipment)	1 set
3.	Transmitter Input and Monitoring Equipment	1 set
4.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
5.	Emergency Power Supply	1 set
(B)	Cable Link Equipment	
1.	Video and Audio Terminal Equipment	1 set
(C)	Installation Materials	1 set
(D)	Minor Spare Parts	1 set

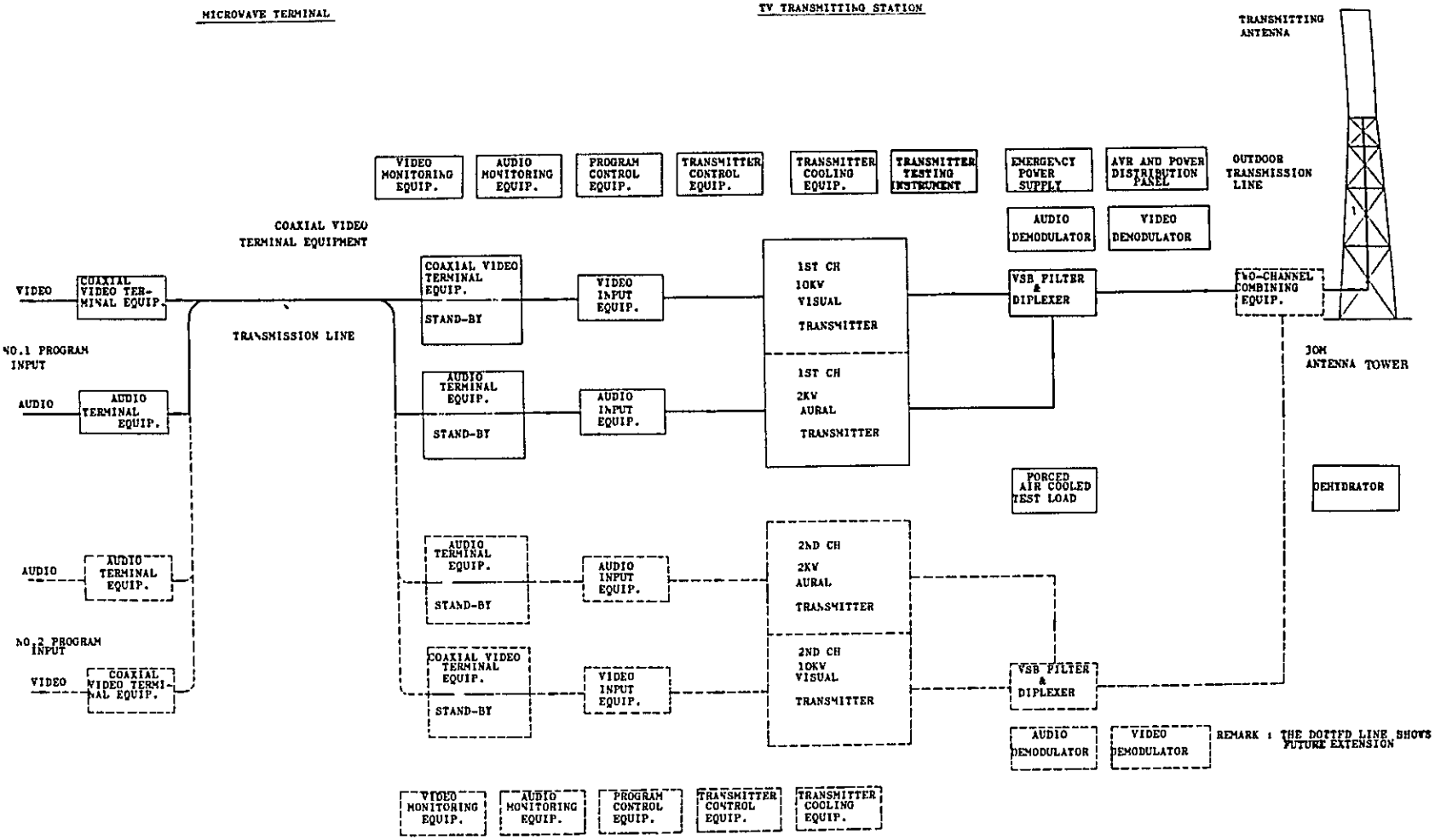

Fig. S-8-3 SCHEMATIC DIAGRAM OF TV TRANSMITTING FACILITIES FOR YALA STATION

S-9 Thung Song

Inside Nakhon Si Thammarat Provinces, Thung Song and two other districts lie, for topographical reasons, outside the service area of Nakhon Si Thammarat TV Station. These 3 districts have comparatively reasonable population, and the service efficiency is high for topographical reasons.

Since Thung Song City is a railway key center, construction of a translator station having Nakhon Si Thammarat Station as its measter station and serving the whole area was considered.

Khao Tao which has a good line-of-sight distance to the 3 districts and where it is easy to receive the signals from Nakhon Si Thammarat Station was selected as the transmitting point.

TABLE S-9-1 Main Specifications of Thung Song Station

Name of Station		Thung Song
Type of Station		Translator
Transmitting Site	Site	Khao Tao, Ref. to Fig. S-9-1
	Latitude and Longitude	8°3'35" N. 99°30'25" E.
	Altitude	321 m
	Access Road	4 km
Transmitting Channel No.		5, 7
Transmitting Antenna	Height of Tower	30 m, Ref. to Fig. 3-1-11
	Polarization	Horizontal
	Required E.R.P.	Max. 3 kW, Ref. to Fig. S-9-2
Output Power of Transmitter		300 W, Ref. to Fig. 3-1-12 & Table S-9-2
Service Area	Area	Some part of Nakhon Si Thammarat province
	Population Covered	158,000 persons
Studio	Building	—
	Facilities	—
Receiving Station	Name	Thung Song
	Site	Same as the transmitting site
Master Station		Nakhon Si Thammarat
Station Building		48 m^2, Ref. to Fig. 3-1-4 & Fig. 3-1-6
(Thousand Bahts) Construction Cost (1st Channel)	Equipment	1,880
	Building, Road, etc.	3,100
	Total	4,980

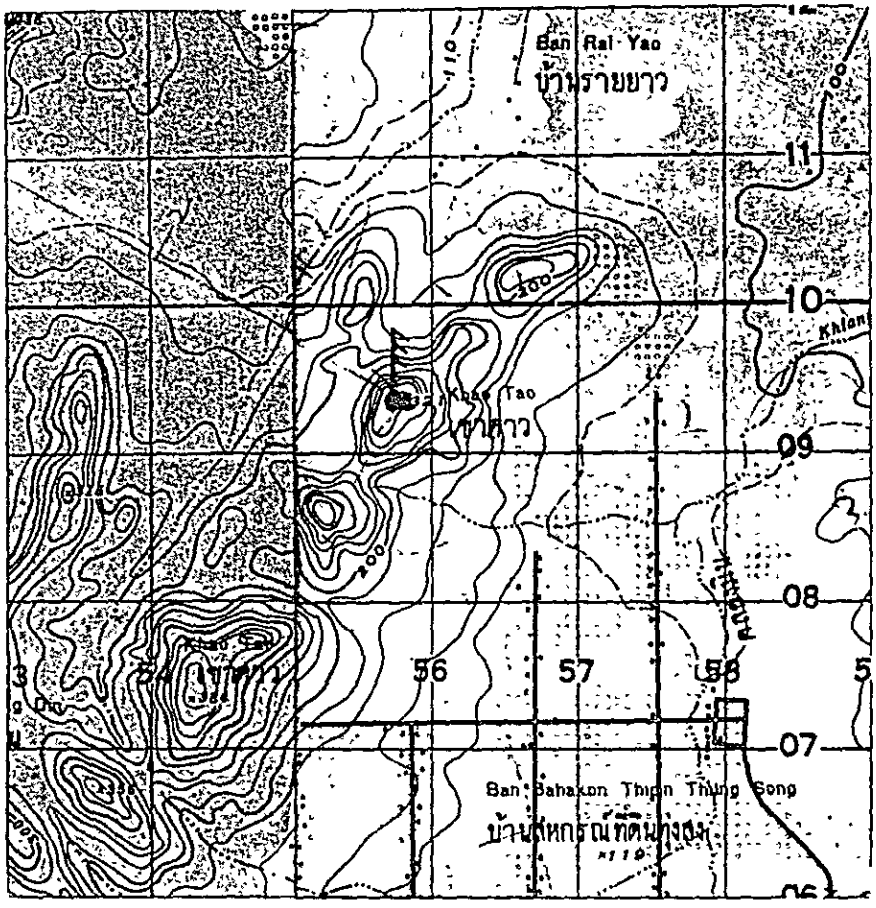

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Fig. S-9-1 LOCATION OF TRANSMITTING SITE (THUNG SONG STATION)

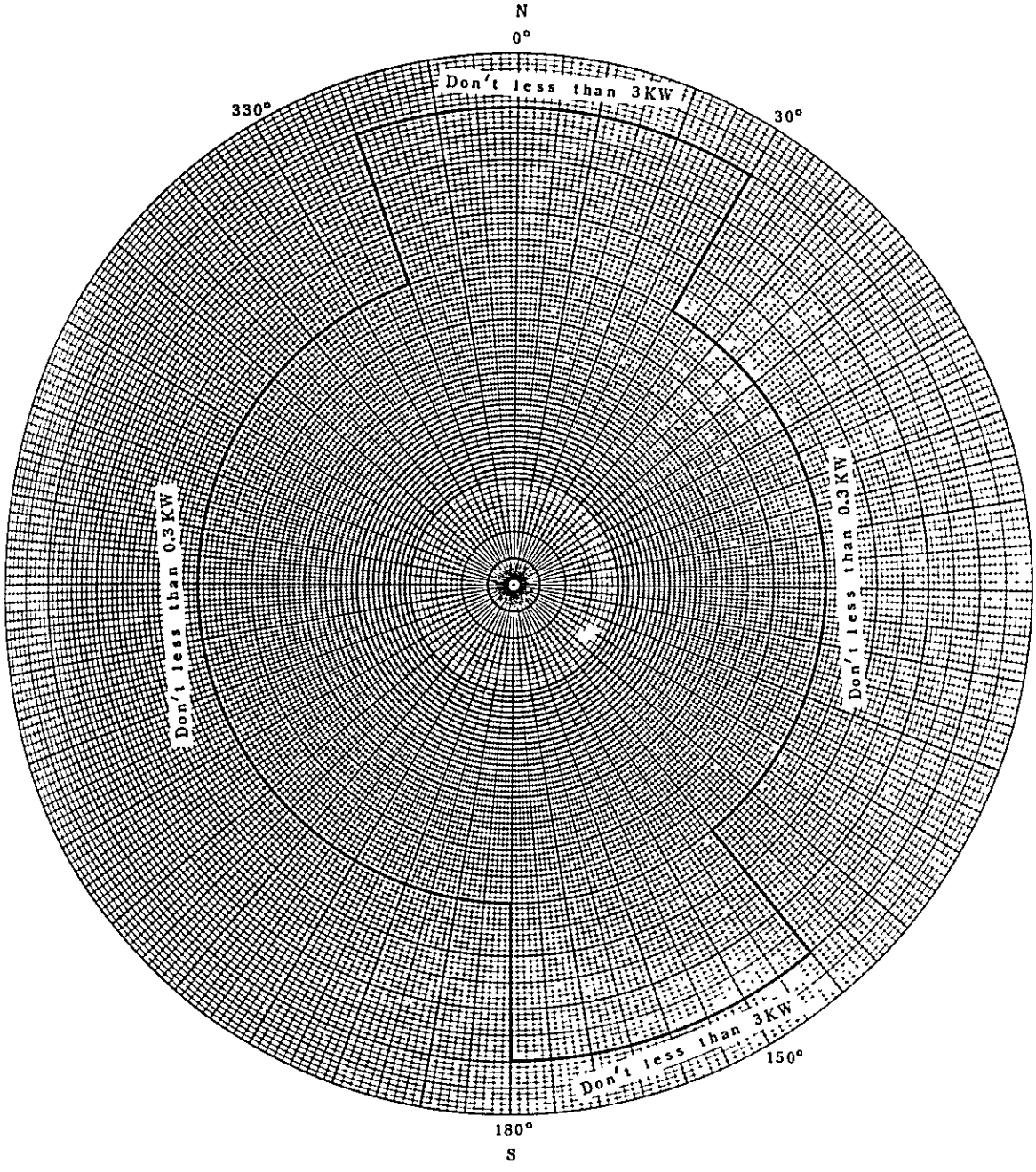

Fig. S-9-2 HORIZONTAL PATTERN OF REQUIRED E.R.P. (THUNG SONG STATION)

TABLE S-9-2 List of TV Transmitting Facilities

Thung Song Translator Station, 1st Channel

Item	Description	Q'ty
1.	300 W TV Translator	2 sets
2.	Coaxial Equipment (Including Air Cooled Test Load, Input Filter and Output Filter, etc.)	1 set
3.	Transmitting Antenna	1 set
4.	Transmitting Feeder System	1 set
5.	30 Meters Antenna Tower	1 set
6.	Monitoring Equipment	1 set
7.	Receiving Antenna and Feeder System	1 set
8.	Maintenance Instrument	1 set
9.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
10.	Emergency Power Supply	1 set
11.	Installation Materials	1 set
12.	Minor Spare Parts	1 set

Thung Song Translator Station, 2nd Channel (Future Extension)

Item	Description	Q'ty
1.	300 W TV Translator	2 sets
2.	Coaxial Equipment (Including Air Cooled Test Load, Input and Output Filter, and Two-channel Combining Equipment, etc.)	1 set
3.	Monitoring Equipment	1 set
4.	Receiving Antenna and Feeder System	1 set
5.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
6.	Emergency Power Supply	1 set
7.	Installation Materials	1 set
8.	Minor Spare Parts	1 set

S-10 Ao Luk

Off-the-air pick up of a station at Trang, Thung Song or Surat Thani as the program relaying route to Phuket is conceivable. However, the route from Surat Thani requires the least relay stations and is advantageous because a place near the trunk road can be selected as the site of the relay station.

This relay broadcasting station on the top of Mt. Khao Pa will be the master station to Phuket and at the same time will serve the surrounding areas such as Ao Luk country (Krabi Province) and the greater part of Thap Put (Phang Nga Province), and also will become the master station for translator stations serving Phang Nga City and Krabi City in the future.

TABLE S-10 Main Specifications of Ao Luk Station

Name of Station		Ao Luk
Type of Station		Translator
Transmitting Site	Site	Khao Sa, Ref. to Fig. S-10-1
	Latitude and Longitude	8°28'51" N. 98°44'47" E.
	Altitude	342 m
	Access Road	4.5 km
Transmitting Channel No.		6, 10
Transmitting Antenna	Height of Tower	30 m, Ref. to Fig. 3-1-11
	Polarization	Horizontal
	Required E.R.P.	Max. 3 kW, Ref. to Fig. S-10-2
Output Power of Transmitter		300 W, Ref. to Fig. 3-1-12 & Table S-10-2
Service Area	Area	Some Part of Phang Nga and Krabi Province
	Population Covered	28,000 persons
Studio	Building	—
	Facilities	—
Receiving Station	Name	Ao Luk
	Site	Same as the transmitting site
Master Station		Surat Thani
Station Building		48 m^2, Ref. to Fig. 3-1-4 & Fig. 3-1-6
(Thousand Bahts) Construction Cost (1st Channel)	Equipment	1,938
	Building, Road, etc.	3,100
	Total	5,038

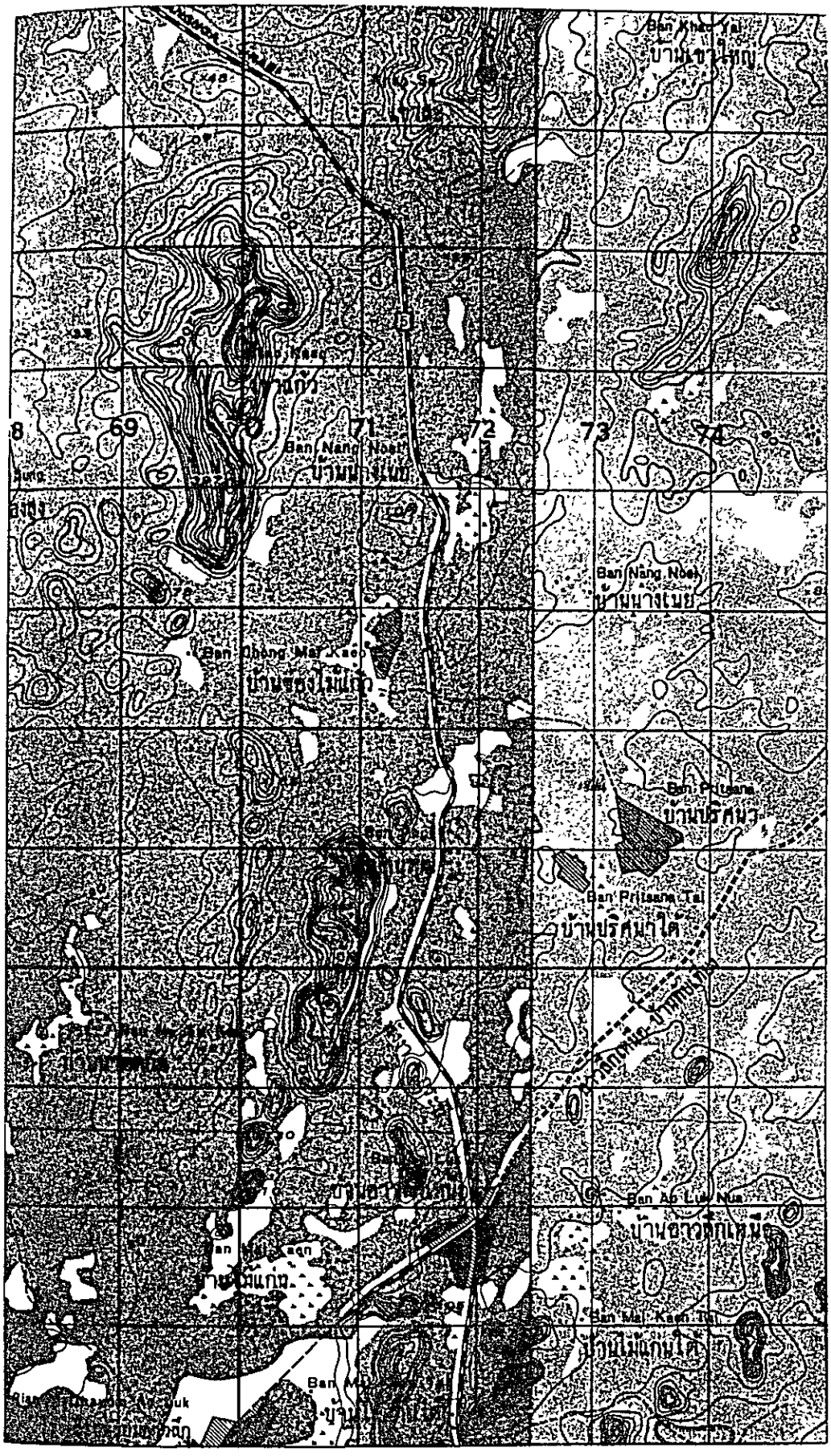

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Fig. S-10-1 LOCATION OF TRANSMITTING SITE (AO LUK STATION)

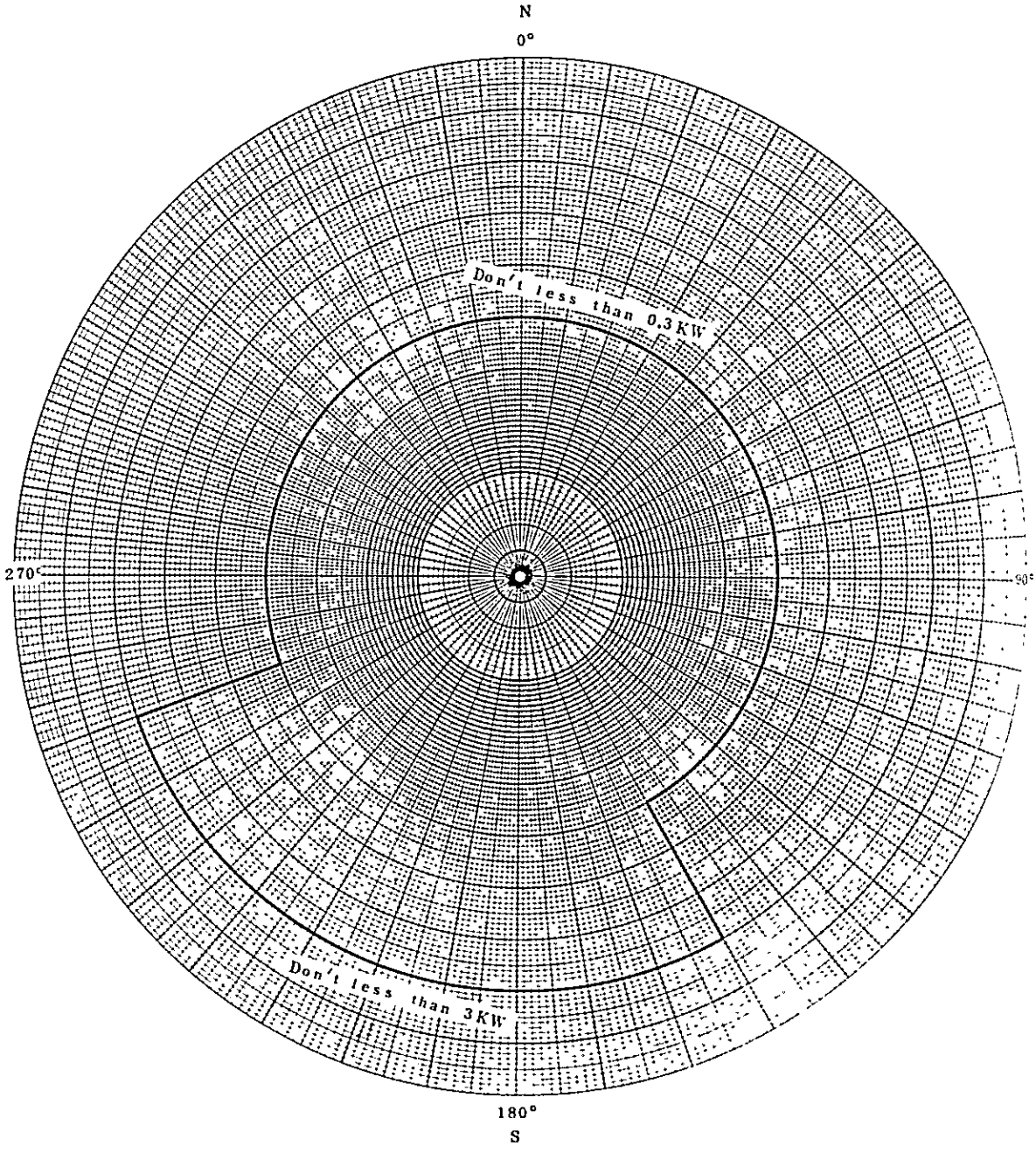

Fig. S-10-2 HORIZONTAL PATTERN OF REQUIRED E.R.P. (AO LUK STATION)

TABLE S-10-2 List of TV Transmitting Facilities

Ao Luk Translator Station, 1st Channel

Item	Description	Q'ty
1.	300 W TV Translator	2 sets
2.	Coaxial Equipment (Including Air Cooled Test Load, Input Filter and Output Filter, etc.)	1 set
3.	Transmitting Antenna	1 set
4.	Transmitting Feeder System	1 set
5.	30 Meters Antenna Tower	1 set
6.	Monitoring Equipment	1 set
7.	Receiving Antenna and Feeder System	1 set
8.	Maintenance Instrument	1 set
9.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
10.	Emergency Power Supply	1 set
11.	Installation Materials	1 set
12.	Minor Spare Parts	1 set

Ao Luk Translator Station, 2nd Channel (Future Extension)

Item	Description	Q'ty
1.	300 W TV Translator	2 sets
2.	Coaxial Equipment (Including Air Cooled Test Load, Input and Output Filter, and Two-Channel Combining Equipment, etc.)	1 set
3.	Monitoring Equipment	1 set
4.	Receiving Antenna and Feeder System	1 set
5.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
6.	Emergency Power Supply	1 set
7.	Installation Materials	1 set
8.	Minor Spare Parts	1 set

3.2.2 Northern Region

(1) Outline

The Northern part of Thailand consists of the wide plain flanked by the mountainous area which extends widely on the west side from the frontier with Burma and the mountainous area in the northeastern Thailand on the east side and the plateau land as seen in such areas as Chiang Mai, Lampang, etc.

