REPORT OF INVESTIGATION
ON
NATION - WIDE TELEVISION BROADCASTING
NETWORK PROJECT
IN
REPUBLIC OF UGANDA

MAY 1969

OVERSEAS TECHNICAL COOPERATION AGENCY

GOVERNMENT OF JAPAN

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PREFACE

In response to the request of the Government of Uganda in East Africa, the Government of Japan agreed to undertake the feasibility investigation of the nation-wide television network project in continuation of the preliminary investigation performed in 1968 and entrusted its execution to the Overseas Technical Cooperation Agency.

In the Republic of Uganda, this nation-wide television network project is taken up as one of the important measures in its Second Five-Year Plan for Economic Development (1966-1971). With due consideration given to the importance of the project and smooth and scrupulous investigation, the Agency organized a survey team composed of the technical survey party and management survey party and headed by Shuzo Tokuda, a deputy director, Broadcast Dept., Radio Regulatory Bureau of the Ministry of Posts and Telecommunications, and dispatched it to the Republic of Uganda for about 110 days from the middle of November, 1968.

The technical party consisting of seven engineers carried out technical investigations on various plans for the nation-wide television network, programme relaying network and other facilities as well as practice tests for the propagation of radio waves. The management party comprising two staffs conducted investigations on the establishment of various systems required for the operation of the television broadcasting enterprise as well as on other problems including dissemination, personnel, finances, etc.

Each party of the team has already submitted its interim report to the Government of Uganda, having put together the investigation results on the spot. This final report has been prepared after their return, with minute examinations and studies made on data and materials collected during the field investigations.

It would give us great pleasure if this report should in some way contribute to the materialization of the nation-wide television network project in the Republic of Uganda and prove useful for further development of its education and culture as well as for the promotion of amicable relations between the Republic of Uganda and Japan.

On behalf of the Agency, I take this opportunity to express my hearty thanks for the kind cooperation and assistance extended to the team by the Government of Uganda and its officials concerned.

May, 1969

S. Shibusawa

Shin-ichi Shibusawa
Director General
Overseas Technical Cooperation Agency
Japan

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PART II DETAILED DESCRIPTION

List of Abbreviations

This list enumerates the abbreviations used in this report.

Abbreviation	
CCIR	International Radio Consultative Committee
CH	Channel
EG	Engine Generator
ERP	Effective Radiated Power
IFRB	International Frequency Registration Board
ITU	International Telecommunication Union
NHK	Japan Broadcasting Corporation (Nippon Hoso Kyokai)
RX	Receiver
ReRX	Rebroadcasting Receiver
SV	Supervisory Equipment
TV	Television
TX	Transmitter
VTR	Video Tape Recorder
VTVM	Vacuum Tube Volt Meter

dB is a unit of field strength or voltage indicated by decibel. And 1μV/m or 1 μV is expressed as 0 dB.

dBk is a unit of electric power indicated by decibel. And 1 KW is expressed as 0 dBk.

As to the unit of length, meter was used in principle since the Republic of Uganda has converted itself into the use of metric system since 1969. But still there are many data that have the description of only mile and foot. For the purpose of such data, a conversion table is given below.

Conversion Table to Metric System (Length)

1 inch	:	25.4 mm
1 foot	:	0.305 m
1 mile	:	1.609 km

PART I SUMMARY

CHAPTER 1 RECOMMENDATIONS

PART I SUMMARY

This report has been prepared on the basis of the results of the field investigations and the radio wave propagation test executed by the Japanese Television Survey Team from December 1968 through February 1969, and is designed to contribute to the formulation of the construction and management plans for Uganda's nation-wide TV broadcasting network.

Chapter 1 Recommendations

1.1 Installation of Television Broadcasting Station

To establish a nation-wide TV broadcasting network, it is necessary to install a new TV broadcasting station in every district of Jinja, Gulu, Kabale, Hoima, Masindi, Arua, Fort Portal, Kasese, Tororo and Moroto, in addition to the existing TV broadcasting stations installed in Kampala, Mbale, Soroti, Lira, Masaka and Mbarara.

This will make it possible to afford the television broadcasting service to about 90% of the whole population.

1.2 Establishment of Programme Relay Network

All the TV broadcasting programmes are produced at the Nakasero Studio in Kampala, the capital, and transmitted through the programme relay network to each TV station. In consideration of economy and convenience of maintenance, it is advisable to adopt chiefly an UHF relay system for this programme relay network.

Further, to establish a relay network for the transmission of programmes, it is necessary to install UHF relay stations in Jinja (together with a TV station), Kagulu, Ongora, Nkirakira, Nakisaja, Kabuga, Biko and Erusi East.

1.3 Construction of Supervisory Network

To make up for the shortage of maintenance personnel through the rationalization of maintenance system, it is necessary to make all stations unattended except for those in Kampala, Soroti, Mbarara and Hoima, and to establish a supervisory network that can constantly monitor the working condition of all stations excepting those having weak transmitting power.

Through this medium, the maintenance personnel at the Kampala, Soroti, Mbarara and Hoima stations can take prompt and adequate steps in the case of troubles at any unattended stations except for those with weak transmitting power.

1.4 Improvement on Equipment of Existing TV Broadcasting Stations

Even after the establishment of the programme relay network using UHF relaying system, the existing TV broadcasting stations will continue to have the functions of both broadcasting and relaying the programmes. Therefore, if the broadcasting of an existing station is suspended by the trouble in its equipment, the broadcasting of its sub-stations, to which the broadcasting programme of the said station should be relayed through the programme relay network, will also be suspended as ever. To minimize such faults, it is not only desirable to provide the Kampala and Soroti stations, which are the central and sub-central stations respectively, with the stand-by transmitters but also necessary to adjust and put in order all the machinery and equipment of the existing stations as well as to repair in advance those with deteriorated characteristics.

1.5 Improvement on Studio Facilities

To increase the broadcasting hours and to enrich the content of programmes, it is necessary to add a compact outside broadcasting van (including VTR) and a floor type VTR to the existing studio facilities.

For the drastic improvement on the studio facilities, it is most effective to establish a new broadcasting centre. However, this will need careful considerations with respect to the finance, programme enlargement and personnel training programmes. Therefore, it is desirable to set up a new project for this purpose from a long-range point of view after the completion of the present project.

1.6 Schedule and Costs of Construction Project of Nation-wide Television Broadcasting Network

It will require a period of about three years and a half to complete the construction of the nation-wide TV broadcasting network.

Therefore, it is advisable to divide the whole construction process into two phases, with priority given to the first phase construction involving the improvement on the existing TV broadcasting network and the construction of new stations in the districts of Jinja, Gulu and Kabale where the relaying of the programmes is easier and the density of population is higher, so that it will be completed within the period of the Second Five-Year Plan for Economic Development.

The processes for each phase and the details of construction costs are tabulated below.

Construction Schedule for the Nation-wide TV Broadcasting Network Project

Period	Preparatory Period	First Phase Construction	Second Phase Construction
Year	1969	1970 — 1971	1971 — 1972
Content of Construction Project	Establishment of Project Preparation of Specifications Contract	Improvement on Existing TV Broadcasting Network Installation of Stand-by Transmitter at Kampala Station First-phase Expansion of TV Broadcasting Network Establishment of Supervisory Network	Installation of Stand-by Transmitter at Soroti Station Completion of Nation-wide TV Broadcasting Network Expansion of Supervisory Network Improvement on Studio Facilities

Construction Costs for Nation-wide TV Network Project

(Unit: 1,000 shillings)

	Machinery & Equipment	Power Line, Building & Other Local Construction (Except road construction and excavation and levelling of sites)	Total
First Phase Construction	7,620	930	8,550
Second Phase Construction	7,540	880	8,420
Total	15,160	1,810	16,970

1.7 Installation of TV Receivers for Community Viewing

Under the present circumstances where no rapid popularization of TV receivers can be expected, it is necessary to install TV receivers for community viewing at the community centre, schools, etc. where no TV receivers are installed now, so that the public may be afforded with the opportunity to watch TV.

1.8 Form of Enterprise

Considering the present situation of Uganda, it appears appropriate to keep the broadcasting government-managed for the time being. But it is desirable to place it under the management of some public corporation in future.

Even under the governmental management, it will be advisable, for the acceleration of enterprise activities, to adopt a special accounting system, independent from the general account of the government, or to make it a government enterprise, namely an independent enterprise from the viewpoint of financial and management techniques.

1.9 Integration of Radio and TV

At present, radio and TV form two different enterprises, each constituting a division of the Ministry of Information, Broadcasting and Tourism. For the purpose of rationalizing the broadcasting enterprises, it is recommended to integrate them into a single enterprise.

1.10 Management Organization

A director general who heads the directors of both radio and TV bureau as the chief of the whole broadcasting enterprise must be appointed in addition to the establishment of the management planning division to draw up long-range management programmes.

1.11 Receiving Licence Fee

Uganda's current receiving licence fee, five shillings per year, is much cheaper than the subscription to a paper, power rates and other prices. So, it is recommended to raise it to about fifty shillings per year.

1.12 Advertisement Broadcasting Income

When the nation-wide network is completed and the number of audience increases, the advertisement broadcasting by TV will become a much powerful advertising medium that produces extensive effects. Therefore, it is necessary to raise unit advertisement rates as well as to secure and increase the number of sponsors, keeping pace with the development of economy.

1.13 Increase of Broadcasting Hours and Programme Compilation

UTV is now broadcasting for about six hours and a half per day on the average, and the government expects that TV broadcasting will play an effective role in achieving the national objects. It is considered necessary to increase the broadcasting hours to the level of about ten hours per day to cover government's public relations programmes, school programmes, etc..

Proper arrangement of programmes will be 40-50% for education and culture, 25-35% for news and information and 20-30% for entertainment (including advertisement).

1.14 Contents of Programme

As to the contents of programmes, it is desirable to gradually increase such programmes as school programmes (particularly for elementary schools and lower secondary schools) designed to cover the shortage of school facilities and teachers, language programmes for the unification of the national language, vocational and technical lecture programmes for social and economic development, and locally made programmes including domestic news, sportcasts, national events, typical local events, folk dances, etc.. These are produced by the aid of the outside broadcast van to promote mutual understanding and cooperation among the nation.

1.15 Improvement and Maintenance of Programme Quality

To improve the quality of and to maintain the high level of programmes, it is recommended to take the following steps.

(1) Organization of Programme Advisory Committee

(2) Establishment of Programme Standards

(3) Establishment of Programme Examination System

(4) Survey of the Televiewer's Opinions and Requirements

1.16 Measures for Dissemination

If adquate measures are taken, dissemination of about 240 thousand units of TV receivers may be expected by 1981.

For the purpose of dissemination, the following steps must be taken.

(1) To install TV receivers for community viewing at the community centres, schools, etc., so that the public may be afforded with the oppurtunity to watch TV. In this case, care should be taken so that the receivers with small generators will be installed where no electricity is available.

(2) In order to disseminate cheap and good TV receivers, promote the import of standard 16" or smaller TV receivers and lower their prices through the progressive governmental price policies such as reduction or abolition of import tax, excise and sales duties.

(3) To adopt a long-term hire-purchase system with a low interest. To assist this system, it will be necessary for the government to loan the low-interest funds to retailers.

(4) To increase the broadcasting hours and improve and enrich the contents of programmes, in order to arouse the interest of the public in the TV broadcasting.

1.17 Repletion and Training of Personnel

For the operation of TV broadcasting enterprise on a nation-wide scale, a large number of personnel with high technical knowledges must be increased in each field of technique, programme production, and management and administration. Therefore, a long-term personnel programme must be set up, upon which employment and training of personnel are to be pushed forward progressively.

And their training may be performed in the following ways.

(1) Installation of training facilities in UTV

(2) Dispatching personnel for overseas training

(3) Employment of experts from advanced nations

The following table shows a long-range prospect for the personnel required for the implementation of this project.

Annual Personnel Plan

Station	Item	1971	1973	1976	1981
Kampala	Management planning & administration	19	25	32	34
	Transmission technique	18	21	17	17
	Reception technique	7	13	15	17
	Broadcasting service	16	16	16	16
	Programme production	47	63	99	106
	Programme production technique	54	62	102	102
	Total	161	200	281	292
Soroti	Transmission technique	7	7	9	9
	Reception technique	3	6	7	8
	Total	10	13	16	17
Mbarara	Transmission technique	7	7	9	9
	Reception technique	3	6	7	8
	Total	10	13	16	17
Hoima	Transmission technique	-	7	9	9
	Reception technique	-	6	7	8
	Total	-	13	16	17
Grand Total		181	239	329	343

(Remarks): Personnel belonging to the Radio Bureau are not included.

1.18 Financial Programme

It is expected that the governmental grant-in-aid (national expenditure on TV minus TV broadcasting income) will continue to increase until 1976 but will be no longer necessary in 1981.

CHAPTER 2 SCOPE OF INVESTIGATION

Chapter 2 Scope of Investigation

2.1 Scope of Investigation

On December 9, 1968, it was agreed between the Hon. Minister of Information, Broadcasting and Tourism, Mr. A. A. Ojera and the Japanese Television Survey Team that the investigation should cover the following.

(1) Selection of the location, scale and specifications of each broadcasting station which would be most expedient in extending good television broadcasting services to the districts of Jinja, Gulu, Kabale, Hoima, Masindi, Fort Portal, Arua, Moroto, Tororo and Kasese; and measurement of the field strength required for estimating the service area of each station.

(2) Selection of the location, scale and specifications of each relay station based on the radio wave propagation test and field investigations, which would serve for satisfactory programme relay through the UHF relay system.

(3) Investigations for the improvement of the studio facilities.

(4) Estimate of the time and cost required for the construction works.

(5) Preparation of a management plan including the organization, finance, form of enterprise, personnel, programme, popularization, etc.

2.2 Organization of Survey Team and Allotment of Work for Each Member

The Japanese Television Survey Team was organized by the Overseas Technical Cooperation Agency in November, 1968. The team comprised nine members headed by Shuzo Tokuda. The name, position, period of despatch and allotment of work of each member are shown below.

Chief of Team

Shuzo Tokuda

Deputy Director,
Broadcast Dept.,
Radio Regulatory Bureau,
Ministry of Posts and Telecommunications

Period of despatch: 96 days

In charge of all investigation works

Kyoichi Okamura

Chief of the International Section,
Legal Division,
Radio Regulatory Bureau,
Ministry of Posts and Telecommunications

Period of despatch: 60 days
In charge of management investigation

Yasuo Otaki

Chief of the Engineering Section,
Broadcast Dept.,
Radio Regulatory Bureau,
Ministry of Posts and Telecommunications

Period of despatch: 96 days

In charge of technical investigation

Tadamasa Hatano

Television Engineer,
Broadcast Dept.,
Radio Regulatory Bureau,
Ministry of Posts and Telecommunications

Period of despatch: 110 days

In charge of technical investigation

Takeshi Kobayashi

Senior Engineer of Station Planning,
Headquarters of Technical Administration
and Construction,
Japan Broadcasting Corporation (N H K)

Period of despatch: 96 days

In charge of technical investigation

Hajime Inada

Senior Officer,
Policy Planning Bureau,
Japan Broadcasting Corporation (N H K)

Period of despatch: 60 days

In charge of management investigation

Akira Keida

Television Engineer of Station Planning,
Headquarters of Technical Administration
and Construction
Japan Broadcasting Corporation (N H K)

Period of despatch: 96 days

In charge of technical investigation

Akira Miki

Television Engineer,
Ministry of Posts and Telecommunications

Period of despatch: 96 days

In charge of technical investigation

Shozo Hayami

Engineering Adviser,
Development Survey Div.,
Overseas Technical Cooperation Agency

Period of despatch: 110 days

In charge of liaison and coordination
and technical investigation

2.3 Outline of Method and Schedule of Investigation

The survey team was divided into two parties, i.e. a technical party and a management party; the former being engaged in activities under items (1) through (4) of 2.1 and the latter in activities under item (5).

During the period from December 9, 1968 to February 26, 1969, the technical party exchanged opinions with the officials concerned of the Ministry of Information, Broadcasting and Tourism and the Uganda Electricity Board, conducted field investigations at the nineteen prospective station sites in Jinja, Gulu, Kabale, etc. and checked up the facilities of the six existing TV broadcasting stations and the Nakasero studio.

The party also carried out the practice tests for radio wave propagation for twenty programme relay routes utilizing the transmitters, receivers, and other measuring apparatus.

Further, in order to prepare the data with which to estimate the overall service conditions upon completion of the nation-wide TV broadcasting network, the service areas of the existing stations were investigated through the measurement of their field strength at sixty points.

The management party, during the period from December 9, 1968 to January 23, 1969, also exchanged opinions with the officials concerned of the Ministry of Information, Broadcasting and Tourism, the Ministry of Planning and Economic Development, the Ministry of Education, the Ministry of Culture and Community Development, and the Uganda Electricity Board. The party also made two local trips to investigate the actual conditions of the community viewing in local districts.

CHAPTER 3 ACKNOWLEDGEMENT

Chapter 3 Acknowledgement

This investigation was carried out by the all-out cooperation of the Ministry of Information, Broadcasting and Tourism. Throughout the whole investigation period, the Ministry furnished the survey team with three automobiles with drivers and offered us a storeroom and workshop to store and put in order the machinery and equipments for investigation. During the field investigations, two land-rovers and one truck were furnished with their drivers in addition to the said three automobiles, for the transportation of the machinery, equipments and porters, and several staffs of the Ministry of Information, Broadcasting and Tourism accompanied the team as the liaison officers. Furthermore, unlimited co-operation and assistance were offered to the team, including the furnishing of the first-aid medicines, the issuance of certificates in the name of Permanent Secretary of the Ministry of Information, Broadcasting and Tourism, etc., which all played an indispensable role in smoothing the execution of the investigation and securing the safety of the members.

The staff of the Ministry of Planning and Economic Development, the Ministry of Education, the Ministry of Works, Communications and Housing, the Ministry of Culture and Community Development, and the Uganda Electricity Board offered us a lot of direct and indirect co-operations and furnished us with various data required for the investigation.

The Hon. Hee Bahng, the Korean ambassador to Uganda, Dr. C. H. F. Kim, the president of the Korean Medical Association in Uganda, and other Korean doctors in Uganda offered us a progressive assistance in maintaining the health of the team members.

The Hon. R. Ando, the Japanese ambassador in Kenya, Mr. T. Sato, First secretary of the Embassy of Japan in Kenya and other Embassy staff provided us with their superior guidance and assistance throughout the whole investigation period.

We owe much official and private co-operations to many other people of Uganda and the Japanese.

We express our hearty gratitude to all of them and hope that this investigation will contribute to further development of education and civilization in the Republic of Uganda and serve for the promotion of the amicable relations between the Republic of Uganda and Japan.

PART II DETAILED DESCRIPTION

CHAPTER 1 INTRODUCTION

PART II DETAILED DESCRIPTION

Chapter 1 Introduction

1.1 Scope of the Report

Television broadcasting service in the Republic of Uganda, which is under control of the Ministry of Information, Broadcasting and Tourism, is actively operated by TV stations located in Kampala, Mbale, Soroti, Lira, Masaka, and Mbarara. Programmes are produced at the TV studio in Kampala, the capital of the Republic, and relayed to these stations. Unfortunately, the service area of the present network is somewhat limited, and the programme relay system and the maintenance and operation of the existing TV stations require some improvement.

With the view to accelerating the elevation of educational level through the nation-wide spread of television broadcast, the Government of Uganda included the TV network expansion plan in the major projects incorporated in the Second Five Year Plan for Economic Development (1966 to 1971), and requested the Government of Japan to despatch a technical survey team.

This report was prepared based upon the field investigations and radio wave propagation tests conducted for 3 months starting from December 1968, and is designed to contribute to the formulation of detailed construction and management plans of the nation-wide television network.