In case a station is installed in the plain south of Uttradit, the transmitting antenna height will have to be within 100 - 200 m, and the radius of the service area also will be only up to 70 Km at the maximum. Therefore, the suitable transmitting points are found to be Bangkok, then the vicinity of Lop Buri City, and then the vicinities of such cities as Nakhon Sawan, Phitsanulok and Uttradit. In the plateau area, some of the plateaus are large. The population is also large and distributed considerably in the mountainous areas. Therefore, it is recommended to use the top of a high mountain having a good profile as much as possible, taking future installation of translator stations into consideration.

Programs will mostly be carried through microwave radio link. However, translator system will be adopted for Chiang Rai and 2 - 3 other stations.

N-1 Lop Buri

The servicing of the provinces of Sara Buri, Ang Thong, Suphan Buri, which are difficult to service from Bangkok, must be taken into consideration. Geographically, Lop Buri extends more than 70 kilometers to the West, and even more to the East, but except towards Sara Buri, the area is sparsely populated and mountainous, the result of which makes for difficulty in servicing.

Although Lop Buri has a mountain in the army base which can be used as transmitting point, but from construction points of view and Sara Buri servicing, there will be problems.

Because there is no other suitable mountain, in order to facilitate the Sara Buri City servicing, we decide to erect a 100 meter mast in Lop Buri City. For its site, it is feasible to select a spot within 500 meters from the microwave repeating terminal station.

Broadcasting programs will be furnished by cable from the microwave repeating terminal station.

TABLE N-1-1 Main Specifications of Lop Buri Station

Name of Station		Lop Buri
Type of Station		TV Broadcasting Station
Transmitting Site	Site	Near the microwave relaying station Ref. to Fig. N-1-1
	Latitude and Longitude	14°47'43" N. 100°37'56" E.
	Altitude	12 m
	Access Road	—
Transmitting Channel No.		6, 10
Transmitting Antenna	Height of Mast	100 m, Ref. to Fig. 3-1-9
	Polarization	Horizontal
	Required E.R.P.	Max. 150 kW, Ref. to Fig. N-1-2
Output Power of Transmitter		10 kW, Ref. to Fig. N-1-3 & Table N-1-2
Service Area	Area	Lop Buri, Sara Buri, Sin Buri, Ang Thong, and Chai Nat, greater part of each province listed above. Suphan Buri, Phra Nakhon Si Ayuthaya, Nakhon Sawan, Some part of each province listed above.
	Population Covered	1,176,000 persons
Studio	Building	—
	Facilities	—
Receiving Station	Name	—
	Site	—
Master Station		—
Station Building		199 m^2, Ref. to Fig. 3-1-1 & Fig. 3-1-5
Construction Cost (Thousand Bahts) (1st Channel)	Equipment	5,127
	Building, Road, etc.	414
	Total	5,541

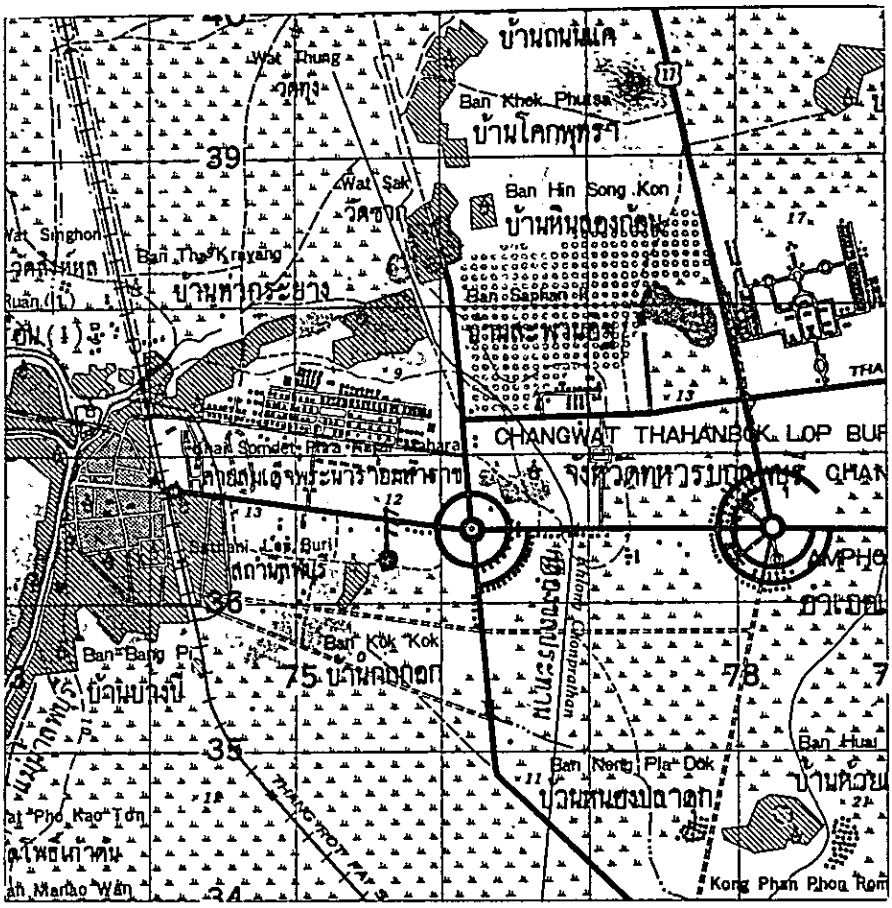

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Fig. N-1-1 LOCATION OF TRANSMITTING SITE (LOP BURI STATION)

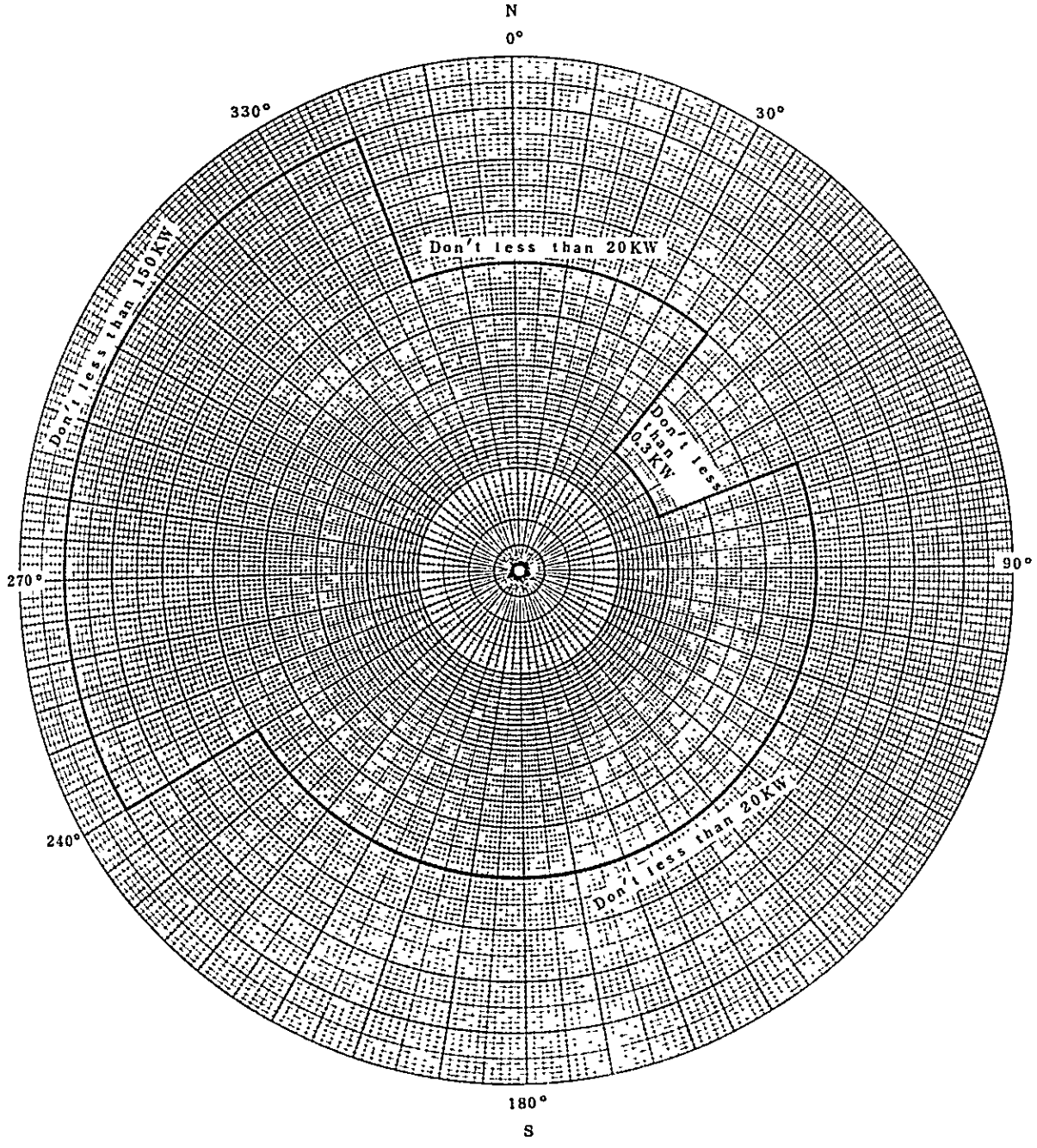

Fig. N-1-2 HORIZONTAL PATTERN OF REQUIRED E.R.P. (LOP BURI STATION)

TABLE N-1-2 List of TV Transmitting Facilities

Lop Buri Station, 1st Channel

Item	Description	Q'ty
(A)	TV Transmitting Facilities	1 set
1.	10 KW TV Transmitter	1 set
2.	Output Coaxial Equipment (Including Air Cooled Test Load)	1 set
3.	Transmitting Antenna	1 set
4.	Transmitting Feeder System	1 set
5.	100 Meters Antenna Mast	1 set
6.	Transmitter Input and Monitoring Equipment	1 set
7.	Measuring Instruments	1 set
8.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
9.	Emergency Power Supply	1 set
(B)	Cable Link Equipment	1 set
1.	Video and Audio Terminal Equipment	1 set
2.	Transmission Line	1 set
3.	Microwave IF Demodulator	1 set
4.	Monitoring Equipment	1 set
5.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
6.	Emergency Power Supply	1 set
(C)	Installation Materials	1 set
(D)	Minor Spare Parts	1 set

Lop Buri Station, 2nd Channel
(Future Extension)

Item	Description	Q'ty
(A)	TV Transmitting Facilities	1 set
1.	10 KW TV Transmitter	1 set
2.	Output Coaxial Equipment (Including Two-channel Combining Equipment)	1 set
3.	Transmitter Input and Monitoring Equipment	1 set

Item	Description	Q'ty
4.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
5.	Emergency Power Supply	1 set
(B)	Cable Link Equipment	1 set
1.	Video and Audio Terminal Equipment	1 set
2.	Microwave IF Demodulator	1 set
3.	Monitoring Equipment	1 set
4.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
5.	Emergency Power Supply	1 set
(C)	Installation Materials	1 set
(D)	Minor Spare Parts	1 set

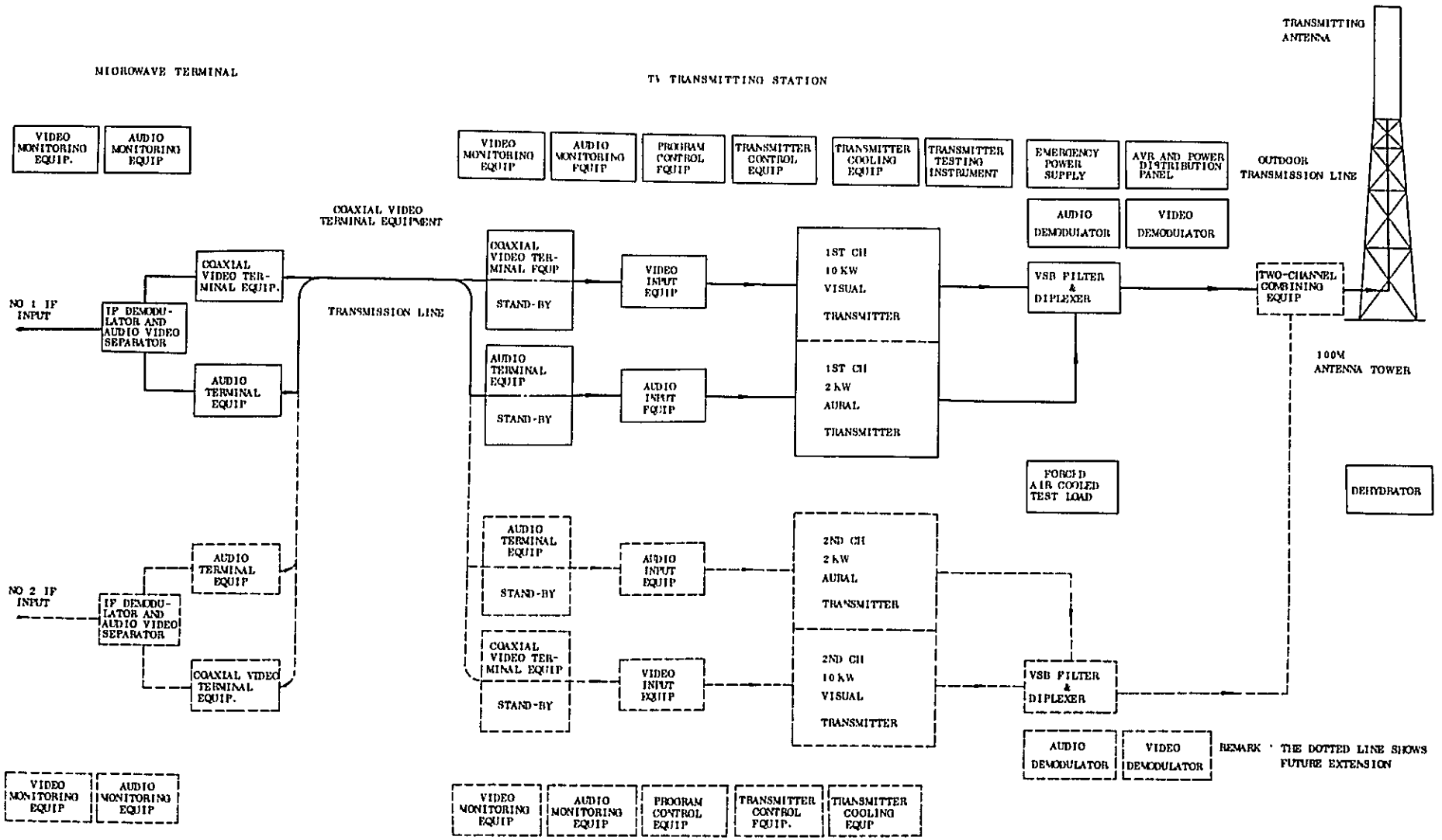

Fig. S-8-3 SCHEMATIC DIAGRAM OF TV TRANSMITTING FACILITIES FOR YALA STATION

N-2 Nakhon Sawan

Nakhon Sawan City is located about 110 Km from Lop Buri City. The city is 50 km away from the Lop Buri television station's servicing area. Also, Nakhon Sawan is located in the center of the surrounding provinces of Uthai Thani and Phichit, the result of which makes Nakhon Sawan the most suitable for the servicing of these areas.

Around the city are several hills but the most suitable appears to be "187 meter Hill", the closest to the center of the city.

Programs will be supplied via STL (radio) from the microwave repeating terminal station approximetely 2 kilometers away.

TABLE N-2-1 Main Specifications of Nakhon Sawan Station

Name of Station		Nakhon Sawan
Type of Station		TV Broadcasting Station
Transmitting Site	Site	Ref. to Fig. N-2-1
	Latitude and Longitude	15°42'58" N. 100°07'42" E.
	Altitude	187 m
	Access Road	1.5 km
Transmitting Channel No.		8, 12
Transmitting Antenna	Height of Tower	30m, Ref. to Fig. 3-1-11
	Polarization	Horizontal
	Required E.R.P.	Max. 30 kW, Ref. to Fig. N-2-2
Output Power of Transmitter		2 kW, Ref. to Fig. N-2-3 & Table N-2-2
Service Area	Area	Greater Part of Uthai Thani, Nakhon Sawan and Phichit Province. Some Part of Chai Nat Province
	Population Covered	981,000 persons
Studio	Building	—
	Facilities	—
Receiving Station	Name	—
	Site	—
Master Station		—
Station Building		148 m^2, Ref. to Fig. 3-1-2 & Fig. 3-1-6
(Thousand Bahts) Construction Cost (1st Channel)	Equipment	3,878
	Building, Road, etc.	1,100
	Total	4,978

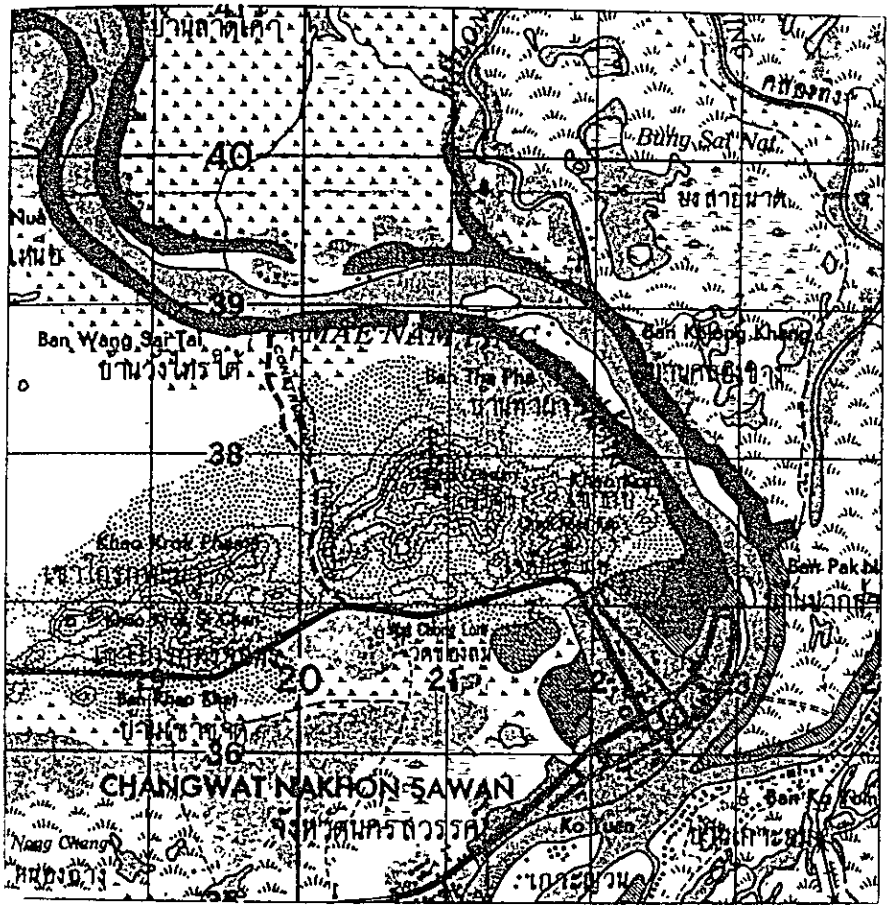

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Fig. N-2-1 LOCATION OF TRANSMITTING SITE (NAKHON SAWAN STATION)

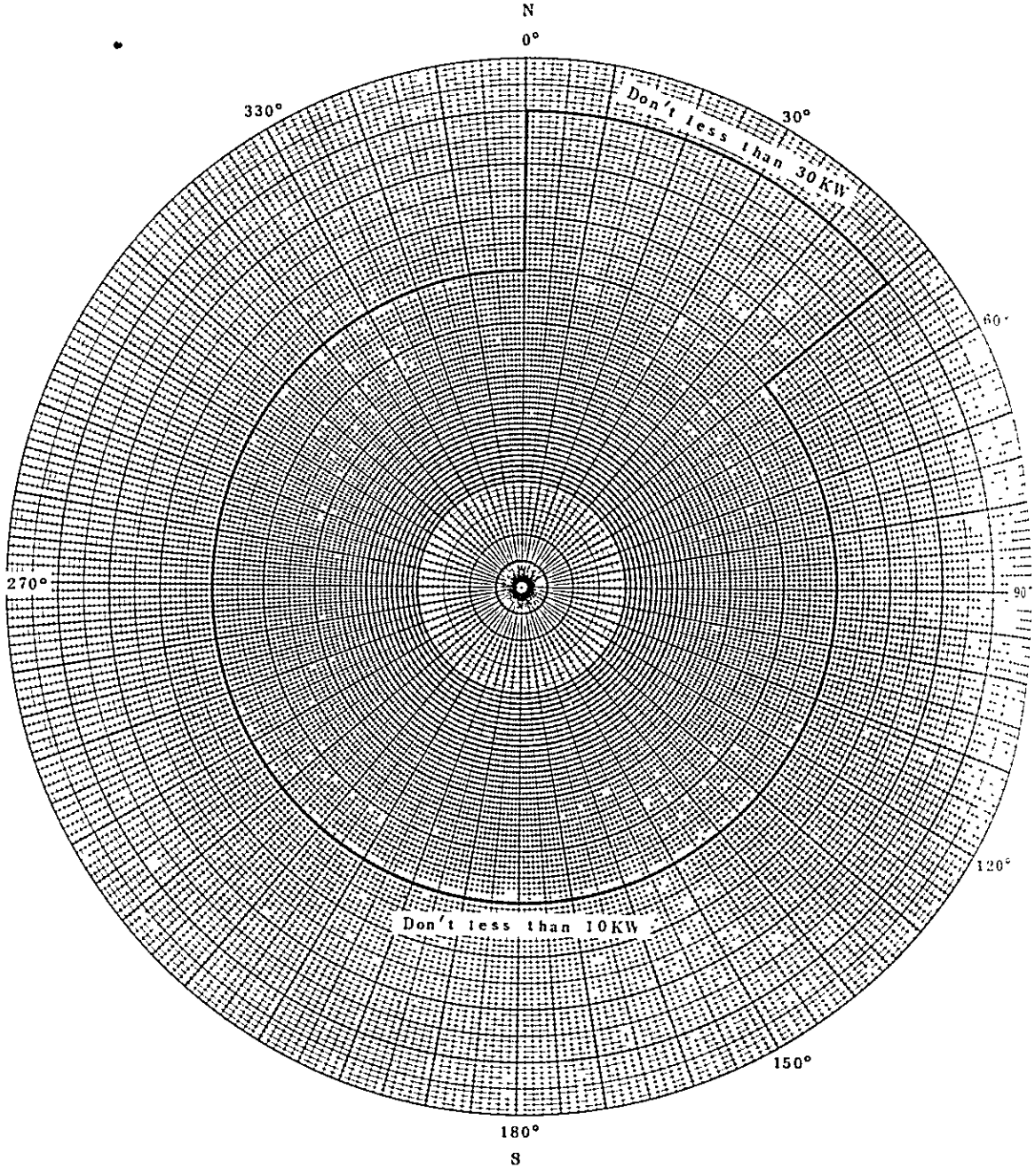

Fig. N-2-2 HORIZONTAL PATTERN OF REQUIRED E.R.P. (NAKHON SAWAN STATION)

TABLE N-2-2 List of TV Transmitting Facilities

Nakhon Sawan Station, 1st Channel

Item	Description	Q'ty
(A)	TV Transmitting Facilities	1 set
1.	2 KW TV Transmitter	1 set
2.	Output Coaxial Equipment (Including Air Cooled Test Load)	1 set
3.	Transmitting Antenna	1 set
4.	Transmitting Feeder System	1 set
5.	30 Meters Antenna Tower	1 set
6.	Transmitter Input and Monitoring Equipment	1 set
7.	Measuring Instrument	1 set
8.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
9.	Emergency Power Supply	1 set
(B)	Microwave ST-Link Equipment	1 set
1.	Microwave Television Relay Equipment	1 set
2.	Program Input and Monitoring Equipment	1 set
3.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
4.	Emergency Power Supply	1 set
(C)	Installation Materials	1 set
(D)	Minor Spare Parts	1 set

Nakhon Sawan Station, 2nd Channel (Future Extension)

Item	Description	Q'ty
(A)	TV Transmitting Facilities	
1.	2 KW TV Transmitter	1 set
2.	Output Coaxial Equipment (Including Two-Channel Combining Equipment)	1 set
3.	Transmitter Input and Monitoring Equipment	1 set
4.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
5.	Emergency Power Supply	1 set
(B)	Microwave ST-Link Equipment	1 set
1.	Microwave Television Relay Equipment	1 set
2.	Program Input and Monitoring Equipment	1 set
3.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
4.	Emergency Power Supply	1 set
(C)	Installation Materials	1 set
(D)	Minor Spare Parts	1 set

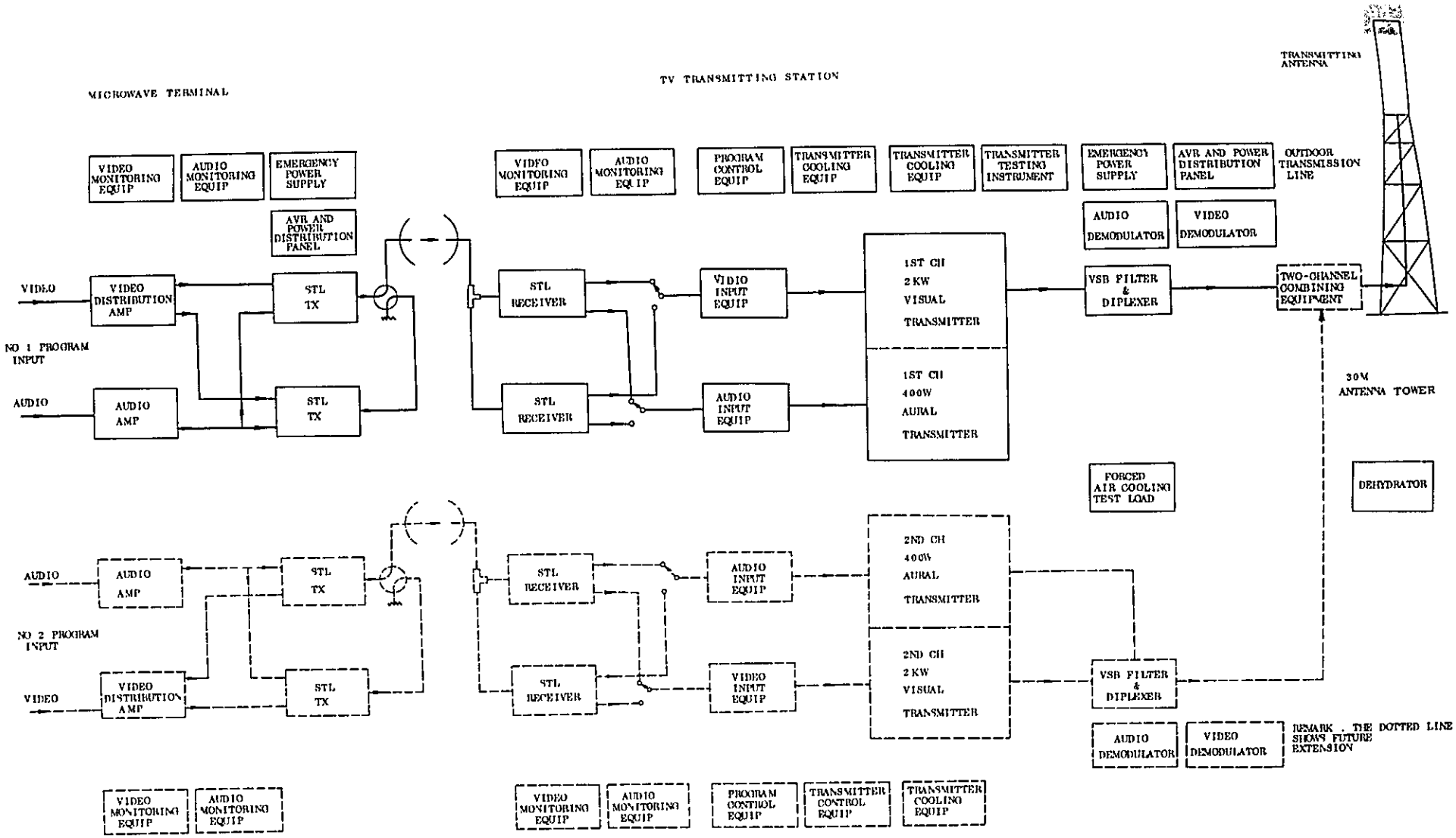

Fig. N-2-3 SCHEMATIC DIAGRAM OF TV TRANSMITTING FACILITIES FOR NAKHON SAWAN STATION

N-3 Phitsanulok

Phitsanulok Province's northern half is mountainous and is difficult to be covered. Therefore, Phitsanulok City and its western region as well as parts of the two provinces of Phichit and Sukhothai will be covered.

Although the city has a mountain to its East which can be served as transmitting points. It is, however, quite far from the city and the road conditions are so bad that it may not be too advantageous for transmission purposes. For this reason we consider erecting within the city a 150 meter mast for servicing. Its site should be within 500 meters from the microwave repeating terminal station.

Programs will be supplied via cable from the microwave repeating terminal station.

TABLE N-3-1 Main Specifications of Phitsanulok Station

Name of Station		Phitsanulok
Type of Station		TV Broadcasting Station
Transmitting Site	Site	Ref. to Fig. N-3-1
	Latitude and Longitude	16°48'32" N. 100°16'18" E.
	Altitude	46 m
	Access Road	—
Transmitting Channel No.		5, 7
Transmitting Antenna	Height of Mast	150 m, Ref. to Fig. 3-1-8
	Polarization	Horizontal
	Required E.R.P.	Max. 50 kW, Ref. to Fig. N-3-2
Output Power of Transmitter		10 kW, Ref. to Fig. N-3-3 & Table N-3-2
Service Area	Area	Greater Part of Phitsanulok, and Sukhothai Province, Some Part of Phichit Province
	Population Covered	623,000 persons
Studio	Building	—
	Facilities	—
Receiving Station	Name	—
	Site	—
Master Station		—
Station Building		199 m^2, Ref. to Fig. 3-1-1 & Fig. 3-1-5
Construction Cost (Thousand Bahts) (1st Channel)	Equipment	5,158
	Building, Road, etc.	414
	Total	5,572

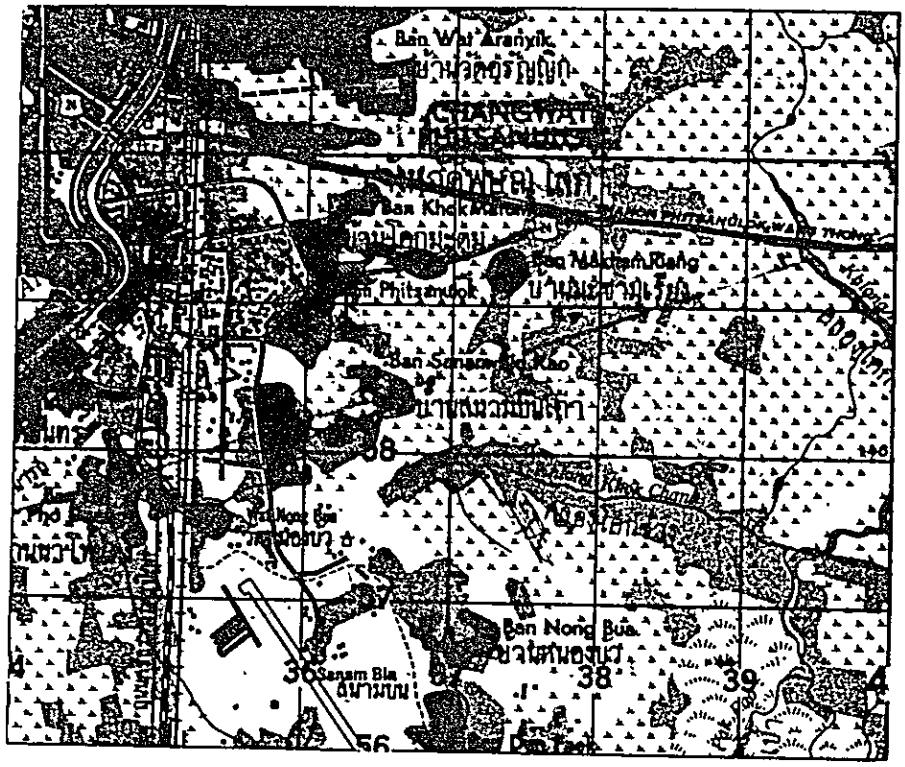

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Fig. N-3-1 LOCATION OF TRANSMITTING SITE (PHITSANULOK STATION)

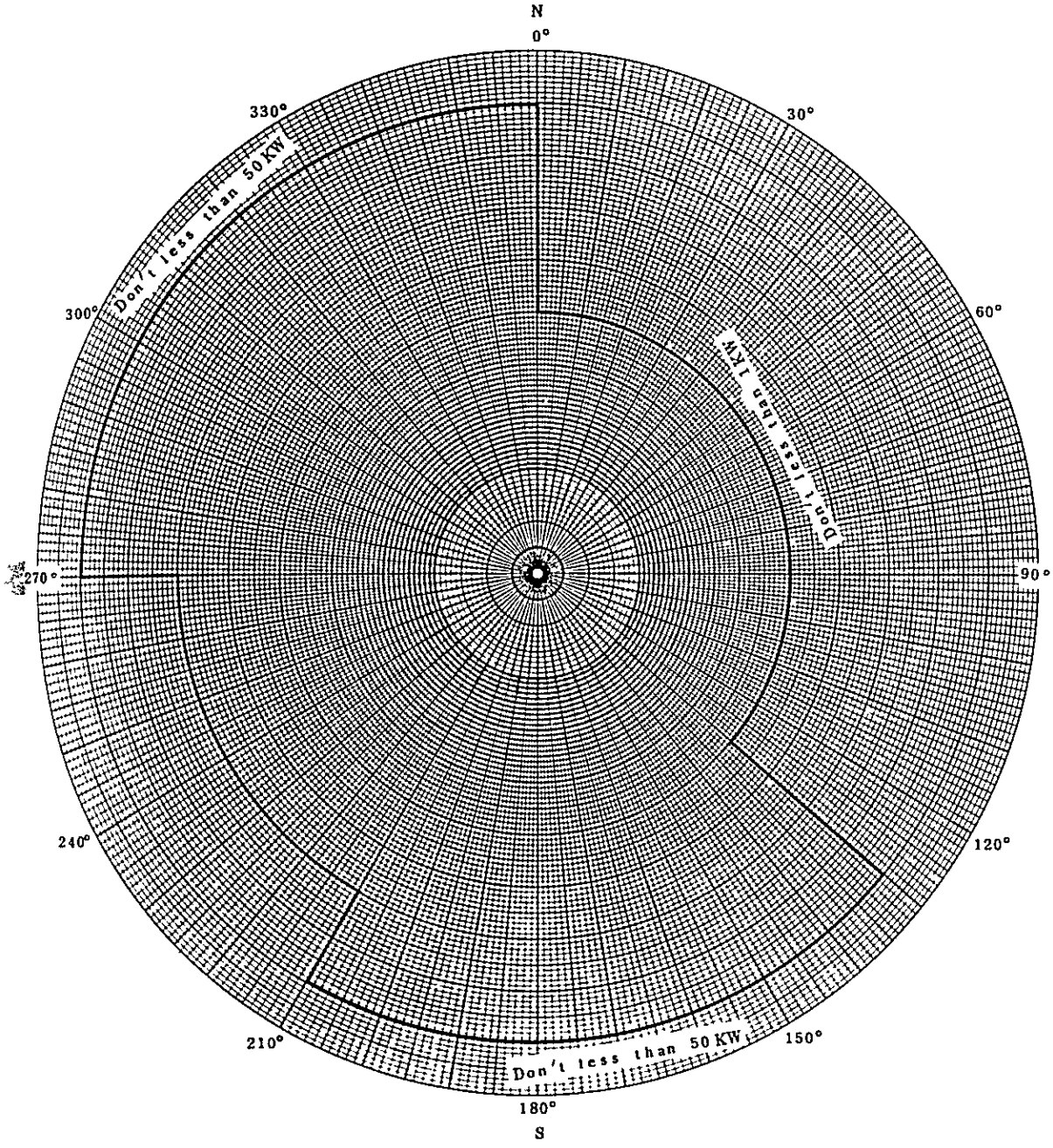

Fig. N-3-2 HORIZONTAL PATTERN OF REQUIRED E.R.P.
(PITSANULOK STATION)

TABLE N-3-2 List of TV Transmitting Facilities

Phitsanulok Station, 1st Channel

Item	Description	Q'ty
(A)	TV Transmitting Facilities	1 set
1.	10 KW TV Transmitter	1 set
2.	Output Coaxial Equipment (Including Air Cooled Test Load)	1 set
3.	Transmitting Antenna	1 set
4.	Transmitting Feeder System	1 set
5.	150 Meters Antenna Mast	1 set
6.	Transmitter Input and Monitoring Equipment	1 set
7.	Measuring Instrument	1 set
8.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
9.	Emergency Power Supply	1 set
(B)	Cable Link Equipment	1 set
1.	Video and Audio Terminal Equipment	1 set
2.	Transmission Line	1 set
(C)	Installation Materials	1 set
(D)	Minor Spare Parts	1 set

Phitsanulok Station, 2nd Channel (Future Extension)

Item	Description	Q'ty
(A)	TV Transmitting Facilities	1 set
1.	10 KW TV Transmitter	1 set
2.	Output Coaxial Equipment (Including Air Cooled Test Load and Two-channel Combining Equipment)	1 set
3.	Transmitter Input and Monitoring Equipment	1 set
4.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
5.	Emergency Power Supply	1 set
(B)	Cable Link Equipment	
1.	Video and Audio Terminal Equipment	1 set
(C)	Installation Materials	1 set
(D)	Minor Spare Parts	1 set

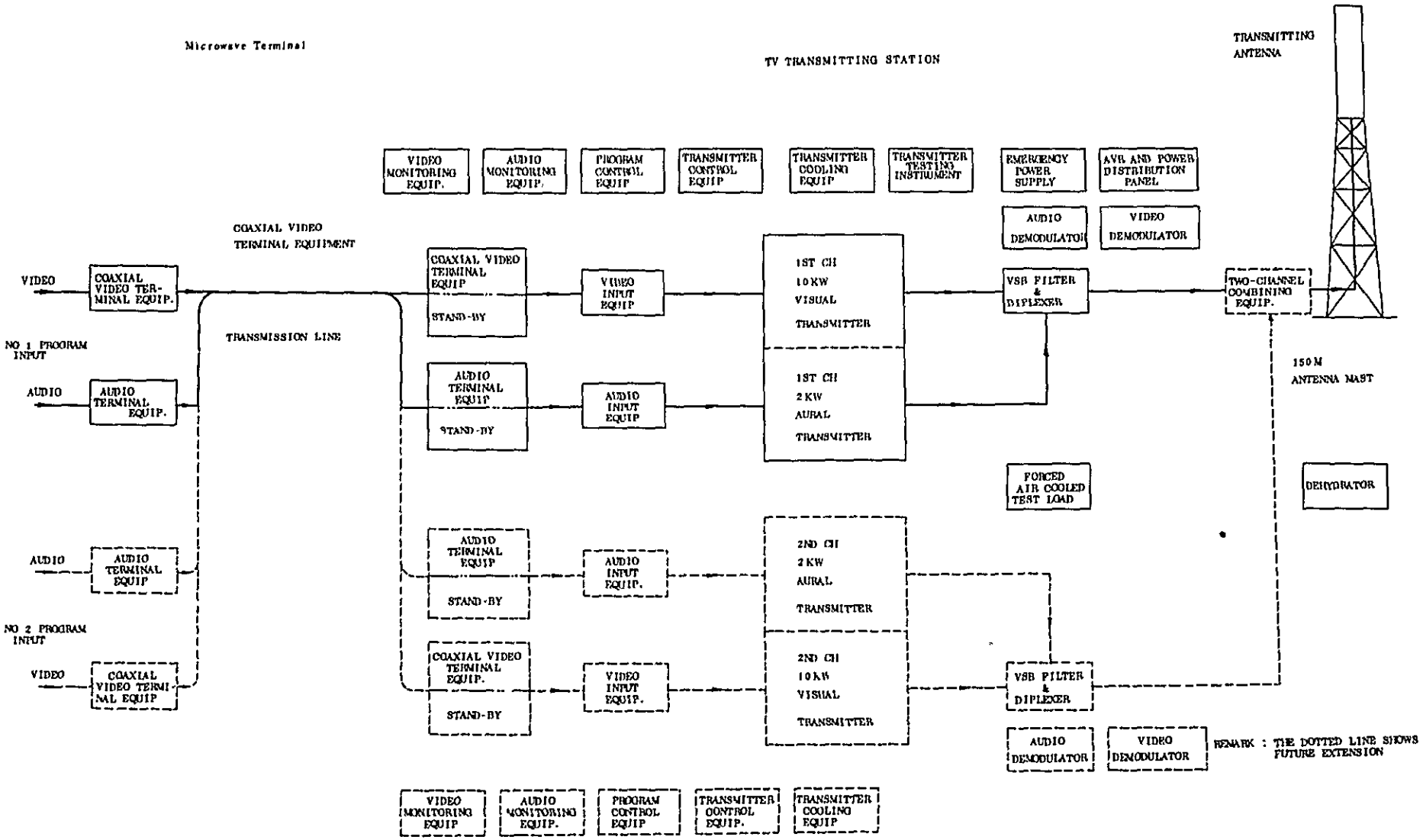

Fig. N-3-3 SCHEMATIC DIAGRAM OF TV TRANSMITTING FACILITIES FOR PHITSANULOK STATION

N-4 Uttradit

Uttradit Province is located at the end of the great plains that extend from Bangkok. Northern area of Uttradit city is mountainous which is difficult for radio wave propagation; also population density is low. For this reason, the south of Uttradit city should be covered, at the same time covering parts of Sukhothai and Phitsanulok.