1.2 Background

Japan's cooperation for the television network expansion programme of the Republic of Uganda started in August, 1967, when Japanese Ambassador in Kenya, the Hon. T. Urabe visited Secretary for Planning, Mr. A. K. K. Mubanda, at his office in the Ministry of Planning and Economic Development of Uganda, and had a talk with him about the mutual economic and technical cooperation between the two countries. At the meeting, the Secretary asked the Hon. T. Urabe for Japan's cooperation in formulating a detailed plan for establishing a nation-wide TV broadcasting network.

Prior to the despatch of the survey team, the Government of Japan sent a pre-survey group composed of three experts, Tohru Kamahara, Shuzo Tokuda and Hiroshi Hara, to the Republic of Uganda to consult with the Government of Uganda on the details of the project, and to pre-investigate the operating conditions of the existing TV broadcasting stations, as well as the geographic, climatic, and financial situations directly concerned with the TV broadcasting.

As a result of the meetings held between the officials of the Government of Uganda and the pre-survey group, and in response to the ardent desire of the Uganda Government for early establishment of the nation-wide TV broadcasting network, the pre-survey group conducted investigations on those specific items which were indispensable in mapping out basic plans for the prospective network, and submitted, in June 1968, a preliminary survey report which described the summary of the proposed network.

The pre-surveying clarified that the requirements of the Government of Uganda included a comprehensive survey on organization, personnel, finance, popularization of TV sets, and other items in various phases necessary for the planning of a long-term administrative programme, as well as technical studies needed for planning the expansion of TV network and improvement of existing equipments and facilities.

In November, 1968, the Government of Japan despatched a survey team composed of nine members to the Republic of Uganda to investigate all necessary matters for establishment of a practical and comprehensive programme which will cover all phases of TV broadcasting.

1.3 Scope of Investigation

A joint meeting was held on December 9, 1968, at the Ministry of Information, Broadcasting and Tourism between the Hon. Minister Mr. A. A. Ojera and other staffs concerned and all members of the survey team, which was also attended by Mr. T. Sato, First Secretary of the Embassy of Japan in Nairobi.

At this meeting, the scope of the survey team activity and its schedule were discussed and resulted in the following agreement.

1.3.1 Scope of the Technical Survey

The scope of the survey team activity agreed by the Government of Uganda was as follows:

(1) To select sites suitable for TV stations to provide satisfactory services for the districts of Jinja, Gulu, Kabale, Hoima, Masindi, Fort Portal, Arua, Moroto, Tororo, and Kasese, and to determine the scale and detailed specifications of these stations.

(2) To measure field strength of TV waves transmitted from the existing stations for the purpose of determining service areas of the existing stations and estimating those for new stations.

(3) To select sites suitable for relay stations by which TV programmes are to be relayed with fine picture and voice quality using UHF relay system, and to determine proper scale and detailed specifications of the relay stations.

(4) To investigate the facilities of the existing TV stations and to test the propagation of radio waves from the existing and prospective stations for the establishment of a programme relay network linking TV stations.

(5) To determine necessary studio facilities for reinforcement of programme production capacity.

(6) To specify details of construction work and time required for the construction.

(7) To estimate cost of construction and operation of the nation-wide television network and to classify the cost into the equipment cost and the local construction cost.

1.3.2 Scope of the Management Survey

The scope of the survey in the management and administrative phases as agreed by the

Government of Uganda was as follows:

(1) To study the legislative aspect and the form of the broadcasting enterprise as well as other matters related to the systematic TV broadcasting, and if necessary, to advise the Government of Uganda on these matters.

(2) To study the preferable form of the broadcasting organization, a long-term management plan and other matters related to the arrangement of management system, and if necessary, to advise the Government of Uganda on these matters.

(3) To prepare a preferable TV broadcasting programme plan.

(4) To prepare plans to popularize TV sets.

(5) To prepare financial and personnel training plans.

1.4 Method and Schedule of Investigation

After the meeting with the Hon. Minister, Mr. A. A. Ojera and other staffs on December 9, 1968, the survey team was reorganized in two parties, the technical and the management parties, and both parties started their activities in the fields described in the previous paragraph. Survey method and schedule of the parties are as follows.

1.4.1 Technical Survey Party Activities

Seven members of the team, Tokuda, Otaki, Hatano, Kobayashi, Keida, Miki, and Hayami, who were assigned to the technical survey party, conducted the following technical survey activities including the field survey and propagation tests using transmitters, receivers and other measuring instrument shipped from Japan. For transportation of personnel and instruments, three automobiles, two landrovers and a truck were offered by the Ministry of Information, Broadcasting and Tourism.

Between 9th and 17th December, 1968, the technical survey party stayed in Kampala to receive air transported instruments, assemble and adjust these instruments, and purchase necessary articles. Members of the party had meetings with the staffs of the Ministry of Information, Broadcasting and Tourism to arrange practical affaris on the survey, and also with the staff of the Uganda Electricity Board to be informed of the general situation of power supply in Uganda.

The party also visited the radio and TV transmitting stations and studios in Kampala to study existing facilities of these places.

During the following four days, the party visited the prospective station sites in Jinja, Tororo and Moroto. Service areas of the Kampala, Mbale and Soroti stations were also measured during this tour.

From December 22, 1968 to January 4, 1969, the party stayed in Kampala to receive marine transported instruments, and to assemble and adjust these instruments. Meetings with the staffs of the Ministry of Information, Broadcasting and Tourism were also held during this period. After the assembling and adjustment of the marine transported instruments were completed, the party initiated the full-scale propagation tests and service area measurements.

During a week starting from 5th January, 1969, the party conducted the field survey of station sites scheduled for Ongora and Gulu stations, study of facilities at Lira station, and service area measurement of Soroti and Lira stations. The propagation tests to determine the programme relay routes were also conducted in this period.

Between 15th and 21st of January, 1969, the party visited prospective sites for Jinja, Kagulu, Tororo, Akisim and Moroto stations, studied facilities and service areas of Mbale and Soroti stations, and conducted the propagation tests required to determine the relay routes.

Activities conducted by the party between January 27 and February 6 included the field survey of prospective sites for Nkirakira, Nakisaja, Kabale, Fort Portal, Mabale and Kasese stations, measurement of service areas of Kampala, Masaka and Mbarara stations, propagation tests for relay routes in these areas.

From February 10 to February 17, the party conducted various types of surveys including field survey of prospective station sites in Biko, Hoima, Masindi, Erusi East, Arua and Kabuga, service area measurement for Kampala, Masaka and Mbarara stations, and radio wave propagation tests for prospective programme relay routes.

From 18th to 25th February, the party stayed in Kampala to consult with the staffs of the Ministry of Information, Broadcasting and Tourism and analyse a considerable amount of materials obtained during the survey activities, and started preparation of an interim report. Packing of and customs and shipping procedures for test instrument and equipment were conducted in this period.

On 25th February, the party submitted an interim report on the survey activities to Mr. M. Emojong, Permanent Secretary for Information, Broadcasting and Tourism.

On 28th February, the party completed the survey activities which had been carried out successfully for about 100 days, and left the Republic of Uganda.

1.4.2 Management Survey Party Activities

Okamura and Inada of the Survey Team were assigned to the management survey. Activities conducted by the management survey party were as follows.

(1) Collection and analysis of statistical data on population, finance and economy.

(2) Study of political and administrative situations.

(3) Survey on the present broadcasting enterprise activities.

(4) Survey on the present situation of the affiliated industries.

(5) Survey on the present circumstance of the educational circles.

Between 9th and 17th December 1968, the management survey party stayed in Kampala and had meetings with the staffs of the Ministry of Information, Broadcasting and Tourism, the

Ministry of Planning and Economic Development, and the Uganda Electricity Board to study actual situations and to exchange comments. The party also visited radio and TV stations to survey administration and management of the broadcasting enterprise.

During 4 days starting from 18th December, the party visited the north-eastern region of the country to survey the operation of local TV stations, popularization of TV receivers, community viewing of TV in community centres and schools, and situation in local cities and villages.

From 22nd December 1968 to 3rd January 1969, the party stayed in Kampala to collect data and to meet the staffs of the Ministry of Information, Broadcasting and Tourism, the Ministry of Planning and Economic Development and the Ministry of Culture and Community Development. The party also visited community centres in the suburbs of Kampala to survey the community viewing situation.

During a week from 4th January, the party visited the south-western region for the same purpose as for the visit to the north-eastern region.

From 11th to 22nd January, the party stayed in Kampala to meet the staffs of the Ministry of Information, Broadcasting and Tourism, the Ministry of Planning and Economic Development, and the Ministry of Education, to be informed of more details and to exchange comments. The party started to analyse results of survey activities and to prepare an interim report.

On 23rd January, the party submitted the interim report to Mr.M. Emojong, Permanent Secretary for Information, Broadcasting and Tourism.

Upon completion of the survey activities conducted for 60 days, the management survey party left the Republic of Uganda on 25th January, 1969

1.5 Equipment and Instruments Used for the Survey

Table 1-1 shows major test instrument and equipment used for the technical survey.

Table 1-1 Table of Major Test Instruments

Nomenclature	Q'ty	Type & Rating	Remarks
UHF Propagation Test Transmitter, 10W	1 set	Freq. 765.25 MHz Power Output 10W	Nihon Tsushinki K. K. w/Dummy Load
UHF Propagation Test Transmitter, 5W	1 set	Freq. 663.25 MHz Power Output 5W	Japan Radio Ltd.
VHF Propagation Test Transmitter, 50W	1 set	Freq. 153.33 MHz F_3 Power Output 50W	Japan Radio Ltd. w/Dummy Load
VHF Propagation Test Transmitter, 10W	2 sets	Freq. 153.33 MHz F_3 Power Output 10W	Japan Radio Ltd. w/Dummy Load
VHF Intercomm. Tranceiver, 3W	2 sets	Freq. 153.33 MHz F_3 Power Output 3W	Japan Radio Ltd. AC/DC 2 way w/whip antenna
VHF Intercomm. Tranceiver, 1W	4 sets	Freq. 153.33 MHz F_3 Power Output 1W	Toshiba E. C. w/batt. charger and whip antenna
VHF/UHF Field Strength Meter	2 sets	Freq. Range 30 –1400MHz Level 0 dB/μ or more	Anritsu E. C.
UHF Field Strength Meter	1 set	Freq. Range 470 – 940 MHz Level 42 dB/μ or more	Kyoritsu E. C.
VHF TV Band Field Strength Meter	2 sets	Channel Band III, CCIR Level 20 dB/μ or more	Kyoritsu E. C.
Portable VHF TV Band Field Strength Meter	1 set	Channel Band III, CCIR Level 20 dB/μ or more	Kyoritsu E. C.
Portable Engine Generator, 300W	6 sets	AC 50/60 Hz 100V DC 24V	Honda

Nomenclature	Q'ty	Type & Rating	Remarks
Portable Engine Generator, 600W	4 sets	AC 50/60 Hz 100V DC 24V	Honda
UHF Propagation Test Antenna 5-elem., 2 stack, YAGI	2 sets	Gain 11.0 dB/50Ω w/Ray dome	Yagi Ant. Ltd.
UHF Test Antenna 8-element, YAGI	4 sets	Gain 10.5 dB (7.5 dB/50Ω)	Yagi Ant. Ltd.
VHF Propagation Test Antenna 5-element, YAGI	3 sets	Gain 9.0 dB/75Ω	Yagi Ant. Ltd.
VHF Propagation Test Antenna 3-element, YAGI	2 sets	Gain 5.5 dB/75Ω	Yagi Ant. Ltd.
VHF TV Band Test Antenna 7-element, YAGI	6 sets	Gain 10.0 dB/300Ω (7.0 dB/50Ω)	Toshiba E. C.
Picture and Voice Quality Test TV Receiver	3 sets	CCIR system 11 inch type	Toshiba E. C.
Electrical Antenna Lifter	2 sets	Lift range 2 – 10 m	Denki Kogyo Ltd.
Antenna Support Pole	6 sets	1 m x 10 ea.	
Precision VOM	2 sets		Yokogawa E.C.
Portable VOM	1 set		

1.6 Results of Discussions with the Government of Uganda on the Details of the Preliminary Survey Report

Prior to starting the survey activities and propagation tests, several meetings were held between staffs of the Ministry of Information, Broadcasting and Tourism and the Japanese TV Survey Team to exchange comments on the preliminary survey report which described the summary of prospective nation-wide TV network. Major items of the preliminary survey report upon which both parties reached agreement are as follows.

1.6.1 TV Programme Relay System

Regarding the programme relay system, the preliminary survey report states that "three (3) relay systems, UHF relaying system, microwave/UHF combined relaying system, and microwave relaying system, are possible. However, from the economical view-point, the UHF relaying system would be most desirable". Since it was impracticable to ship all the test instruments necessary to cover the three systems, the Japanese Government inquired of the Government of Uganda, prior to the despatch of the survey team, about the most desirable relay system In reply to this inquiry, Permanent Secretary Mr. A.M. Sibo of the Ministry of Information, Broadcasting and Tourism informed, through Secretary Masuji Yamamoto of the Embassy of Japan in Kenya, that his Government prefered the UHF relaying system over others and decided to request the Japanese Government to undertake a full-scale investigation for the realization of the TV broadcasting network expansion employing the UHF relay system. Accordingly, the Japanese Survey Team conducted field surveys and propagation tests to formulate a plan for programme relay network in which will be employed the UHF relaying system described in the preliminary report.

1.6.2 Suspension of Multiplex Sound Transmission Link Plan

Because of its complicacy of network configuration, the primarily proposed multiplex sound transmission link, which aims at broadcasting TV programmes using vernacular languages concurrently, incurs a substantial increase in the overall construction cost.

In addition, production of multiplex sound TV programmes generally require incomparably much effort and cost to its effect.

Basing upon the practical decision of the Government of Uganda to suspend the construction of multiplex sound transmission link, the Survey Team entirely rearranged the sound relay network plan.

1.6.3 Addition of Supervisory Network

In order to establish a rationalized maintenance system in which less number of skilled engineers would be demanded, the supervisory network plan was revised so that all stations except those in Kampala, Soroti, Mbarara and Hoima may be operated on the unattended station basis, and that a supervisory network to constantly monitor the operation of these unattended stations may be added. This additional provision enables maintenance engineers at the attended stations to take necessary measures immediately if trouble should occur in the unattended stations, and minimizes the break of broadcasting due to such trouble.

1.6.4 Installation of Emergency Engine Generators

The preliminary survey report recommended to install emergency engine generators at all stations except the terminal stations in the relay network. However, the break of broadcasting due to power failure lasts for a short time, and is negligible for the time being considering the predictable speed of TV receiver popularization. The plan was therefore revised to install these generators after the nation-wide TV network is established.

1.6.5 Installation of Stand-by Transmitters

To minimize the break of broadcasting, one set each of stand-by transmitter was added to facilities of Kampala and Soroti stations which operate as the central and the sub-central stations.

CHAPTER 2 INSTALLATION PLAN OF TV BROADCASTING STATIONS

Chapter 2 Installation Plan of Television Broadcasting Stations

2.1 Present Situation of Existing Stations

At present, six (6) TV braodcasting stations of Mbale, Soroti, and Lira stations in eastern region, Masaka and Mbarara stations in western region, and the central station in Kampala are actively operating in the Republic of Uganda.

Frequency, effective radiated power (ERP), and site of these stations have been determined to comply, as shown in Table 2-1, with those assigned to the Republic of Uganda in the Regional Agreement for the African Broadcasting Area, which was confirmed at the African VHF/UHF Broadcasting Conference of I.T.U. These stations use the channels of C.C.I.R. Band III and are based on the C.C.I.R.-B Standard System (Refer to Table 2-2).

Table 2-1 Specifications of Existing TV Stations

Name of Station	Kampala	Mbale	Soroti	Lira	Masaka	Mbarara
Frequency (Channel No.)	V 175.25MC A 180.75MC (ch.5)	V 196.25MC A 201.75MC (ch.8)	V 210.25MC A 215.75MC (ch.10)	V 189.25MC A 194.75MC (ch.7)	V 196.25MC A 201.75MC (ch.8)	V 210.25MC A 215.75MC (ch.10)
Nominal Trans-mitting Power	V 5KW A 1KW	V 5KW A 1KW	V 5KW A 1KW	V 5KW A 1KW	V 5KW A 1KW	V 5KW A 1KW
Type of Antenna	V type 12 stacks Non-Directional	V type 12 stacks Semi-cardioid	V type 12 stacks Non-Directional	V type 12 stacks Non-Directional	V type 14 stacks Non-Directional	V type 12 stacks Semi-cardioid
Nominal Antenna Gain	11 dB	11 dB	11 dB	11 dB	11 dB	11 dB
Nominal E. R. P.	V 60KW A 12KW	V 60KW A 12KW	V 60KW A 12KW	V 60KW A 12KW	V 60KW A 12KW	V 60KW A 12KW
Antenna Mast (above G. L.)	150m	75m	150m	150m	150m	150m
Location	E32°35'29" N00°20'14"	E34°14'26" N01°10'24"	E33°39'03" N01°42'47"	E32°52'19" N02°16'00"	E31°44'51" S00°21'34"	E30°33'24" S00°43'21"

Table 2-2 Summary of the B System

(1)	No. of Lines per Picture	625
(2)	Field Repetition Frequency	50 Hz
(3)	Interlace	2/1
(4)	Frame Frequency	25 Hz
(5)	Line Frequency	15.625 KHz
(6)	Aspect Ratio	4/3
(7)	Scanning Sequence	Line : From left to right Field : From top to bottom
(8)	Synchronization with Power Frequency	Asynchronous
(9)	Approximate Gamma Value of Picture Signal	0.5
(10)	Video Frequency Bandwidth	5 MHz
(11)	Radio-Frequency Bandwidth	7 MHz
(12)	Carrier Relative to Vision Carrier	5.5 MHz
(13)	Nominal Width of Vestigial Sideband	0.75 MHz
(14)	Type of Vision Modulation	A5C
(15)	Polarity of Vision Modulation	Negative
(16)	Type of Sound Modulation	F3 Freq. Deviation · ± 50 KHz Pre-emphasis 50μS
(17)	Ratio of ERP of Vision and Sound	5/1

2.2 Service Area of Existing Stations

In order to investigate the distribution of field strength radiated from the existing six stations, actual field strength measurement was carried out at 60 points. The service areas obtained by plotting the measured values are shown in Fig. 2-1. The received field strength was converted to the value for an antenna height of 10 meters above ground. The figure clarifies that the existing six stations cover only approximately a half of entire area of the Republic of Uganda. It also reveals that the service area contains certain spots with poor reception condition.

2.3 New TV Broadcasting Station Plan

The African VHF/UHF Broadcasting Conference prepared a station assignment plan for the Republic of Uganda in which five new stations were scheduled at Gulu, Fort Portal, Masindi, Kabale and Arua. Viewing from the sites of these prospective stations and the natural features of the regions, it is estimated that operation of all 11 stations, six existing and five prospective would not be sufficient to assure full coverage of entire area of the Republic of Uganda. To cover 90% or more of total population in the service area of network, it is suggestable to build five more stations at Moroto, Tororo, Hoima, Jinja and Kasese.

2.4 Channel Plan

The following conditions must be considered in determining frequency allocation for stations.

(1) Frequencies assigned to the Republic of Uganda at the African VHF/UHF Broadcasting Conferrence must be generally employed.

(2) Change in frequencies of the existing stations is not desirable. If it is necessary, extent of the change must be as small as possible.

(3) Frequency allocation for one station must not cause interference to other stations.

(4) In order to avoid interference of input and output frequencies of a translator station, these frequencies must not be an identical frequency nor must they be in adjacent channels.

In due considerations of these conditions, a recommendable frequency allocation is shown in Fig. 2-2.

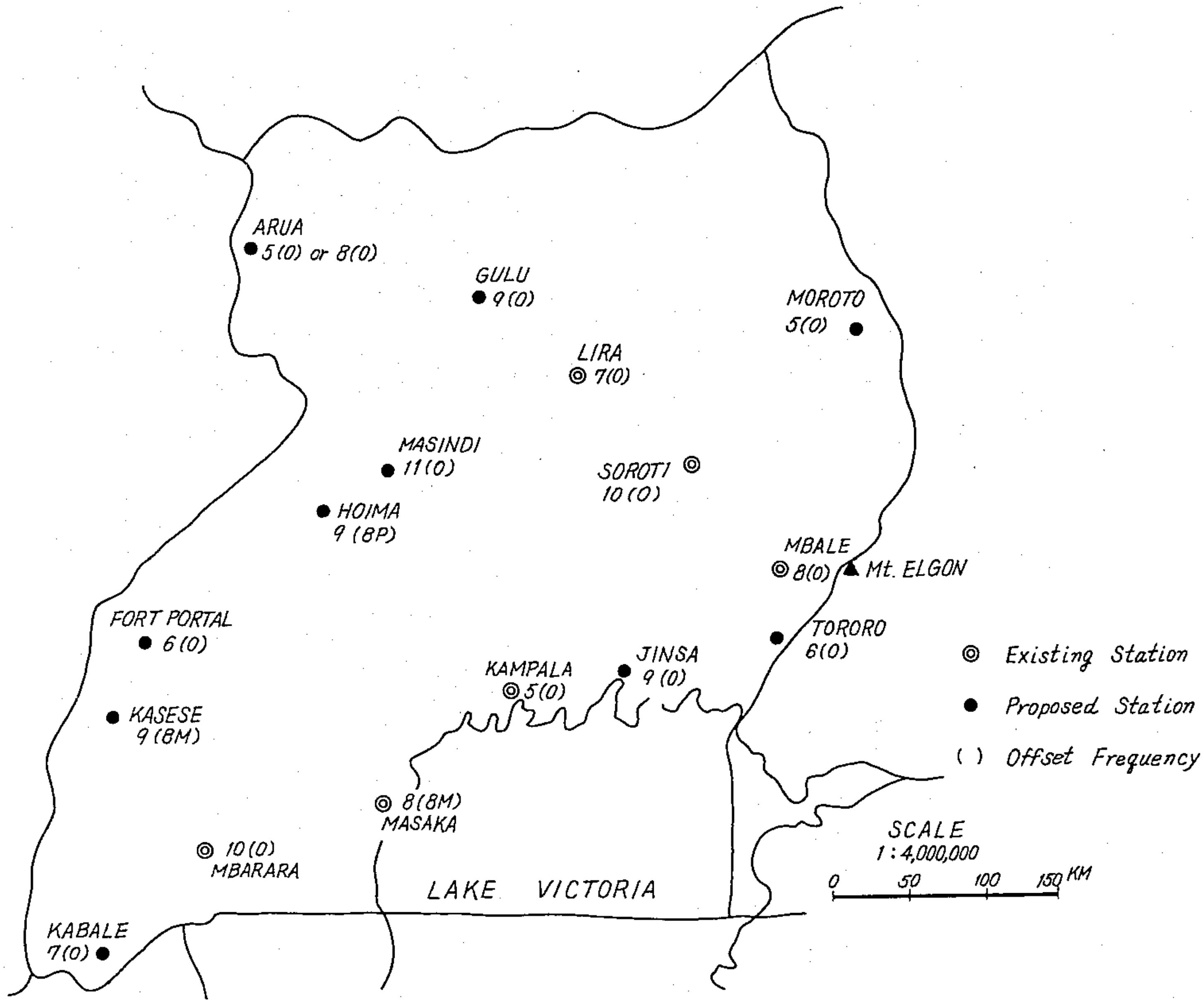


Fig. 2-2 CHANNEL ALLOCATION

To avoid predictable interference between Arua and Masindi stations of which frequencies were assigned to channel 11 at the African VHF/UHF Broadcasting Conference, transmitting frequency of Arua station must be changed to either channel 5 or channel 8.

Prior to construction of this network, it will be necessary, in accordance with Article 3 of the Regional Agreement for the African Broadcasting Area, to apply to I.F.R.B. and take required procedures for the change of the frequency allocation to Arua station and for new assignment of channels to Moroto, Tororo, Hoima, Jinja, and Kasese stations.

2.5 Required Field Strength

C.C.I.R. defines, in its Recommendation No. 417-1, the service area of TV stations as Grade A for areas where the field strength is over 55dB with a receiving antenna height of 10 metres above ground, and Grade B for the field strength of over 40dB. Also, in Report No.409, C.C.I.R. suggests that Grade A may be applied to an sparsely populated area where the field strength is over 49dB.

According to this network plan, in which the stations are located in the neighbourhood of towns, the areas of considerably low field strength are naturally sparsely populated. Therefore, in this report, Grade A is applied for areas having field strength of over 49dB.

As premises to adopt these values to the standards for degree of servicing, relationship between the field strength and picture quality obtainable from a particular field strength must be described.

At present, international standards for evaluation of picture quality is not settled, however, in Japan a number of investigations on the relationship between the evaluation of received picture quality and the S/N of received wave have often been reported. In these reports, the picture quality is generally evaluated in five ranks producing the following quality S/N relationship:

Rank of Quality	Evaluation of Picture	S/N (in carrier stage)
5	Imperceptible	45dB or more
4	Perceptible but not annoying	37dB or more
3	Somewhat annoying	29dB or more
2	Severely annoying	22dB or more
1	Unusable	Below 22dB

The S/N at video detector input of a receiver (in the carrier stage) is defined as:

$$S/N = \frac{Vin^2/R_{in}}{NF \cdot KTB}$$

where: V_{in} = Input Voltage of Receiver (V)

R_{in} = Input Impedance of Receiver (Ω)

NF = Noise Figure

K = Boltzmann's constant (1.37×10^{-23})

T = Absolute Temperature (273° + t°C)

B = Equivalent Noise Bandwidth (Hz)

Required input voltages (V_{in}) for S/N of 37 dB and 29 dB, i.e. grades 4 and 3 respectively, are calculated as; Letting R_{in} = 300Ω, T = 273° + 25°C, and B = 4 MHz, V_{in} (for S/N of 37 dB)= 54 dB and V_{in}(for S/N of 29 dB)=46 dB.While, the relationship between receiver input voltage Vin and field strength E is calculated as:

$$Vin = E \cdot \frac{\lambda}{\pi} \cdot \sqrt{\frac{Ga}{L_f \cdot L_m}} \cdot \sqrt{\frac{R_{in}}{73 \cdot 13}}$$

where: Ga = Antenna Gain

$\frac{\lambda}{\pi}$ = Effective Height of Antenna (m)

L_f = Feeder Loss

L_m = Mismatching Loss

Letting λ = 1.6m, L_f = 1 dB, L_m = 2 dB, and Rin = 300Ω, the antenna gain (Ga) for field strength of 49 dB (Grade A in C.C.I.R. Recommendation) and receiver input levels of 54 dB (Grade 4), and for field strength of 40 dB (Grade B in C.C.I.R. Recommendation) and receiver input level of 46 dB (Grade 3) are respectively calculated as;

8 dB for Grade A and 4

9 dB for Grade B and 3

These values of Ga are approximately equal to those of 7 and 8 elements YAGI antennas.

These calculations prove that Grade 4 picture is obtainable in fringe of Grade A area by using a 7-elements and 10 metres high YAGI antenna, and reception of Grade 3 picture is possible in fringe of Grade B area by using an 8-elements and 10 metres high YAGI.

2.6 Prospective Station Sites and Output Power

In order to determine sites suitable for the broadcasting and relaying, the survey team conducted field investigations as well as studies of data and maps to obtain distribution of population and geographical features.

Also, to determine the most economical and efficient station sites and output power, pro pagation tests were repeated. The study of maps and profiles is an essential factor to determine mine adequate sites and output power, and calculation of TV wave propagation is also conducted on this occasion. The following relates to the calculation method of TV wave propagation. Assuming that the transmitting and receiving antennas are on the line of sight, and the radio wave is transmitted on the smooth earth,field strength at the receiving antenna is theoretically calculated by the following equation.

$$E = \frac{7\sqrt{GP}}{d} \cdot 2 \cdot \sin \frac{2\pi \cdot h_t \cdot h_r}{\lambda d}$$

where:	E	=	Field Strength (V/m)
	G	=	Transmitting Antenna Gain
	P	=	Transmitting Output Power (watt)
	h_t	=	Height of Transmitting Antenna (m)
	h_r	=	Height of Receiving Antenna (m)
	λ	=	Wavelength (m)

In case that the transmitting and receiving antennas are out of the line of sight due to the curvature of the earth, the aforementioned theoretical equation must be corrected.

If a mountain is located between the antennas and disturbs the line of sight transmission, the receiving field strength is theoretically calculated by the following equation.

E $$E = 4\,\frac{7\sqrt{G \cdot P}}{d} \cdot S \cdot \mathrm{Sin}\,\frac{2\pi \cdot h_t \cdot h_r}{\lambda d_1} \cdot \sin \frac{2\pi \cdot h_o \cdot h_r}{\lambda d_2}$$

where:	h_o	=	Height of diffracting point above the line of sight.
	d_1	=	Distance between the transmitting antenna and the diffracting point.
	d_2	=	Distance between the receiving antenna and the diffracting point.
	S	=	Diffraction loss (culculated from Fig. 2-3)

(1) Gulu TV Station

I) Prospective Station Site

Since this area is comparatively flat, the station may, from the viewpoint of radio wave propagation, be constructed at any place in a radius of 20 to 30 Kilometres from Gulu. However, if the antenna tower is to be built on the plain near Gulu, it must be 100 metres or more in height to expect high quality reception of the TV wave for relaying programmes transmitted from Lira station which is 85 Km apart. This antenna height is economically impractical. Further, Mt. Moru between the two cities may cause ghost image on the received picture. These problems can be solved simply by building the antenna mast on Mt. Moru, since its summit has a height of 150 metres from average ground level and is 65 Km from the Lira station and on the line of sight. The station site will insure stable relaying of programmes (receiving of Lira station) and efficient broadcasting.

II) Output Power and Transmitting Antenna

In order to make the service area of the station as wide as possible, extending from Gulu toward the circumference of the Acholi district, output power of 5 Kilowatts is considered appropriate. To include Kitugum, the second largest town in this district, in Grade A service area of Gulu station, it is advisable to install 4-sections 2 dipoles antenna toward N-E, and 2-sections 2 dipoles toward N-W and S-W. (Refer to antenna directivity charts in Chapter 6.)

(2) Moroto TV Station

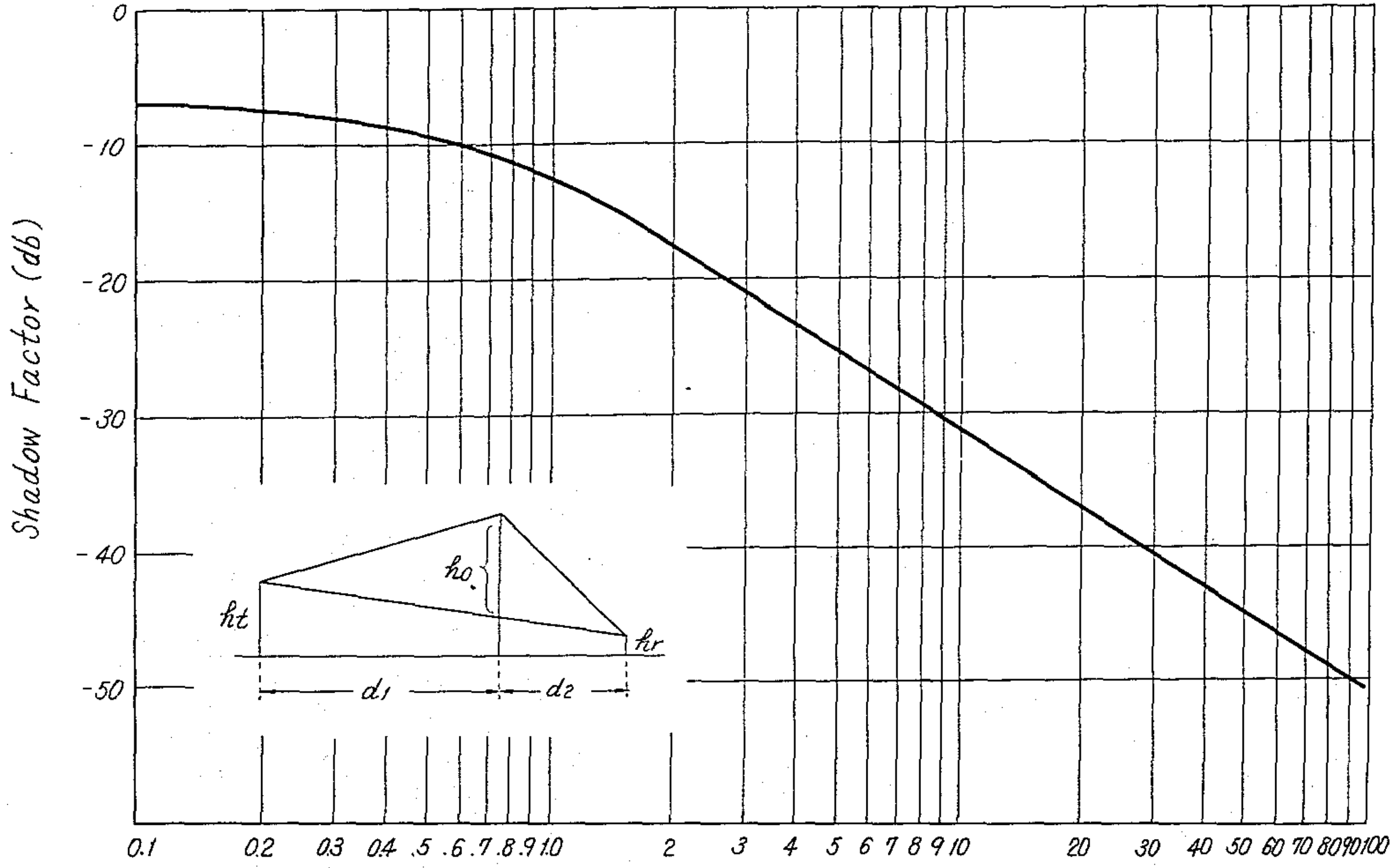
I) Prospective Station Site

From the viewpoint of transmission, a low antenna tower will be sufficient at this station which is to serve only for Moroto town and its surburban area, however, to receive TV wave of the preceding station, Soroti station which is 140 Km apart, with high quality of picture for relaying programme, the tower will have to be placed on the top of a mountain in the south.
(The tower on the mountain will increase receiving field strength by more than 10 dB.)

II) Output Power and Transmitting Antenna

Due to the narrow service area, a small power, 3W, all solid state transmitter will be adequate. Also, a simple 3-element YAGI antenna will provide efficient service. (Refer to the antenna directivity diagrams in Chapter 6.)

$$|S|_{db} = 20 \log \left| \sqrt{\frac{d}{\pi}} \int^{\alpha} \varepsilon^{-j\omega} \, d\omega \right|$$



$$\omega = h_o \sqrt{\frac{\pi}{\lambda}\left(\frac{1}{d_1} + \frac{1}{d_2}\right)}$$

Fig. 2-3 DIFFRACTION LOSS.

(3) Jinja TV Station

I) Prospective Station Site

As is clear in Fig. 2-1,* Jinja town is in the Grade B area of the Kampala station. Because of its high population density, Jinja station must provide servicing of high field strength, 55 dB or more. The Bugenbe hill located 5 km north of the metropolitan area, approximately 170 metres in height, will be appropriate for the station site. The prospective site is on the line of sight with the metropolitan area, with a sufficient field strength of TV wave transmitted from Kampala, and the test confirmed that no ghost image is present. What is more convenient, a road that allows the passage of trucks leads up to the top of the hill, and power line runs only approximately 300 metres from the site. This will greatly ease the construction work.

II) Output Power and Transmitting Antenna

Similar to Moroto, Jinja station serves only for Jinja town and its suburban area; hence the all solid state 3W transmitter will be sufficient. Effective transmission can be expected by use of a 1-stack 3-element YAGI antenna. (Refer to the antenna directivity diagrams in Chapter 6.)

(4) Tororo TV Station

I) Prospective Station Site

The existing Mbale station wave extends far beyond Tororo, however, the 250 metre high Tororo Rock near the centre of the town interrupts the receiving of Mbale station wave in south of the hill. Also, Mt. Elgon shadows the wave resulting in a comparatively low field strength in the eastern part of the town. To cover these areas, top of Tororo Rock will be adequate for prospective station site. In this place, the field strength of the preceding station, Soroti, is sufficiently high to obtain good picture quality.

II) Transmitting Power and Antenna

Because of the comparatively narrow service area and natural height of tower site, the all solid state 3W transmitter will be sufficient. Regarding the transmitting antenna, four 3-sections 2 dipoles antennas, arranged rectangularly, will provide non-directivity and be appropriate.

(5) Hoima TV Station

I) Prospective Station Site

Geographically, Hoima is only 50 kilometres away from Masindi, but two hills, both 100 to 200 metres high, located between the two towns adversely affect coverage of the two towns by one station. Ibamba hill, in east of Hoima, is approximately 230 metres high from average ground level, and is on the line of sight with most of the surrounding areas as well as the town area of Hoima. The hill top is also on the line of sight with the UHF relay station, Biko, and the succeeding station, Masindi.

*See page 361.

II) Transmitting Power and Antenna

Since the station is a medium sized station which must cover the shore of Lake Albert on the north side, a range of mountains 50 kilometres apart on the south side, and Masindi on the north-eastern side, its transmitter will require 500 watts power. Recommendable antenna is a combination of four elements (non-directional), each composed of 2-sections 2 dipoles arranged rectangularly.

(6) Masindi TV Station

I) Prospective Station Site

A P&T radio station which is furnished with two 4mϕ parabolic and two 6-elements YAGI antennas on a self-supported tower of 50 metres high, is located in the west end of Mt. Kigulya in the east of Masindi. The flat site in the west of the station is approximately 300 metres high from average ground level and excellently on the line of sight with the town area and the suburbs of Masindi. The site is also on the line of sight with Hoima station and Erusi East relay station, and a fine road, 2.5 to 3 metres in width runs from the foot to the east end of the radio station. These conditions are very favorable for prospective station site.

II) Transmitting Power and Antenna

Two-sections 2 dipoles facing north-east and 4-sections 2 dipoles toward north-west will be appropriate, and an output power of 500 watts will be required. By this combination of antennas and transmitter, service area of this station will cover fringe areas of Lira and Gulu stations in north-east, and Pakwach in north-west, and the high quality reception at Erusi East relay station will be facilitated. The southern area, on which no antenna faces, will be sufficiently covered by leakage from the aforesaid elements. (Refer to the antenna directivity drawings in Chapter 6.)

(7) Arua TV Station

I) Prospective Station Site

The hill top in the town of Arua, which is approximately 120 metres high, will be feasible for the site. The hill is also provided with the Memorial Tower of Independence and a P&T radio station.

The prospective site is on the line of sight with the town area and the surrounding areas, and satisfies the line of sight with Erusi East relaying station.

II) Transmitting Output Power and Antenna

A combination of 100 watts transmitter and four 2-sections 2 dipoles antennas (non-directional) will provide coverage of major parts of West Nile district.