Although there are several mountains northwest to the city which are suitable for transmitting point, because of the need for access road, plus the consideration to make the servicing area not too large, it is best for convenient operations to build a 100 meters mast on a hill, southwest of the city.

Programs will be supplied via STL (radio) from the microwave repeating terminal station located in Uttradit city.

TABLE N-4-1 Main Specifications of Uttaradit Station

Name of Station		Uttaradit
Type of Station		TV Broadcasting Station
Transmitting Site	Site	Wat Phrathaen, Ref. to Fig. N-4-1
	Latitude and Longitude	17°35'52" N. 100°02'56" E.
	Altitude	92 m
	Access Road	100 m
Transmitting Channel No.		8, 12
Transmitting Antenna	Height of Mast	100 m, Ref. to Fig. 3-1-9
	Polarization	Horizontal
	Required E.R.P.	Max. 10 kW, Ref. to Fig. N-4-2
Output Power of Transmitter		1 kW, Ref. to Fig. N-4-3 & Table N-4-2
Service Area	Area	Greater Part of Uttaradit Province and Some Part of Sukhothai Province
	Population Covered	310,000 persons
Studio	Building	—
	Facilities	—
Receiving Station	Name	—
	Site	—
Master Station		—
Station Building		148 m^2, Ref. to Fig. 3-1-2& Fig. 3-1-6
(Thousand Bahts) Construction Cost (1st Channel)	Equipment	5,015
	Building, Road, etc.	330
	Total	5,345

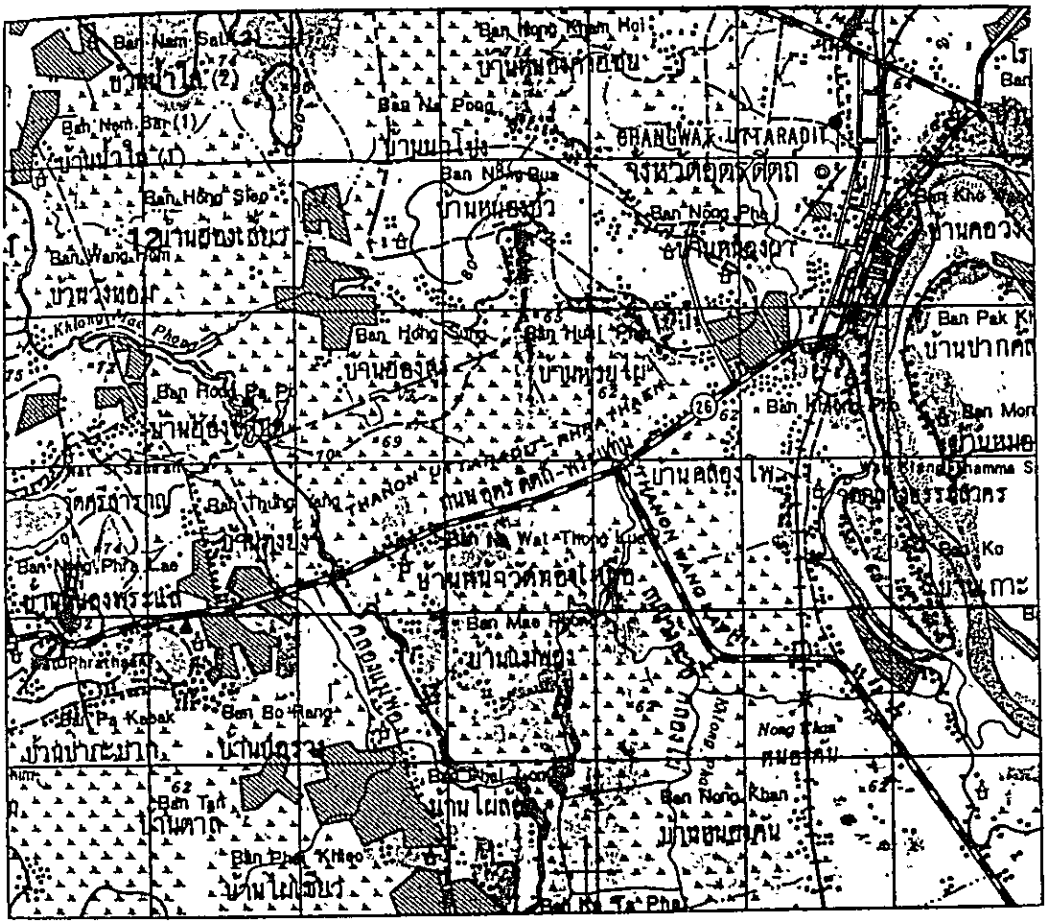

Fig. N-4-1 LOCATION OF TRANSMITTING SITE (UTTRADIT STATION)

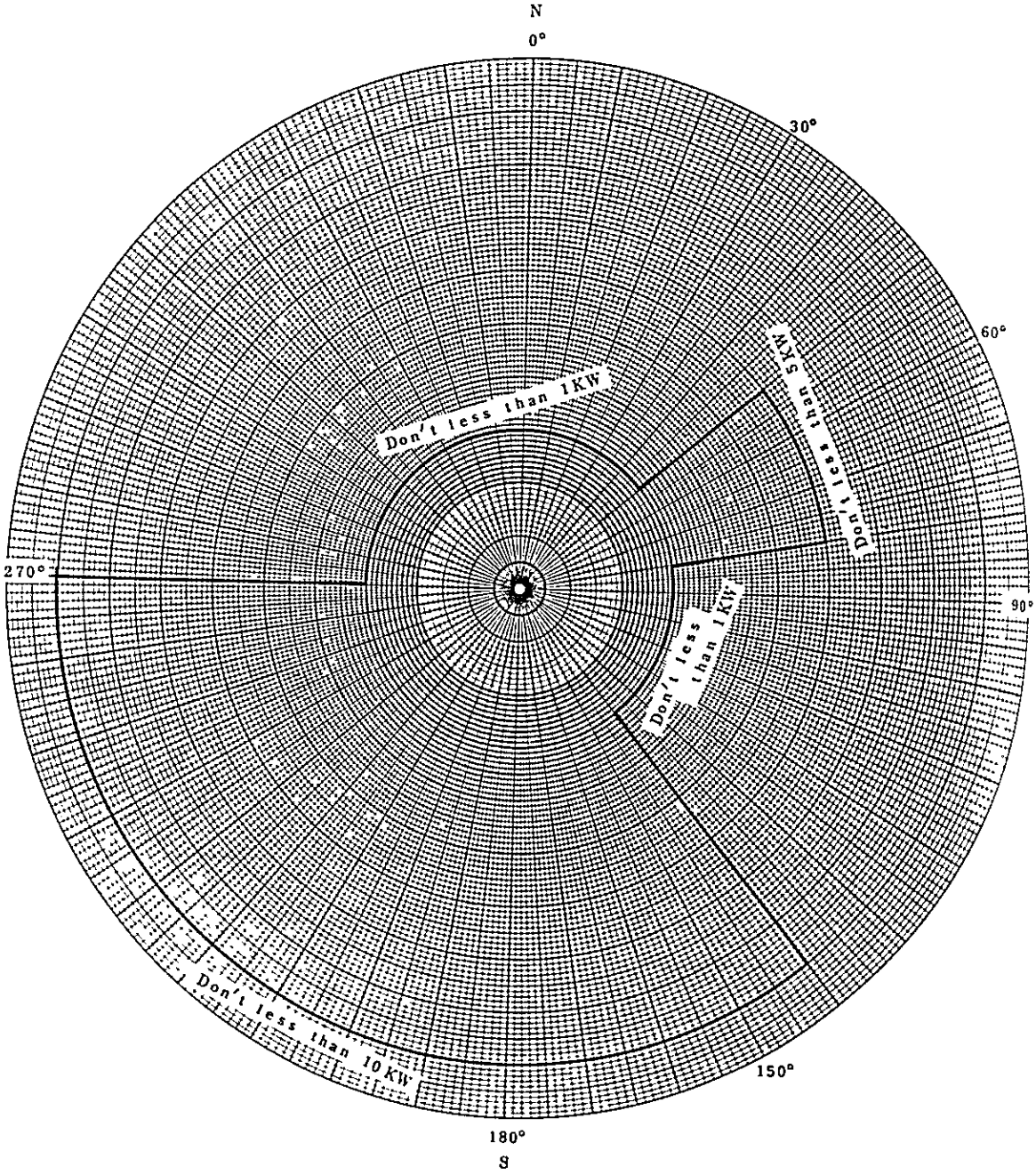

Fig. N-4-2 HORIZONTAL PATTERN OF REQUIRED E.R.P. (UTTRADIT STATION)

TABLE N-4-2 List of TV Transmitting Facilities

Uttaradit Station, 1st Channel

Item	Description	Q'ty
(A)	TV Transmitting Facilities	1 set
1.	1 KW TV Transmitter	1 set
2.	Output Coaxial Equipment (Including Air Cooled Test Load)	1 set
3.	Transmitting Antenna	1 set
4.	Transmitting Feeder System	1 set
5.	100 Meters Antenna Mast	1 set
6.	Transmitter Input and Monitoring Equipment	1 set
7.	Measuring Instruments	1 set
8.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
9.	Emergency Power Supply	
(B)	Microwave ST-Link Equipment	1 set
1.	Microwave Television Relay Equipment	1 set
2.	Program Input and Monitoring Equipment	1 set
3.	Microwave IF Demodulator	1 set
4.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
5.	Emergency Power Supply	1 set
(C)	Installation Materials	1 set
(D)	Minor Spare Parts	1 set

Uttaradit Station, 2nd Channel (Future Extension)

Item	Description	Q'ty
(A)	TV Transmitting Facilities	1 set
1.	1 KW TV Transmitter	1 set
2.	Output Coaxial Equipment (Including Two-channel Combining Equipment)	1 set
3.	Transmitter Input and Monitoring Equipment	1 set
4.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
5.	Emergency Power Supply	1 set
(B)	Microwave ST-Link Equipment	1 set
1.	Microwave Television Relay Equipment	1 set
2.	Program Input and Monitoring Equipment	1 set
3.	Microwave IF Demodulator	1 set
4.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
5.	Emergency Power Supply	
(C)	Installation Materials	1 set
(D)	Minor Spare Parts	1 set

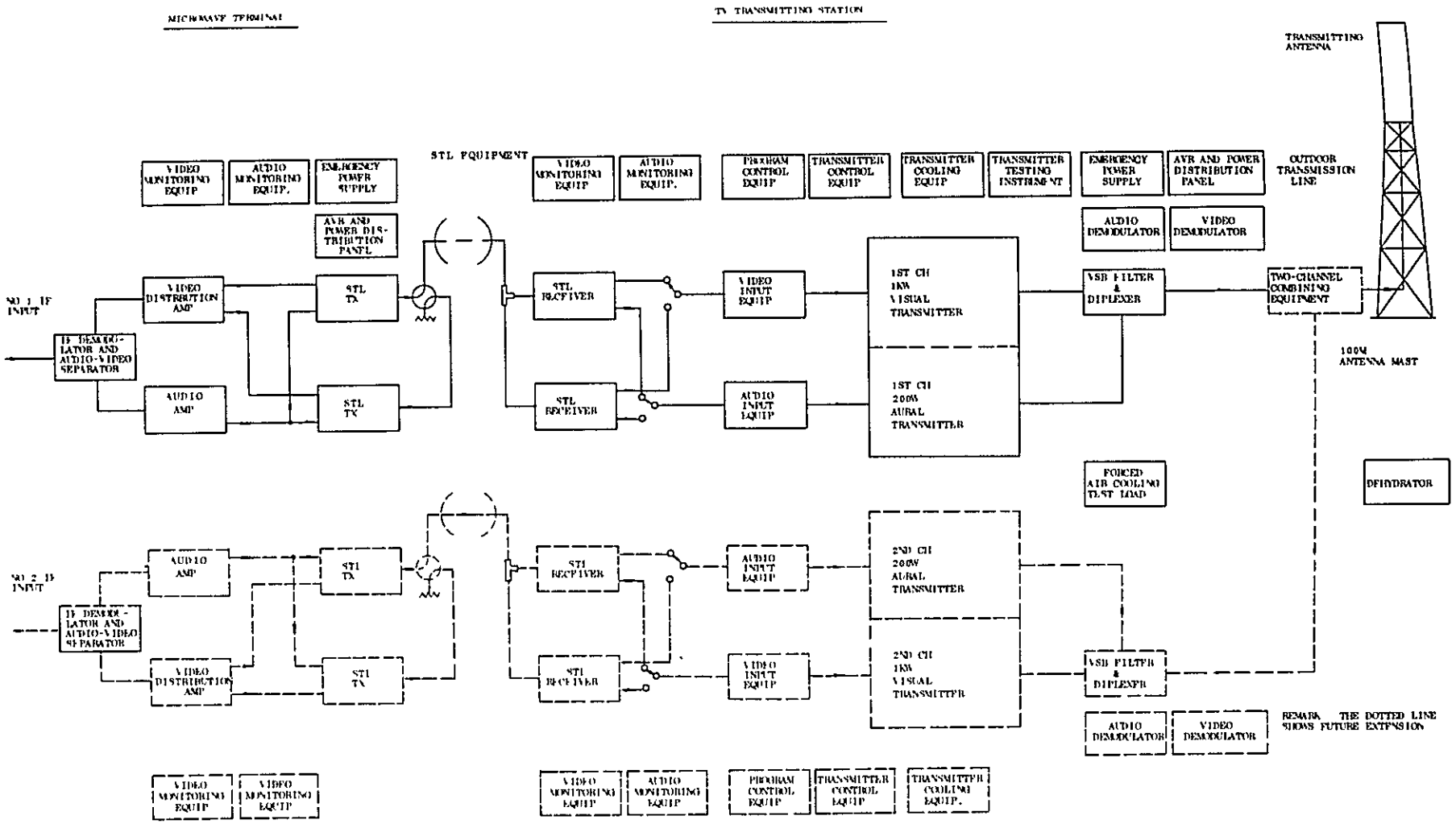

Fig. N-4-3 SCHEMATIC DIAGRAM OF TV TRANSMITTING FACILITIES FOR UTTARADIT STATION

N-5 Lampang

The transmitting system presently in operation is satisfactory, if coverage is to be made in the main part of Lampang Province with Lampang City as the center. However, in order to relay broadcasts to Chiang Rai and to use it in the future as master station for translators within the province, it is not sufficient.

The peak of Doi Ton, located near the microwave relay station, will be transmitting point, as there is already an access road available.

Programs will first be sent to the studio by the microwave circuit within the city. From the studio, it will be sent by STL system to the transmitting station on the peak.

Regarding the studio, the building presently in use is sufficient and there is no need to enlarge the facilities.

The studio equipment must all be replaced by C.C.I.R. system. Besides this, there is need here for O.B. Van.

TABLE N-5-1 Main Specifications of Lampang Station

Name of Station		Lampang
Type of Station		TV Broadcasting Station
Transmitting Site	Site	Doi Ton Ref. to Fig. N-5-1
	Latitude and Longitude	99°33'41" E. 18°13'50" N.
	Altitude	709 m
	Access Road	2 km
Transmitting Channel No.		5, 7
Transmitting Antenna	Height of Tower	30 m, Ref. to Fig. 3-1-11
	Polarization	Horizontal
	Required E.R.P.	Max. 25 kW, Ref. to Fig. N-5-2
Output Power of Transmitter		2 kW, Ref. to Fig. N-5-8 & Table N-5-3
Service Area	Area	Greater Part of Lampang Province
	Population Covered	332,000 persons
Studio	Building	Ref. to Fig. N-5-3 (existing)
	Facilities	Ref. to Fig. N-5-4,5 & Table N-5-2
Receiving Station	Name	—
	Site	—
Master Station		—
Station Building		148 m^2, Ref. to Fig. 3-1-2 & Fig. 3-1-6
(Thousand Bahts) Construction Cost (1st Channel)	Equipment	4,070 + 9,280
	Building, Road, etc.	1,800
	Total	5,870 + 9,280

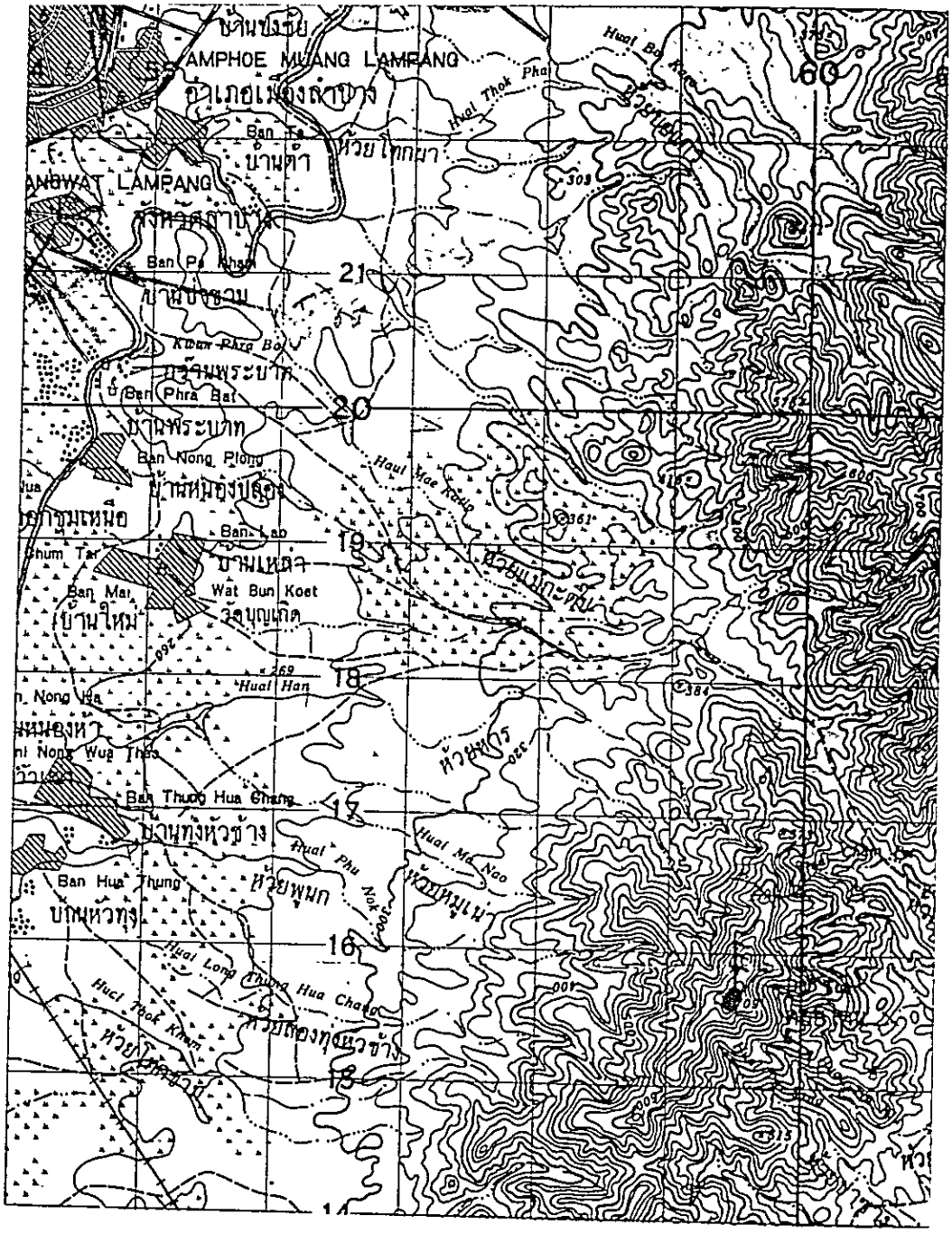

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Fig. N-5-1 LOCATION OF TRANSMITTING SITE (LAMPANG STATION)