(8) Fort Portal TV Station

I) Prospective Station Site

Since Fort Portal is located in the mountain area, its undulating geography affects selection of proper station site. Mt. Kamengo, 3 kilometres north-east of the town is one of the best sites which is on the line of sight with the town of Fort Portal, and with the preceding Kabuga relay station, and Kasese TV station which is scheduled to be the succeeding station.

II) Transmitting Output Power and Antenna

The geographic features of this area necessitate a 500 watts transmitter and two 3-sections 2 dipoles antennas for adequate servicing. (Refer to antenna directivity diagrams in Chapter 6.)

(9) Kasese TV Station

I) Prospective Station Site

To cover both the town area of Kasese and Kilembe in the mountain area, Mt. Nyakibingo which is 5.5 kilometres west of Kasese and 550 meters higher than the town will be suitable for the site. From the site, approximately 70% of the town area of Kasese and approx. 90% of the residential area of Kilembe are on the line of sight. Field strength of the preceding station, Fort Portal, is 66 dB at the mountain top, and is sufficient for high quality broadcasting.

II) Transmitting Output Power and Antenna

For this station, which should cover Kasese and Kilembe, the all solid state 3 watts transmitter will be sufficient. Recommendable antenna arrangement is two 5-elements YAGI's which are respectively facing to Kasese and Kilembe. (Refer to the antenna directivity diagrams in Chapter 6.)

(10) Kabale TV Station

I) Prospective Station Site

To cover town and suburbs of Kabale which is in the heavily undulating mountain area, a mountain located 3.5 kilometres in the south-east of Kabale and 450 metres higher than the town, will be appropriate. The site is excellently on the line of sight with Kabale, and obtainable field strength of the preceding station, Mbarara, is 65.5 dB.

II) Transmitting Output Power and Antenna

A transmitter of 500 watts and four 2-sections 2-dipoles antennas (non-directional) will be required. Even with the high power output, some parts of this area are owed by mountains. Therefore, increase of power output will not be always effective to improve reception in the shadowed areas.

2.7 Service Areas of Prospective Stations

Measured values of field strength of the existing stations (shown in Fig. 2-1) fairly coincided with those based the calculation on the precise profile for each transmission path obtained from maps of 1/50,000 or 1/250,000. In Fig. 2-1, both the measured values of field strength and the calculated service areas of the existing stations obtained from the profiles for various directions are shown. Service areas for the prospective TV stations can also be calculated by using the same method. Fig. 2-4* shows the estimated service areas of these stations. For convenience of comparison, Fig. 2-4 includes the service areas of the existing stations. Calculated population to be contained in the service areas of these stations is shown in Table 2-3 which indicates that the nation-wide TV network will cover a total of 5,900,000 persons, or approximately 90% of the nation's total population in its service area.

*See page 363.

Table 2-3 Population in the Service Areas of TV Broadcasting Stations

Location	Population (Thousands)			Coverage (%)
	Grade A	Grade B	Total	
Kampala	992	295	1,287	19.7
Soroti	265	98	363	5.5
Mbale	1,123	231	1,354	20.7
Lira	283	79	362	5.5
Masaka	297	103	400	6.1
Mharara	325	128	453	6.9
Total	3,285	934	4,219	64.4
Gulu	188	87	275	4.2
Arua	229	36	265	4.1
Masindi	153	84	237	3.6
Hoima	101	31	132	2.0
Fort Portal	203	89	292	4.5
Kasese	33	4	37	0.6
Kabale	225	37	262	4.1
Moroto	10	8	18	0.3
Jinja	45	11	56	0.9
Tororo	118	7	125	1.9
Total	1,305	394	1,699	26.2
Grand Total	4,590	1,328	5,918	90.6

Note: (1) Total population of Uganda is about 6,537,000 (as of 1959 census.)

(2) Grade A: Within 4~~0~~9 dB field intensity contour line, where viewers will receive ~~fair~~ fine TV signal.

Grade B: Within 40 dB field intensity contour line, where viewers will receive fair TV signal.

CHAPTER 3 RELAY NETWORK AND SUPERVISORY NETWORK PLAN

Chapter 3 Relay Network and Supervisory Network Plans

3.1 Programme Relay Network Plan

3.1.1 Relay Network

The network configuration shown in Fig. 3-1 will be appropriate for the programme relay network to be established in this project.

In the figure, the V.H.F. RELAY link which is shown by dotted lines denotes relaying of programme transmitted from mother stations in the V.H.F. frequencies (CCIR Band III, CH.5 thru CH.11) to succeeding stations, and, the U.H.F. RELAY link which is showned by solid lines relays the mother station programme to succeeding stations by means of U.H.F. channels (CCIR Band V, CH.61 or CH.65).

The location of prospective relay stations were determined in due consideration of technical, constructional, maintenance, and financial conditions. All the sites were determined after field surveys conducted for every proposed locations.

For ease of maintenance and economy, it is advisable to unit transmitting output power of U.H.F. relay stations to 100 watts.

The relay network plan in this report differs in the following points from that described in the preliminary survey report. Reasons of the revision are given below.

(a) Kampala ⟶ Jinja ⟶ Kagulu

In the preliminary report, the link routed Kampala ⟶ Butangala ⟶ Kagulu, because the multiplex sound transmission plan necessitated a direct line of site relaying in U.H.F. band between Kampala and Butangala.

The suspension of the multiplex sound transmission plan and the newly proven possibility of U.H.F. relaying between Jinja and Kagulu, as resulted from the field survey of propagation, enabled this revision. The new route will largely contribute to the economy of the network.

(b) Soroti ⟶ Tororo

In the preliminary report, the link routed Soroti ⟶ Mbale ⟶ Tororo. The propagation test revealed that the picture of Mbale station received at the proposed site was badly interfered by unwanted waves and was impractical for broadcasting. Since the test disclosed that the sufficiently strong field strength of Soroti station will make high quality picture reception possible, the route was revised to the direct reception from Soroti station.

(c) Soroti ⟶ Moroto

The route was originally planned to connect Soroti ⟶ Akisim ⟶ Moroto. The propagation test, which was conducted two times at the proposed site for Moroto station, succeeded in finding a suitable location to receive Soroti wave with a sufficiently practical field strength. The relaying at Akisim was eliminated for economy of the system.

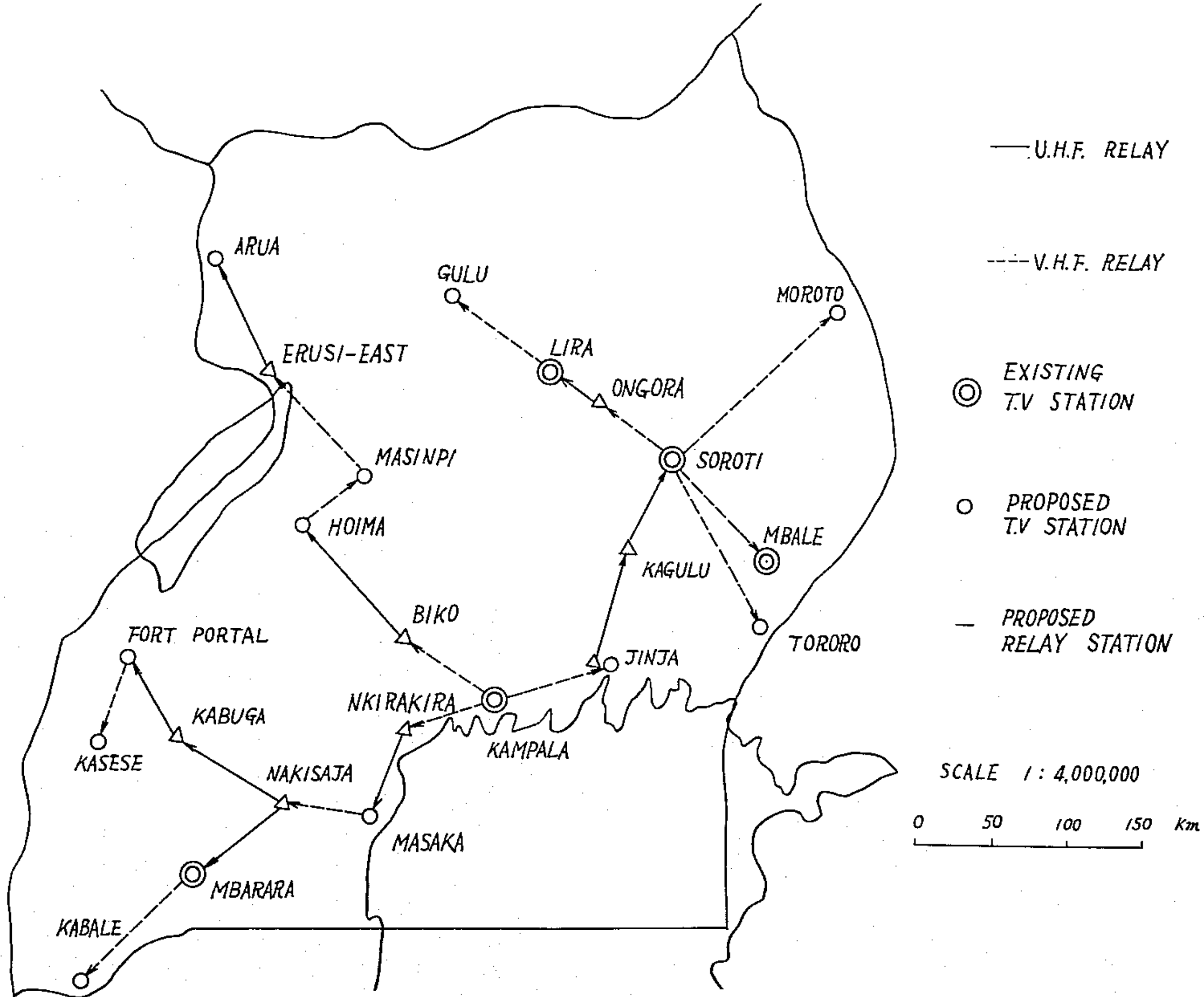


Fig 3-1 T.V. PROGRAMME RELAY NETWORK

(d) Kampala ⟶ Nakisaja ⟶ Kabuga ⟶ Fort Portal

In the preliminary report, the route to Fort Portal was relayed at Mabale, through Hoima, however, the propagation test revealed that no serviceable field strength could be obtained by direct U.H.F. relaying between Mabale and Fort Portal. The link via Hoima is technically possible by increasing number of relay stations, however, it is not economically advisable. The practical solution of this problem was to divide the output power of Nakisaja relaying station, which is for relaying to Mbarara, in two directions, and to use a half of the output for relaying to Kabuga relay station (to be installed instead of Mabale relay station) which relays the programme to Fort Portal.

(e) Masindi ⟶ Erusi East ⟶ Arua

The corresponding route in the preliminary report was Gulu ⟶ Odora ⟶ Gori ⟶ Arua.

The route was determined to avoid K-type fading due to the on-the-lake propagation, which might happen in the Masindi ⟶ Erusi East link, since the link traverses Lake Albert. A thorough investigation of geographical conditions of these areas proved that the reflection point of wave propagated between Masindi and Erusi East was on land, and not on the lake. Therefore, the possibility of K-type fading was almost eliminated.

The route was therefore revised to minimize the number of relay stations.

3.1.2 Channels to be Used for U.H.F. Relaying

The channels above CH.61 within Band V, CCIR, which are also approved for use in fixed stations in Africa (Region I), will be appropriate for the U.H.F. relaying in this project.

Considering merits in configuration of antenna and transmitter, stability, and ease of maintenance, lesser number of channels (lower frequency) is desirable.

Based upon a thorough study of possible mutual interference between U.H.F. relay stations and the aforesaid considerations, the U.H.F. relay network was composed by using only two channels, CH.61 and CH.65. Adequate channels for individual relay stations are described in the "Design of Links".

3.1.3 Design Standards for Relay Links

The most important factor in relaying broadcasting programmes is how to relay the picture transmitted from the Key Station (Kampala in this project) to succeeding stations without deterioration of picture quality. The relay link should be designed to allow a minimum degree of picture quality distortion.

The picture quality can be evaluated in various methods. In the case of OFF AIR relaying system, the visual evaluation is the most common method in which the picture quality is evaluated based on the following items. Cause of deterioration of picture quality, measures, for improving picture quality.

and cautions to be taken for system design will be briefly described.

(a) Ghost Image

With the exception of the ghost image caused by mismatching of the transmitting or receiving antenna and the transmitter, the ghost image develops when phases of direct wave and reflected wave differ largely from each other, and when the reflected wave is considerably strong.

Generally, such a large phase difference between the direct and reflected waves is indicative of the difference in their path. If an angle difference is created between these waves, the influence of the reflected wave can be reduced by use of two antennas of the same type. These antennas are arranged so that they may form a right angle to the direct wave, and that their distance may be variable. By adjusting the distance between two antennas and consequently the resultant directivity, the influence of the reflected wave can be reduced, irrespective of its path. Fig. 3-2 shows a chart by which to find the direction and depth of dip in the composited directivity of two antennas.

(b) Beat

If a wave whose frequency is very close to the receiving frequency is present, the wave causes beat interruption. (Example; Mbale station signal received at the proposed receiving point for Tororo station). If the field strength of interrupting signal is considerably small and possesses an angular difference to the desired wave, the interrupting signal can be eliminated by using the two antenna method described in the preceding paragraph. And, if the frequency of the interrupting signal is out of the receiving frequency band, a band-pass filter inserted in the input circuit of a relaying (or a broadcasting) transmitter eliminates the heat interruption.

It is advisable, in due consideration of future congestion of radio waves, to prepare the band-pass filter in the input of relaying (or broadcasting) transmitter.

(c) Fading

The fading is caused by meteorological variation in the propagation path. If the field strength of received signal varies due to the fading, output power of relaying (or broadcasting) transmitter will fluctuate, and may cause, when the output power decreases, deterioration of picture quality due to inherent thermal noise.

Adequate provision for AGC operation will effectively reduce the fluctuation of output power of relaying (or broadcasting) transmitter. It is easy to reduce the output power fluctuation within approximately $^{+0.5}_{-1}$ dB against input level variation of $^{+10}_{-20}$ dB. The picture quality deterioration can be effectively reduced by providing an ample fading margin in the system or employing a switchover system by which to receive the signal of the other TV station having different broadcasting channel and/or incidence angle and select the receiving channel least susceptible to the fading effect.

However, the system economy will restrict generous use of these measures, and essentially, the fading is caused by very vague meterological conditions. Therefore,

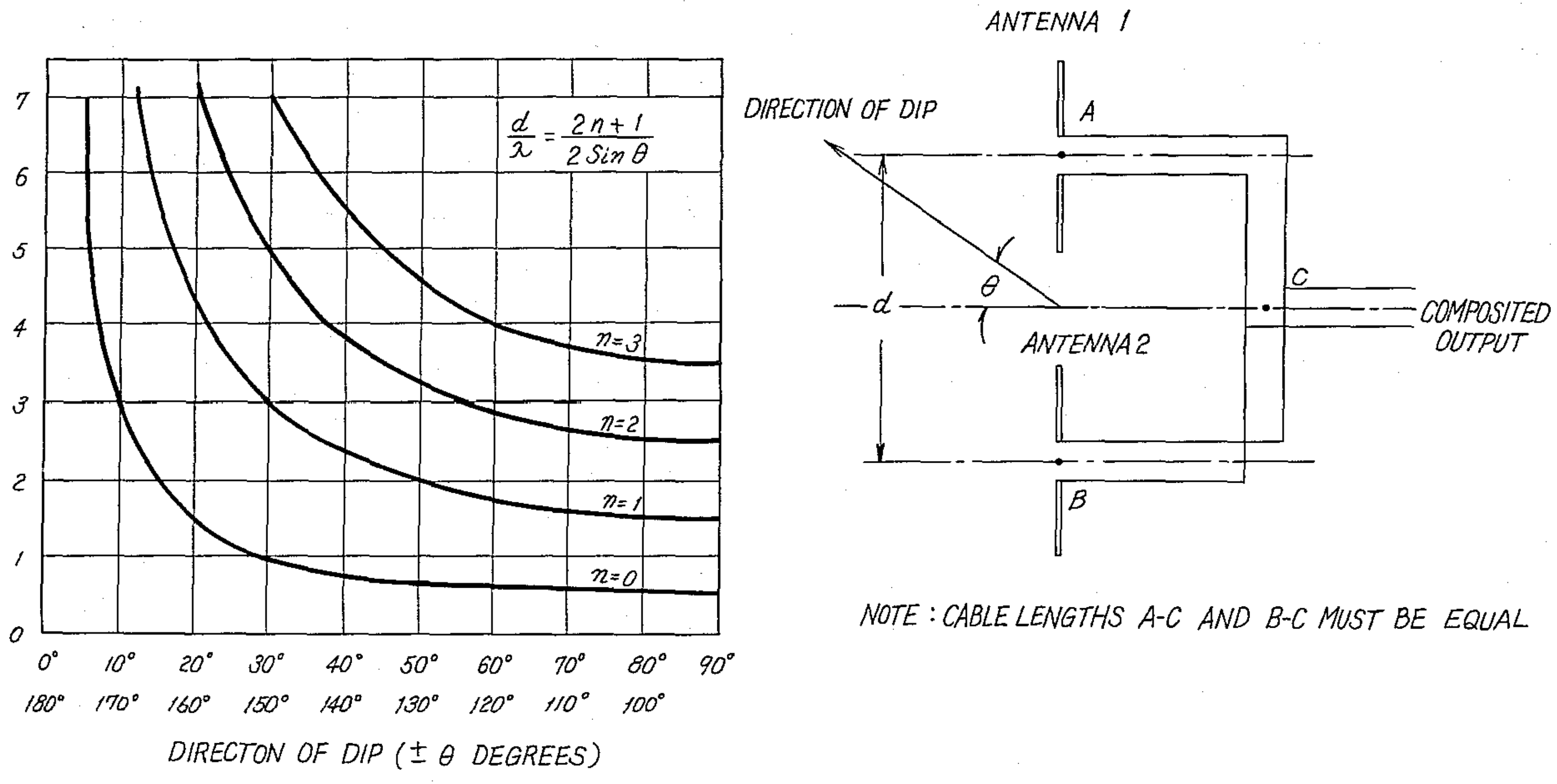


Fig. 3-2 CHART TO FIND DIP IN COMPOSITED DIRECTIVITY OF TWO ANTENNAS

it will be not practical to prepare a complete measure against fading. If the fading should occur excessively and frequently, to such an extent to badly affect use of the relay link, it would be advisable to carry out an extensive technical survey to determine measures such as modification and extension of receiving system or increase of relay stations.

(d) Artificial Noise

Source of the artificial noise includes ignition noise of automobiles, leakage from high voltage power transmission lines and high frequency welders, etc. These artificial noises were scarcely observed during the survey at any of the proposed sites. Influence of the artificial noise may be neglected.

(e) Thermal Noise

The ratio of detectable inherent thermal noise N to high frequency video input amplitude S is approximately 45 dB in commonly available TV receivers. (N; r.m.s Value, S; Peak Value of Synchronizing Signal)

Thus, the S/N of picture signal transmitted from broadcasting (including relaying) stations must be more than 45 dB. Letting the high frequency input signal level of a broadcasting (or relaying) transmitter as E_t (50 ohms terminated), and noise figure of the equipment as N.F., the S/N of picture output signal of the transmitter is represented by the following equation (S/N of input signal is assumed ∞);

$$S/N\,(dB) = E_t\,(dB) - N.F.\,(dB) - 1\,(dB)$$

Appropriate noise figure, N.F., of a broadcasting (or relaying) transmitter is, as a design value, 8.0 dB for V.H.F reception, or 11.0 dB for U.H.F. reception.