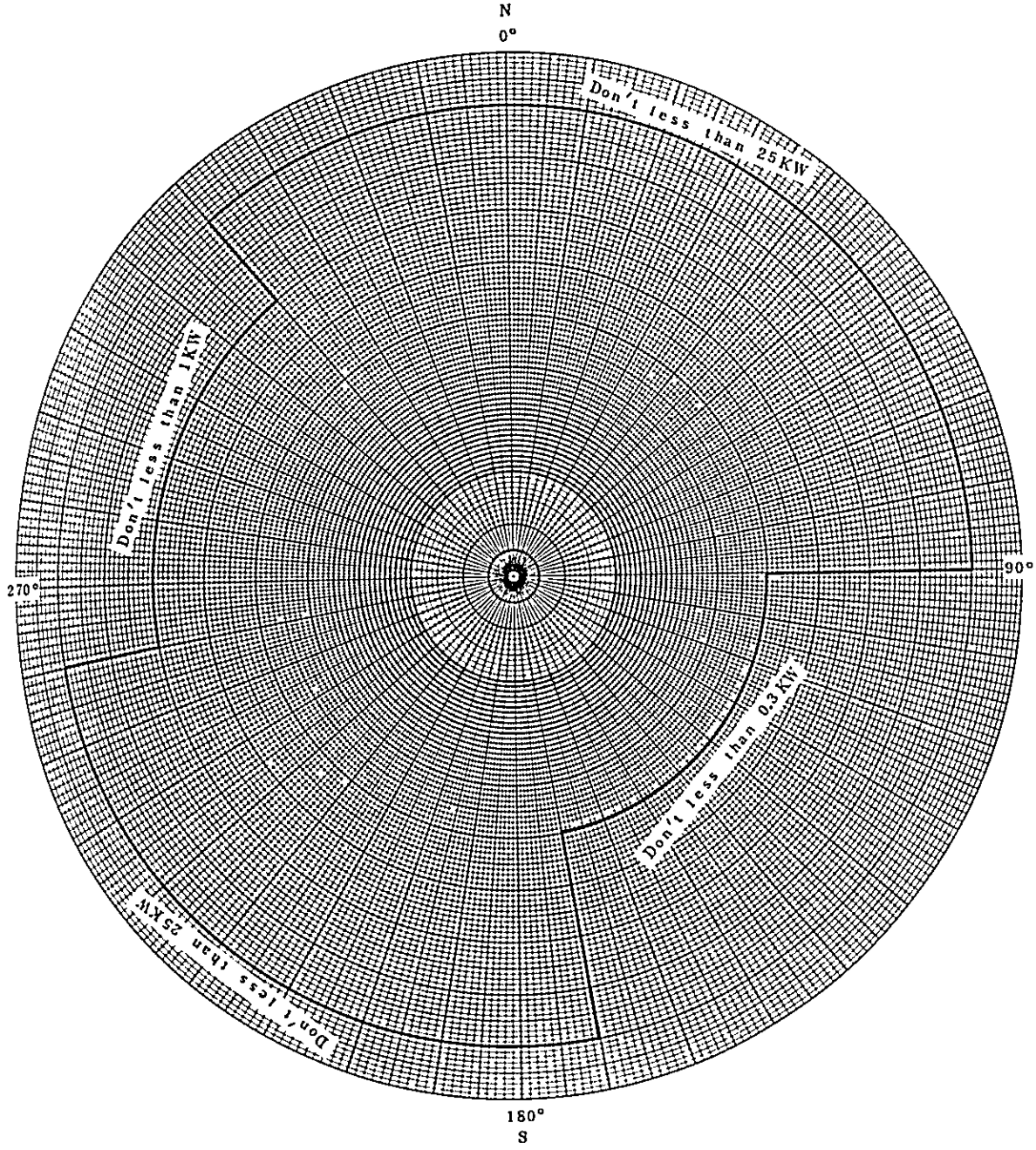

Fig. N-5-2 HORIZONTAL PATTERN OF REQUIRED E.R.P. (LAMPANG STATION)

TABLE N-5-2 LIST OF TV STUDIO FACILITIES

Item	Description	Q'ty
1.	STUDIO EQUIPMENT	
1.	4-½" Image orthicon camera chain	2 sets
2.	Video Mixer	1 set
3.	Microphone and microphone boom stands	1 lot
4.	Picture monitors	1 lot
5.	Studio lighting equipment	1 lot
6.	Monitor speakers	1 lot
2.	MASTER CONTROL ROOM	
1.	Video control console	1 set
2.	Audio control console	1 set
3.	Picture monitors	1 lot
4.	Monitor speakers	1 lot
5.	Master monitor (picture and waveform monitor)	1 set
6.	Turn table (disc reproducer)	1 set
7.	Tape recorder and reproducer	1 set
8.	Sync. signal generator	1 set
9.	Video tape recorder	2 sets
10.	Vidicon film camera	1 set
11.	16mm film projector	2 sets
12.	Slide projector	1 set
13.	Opaque scanner	1 set
14.	Off air check receiver	1 set
3.	TEST EQUIPMENT	
1.	Test equipment	1 lot
4.	TV OUTSIDE BROADCASTING SYSTEM	
1.	TV outside broadcasting van	1 set
5.	MICROWAVE ST-LINK EQUIPMENT	
1.	Microwave television relay equipment	1 set
2.	Program input and monitoring equipment	1 set

Item	Description	Q'ty
6.	SPARE PARTS	
	1. Spare parts	1 lot
7.	INSTALLATION MATERIALS	
	1. Installation materials	1 lot

TABLE N-5-3 List of TV Transmitting Facilities

Lampang Station, 1st Channel

Item	Description	Q'ty
(A)	TV Transmitting Facilities	1 set
	1. 2 KW TV Transmitter	1 set
	2. Output Coaxial Equipment (Including Air Cooled Test Load)	1 set
	3. Transmitting Antenna	1 set
	4. Transmitting Feeder System	1 set
	5. 30 Meters Antenna Tower	1 set
	6. Transmitter Input and Monitoring Equipment	1 set
	7. Measuring Instrument	1 set
	8. Automatic Voltage Regulator and Power Distribution Equipment	1 set
	9. Emergency Power Supply	1 set
(B)	Microwave ST-Link Equipment	1 set
	1. Microwave Television Relay Equipment	1 set
	2. Program Input and Monitoring Equipment	1 set
	3. Automatic Voltage Regulator and Power Distribution Equipment	1 set
	4. Emergency Power Supply	1 set
(C)	Installation Materials	1 set
(D)	Minor Spare Parts	1 set

Lampang Station, 2nd Channel (Future Extension)

Item	Description	Q'ty
(A)	TV Transmitting Facilities	
1.	2 KW TV Transmitter	1 set
2.	Output Coaxial Equipment (Including Two-channel Combining Equipment)	1 set
3.	Transmitter Input and Monitoring Equipment	1 set
4.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
5.	Emergency Power Supply	1 set
(B)	Microwave ST-Link Equipment	1 set
1.	Microwave Television Relay Equipment	1 set
2.	Program Input and Monitoring Equipment	1 set
3.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
4.	Emergency Power Supply	1 set
(C)	Installation Materials	1 set
(D)	Minor Spare Parts	1 set

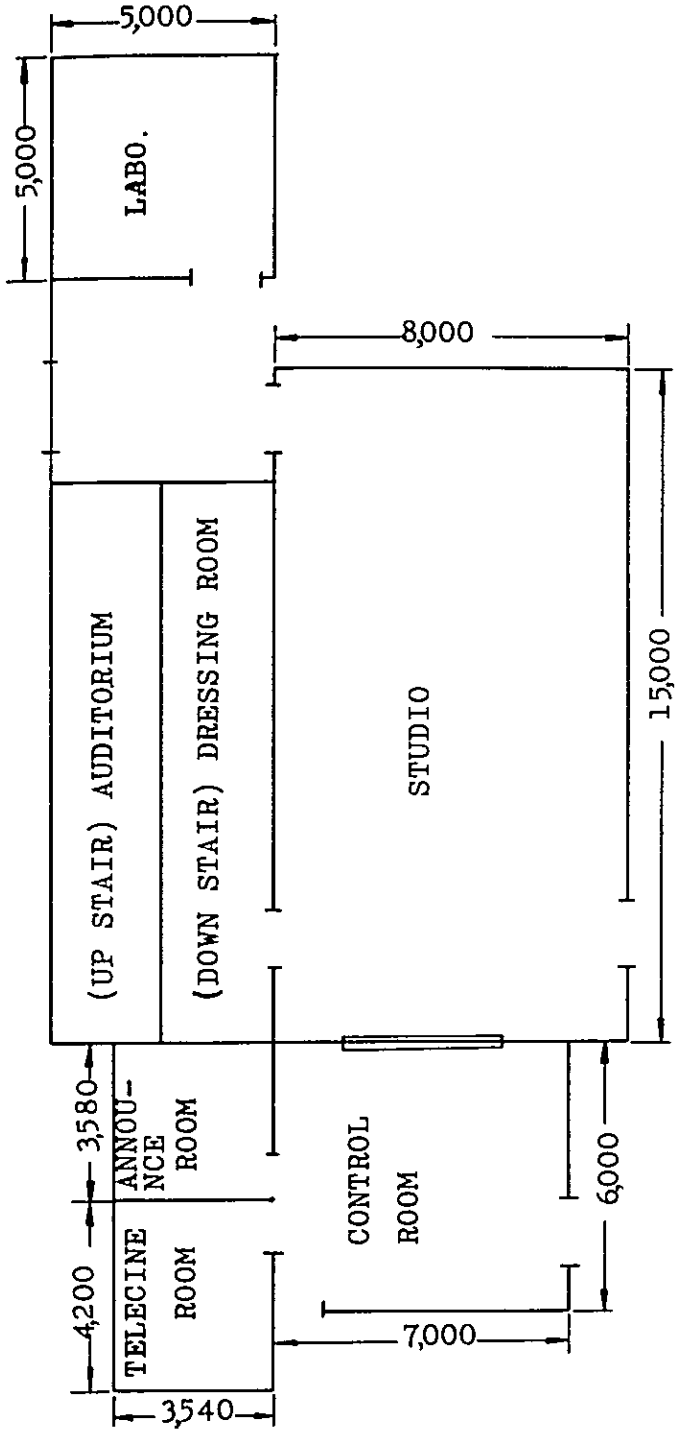

Fig. N-5-3 STUDIO LAYOUT OF LAMPANG STATION

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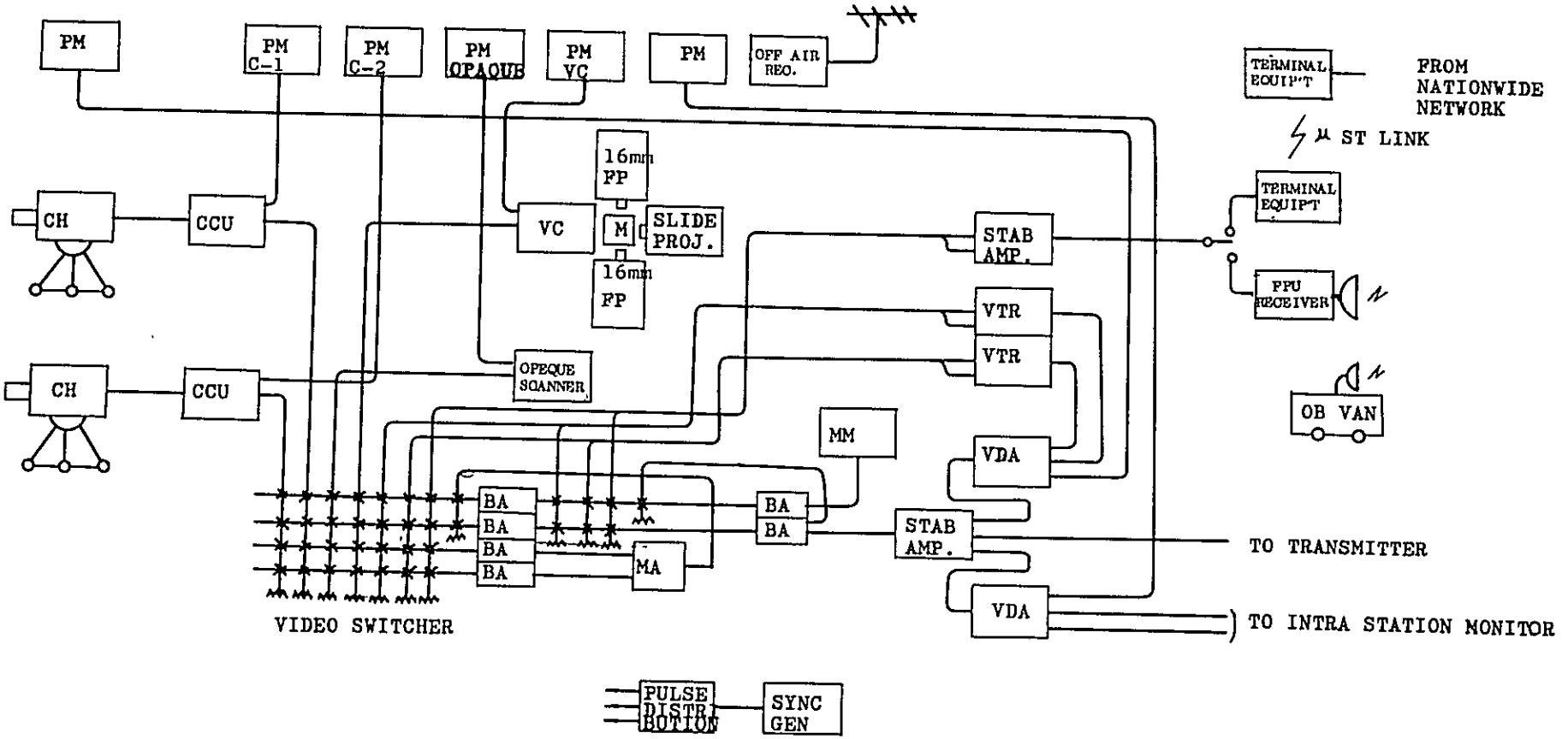

Fig. N-5-4 VIDEO BLOCK DIAGRAM OF LAMFANG STATION

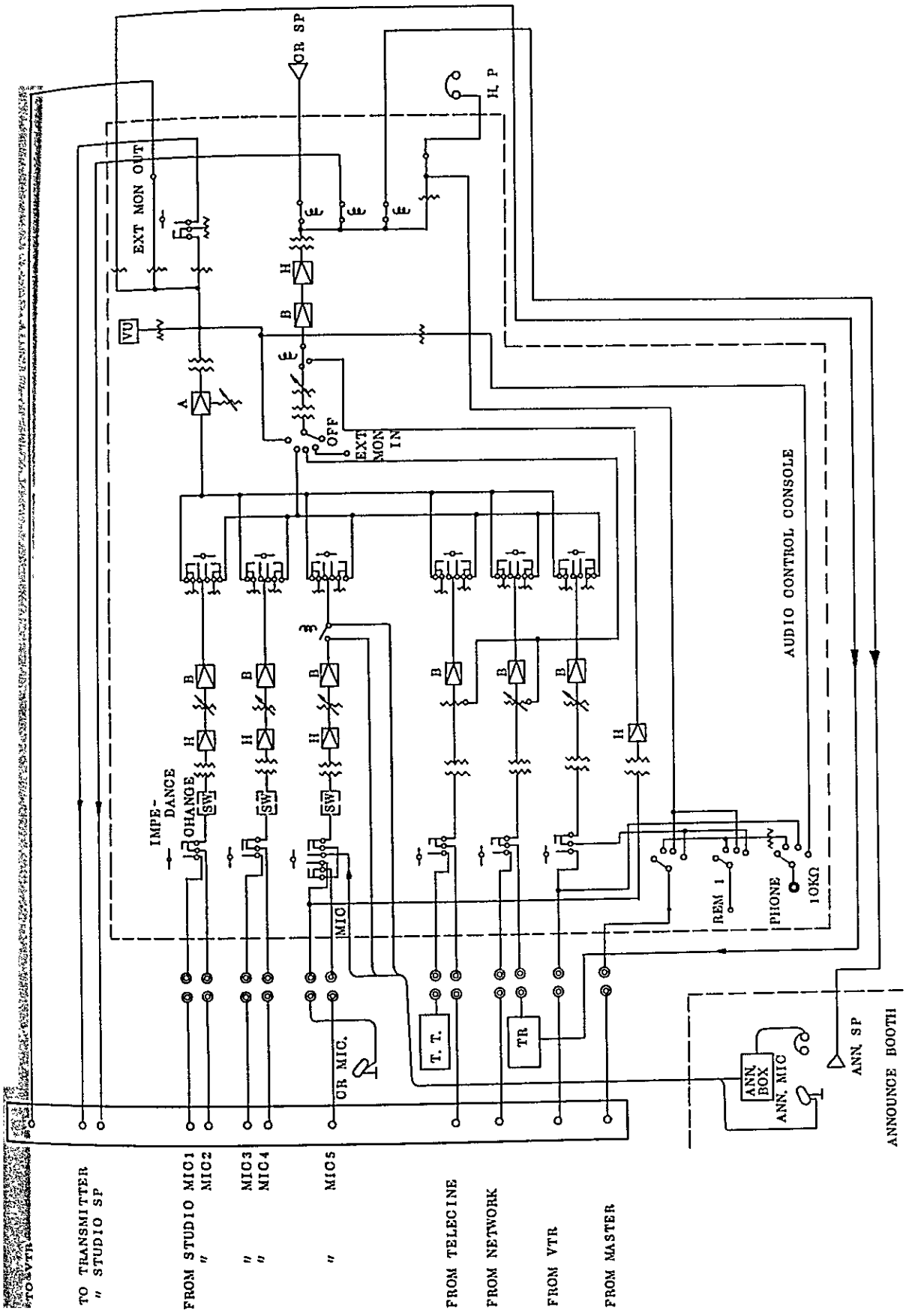

Fig. N-5-5 AUDIO BLOCK DIAGRAM OF LAMPANG STATION

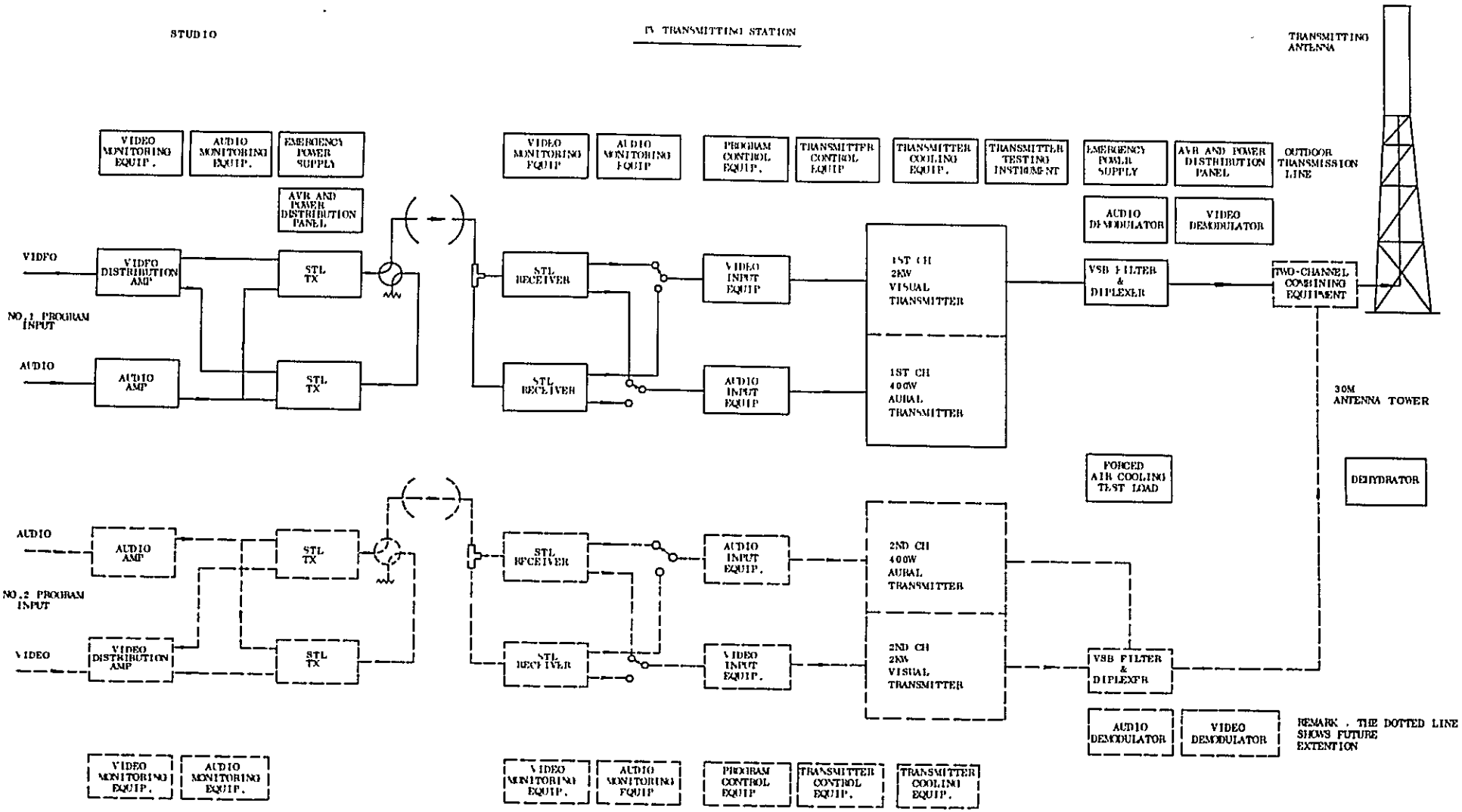

Fig. N-5-8 SCHEMATIC DIAGRAM OF TV TRANSMITTING FACILITIES FOR LAMPANG STATION

N-6 Chiang Mai

The location of the present translator station is the most suitable. Programs will be sent via STL (radio) from the microwave repeating terminal station within the city.

TABLE N-6-1 Main Specifications of Chiang Mai Station

Name of Station		Chiang Mai
Type of Station		TV Broadcasting Station
Transmitting Site	Site	Doi Su Thep, Ref. to Fig. N-6-1
	Latitude and Longitude	18°48'23" N. 98°55'35" E.
	Altitude	1,100 m
	Access Road	—
Transmitting Channel No.		6, 10
Transmitting Antenna	Height of Tower	30 m, Pef. to Fig. 3-1-11
	Polarization	Horizontal
	Required E.R.P.	Max. 6 kW, Ref. to Fig. N-6-2
Output Power of Transmitter		500 W, Ref. to Fig. N-6-3 & Table N-6-2
Service Area	Area	Center Part of Chiang Mai, Lampang province
	Population Covered	736,000 persons
Studio	Building	—
	Facilities	—
Receiving Station	Name	—
	Site	—
Master Station		—
Station Building		48 m^2, Ref. to Fig. 3-1-3 & Fig. 3-1-7
(Thousand Bahts) Construction Cost (1st Channel)	Equipment	3,567
	Building, Road, etc.	280
	Total	3,847

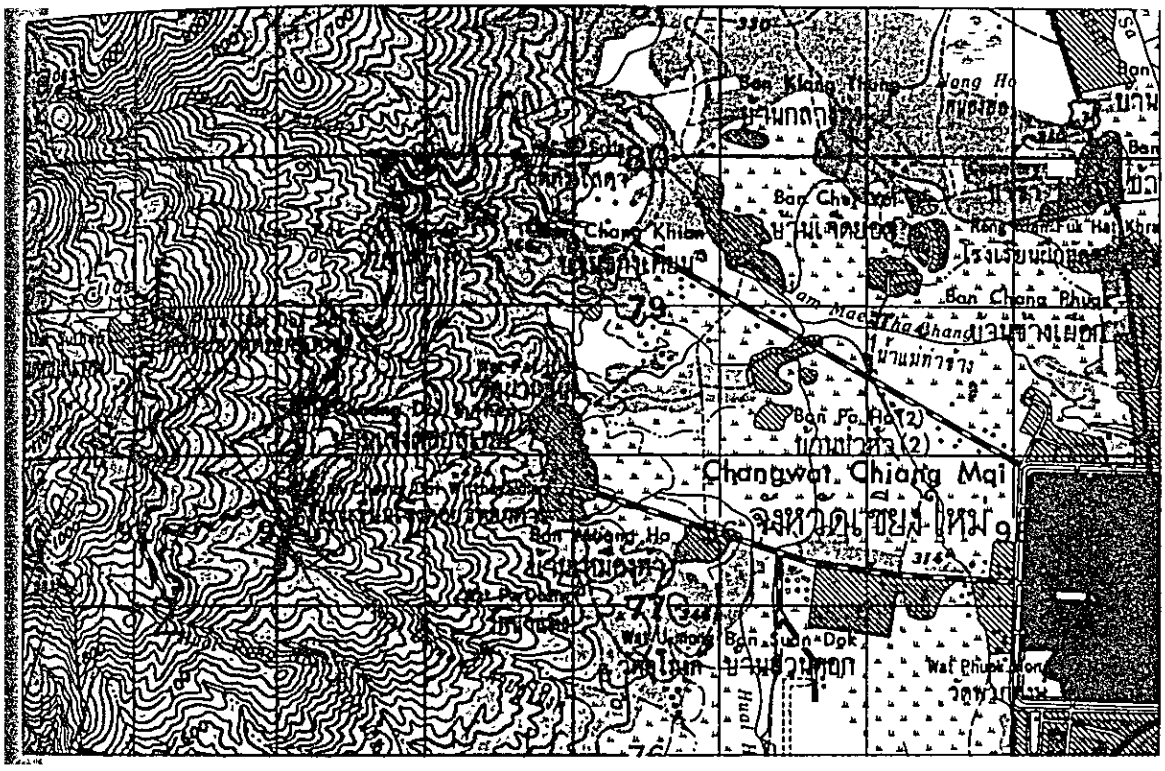

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Fig. N-6-1 LOCATION OF TRANSMITTING SITE (CHIANG MAI STATION)

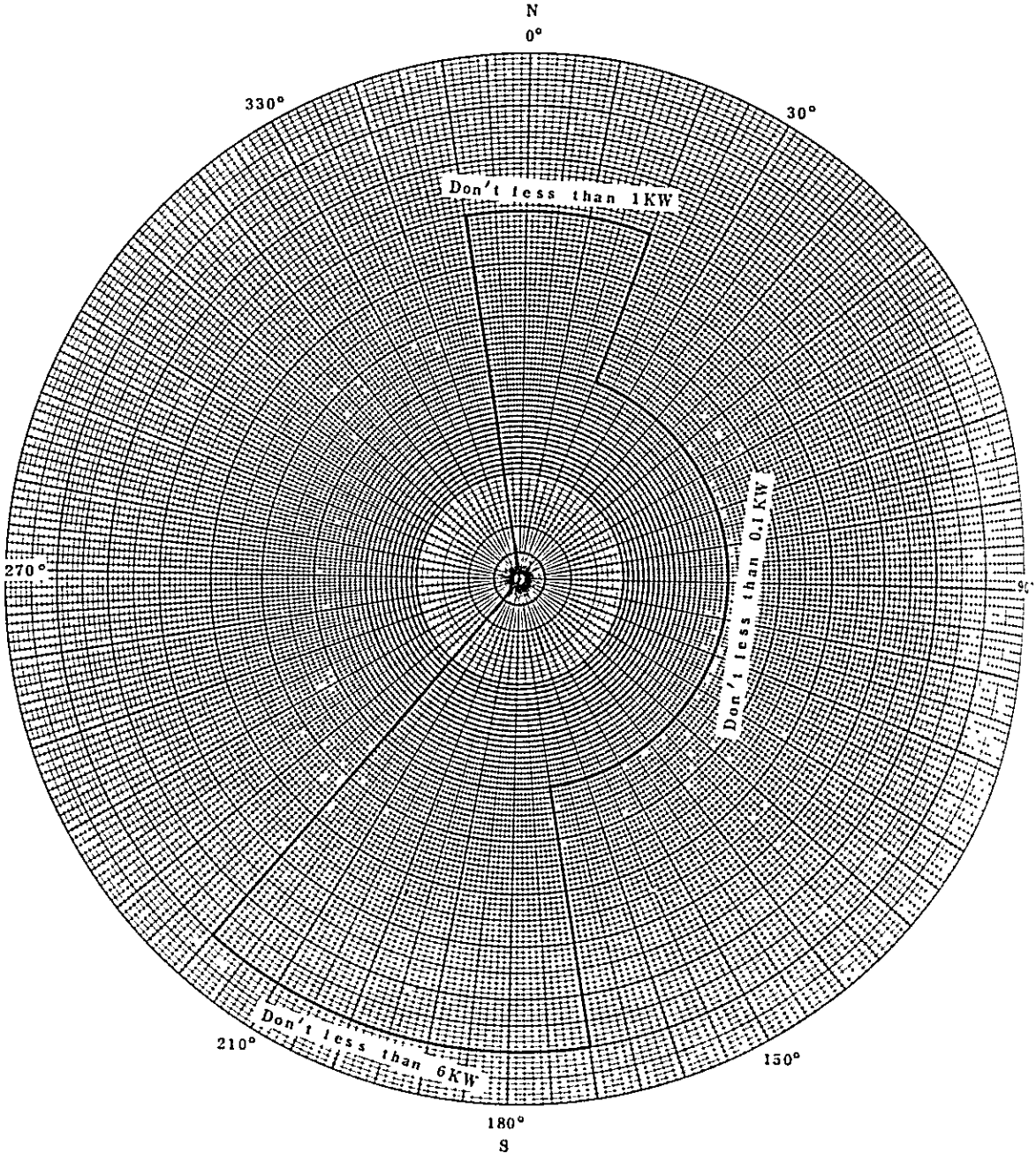

Fig. N-6-2 HORIZONTAL PATTERN OF REQUIRED E.R.P.
(CHIANG MAI STATION)

TABLE N-6-2 List of TV Transmitting Facilities

Chiang Mai Station, 1st Channel

Item	Description	Q'ty
(A)	TV Transmitting Facilities	1 set
1.	500 W TV Transmitter	1 set
2.	Output Coaxial Equipment (Including Air Cooled Test Load)	1 set
3.	Transmitting Antenna	1 set
4.	Transmitting Feeder System	1 set
5.	30 Meters Antenna Tower	1 set
6.	Transmitter Input and Monitoring Equipment	1 set
7.	Measuring Instrument	1 set
8.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
9.	Emergency Power Supply	1 set
(B)	Microwave ST-Link Equipment	1 set
1.	Microwave Television Relay Equipment	1 set
2.	Program Input and Monitoring Equipment	1 set
3.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
4.	Emergency Power Supply	1 set
(C)	Installation Materials	1 set
(D)	Minor Spare Parts	1 set

Chiang Mai Station, 2nd Channel (Furture Extension)

Item	Description	Q'ty
(A)	TV Transmitting Facilities	
1.	500 W TV Transmitter	1 set
2.	Output Coaxial Equipment (Including Two-channel Combining Equipment)	1 set
3.	Transmitter Input and Monitoring Equipment	1 set
4.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
5.	Emergency Power Supply	1 set
(B)	Microwave ST-Link Equipment	1 set
1.	Microwave Television Relay Equipment	1 set
2.	Program Input and Monitoring Equipment	1 set
3.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
4.	Emergency Power Supply	1 set
(C)	Installation Materials	1 set
(D)	Minor Spare Parts	1 set

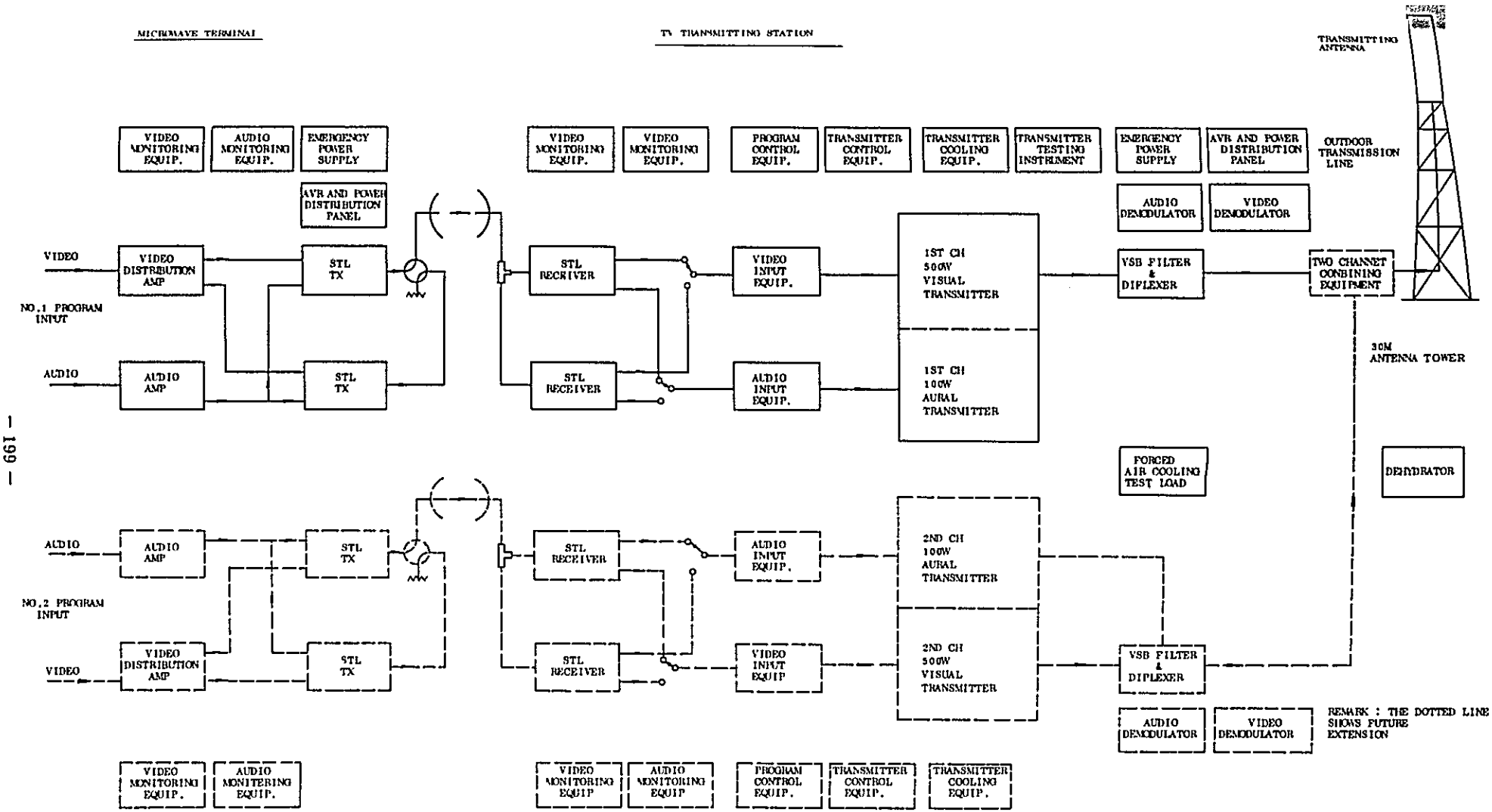

Fig. N-6-3 SCHEMATIC DIAGRAM OF TV TRANSMITTING FACILITIES FOR CHIANG MAI STATION

N-7 Chiang Rai

In order to give service of TV in Chiang Rai Province, there are two ways of transmission of programs, one by means of microwave radio link and the other by means of translator stations.

Upon studying the circuit construction for the former, it is found that 6 - 7 relay stations are necessary and there are many points which are disadvantageous both economically and from the standpoint of maintenance.

On the other hand, in the case of the translator relay system, a route along No. 5 highway and the direct route to the north can be considred as its route. However, in the former case, at least 4 stations are necessary and together with the same problem as the case of microwave radio link, problems of deterioration of picture quality, interference, etc. are apt to occur. In the latter case, Chiang Rai can be reached with 2 stations. When it is considered that in the future the translator station in Chiang Rai will be the master station of other translator stations in Chiang Rai Province, the latter with less relay stages is advantageous.

Judging from the fact that the Chiang Rai Translator station will become the central master station for translator stations in the Province and the service area should be wide in order to decrease the number of translator stations in the Province as much as possible, a point as high as possible should be selected as transmitting point.

Therefore, Doi Pui was selected as the transmitting point where it is easy to relay from Wang Nua and the service area is very wide.

TABLE N-7-1 Main Specifications of Chiang Station

Name of Station		Chiang Rai.
Type of Station		Translator
Transmitting Site	Site	Doi Pui, Ref. to Fig. N-7-1
	Latitude and Longitude	19°41'13" N. 99°46'14" E.
	Altitude	816 m
	Access Road	7.5 km
Transmitting Channel No.		5, 7
Transmitting Antenna	Height of Tower	30 m , Ref. to Fig. 3-1-11
	Polarization	Horizontal
	Required E.R.P.	Max. 3 kW, Ref. to Fig. N-7-2
Output Power of Transmitter		300 W , Ref. to Fig. 3-1-12 & Table N-7-2
Service Area	Area	Chiang Rai Province
	Population Covered	310,000 persons
Studio	Building	—
	Facilities	—
Receiving Station	Name	Chiang Rai
	Site	Same as the transmitting site
Master Station		Wang Nua
Station Building		48 m^2, Ref. to Fig. 3-1-4 & Fig. 3-1-6
(Thousand Bahts) Construction Cost (1st Channel)	Equipment	2,060
	Building, Road, etc.	5,100
	Total	7,160

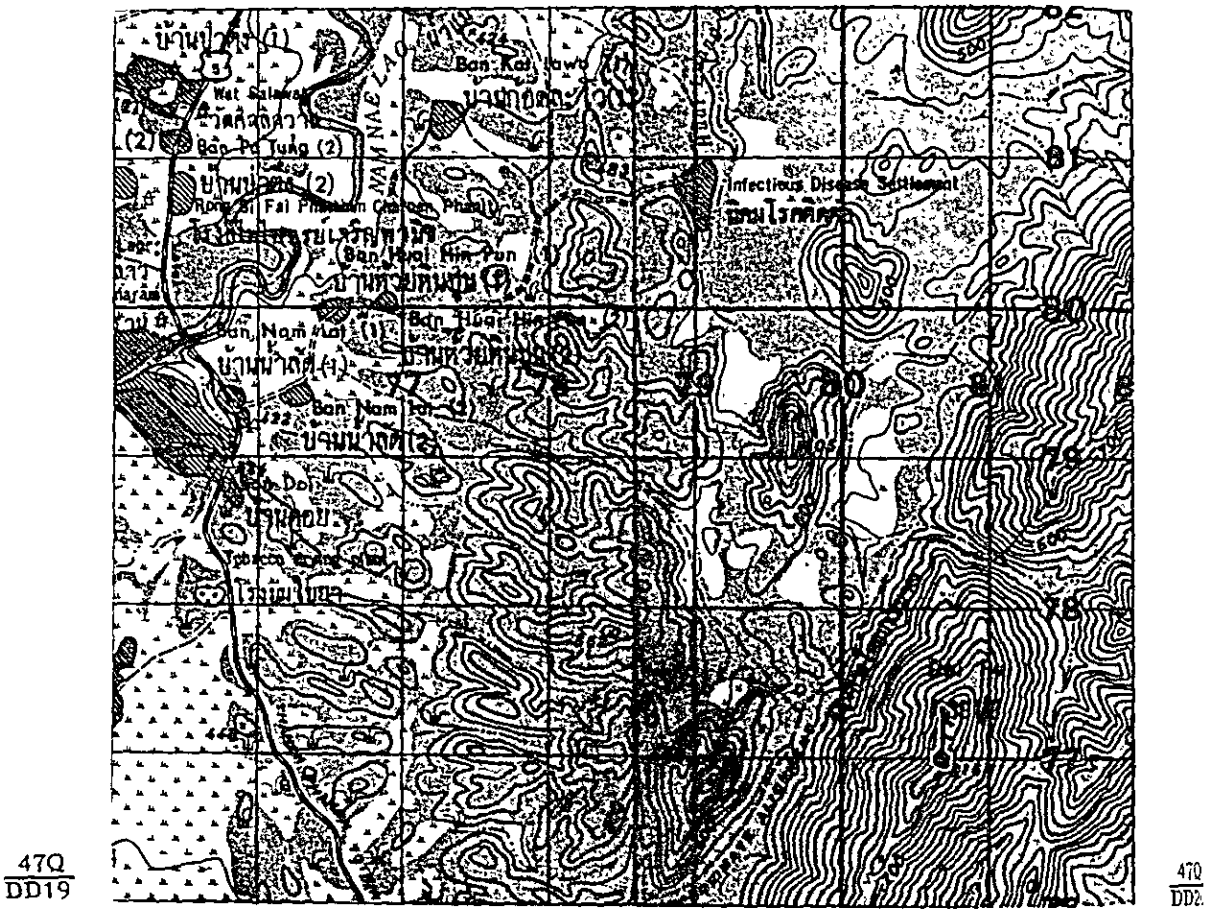

Fig. N-7-1 LOCATION OF TRANSMITTING SITE (CHIANG RAI STATION)