These values of S/N represent cases where stations directly transmit their own programmes. When a number of stations (n stations) are connected in cascade (n stages), the overall S/N of the output picture signal at the n'th station, (S/N)n, is calculated as:

$$\frac{1}{(S/N)n} = \frac{1}{\sum_{n=1}^{n} (S_n/N_n)}$$

For designing of a multi-stage relay link, provisions to improve S/N corresponding to number of relaying to be repeated, of broadcasting (or relaying) transmitter must be prepared in each station.

3.1.4 Design of Individual Relay Link

Design and profile of individual relay link, based upon items described in sub-sections 3.1.1 through 3.1.3, are shown in Tables 3-1 through 3-22. For particular links where the examination of profile and investigation of geographical condition permitted the survey team to omit the field propagation tests, the measured values are not described. Design of these links is based on the field strength calculated from precise profiles.

Note: Symbols used to represent antenna type in these tables should be read as follows.

2 . 2 D . 4

- 4 — Number of directions
- D — D for Dipole, Y for YAGI
- 2 (second) — Number of elements
- 2 (first) — Number of sections

3mϕ . GP

- GP — Grid Parabora
- 3mϕ — Diameter (unit in meter)

3.1.5 S/N of Picture Outputs

Calculated S/N of picture output for individual broadcasting (or relaying) stations is shown in Table 3-23.

3.1.6 Reference

Characteristics of test instruments used for the propagation tests and for designing are shown in Table 3-24.

Table 3-1 Design Specification for Programme Relay Link from KAMPALA to JINJA

Channel 5

1. Measured and Calculated Field Strength of Mother Station

Measured Values			Calculated Values		
Receiving Antenna Gain	1	-7.0 dB	Free Space Field Strength Eo (for E.R.P. 1 KW)	1	+69.6 dB
Receiving Feeder Loss	2	+2.4 dB	Shadow Loss S	2	-10.6 dB
$\frac{\lambda}{\pi}$	3	+6.4 dB	Phase Loss θ	3	0 dB
Peak to Mean Conversion Factor	4	+6.0 dB	Field Strength E' (for E.R.P. 1 KW)	1+2+3=4	+59.0 dB
Measured Level (mean value)	5	+64.5 dB	E.R.P. conversion	5	+16.0 dB
Field Strength E	1+2+3+4+5	+72.3 dB	Field Strength E	4+5	+75.0 dB
Remarks:			Remarks:		
Receiving Antenna Type	7Y.1		Distance	73.0 km	
Receiving Antenna Height	10 m				
Receiving Feeder Type and Length	5D-2V 20 m				

2. Design Specifications for Receiving System

Field Strength (Measured level)	+72.3 dB		
Receiving Antenna Gain	+10.5 dB	Type 8Y.1	Height 10 m
Receiving Feeder Loss	-2.0 dB		
$\frac{\lambda}{\pi}$	-6.4 dB		
Open-end/50 ohms Termination Loss	-6.0 dB		
Receiver Input Level (terminated by 50 ohms)	+68.4 dB		

3. Particular Considerations

For the JINJA station, two sets of receiving facilities should be installed, one for broadcasting and the other for relaying.

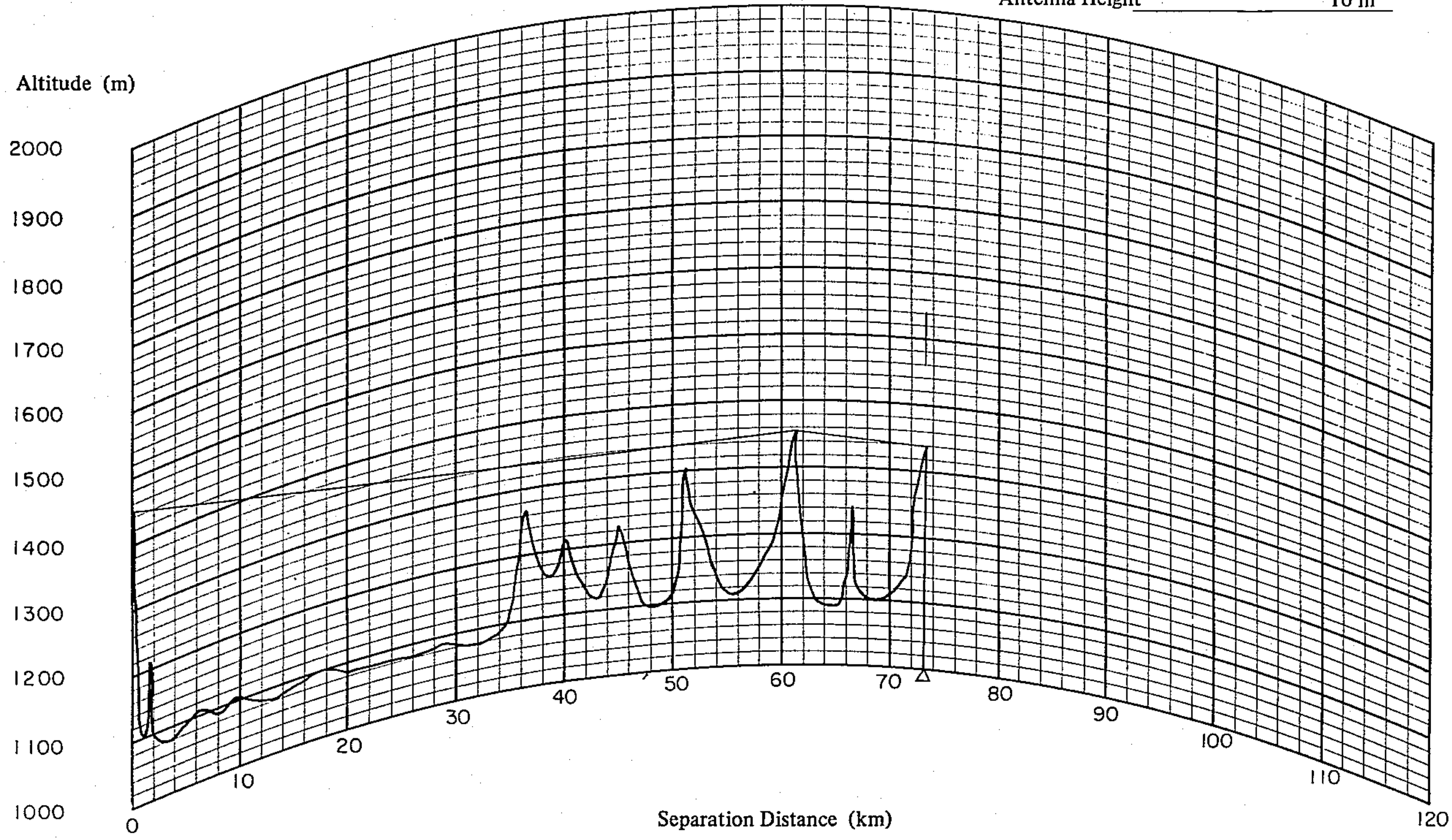
Altitude of Transmitting Station 1,310 m

Altitude of Transmitting Antenna 1,460 m

Separation Distance 73 km

Altitude of Receiving Point 1,330 m

Antenna Height 10 m



Map Scale 1/50,000

Profile KAMPALA – JINJA

Table 3-2 Design Specifications for Programme Relay Link from JINJA to KAGULU

Proposed Channel 61

1. Field Strength Measured and Calculated in Propagation Test

Measured Values			Calculated Values		
Output Power of Test Transmitter	1	-24.6 dB	Free Space Field Strength Eo (for E.R.P. 1 KW)	1	+68.7 dB
Transmitting Antenna Gain	2	+11.0 dB	Shadow Loss S	2	0 dB
Transmitting Feeder Loss	3	-4.0 dB	Phase Loss θ	3	0 dB
E.R.P. in Propagation Test Equip.	1+2+3	-17.6 dB	Field Strength E' (for E.R.P. 1 KW)	1+2+3=4	+68.7 dB
Receiving Antenna Gain	4	-7.5 dB	E.R.P. Conversion	5	+13.0 dB
Receiving Feeder Loss	5	+6.0 dB	Field Strength E	4+5	+81.7 dB
$\frac{\lambda}{\pi}$	6	+16.8 dB			
Measured Level (Peak Value)	7	+32.0 dB			
Field Strength in Propagation Test	4+5+6+7=8	+47.3 dB	Remark:		
Necessary E.R.P.	9	+13.0dBk	Distance	80.5 km	
	9-(1+2+3)=10	+30.6 dB			
Field Strength E	8+10	+77.9 dB			
Remarks:					
Transmitting Antenna Type		8Y-2			
Transmitting Antenna Height		10 m			
Transmitting Feeder Type		8D-2V			
Transmitting Feeder Length		20 m			
Receiving Antenna Type		8Y.1			
Receiving Antenna Height		10 m			
Receiving Feeder Type		5D-2V			
Receiving Feeder Length		20 m			
Test Frequency		663.25 MHz			

2. Design Specifications for Transmitting System

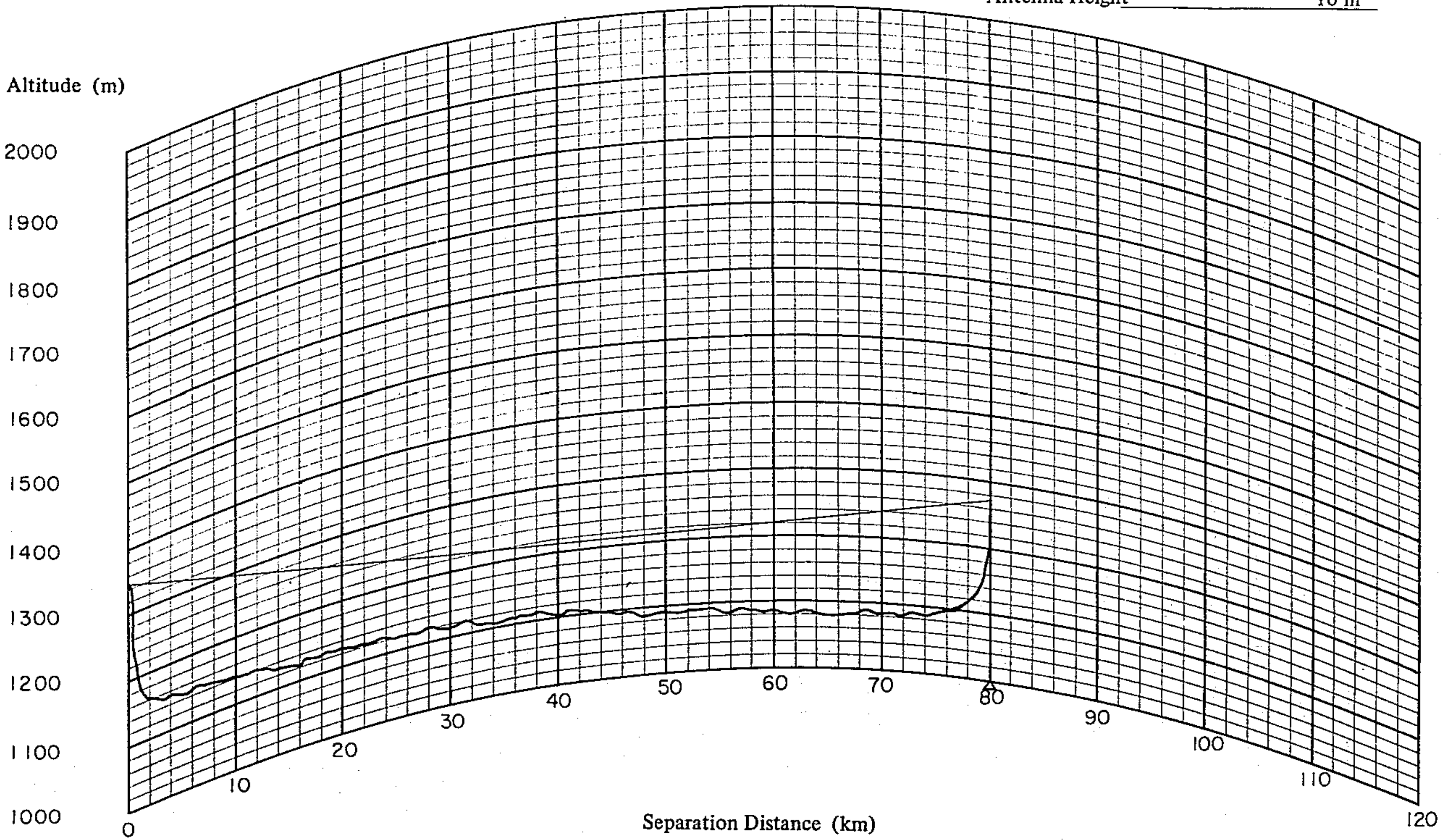
Transmitter Output Power	-10 dBk	
Transmitting Antenna Gain	+2.5 dB	Type 4 mϕ - GP Height 15 - 20 m
Transmitting Feeder Loss	-2 dB	
E.R.P. in Transmission	+13 dBk	

3. Design Specifications for Receiving System

Field Strength (Measured Level)	+77.9 dB	
Receiving Antenna Gain	+25.0 dB	Type 4mϕ - GP Height 10m or more
Receiving Feeder Loss	-2.0 dB	
$\frac{\lambda}{\pi}$	-19.0 dB	
Open-end/50 ohms Termination Loss	-6.0 dB	
Receiver Input Level (Terminated by 50 ohms)	+75.9 dB	

Altitude of Transmitting Station 1,330 m
Altitude of Transmitting Antenna 1,345 m

Separation Distance 80.5 km
Altitude of Receiving Point 1,270 m
Antenna Height 10 m



Profile JINJA – KAGULU

Map Scale 1/50,000

Table 3-3 Design Specifications for Programme Relay Link from KAGULU to SOROTI

Proposed Channel 63

1. Field Strength Measured and Calculated in Propagation Test

Measured Values			Calculated Values		
Output Power of Test Transmitter	1	-24.6dBk	Free Space Field Strength Eo (for E.R.P. 1 KW)	1	+70.6 dB
Transmitting Antenna Gain	2	+11.0 dB	Shadow Loss S	2	-3.0 dB
Transmitting Feeder Loss	3	-4.0 dB	Phase Loss θ	3	0 dB
E.R.P. in Propagation Test Equip.	1+2+3	-17.6dBk	Field Strength E' (for E.R.P. 1 KW)	1+2+3=4	+67.6 dB
			E.R.P. Conversion	5	+13.0 dB
Receiving Antenna Gain	4	-11.0 dB	Field Strength E	4+5	+80.6 dB
Receiving Feeder Loss	5	+10.2 dB			
$\frac{\lambda}{\pi}$	6	+16.8 dB			
Measured Level (Peak Value)	7	+29.5 dB	Remark:		
Field Strength in Propagation Test	4+5+6+7=8	+45.5 dB	Distance	65.0 km	
Necessary E.R.P.	9	+13.0 dB			
	9-(1+2+3)=10	+30.6 dB			
Field Strength E	8+10	+76.1 dB			
Remarks:					
Transmitting Antenna Type		5Y-2			
Transmitting Antenna Height		10 m			
Transmitting Feeder Type		8D-2V			
Transmitting Feeder Length		20 m			
Receiving Antenna Type		5Y-2			
Receiving Antenna Height		53 m			
Receiving Feeder Type		10D-2V			
Receiving Feeder Length		60 m			
Test Frequency		663.25 MHz			

2. Design Specification for Transmitting System

Transmitter Output Power	-10 dBk	
Transmitting Antenna Gain	+25 dB	Type 4mϕ - GP Height 10 m
Transmitting Feeder Loss	-2 dB	
E.R.P. in Transmission	+13 dBk	

3. Design Specifications for Receiving System

Field Strength (Measured Level)	+76.1 dB	
Receiving Antenna Gain	+20.0 dB	Type 2.4mϕ - GP Height 70 m or more
Receiving Feeder Loss	-0.5 dB	
$\frac{\lambda}{\pi}$	-19.0 dB	
Open-end/50 ohms Termination Loss	-6.0 dB	
Receiver Input Leverl (Terminated by 50 ohms)	+70.6 dB	

4. Particular Considerations

The receiver equipment should be installed closely to the receiving antenna, in order to avoid cable transmission loss in U.H.F. band.

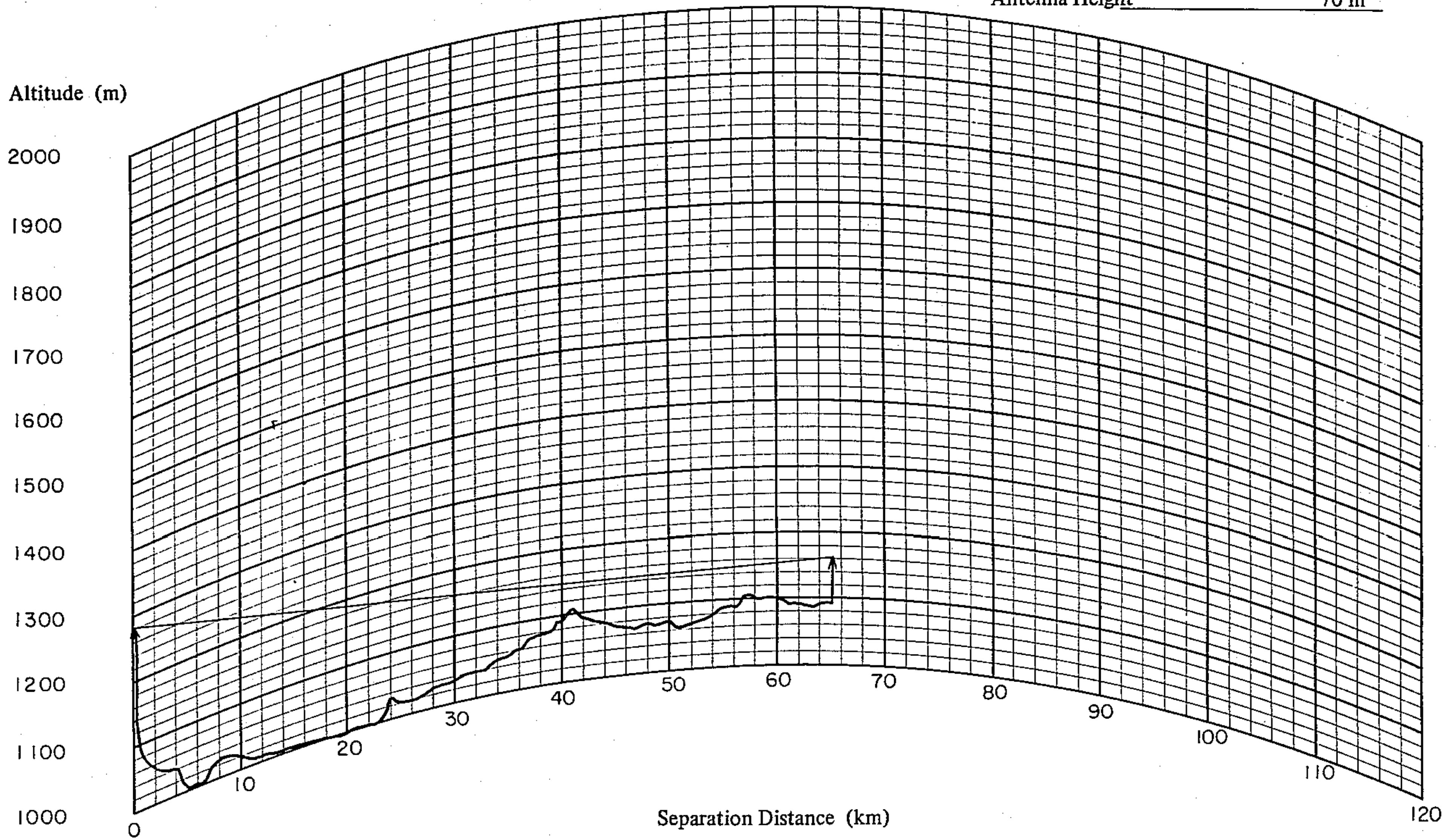
Altitude of Transmitting Station 1,270 m