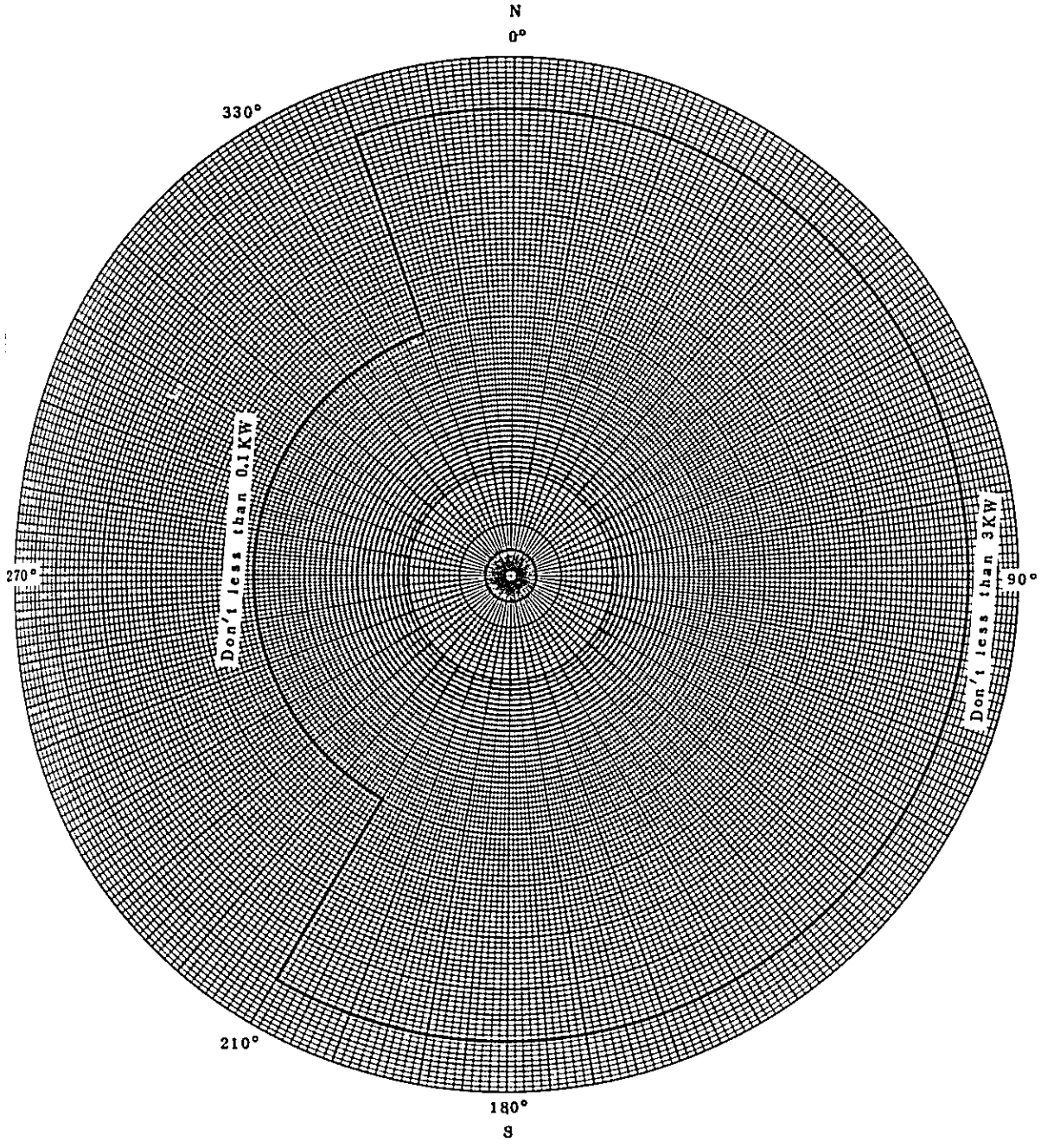

Fig. N-7-2 HORIZONTAL PATTERN OF REQUIRED E.R.P.
(CHIANG RAI STATION)

TABLE N-7-2 List of TV Transmitting Facilities

Chieng Rai Translator Station, 1st Channel

Item	Description	Q'ty
1.	300 W TV Translator	2 sets
2.	Coaxial Equipment (Including Air Cooled Test Load, Input Filter and Output Filter, etc.)	1 set
3.	Transmitting Antenna	1 set
4.	Transmitting Feeder System	1 set
5.	30 Meters Antenna Tower	1 set
6.	Monitoring Equipment	1 set
7.	Receiving Antenna and Feeder System	1 set
8.	Maintenance Instrument	1 set
9.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
10.	Emergency Power Supply	1 set
11.	Installation Materials	1 set
12.	Minor Spare Parts	1 set

Chieng Rai Translator Station, 2nd Channel (Future Extension)

Item	Description	Q'ty
1.	300 W TV Translator	2 sets
2.	Coaxial Equipment (Including Air Cooled Test Load, Input and Output Filter, and Two-channel Combining Equipmet, etc.)	1 set
3.	Monitoring Equipment	1 set
4.	Receiving Antenna and Feeder System	1 set
5.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
6.	Emergency Power Supply	1 set
7.	Installation Materials	1 set
8.	Minor Spare Parts	1 set

N-8 Phetchabun

In this Province considerable mountains exist near the frontier of Nakhon, Sawan, Phicht Provinces etc. and the population is concentrated in the plateau extending over these mountains. As for the TV service the translator system by which radio waves from other TV stations are received and rebroadcast in the mountain near the Provincial frontier is the best.

The master station will be the Nakhon Sawan TV station. It is proper to locate the transmitting point on the 513 meter Hill.

TABLE N-8-1 Main Specifications of Phetchabun Station

Name of Station		Phetchabun
Type of Station		Translator
Transmitting Site	Site	Ban Nam Baeng, Ref. to Fig. N-8-1
	Latitude and Longitude	16°13'27" N. 101°0'14" E.
	Altitude	513 m
	Access Road	1.5 km
Transmitting Channel No.		6, 10
Transmitting Antenna	Height of Tower	30 m, Ref. to Fig. 3-1-11
	Polarization	Horizontal
	Required E.R.P.	Max.3 KW, Ref. to Fig. N-8-2
Output Power of Transmitter		300 W, Ref. to Fig. 3-1-12 & Table N-8-2
Service Area	Area	Greater Part of Phetchabun Province
	Population Covered	218,000 persons
Studio	Building	—
	Facilities	—
Receiving Station	Name	Phetchabun
	Site	Same as the transmitting site
Master Station		Nakhon Sawan
Station Building		48 m^2, Ref.to Fig. 3-1-4 & Fig. 3-1-6
(Thousand Bahts) Construction Cost (1st Channel)	Equipment	1,916
	Building, Road, etc.	1,100
	Total	3,016

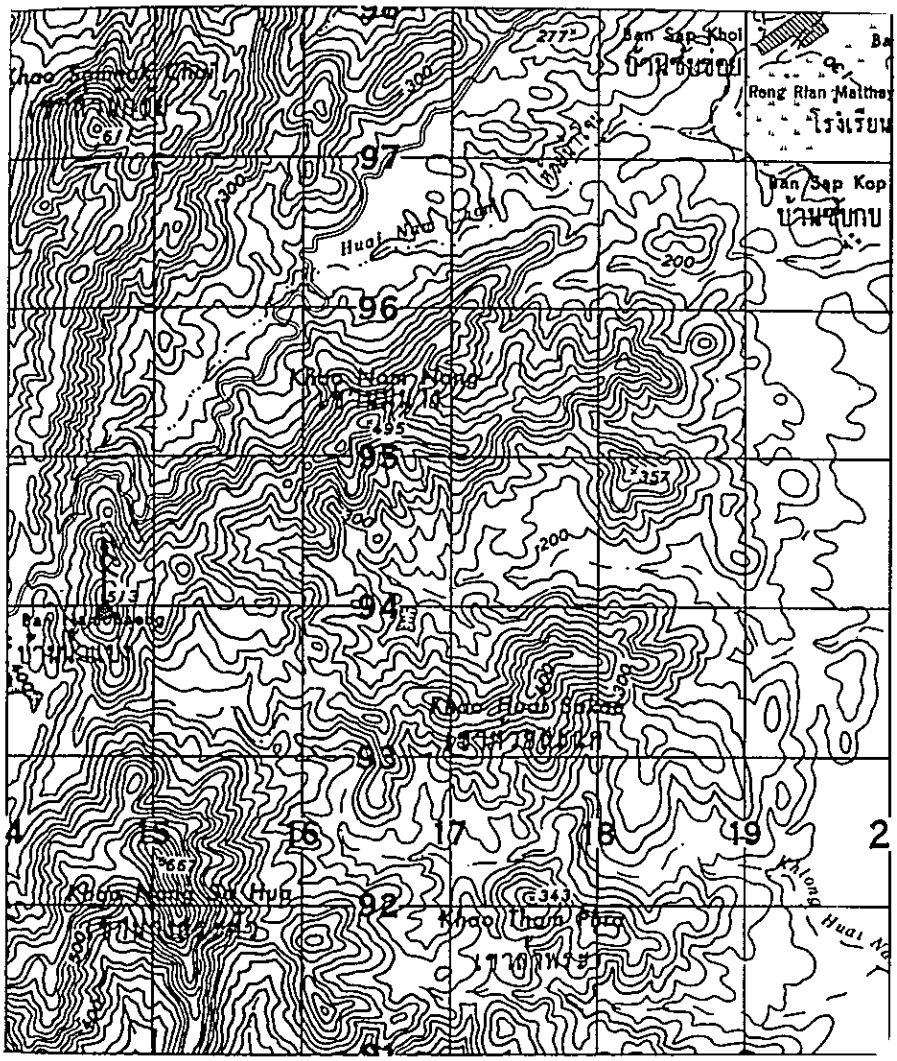

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Fig. N-8-1 LCCATION OF TRANSMITTING SITE (PHETCHABUN STATION)

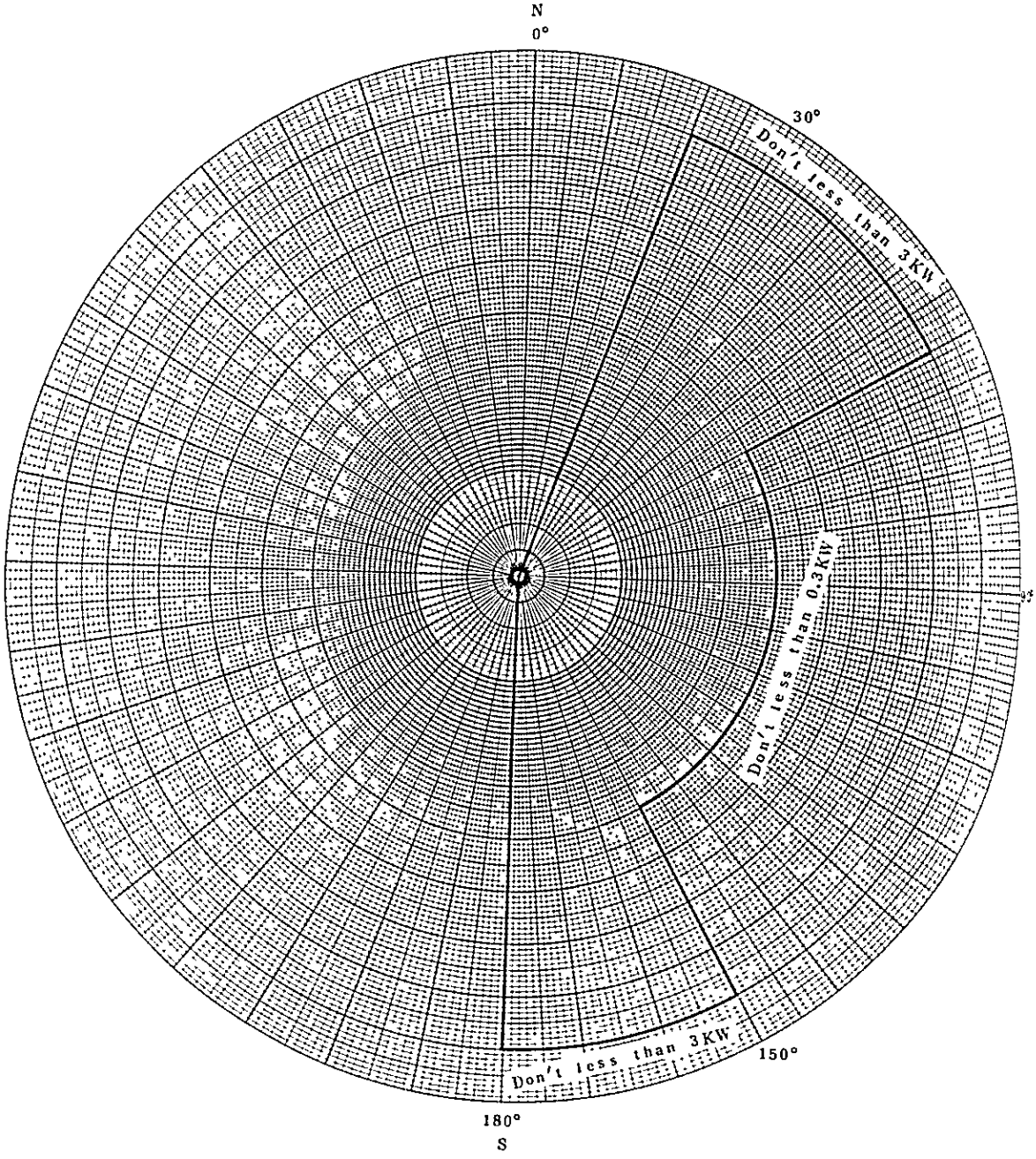

Fig. N-8-2 HORIZONTAL PATTERN OF REQUIRED E.R.P. (PHETCHABUN STATION)

TABLE N-8-2 List of TV Transmitting Facilities

Phetchabun Translator Station, 1st Channel

Item	Description	Q'ty
1.	300 W TV Translator	2 sets
2.	Coaxial Equipment (Including Air Cooled Test Load, Input Filter and Output Filter, etc.)	1 set
3.	Transmitting Antenna	1 set
4.	Transmitting Feeder System	1 set
5.	30 Meters Antenna Tower	1 set
6.	Monitoring Equipment	1 set
7.	Receiving Antenna and Feeder System	1 set
8.	Maintenance Instrument	1 set
9.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
10.	Emergency Power Supply	1 set
11.	Installation Materials	1 set
12.	Minor Spare Parts	1 set

Phetchabun Translator Station, 2nd Channel (Future Extension)

Item	Description	Q'ty
1.	300 W TV Translator	2 sets
2.	Coaxial Equipment (Including Air Cooled Test Load, Input and Output Filter, and Two-channel Combining Equipment, etc.)	1 set
3.	Monitoring Equipment	1 set
4.	Receiving Antenna and Feeder System	1 set
5.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
6.	Emergency Power Supply	1 set
7.	Installation Materials	1 set
8.	Minor Spare Parts	1 set

N-9 Phrae

It is difficult to receive service from the Uttradit TV station and the Lampang TV station in Phrae Province. However, the relay place (737 meter Hill) of the micro-wave circuit from Uttradit to Lampang is the best position for the service to this Phrae Province, and almost the entire Province can be covered.

Therefore, a translator station for receiving and rebroadcasting waves from the Uttradit TV station will be established.

TABLE N-9-1 Main Specifications of Phrae Station

Name of Station		Phrae
Type of Station		Translator
Transmitting Site	Site	Near the microwave relaying station Ref. to Fig. N-9-1
	Latitude and Longitude	17°55'47" N. 100°0'12" E.
	Altitude	737 m
	Access Road	100 m
Transmitting Channel No.		6, 10
Transmitting Antenna	Height of Tower	30 m , Ref. to Fig. 3-1-11
	Polarization	Horizontal
	Required E.R.P.	Max. 5 kW, Ref. to Fig. N-9-2
Output Power of Transmitter		300 W, Ref. to Fig. 3-1-12 & Table N-9-2
Service Area	Area	Greater Part of Phrae Province
	Population Covered	288,000 persons
Studio	Building	—
	Facilities	—
Receiving Station	Name	Phrae
	Site	Same as the transmitting site
Master Station		Uttradit
Station Building		48 m^2, Ref. to Fig. 3-1-4 & Fig. 3-1-6
(Thousand Bahts) Construction Cost (1st Channel)	Equipment	1,919
	Building, Road, etc.	100
	Total	2,019

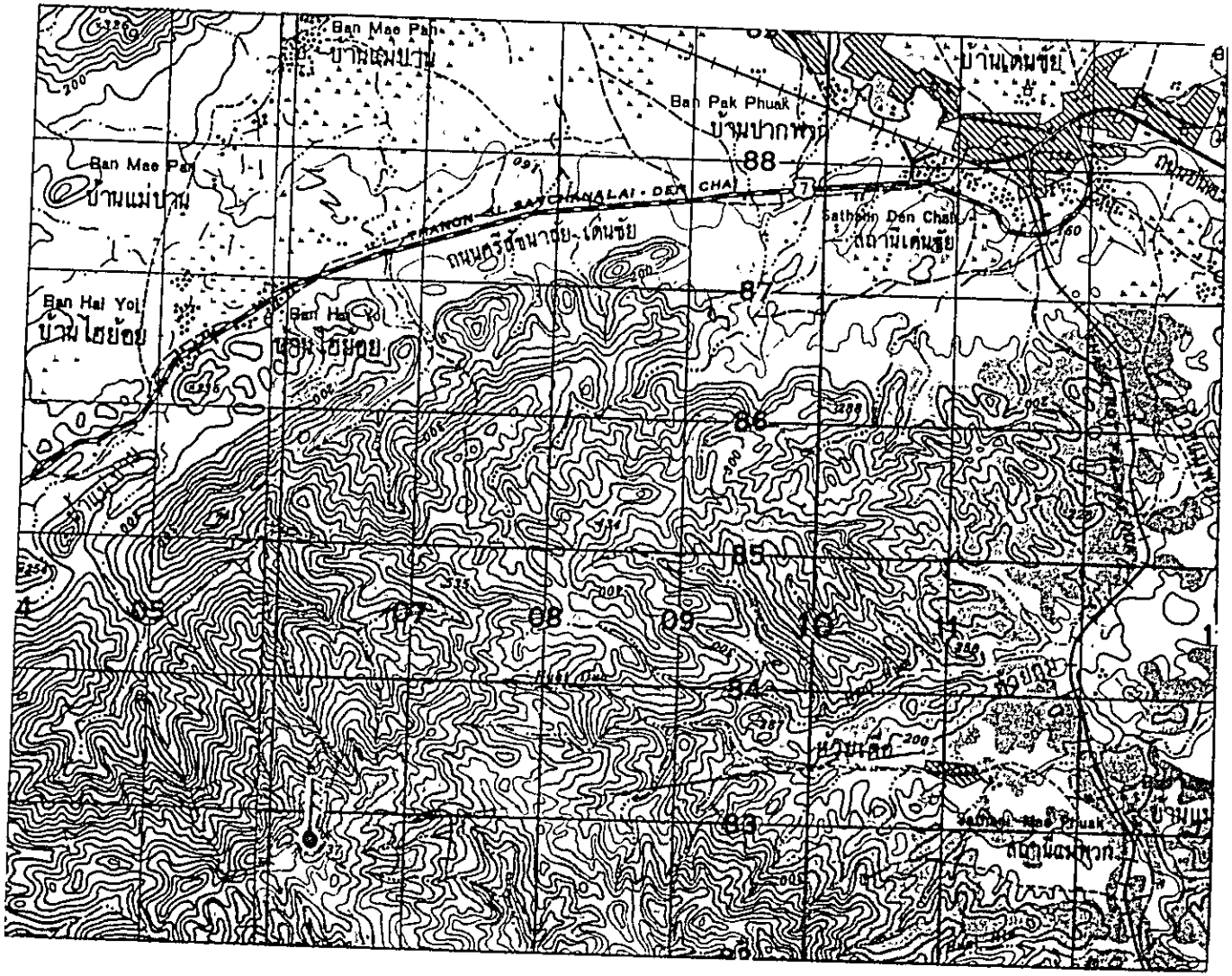

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FIG. N-9-1 LOCATION OF TRANSMITTING SITE (PHRAE STATION)

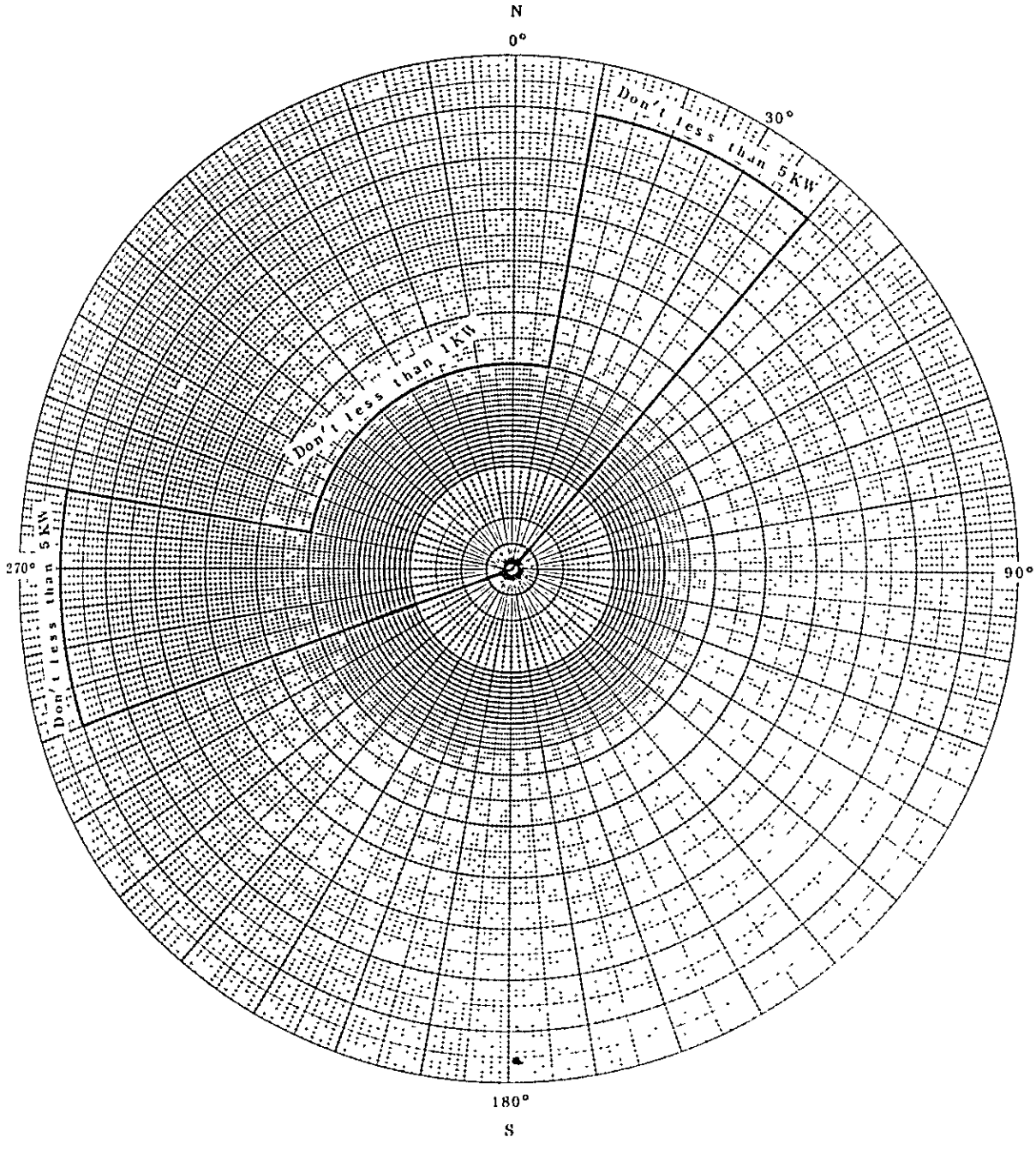

Fig. N-9-2 HORIZONTAL PATTERN OF REQUIRED E.R.P. (PIIRAE STATION)

TABLE N-9-2 List of TV Transmitting Facilities

Phrae Translator Station, 1st Channel

Item	Description	Q'ty
1.	300 W TV Translator	2 sets
2.	Coaxial Equipment (Including Air Cooled Test Load, Input Filter and Output Filter, etc.)	1 set
3.	Transmitting Antenna	1 set
4.	Transmitting Feeder System	1 set
5.	30 Meters Antenna Tower	1 set
6.	Monitoring Equipment	1 set
7.	Receiving Antenna and Feeder System	1 set
8.	Maintenance Instrument	1 set
9.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
10.	Emergency Power Supply	1 set
11.	Installation Materials	1 set
12.	Minor Spare Parts	1 set

Phrae Translator Station, 2nd Channel (Future Extension)

Item	Description	Q'ty
1.	300 W TV Translator	2 sets
2.	Coaxial Equipment (Including Air Cooled Test Load, Input and Output Filter, and Two-channel Combining Equipment, etc.)	1 set
3.	Monitoring Equipment	1 set
4.	Receiving Antenna and Feeder System	1 set
5.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
6.	Emergency Power Supply	1 set
7.	Installation Materials	1 set
8.	Minor Spare Parts	1 set

N-10 Nan

Nan Province is located northeast of Phrae Province. The Province consists of plateau like Phrae Province.