Altitude of Transmitting Antenna 1,280 m

Separation Distance 65.0 km

Altitude of Receiving Point 1,090 m

Antenna Height 70 m



Profile KAGULU – SOROTI

Map Scale 1/50,000

Table 3-4 Design Specifications for Programme Relay Link from SOROTI to TORORO

Channel 10

1. Measured and Calculated Field Strength of Mother Station

Measured Values			Calculated Values		
Receiving Antenna Gain	1	-7.0 dB	Free Space Field Strength Eo (for E.R.P. 1 KW)	1	+64.7 dB
Receiving Feeder Loss	2	+2.5 dB	Shadow Loss S	2	-15.6 dB
$\frac{\lambda}{\pi}$	3	+6.4 dB			
Peak to Mean Conversion Factor	4	+6.0 dB	Phase Loss θ	3	0 dB
Measured Level (Mean Value)	5	+54.0 dB	Field Strength E' (for E.R.P. 1 KW)	1+2+3=4	+49.1 dB
			E.R.P. Conversion	5	+16.0 dB
Field Strength E	1+2+3+4+5	+61.9 dB	Field Strength E	4+5	+65.1 dB
Remarks:			Remarks:		
Receiving Antenna Type		7Y·1	Distance		127 km
Receiving Antenna Height		3 m			
Receiving Feeder Type and Length		5D-2Y 20 m			

2. Design Specifications for Receiving System

Field Strength (Measured Level)	+61.9 dB		
Receiving Antenna Gain	+12.5 dB	Type 8Y·2	Height 10 m
Receiving Feeder Loss	-2.0 dB		
$\frac{\lambda}{\pi}$	-6.4 dB		
Open-end/50 ohms Termination Loss	-6.0 dB		
Receiving Input Level (Terminated by 50 ohms)	+60.0 dB		

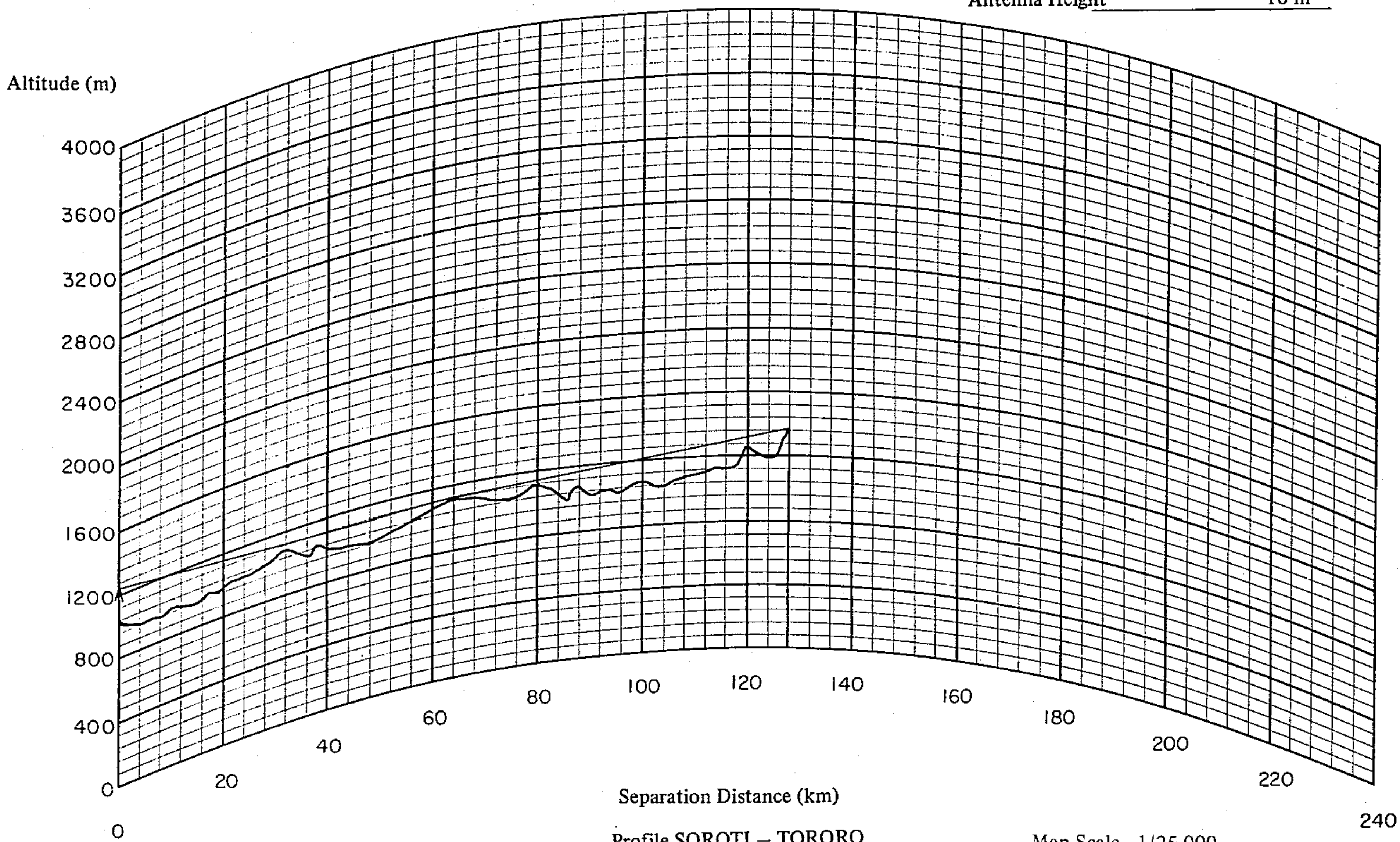
Altitude of Transmitting Station 1,090 m

Altitude of Transmitting Antenna 1,240 m

Separation Distance 127 km

Altitude of Receiving Point 1,480 m

Antenna Height 10 m



Profile SOROTI – TORORO

Map Scale 1/25,000

Table 3-5 Design Specifications for Programme Relay Link from SOROTI to MBALE

Channel 10

1. Measured and Calculated Field Strength of Mother Station

Measured Values			Calculated Values		
Receiving Antenna Gain	1	-7.0 dB	Free Space Field Strength Eo (for E.R.P. 1 KW)	1	+68.0 dB
Receiving Feeder Loss	2	+2.4 dB	Shadow Loss S	2	0 dB
$\frac{\lambda}{\pi}$	3	+6.4 dB	Phase Loss θ	3	0 dB
Peak to Mean Conversion Factor	4	+6.0 dB	Field Strength ' (for E.R.P. 1 KW)	1+2+3=4	+68.0 dB
Measured Level (Mean Value)	5	+77.0 dB	E.R.P. Conversion	5	+16.0 dB
Field Strength E	1+2+3+4+5	+84.8 dB	Field Strength E	4+5	+84.0 dB
Remarks:			Remarks:		
Receiving Antenna Type		7Y.1	Distance	88.4 km	
Receiving Antenna Height		7 m			
Receiving Feeder Type and Length		5D-2V 20 m			

2. Design Specifications for Receiving System

Field Strength (Measured Level)	+84.8 dB	
Receiving Antenna Gain	+10.5 dB	Type 8Y.1 Height 10 m
Receiving Feeder Loss	-2.0 dB	
$\frac{\lambda}{\pi}$	-6.4 dB	
Open-end/50 ohms Termination Loss	-6.0 dB	
Receiver Input Level (Terminated by 50 ohms)	+80.9 dB	

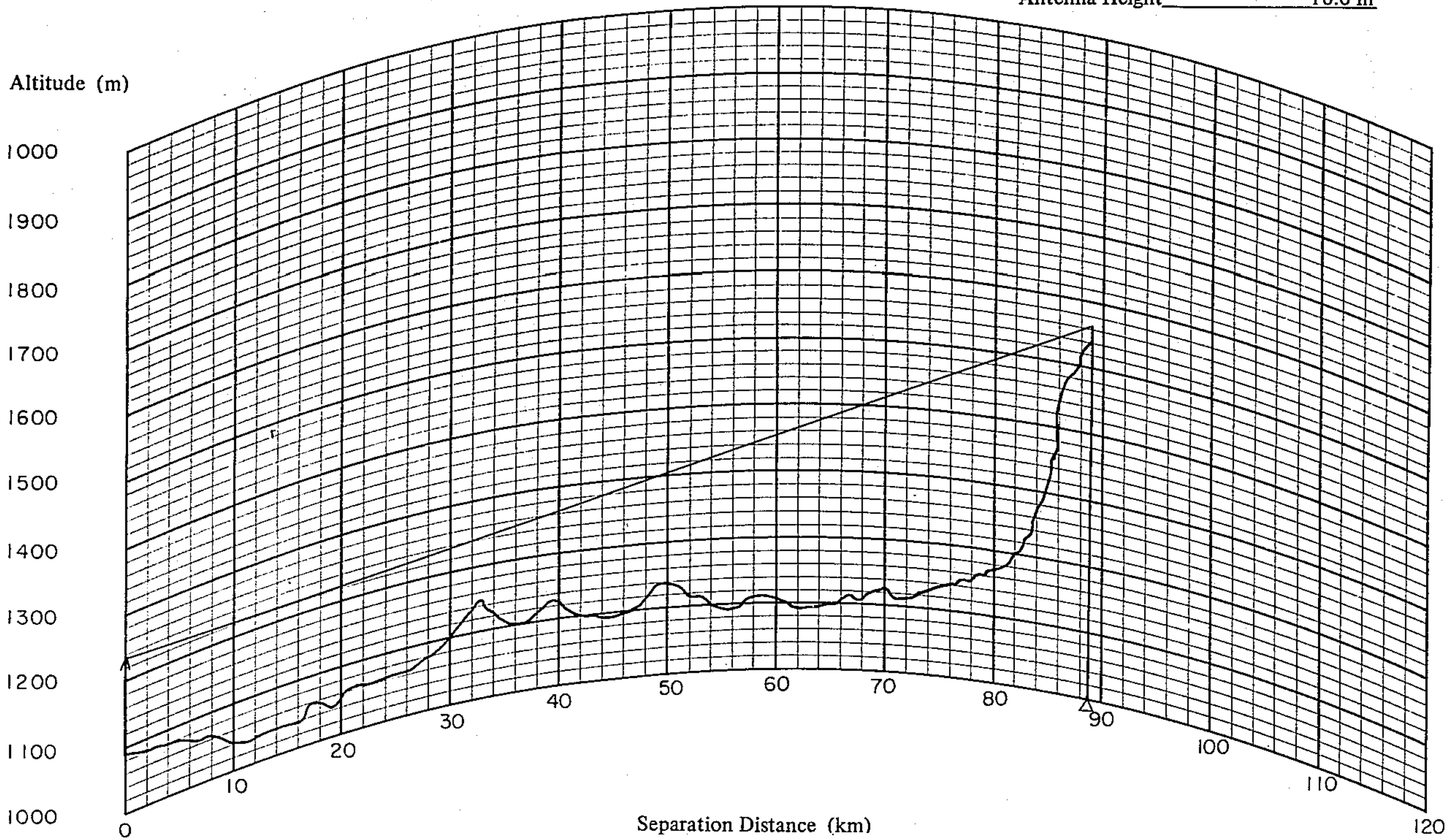
Altitude of Transmitting Station 1,090 m

Altitude of Transmitting Antenna 1,240 m

Separation Distance 88.4 km

Altitude of Receiving Point 1,555 m

Antenna Height 10.0 m



Profile SOROTI – MBALE

Map Scale 1/50,000

Table 3-6 Design Specifications for Programme Relay Link from SOROTI to ONGORA

Channel 10

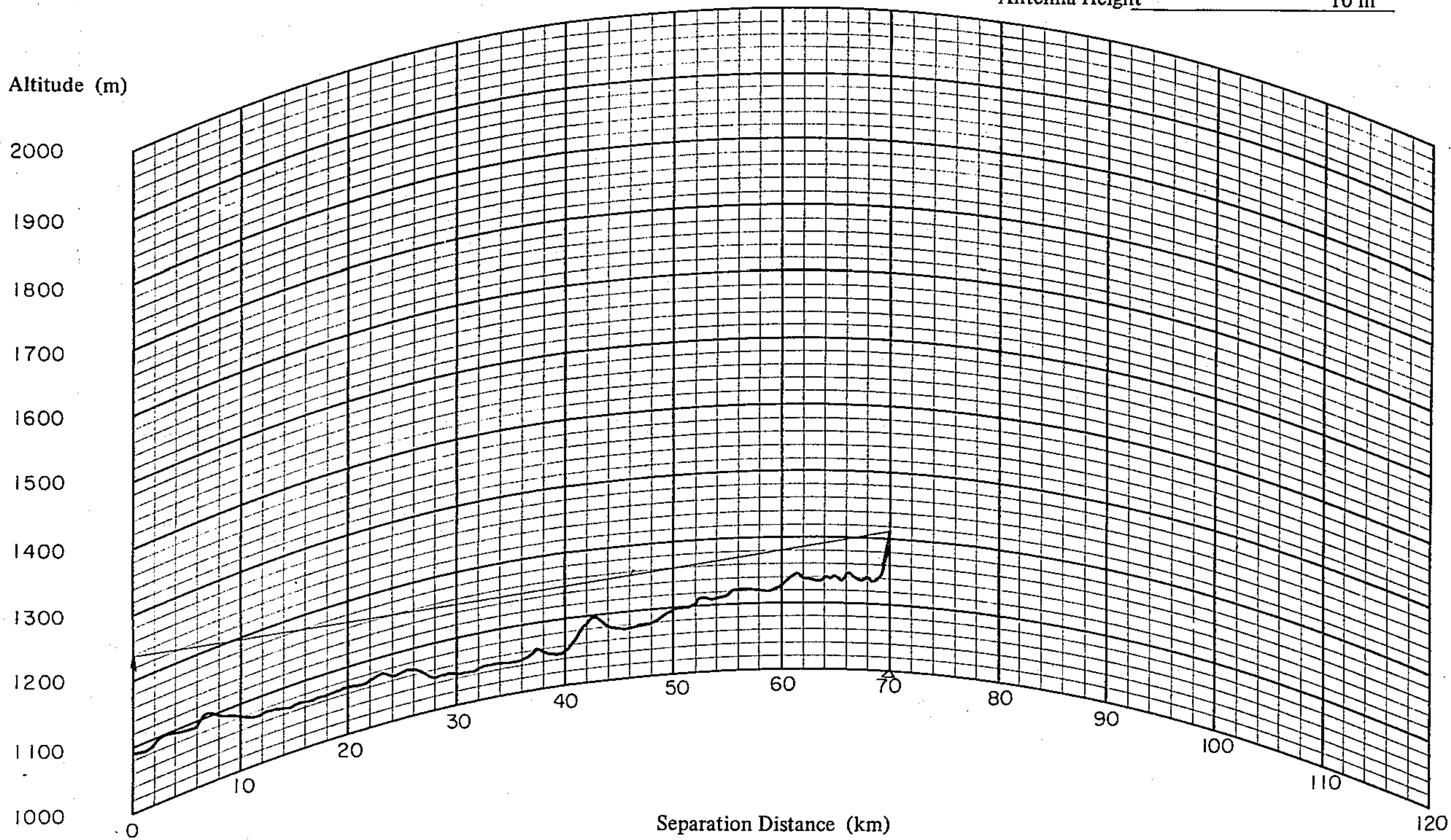
1. Measured and Calculated Field Strength of Mother Station

Measured Values			Calculated Values		
Receiving Antenna Gain	1	-2.5 dB	Free Space Field Strength Eo (for E.R.P. 1 KW)	1	+70.1 dB
Receiving Feeder Loss	2	+2.4 dB	Shadow Loss S	2	-1.2 dB
$\frac{\lambda}{\pi}$	3	+6.4 dB	Phase Loss θ	3	-3.8 dB
Peak to Mean Conversion Factor	4	+6.0 dB	Field Strength E' (for E.R.P. 1 KW)	1+2+3=4	+65.1 dB
Measured Level (Mean Value)	5	+71.0 dB	E.R.P. Conversion	5	+16.0 dB
Field Strength E	1+2+3+4+5	+83.3 dB	Field Strength E	4+5	+81.1 dB
Remarks:			Remarks:		
Receiving Antenna Type		3Y-1	Distance		69.0 km
Receiving Antenna Height		5 m			
Receiving Feeder Type and Length		5D-2V 20 m			

2. Design Specifications for Receiving System

Field Strength (Measured Level)	+83.3 dB	
Receiving Antenna Gain	+10.5 dB	Type 8Y-1 Height 10 m
Receiving Feeder Loss	-2.0 dB	
$\frac{\lambda}{\pi}$	-6.4 dB	
Open-end/50 ohms Termination Loss	-6.0 dB	
Receiver Input Level (Terminated by 50 ohms)	+79.4 dB	

Altitude of Transmitting Station	1,090 m	Separation Distance	69.0 km
Altitude of Transmitting Antenna	1,240 m	Altitude of Receiving Point	1,210 m
		Antenna Height	10 m



Profile SOROTI – ONGORA

Map Scale 1/50,000

Table 3-7 Design Specifications for Programme Relay Link from ONGOLA to LIRA

Proposed Channel 61

1. Field Strength Measured and Calculated in Propagation Test

Measured Values			Calculated Values		
Output Power for Test Transmitter	1	-23.8dBk	Free Space Field Strength Eo (for E.R.P. 1 KW)	1	+75.5 dB
Transmitting Antenna Gain	2	+7.5 dB	Shadow Loss S	2	-6.0 dB
Transmitting Feeder Loss	3	-6.0 dB	Phase Loss θ	3	0 dB
E.R.P. in Propagation Test Equip.	1+2+3	-22.3dBk	Field Strength E' (for E.R.P. 1 KW)	1+2+3=4	+69.5 dB
Receiving Antenna Gain	4	-11.0 dB	E.R.P. Conversion	5	+10.0 dB
Receiving Feeder Loss	5	+12.2 dB	Field Strength E	4+5	+79.5 dB
$\frac{\lambda}{\pi}$	6	+16.8 dB			
Measured Level (Peak Value)	7	+26.0 dB	Remark:		
Field Strength in Propagation Test	4+5+6+7=8	+44.0 dB	Distance	36.8 km	
Necessary E.R.P.	9	+10.0dBk			
	9-(1+2+3)=10	+32.3 dB			
Field Strength E	8+10	+76.3 dB			
Remarks:					
Transmitting Antenna Type		8Y-1			
Transmitting Antenna Height		7 m			
Transmitting Feeder Type		5D-2V			
Transmitting Feeder Length		20 m			
Receiving Antenna Type		5Y-2			
Receiving Antenna Height		50 m			
Receiving Feeder Type and Length		10D-2V, 60 m 8D-2V, 10 m			
Test Frequency		663.25 MHz			

2. Design Specifications for Transmitting System

Transmitter Output Power	-10dBk		
Transmitting Antenna Gain	+22 dB	Type 3mϕ-GP	Height 10 m
Transmitting Feeder Loss	-2 dB		
E.R.P. in Transmission	+10dBk		

3. Design Specifications for Receiving System

Field Strength (Measured Level)	+76.3 dB		
Receiving Antenna Gain	+20.0 dB	Type 2.4 mϕ-GP	Height 70 m or more
Receiving Feeder Loss	-0.5 dB		
$\frac{\lambda}{\pi}$	-19.0 dB		
Open-end/50 ohms Termination Loss	-6.0 dB		
Receiver Input Level (Terminated by 50 ohms)	+70.8 dB		

4. Particular Considerations

The propagation test was carried out from ONGOLA to LIRA. The height of the receiving antenna at LIRA was 50 m above ground. Under these conditions, the value of shadow loss is estimated to be about 6 dB which was derived from map-calculation.