As the TV service to this Province, the best one will be a system to receive waves from Phrae TV station and rebroadcast using a nearby mountain (high place near the Doi Yao road) located at the highest place along the road leading to the two Provinces.

TABLE N-10-1 Main Specifications of Nan Station

Name of Station		Nan
Type of Station		Translator
Transmitting Site	Site	Doi Yao, Ref. to Fig. N-10-1
	Latitude and Longitude	18°30'0" N. 100°30'54" E.
	Altitude	660 m
	Access Road	4.5 km
Transmitting Channel No.		8, 12
Transmitting Antenna	Height of Tower	30 m Ref. to Fig. 3-1-11
	Polarization	Horizontal
	Required E.R.P.	Max. 3 kW, Ref. to Fig. N-10-2
Output Power of Transmitter		300 W, Ref. to Fig. 3-1-12 & Table N-10-2
Service Area	Area	Greater Part of Nan Province
	Population Covered	134,000 persons
Studio	Building	—
	Facilities	—
Receiving Station	Name	Nan
	Site	Same as the Transmitting site
Master Station		Phrae
Station Building		48 m^2, Ref. to Fig. 3-1-4 & Fig. 3-1-6
(Thousand Bahts) Construction Cost (1st Channel)	Equipment	1,837
	Building, Road, etc.	3,100
	Total	4,937

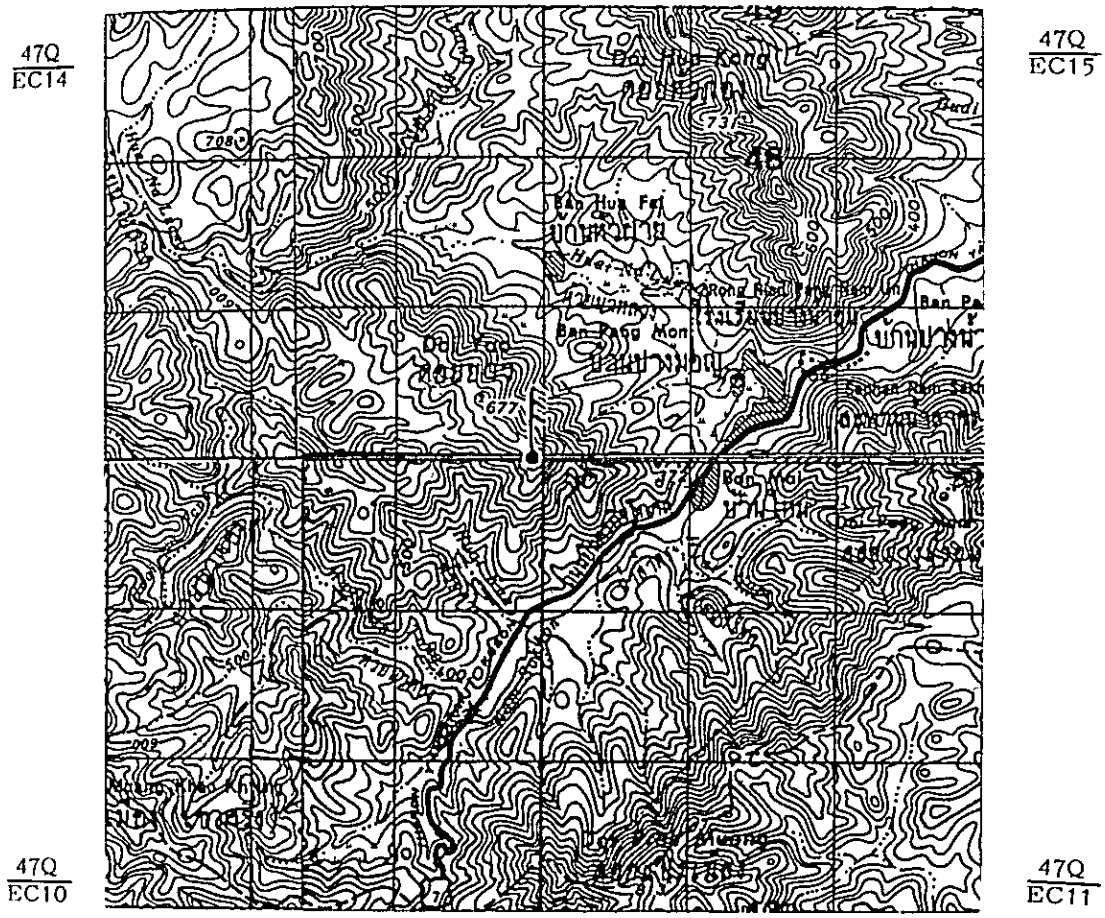

Fig. N-10-1 LOCATION OF TRANSMITTING SITE (NAN STATION)

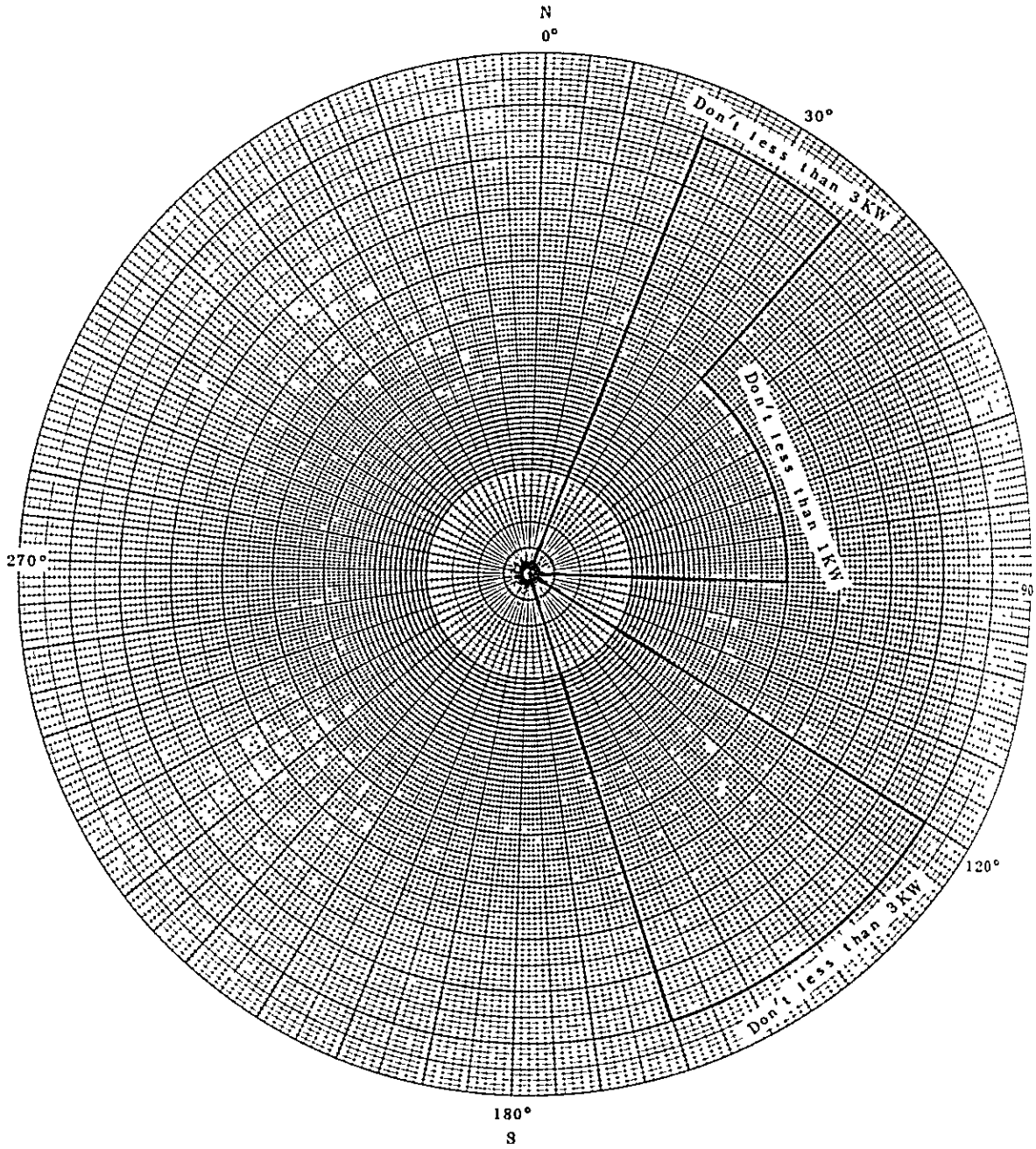

Fig. N-10-2 HORIZONTAL PATTERN OF REQUIRED E.R.P. (NAN STATION)

TABLE N-10-2 List of TV Transmitting Facilities

Nan Translator Station, 1st Channel

Item	Description	Q'ty
1.	300 W TV Translator	2 sets
2.	Coaxial Equipment (Including Air Cooled Test Load, Input Filter and Output Filter, etc.)	1 set
3.	Transmitting Antenna	1 set
4.	Transmitting Feeder System	1 set
5.	30 Meters Antenna Tower	1 set
6.	Monitoring Equipment	1 set
7.	Receiving Antenna and Feeder System	1 set
8.	Maintenance Instrument	1 set
9.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
10.	Emergency Power Supply	1 set
11.	Installation Materials	1 set
12.	Minor Spare Parts	1 set

Nan Translator Station, 2nd Channel (Future Extension)

Item	Description	Q'ty
1.	300 W TV Translator	2 sets
2.	Coaxial Equipment (Including Air Cooled Test Load, Input and Output Filter, and Two-channel Combining Equipment, etc.)	1 set
3.	Monitoring Equipment	1 set
4.	Receiving Antenna and Feeder System	1 set
5.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
6.	Emergency Power Supply	1 set
7.	Installation Materials	1 set
8.	Minor Spare Parts	

N-11 Wang Nua

A mountain west of Wang Nua town was selected in consideration of the fact that it is a point where sufficient field strength can be obtained from Doi Ton where the Lampang TV station is located and it is possible to service surrounding areas.

The service area is the most part of Wiang Pa Pao District of Chiang Rai Province and Wang Nua District of Lampang Province.

TABLE N-11-1 Main Specifications of Wang Nua Station

Name of Station		Wang Nua
Type of Station		Translator
Transmitting Site	Site	Ref. to Fig. N-11-1
	Latitude and Longitude	19°9'8" N. 99°34'38" E.
	Altitude	800 m
	Access Road	5 km
Transmitting Channel No.		9, 11
Transmitting Antenna	Height of Tower	30 m , Ref. to Fig. 3-1-11
	Polarization	Horizontal
	Required E.R.P.	Max. 8 kW, Ref. to Fig. N-11-2
Output Power of Transmitter		300 W, Ref. Fig. 3-1-12 & Table N-11-2
Service Area	Area	Some Part of Lampang and Chiang Rai Province
	Population Covered	55,000 persons
Studio	Building	—
	Facilities	—
Receiving Station	Name	Wang Nua
	Site	Same as the transmitting site
Master Station		Lampang
Station Building		48 m^2, Ref. to Fig. 3-1-4 & Fig. 3-1-6
(Thousand Bahts) Construction Cost (1st Channel)	Equipment	1,679
	Building, Road, etc.	3,500
	Total	5,179

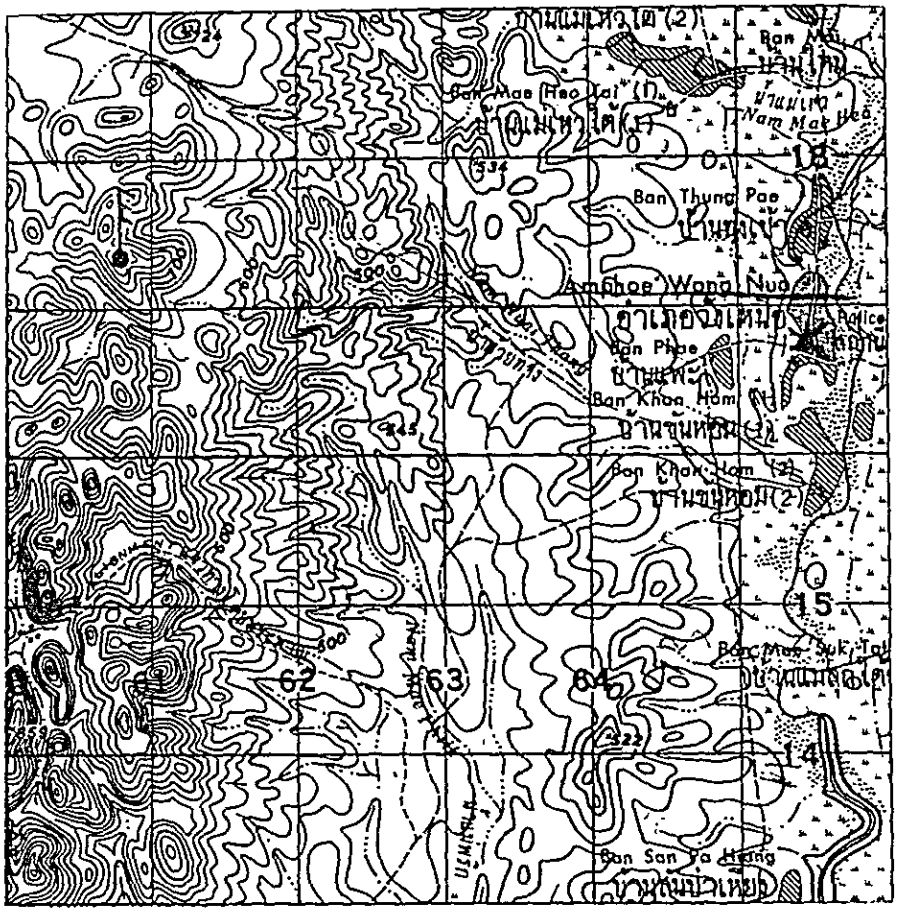

Fig. N-11-1 LOCATION OF TRANSMITTING SITE (WANG NUA STATION)

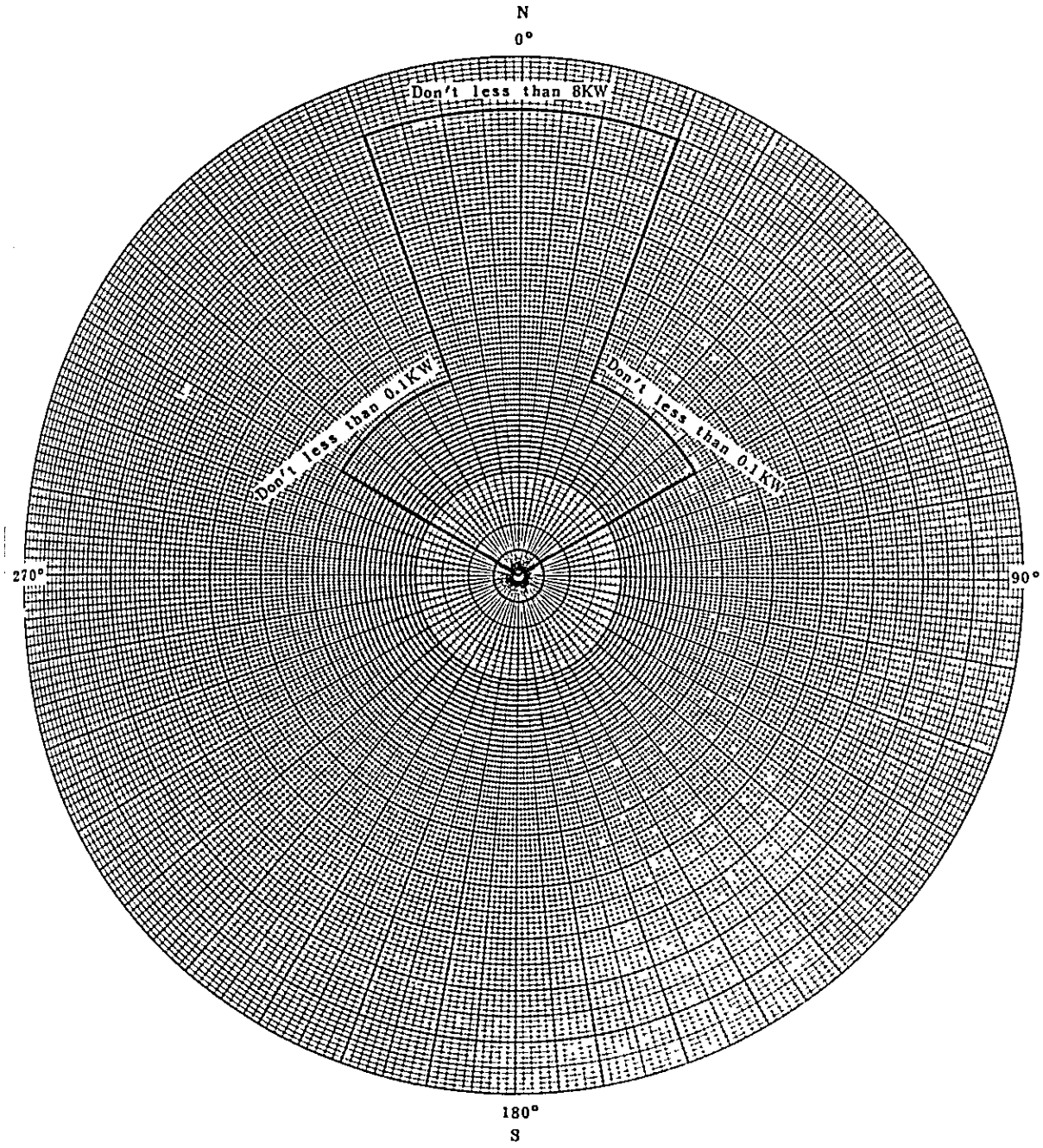

Fig. N-11-2 HORIZONTAL PATTERN OF REQUIRED E.R.P. (WANG NUA STATION)

TABLE N-11-2 List of TV Transmitting Facilities

Wang Nua Translator Station, 1st Channel

Item	Description	Q'ty
1.	300 W TV Translator	2 sets
2.	Coaxial Equipment (Including Air Cooled Test Load, Input Filter and Output Filter, etc.)	1 set
3.	Transmitting Antenna	1 set
4.	Transmitting Feeder System	1 set
5.	30 Meters Antenna Tower	1 set
6.	Monitoring Equipment	1 set
7.	Receiving Antenna and Feeder System	1 set
8.	Maintenance Instrument	1 set
9.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
10.	Emergency Power Supply	1 set
11.	Installation Materials	1 set
12.	Minor Spare Parts	1 set

Wang Nua Translator Station, 2nd Channel (Future Extension)

Item	Description	Q'ty
1.	300 W TV Translator	2 sets
2.	Coaxial Equipment (Including Air Cooled Test Load, Input and Output Filter, and Two-channel Combining Equipment, etc.)	1 set
3.	Monitoring Equipment	1 set
4.	Receiving Antenna and Feeder System	1 set
5.	Automatic Voltage Regulator and Power Distribution Equipment	1 set
6.	Emergency Power Supply	1 set
7.	Installation Materials	1 set
8.	Minor Spare Parts	1 set