To avoid this shadow loss, the height of the receiving antenna should be raised up to at least to height of 70 m above ground. The receiver equipment should be installed closely to the receiving antenna for the same reason as explained in page 52.

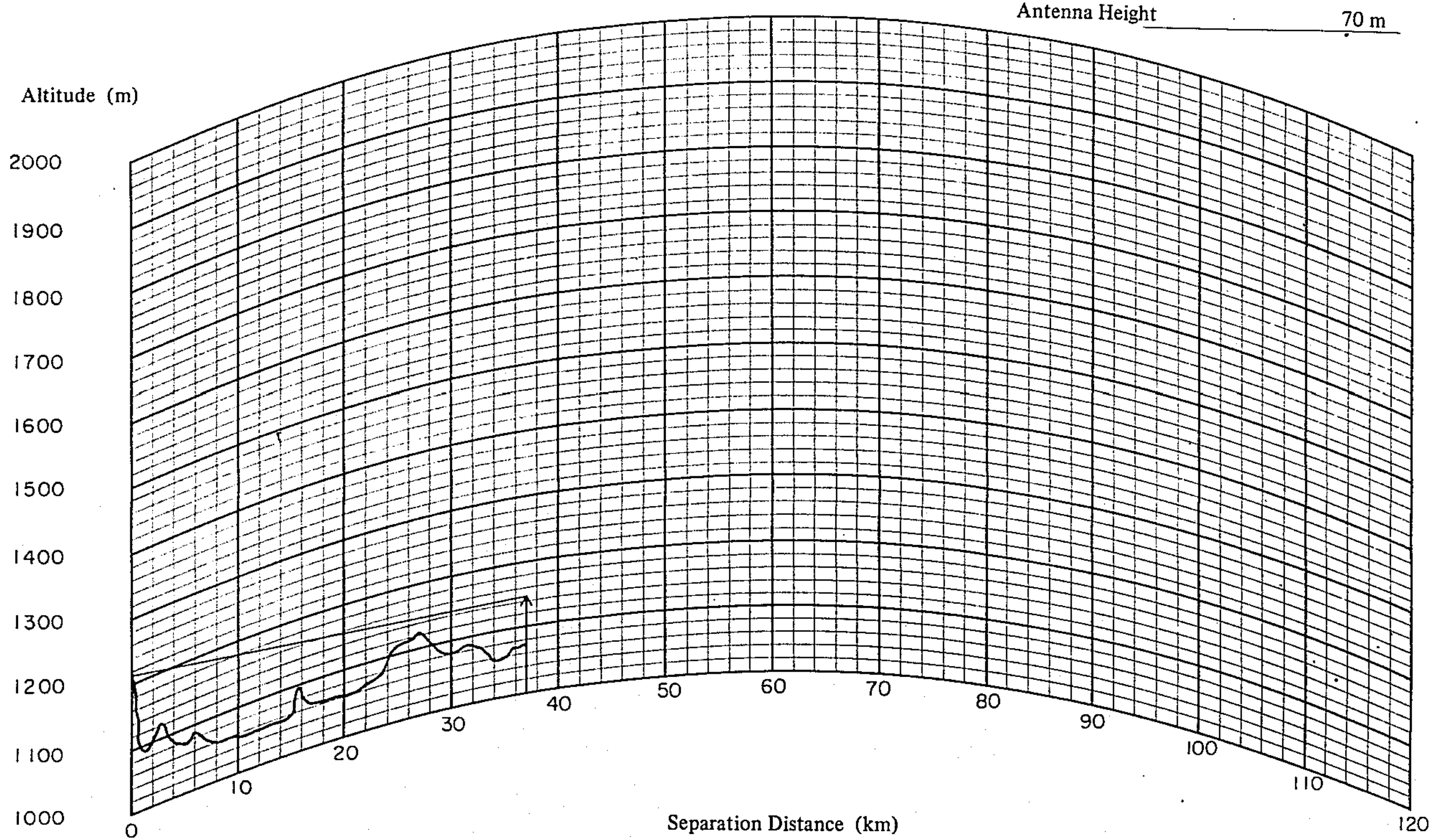
Altitude of Transmitting Station 1,205 m

Altitude of Transmitting Antenna 1,215 m

Separation Distance 36.8 km

Altitude of Receiving Point 1,075 m

Antenna Height 70 m



Profile ONGORA – LIRA

Map Scale 1/50,000

Table 3-8 Design Specifications for Programme Relay Link from LIRA to GULU

Channel 7

1. Measured and Calculated Field Strength of Mother Station

Measured Values			Calculated Values		
Receiving Antenna Gain	1	-2.5 dB	Free Space Field Strength Eo (for E.R.P. 1 KW)	1	+71.1 dB
Receiving Feeder Loss	2	+3.5 dB	Shadow Loss S	2	0 dB
$\frac{\lambda}{\pi}$	3	+6.4 dB	Phase Loss θ	3	0 dB
Peak to Mean Conversion Factor	4	+6.0 dB	Field Strength E' (for E.R.P. 1 KW)	1+2+3=4	+71.1 dB
Measured Level (Mean Value)	5	+60.0 dB	E.R.P. Conversion	5	+14.0 dB
Field Strength E	1+2+3+4+5	+73.4 dB	Field Strength E	4+5	+85.1 dB
Remarks:			Remark:		
Receiving Antenna Type		3Y·1	Distance	61 km	
Receiving Antenna Height		4 m			
Receiving Feeder Type and Length		5D-2V, 20m 5C-2V, 10m			

2. Design Specifications for Receiving System

Field Strength (Measured Level)	+73.4 dB	
Receiving Antenna Gain	+10.5 dB	Type 8Y·1 Height 10 m
Receiving Feeder Loss	-2.0 dB	
$\frac{\lambda}{\pi}$	-6.4 dB	
Open-end/50 ohms Termination Loss	-6.0 dB	
Receiver Input Level (Terminated by 50 ohms)	+69.5 dB	

3. Particular Considerations

The height of measuring point was above 20 m lower than the receiving point in proposal. As the actual receiver is going to be mounted on the transmitter tower, the field strength is expected to become stronger than the level measured.

The calculated field strength levels are those of the proposed receiving point.

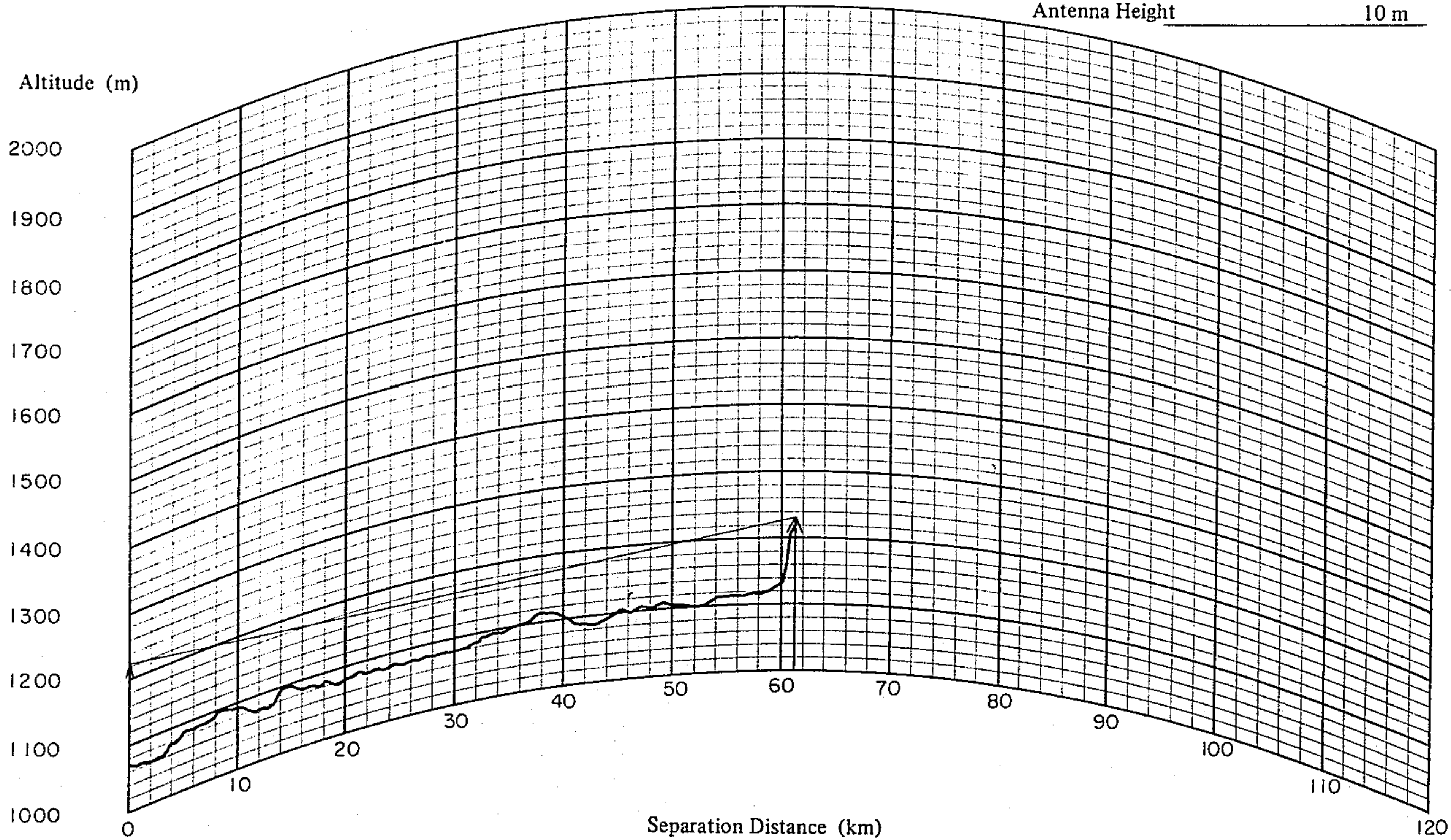
Altitude of Transmitting Station 1,075 m

Altitude of Transmitting Antenna 1,225 m

Separation Distance 61.0 km

Altitude of Receiving Point 1,220 m

Antenna Height 10 m



Profile LIRA – GULU

Map Scale 1/50,000

Table 3-9 Design Specifications for Programme Relay Link from SOROTI to MOROTO

Channel 10

1. Measured and Calculated Field Strength of Mother Station

Measured Values			Calculated Values		
Receiving Antenna Gain	1	-7.0 dB	Free Space Field Strength Eo (for E.R.P. 1 KW)	1	+63.7 dB
Receiving Feeder Loss	2	+1.7 dB	Shadow Loss S	2	-17.9 dB
$\frac{\lambda}{\pi}$	3	+6.4 dB	Phase Loss θ	3	0 dB
Peak to Mean Conversion Factor	4	+6.0 dB	Field Strength E' (for E.R.P. 1 KW)	1+2+3=4	+45.8 dB
Measured Value (Mean Value)	5	+58.2 dB	E.R.P. Conversion	5	+16.0 dB
Field Strength E	1+2+3+4+5	+65.3 dB	Field Strength E	4+5	+61.8 dB
Remarks:			Remarks:		
Receiving Antenna Type		7Y•2	Distance	143 km	
Receiving Antenna Height		4 m			
Receiving Feeder Type and Length		5D-2V, 5m 5C-2V, 10m			

2. Design Specifications for Receiving System

Field Strength (Measured Level)	+65.3 dB	
Receiving Antenna Gain	+14.0 dB	Type 12Y-2 Height 6 m
Receiving Feeder Loss	-2.0 dB	
$\frac{\lambda}{\pi}$	-6.4 dB	
Open-end/50 ohms Termination Loss	-6.0 dB	
Receiver Input Level (Terminated by 50 ohms)	+64.9 dB	

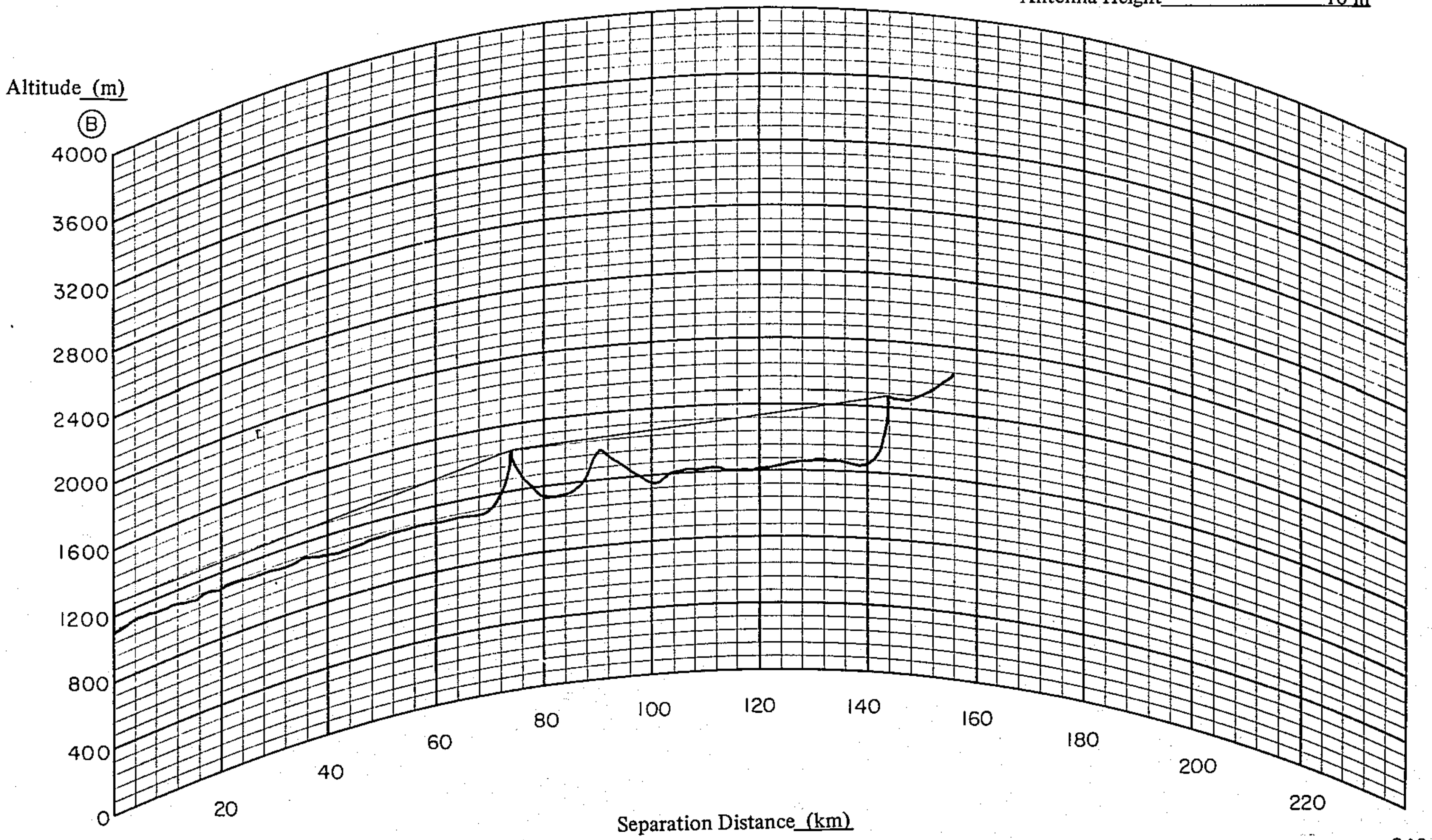
Altitude of Transmitting Station 1,090 m

Altitude of Transmitting Antenna 1,240 m

Separation Distance 143 km

Altitude of Receiving Point 1,670 m

Antenna Height 10 m



Profile SOROTI – MOROTO

Map Scale 1/25,000

Table 3-10 Design Specifications for Programme Relay Link from KAMPALA to BIKO

Channel 5

1. Measured and Calculated Field Strength of Mother Station

Measured Values			Calculated Values		
Receiving Antenna Gain	1	-7.0 dB	Free Space Field Strength Eo (for E.R.P. 1 KW)	1	+68.1 dB
Receiving Feeder Loss	2	+2.4 dB	Shadow Loss S	2	-2.6 dB
$\frac{\lambda}{\pi}$	3	+6.4 dB	Phase Loss θ	3	0 dB
Peak to Mean Conversion Factor	4	+6.0 dB	Field Strength E' (for E.R.P. 1 KW)	1+2+3=4	+65.5 dB
Measured Level (Mean Value)	5	+66.0 dB	E.R.P. Conversion	5	+16.0 dB
Field Strength E	1+2+3+4+5	+73.8 dB	Field Strength E	4+5	+81.5 dB
Remarks:			Remark:		
Receiving Antenna Type		7Y·1	Distance		86.7 km
Receiving Antenna Height		8 m			
Receiving Feeder Type and Length		5D-2V 20 m			

2. Design Specifications for Receiving System

Field Strength (Measured Level)	+73.8 dB		
Receiving Antenna Gain	+10.5 dB	Type 8Y·1	Height 6 m
Receiving Feeder Loss	-2.0 dB		
$\frac{\lambda}{\pi}$	-6.4 dB		
Open-end/50 ohms Termination Loss	-6.0 dB		
Receiver Input Level (Terminated by 50 ohms)	+69.9 dB		

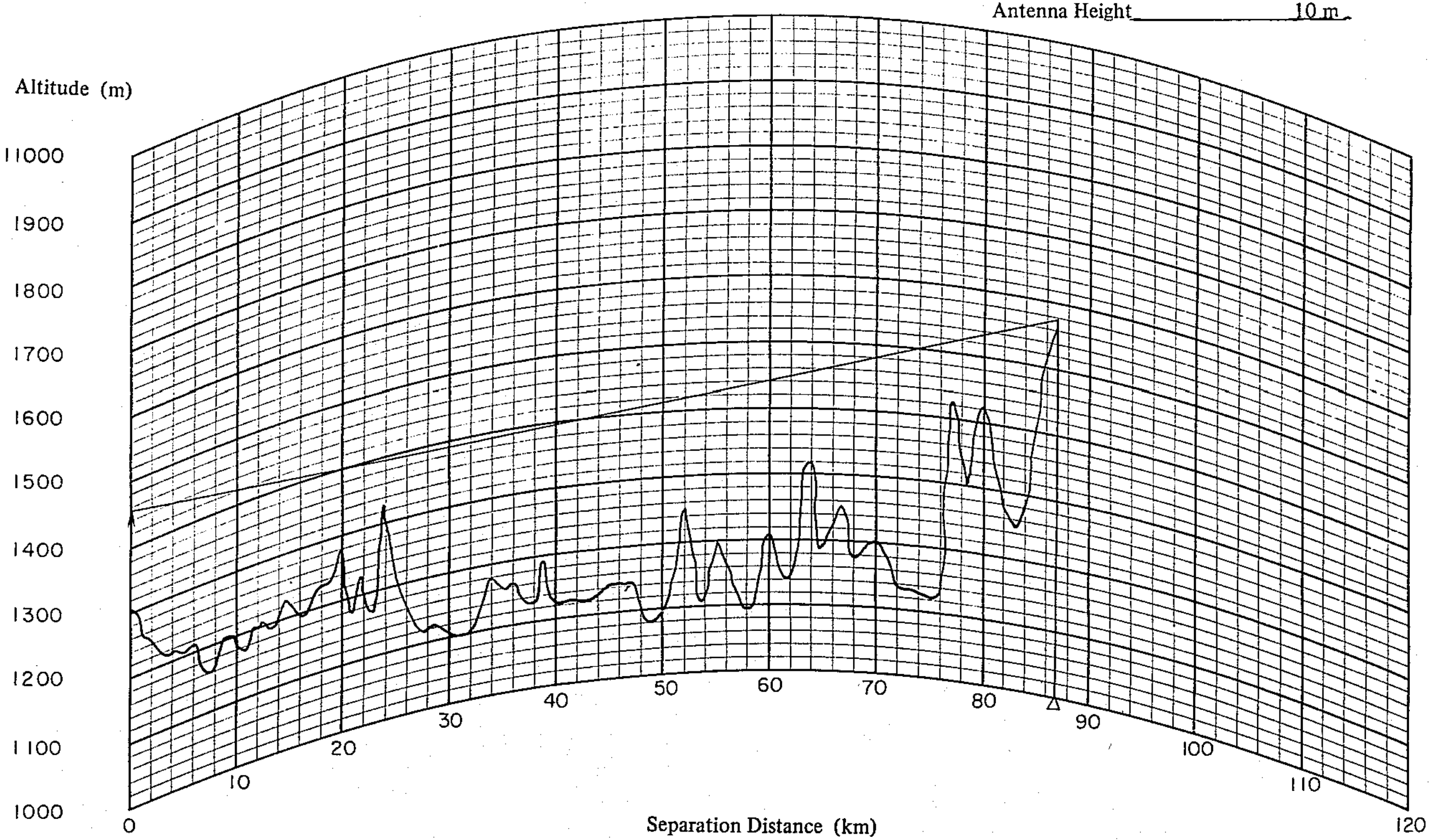
Altitude of Transmitting Station 1,310 m

Altitude of Transmitting Antenna 1,460 m

Separation Distance 86.7 km

Altitude of Receiving Point 1,560 m

Antenna Height 10 m



Profile KAMPALA – BIKO

Map Scale 1/50,000

Table 3-11 Design Specifications for Programme Relay Link from BIKO to HOIMA

Proposed Channel 61

1. Field Strength Measured and Calculated in Propagation Test

Measured Values			Calculated Values		
Output Power of Test Transmitter	1	dBk	Free Space Field Strength Eo (for E.R.P. 1 KW)	1	+67.3 dB
Transmitting Antenna Gain	2	dB	Shadow Loss S	2	0 dB
Transmitting Feeder Loss	3	dB	Phase Loss θ	3	0 dB
E.R.P. in Propagation Test Equip.	1+2+3	dBk	Field Strength E' (for E.R.P. 1 KW)	1+2+3=4	+67.3 dB
Receiving Antenna Gain	4	dB	E.R.P. Conversion	5	+10.0 dB
Receiving Feeder Loss	5	dB	Field Strength E	4+5	+77.3 dB
$\frac{\lambda}{\pi}$	6	dB			
Measured Level (Peak Value)	7	dB	Remark:		
Field Strength in Propagation Test	4+5+6+7=8	dB	Distance	95.5 km	
Necessary E.R.P.	9	dBk			
	9-(1+2+3)=10	dB			
Field Strength E	8+10	dB			
Remarks:					
Trnasmitting Antenna Type					
Transmitting Antenna Height		m			
Transmitting Feeder Type					
Transmitting Feeder Length		m			
Receiving Antenna Type					
Receiving Antenna Height		m			
Receiving Feeder Type					
Receiving Feeder Length		m			
Test Frequency		MHz			

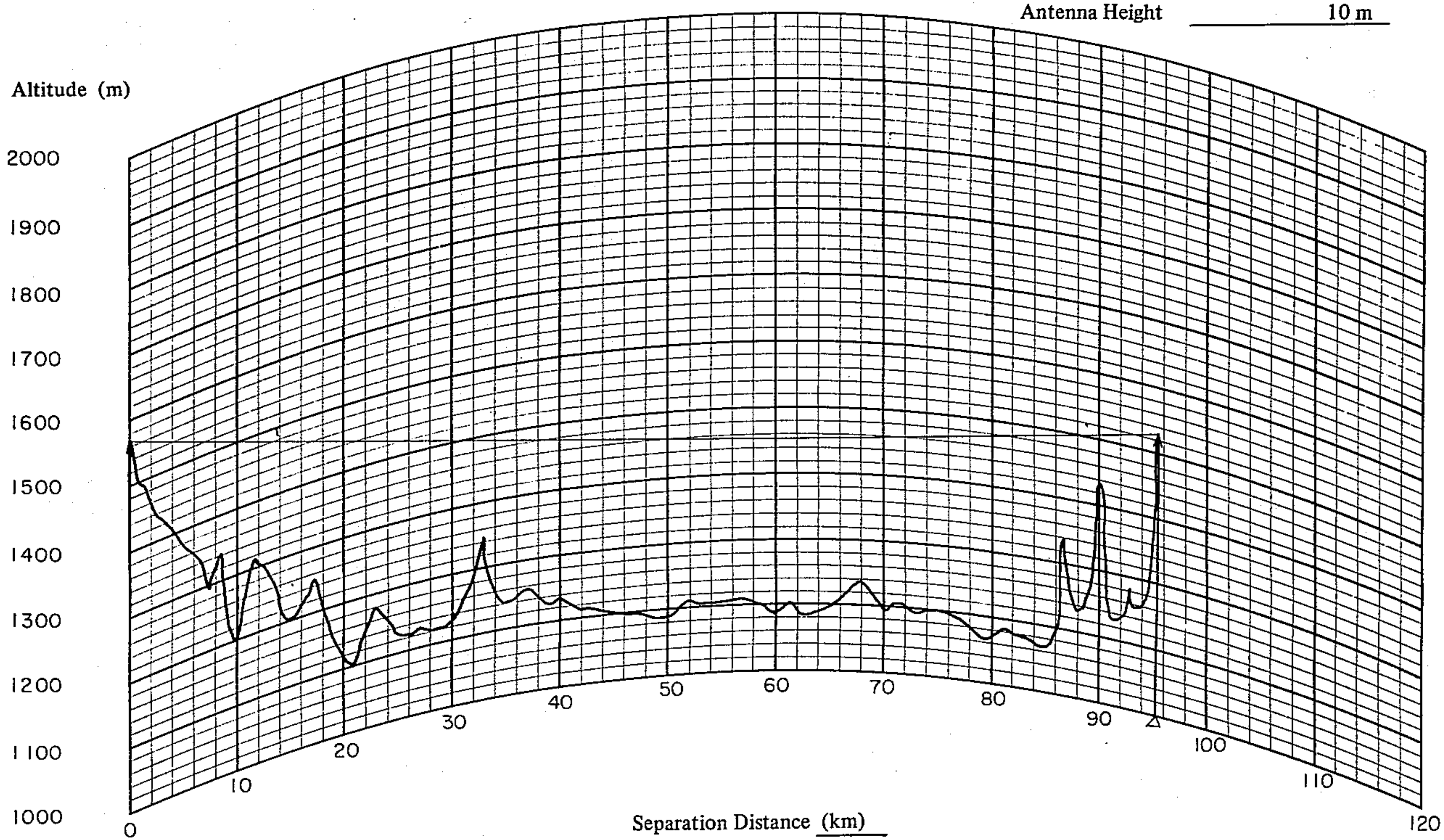
2. Design Specifications for Transmitting System

Transmitting Output Power	10 dBk		
Transmitting Antenna Gain	+22 dB	Type 3mϕ-GP	Height 10 m
Transmitting Feeder Loss	-2 dB		
E.R.P. in Transmission	+10 dBk		

3. Design Specifications for Receiving System

Field Strength (Measured Level)	+77.3 dB		
Receiving Antenna Gain	+22.0 dB	Type 3mϕ-GP	Height 10 m
Receiving Feeder Loss	-2.0 dB		
$\frac{\lambda}{\pi}$	-19.0 dB		
Open-end/50 ohms Termination Loss	-6.0 dB		
Receiver Input Level (Terminated by 50 ohms)	+72.3 dB		

Altitude of Transmitting Station	1,560 m	Separation Distance	95.5 km
Altitude of Transmitting Antenna	1,570 m	Altitude of Receiving Point	1,420 m
		Antenna Height	10 m



Separation Distance (km)

Profile BIKO – HOIMA

Map Scale 1/50,000

Table 3-12 Design Specifications for Programme Relay Link from HOIMA to MASINDI

Proposed Channel 9 .

1. Measured and Calculated Field Strength of Mother Station

Measured Values			Calculated Values		
Receiving Antenna Gain	1	dB	Free Space Field Strength Eo (for E.R.P. 1 KW)	1	+73.2 dB
Receiving Feeder Loss	2	dB	Shadow Loss S	2	-3.2 dB
$\frac{\lambda}{\pi}$	3	dB	Phase Loss θ	3	0 dB
Peak to Mean Conversion Factor	4	dB	Field Strength E' (for E.R.P. 1 KW)	1+2+3=4	+70.0 dB
Measured Level (Mean Value)	5	dB	E.R.P. Conversion	5	0 dBk
Field Strength E	1+2+3+4+5	dB	Field Strength E	4+5	+70.0 dB
Remarks:			Remarks:		
Receiving Antenna Type			Distance	48.2 km	
Receiving Antenna Height		m			
Receiving Feeder Type and Length		m			

2. Design Specifications for Transmitting System

Transmitter Power Output	-3 dBk		
Transmitting Antenna Gain	+4.8 dB	Type 2-2D-4	Height 25 m
Transmitting Feeder Loss	-1.0 dB		
Transmitting E.R.P.	+0.8 dBk		

3. Design Specifications for Receiving System

Field Strength (Calculated Level)	+70.0 dB		
Receiving Antenna Gain	+10.5 dB	Type 8Y-1	Height 10 m
Receiving Feeder Loss	-2.0 dB		
$\frac{\lambda}{\pi}$	-6.4 dB		
Open-end/50 ohms Termination Loss	-6.0 dB		
Receiver Input Level (Terminated by 50 ohms)	+66.1 dB		

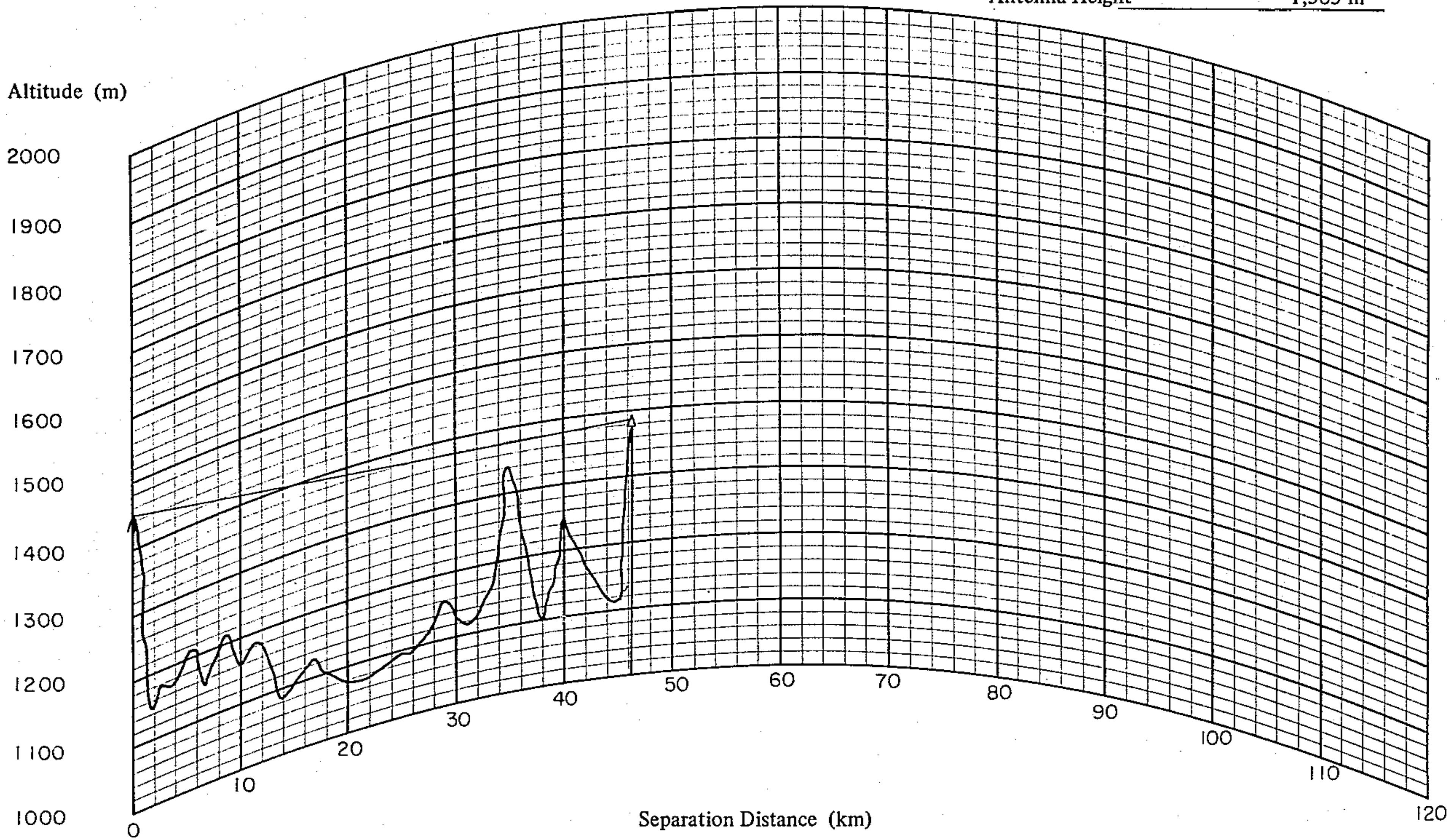
Altitude of Transmitting Station 1,420 m

Altitude of Transmitting Antenna 1,445 m

Separation Distance 48.2 km

Altitude of Receiving Point 1,375 m

Antenna Height 1,385 m



Profile HOIMA – MASINDI

Map Scale 1/50,000

Table 3-13 Design Specifications for Programme Relay Link from MASINDI to ERUSI EAST

Proposed Channel 11

1. Measured and Calculated Field Strength of Mother Station

Measured Values			Calculated Values		
Receiving Antenna Gain	1	dB	Free Space Field Strength Eo (for E.R.P. 1 KW)	1	+66.9 dB
Receiving Feeder Loss	2	dB	Shadow Loss S	2	0 dB
$\frac{\lambda}{\pi}$	3	dB	Phase Loss θ	3	0 dB
Peak to Mean Conversion Factor	4	dB	Field Strength E' (for E.R.P. 1 KW)	1+2+3=4	+66.9 dB
Measured Level (Mean Value)	5	dB	E.R.P. Conversion	5	+8.0dBk
Field Strength E	1+2+3+4+5	dB	Field Strength E	4+5	+74.9 dB
Remarks:			Remarks:		
Receiving Antenna Type			Distance	100 km	
Receiving Antenna Height		m			
Receiving Feeder Type and Length		m			

2. Design Specifications for Transmitting System

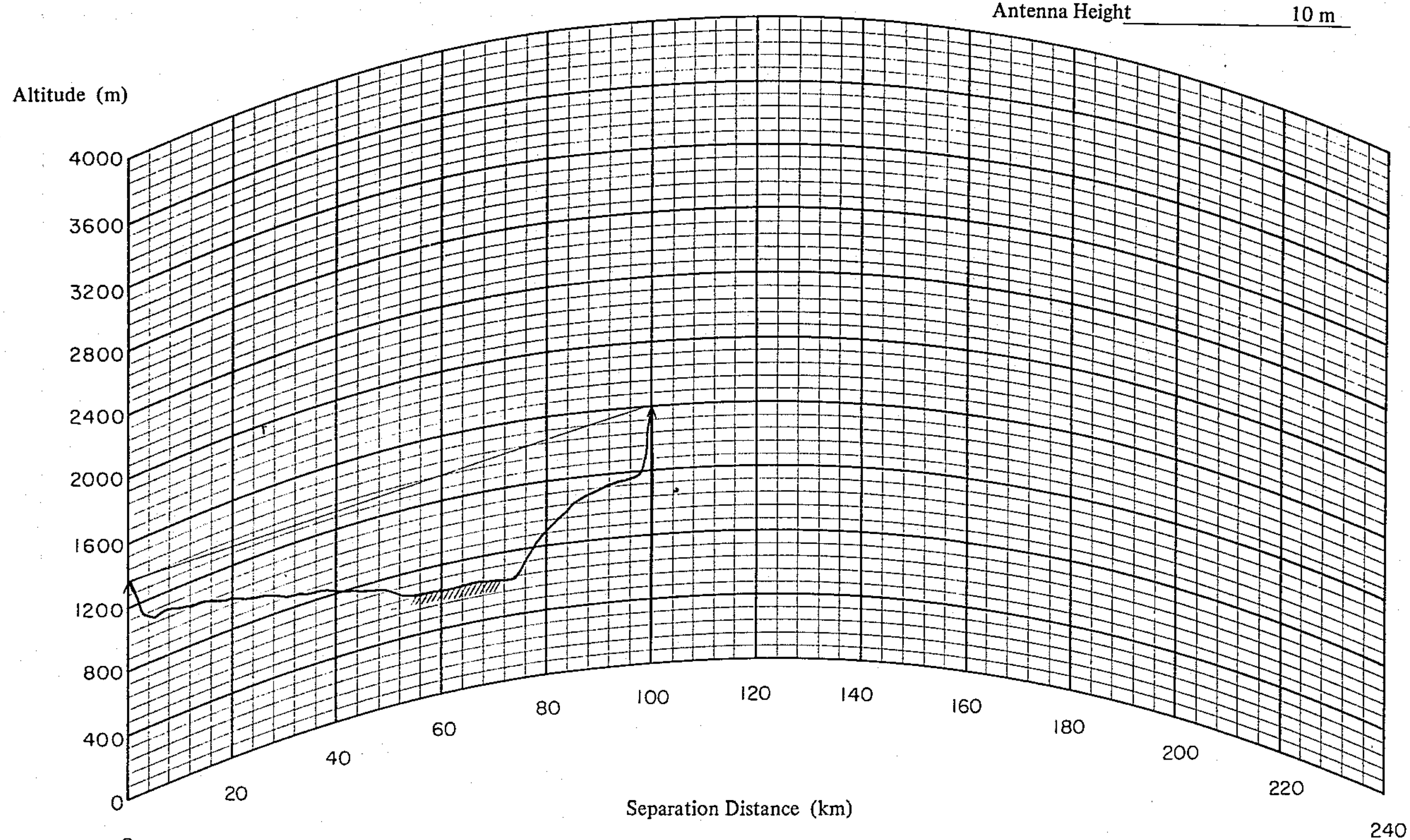
Transmitter Power Output	-3 dBk		
Transmitting Antenna Gain	+12.8 dB	Type 4·2D·1 2·2D·1	Height 15 m
Transmitting Feeder Loss	-1.0 dB		
Transmitting E.R.P.	+8.8 dBk		

3. Design Specifications for Receiving System

Field Strength (Calculated Level)	+74.9 dB		
Receiving Antenna Gain	+10.5 dB	Type 8Y·1	Height 8 m
Receiving Feeder Loss	-2.0 dB		
$\frac{\lambda}{\pi}$	-6.4 dB		
Open-end/50 ohms Termination Loss	-6.0 dB		
Receiver Input Level (Terminated by 50 ohms)	+71.0 dB		

Altitude of Transmitting Station 1,375 m
Altitude of Transmitting Antenna 1,390 m

Separation Distance 100 km
Altitude of Receiving Point 1,610 m
Antenna Height 10 m



Profile MASINDI – ERUSI EAST

Map Scale 1/50,000

Table 3-14 Design Specifications for Programme Relay Link from ERUSI EAST to ARUA

Proposed Channel 65

1. Field Strength Measured and Calculated in Propagation Test

Measured Values			Calculated Values		
Output Power of Test Transmitter	1	dBk	Free Space Field Strength Eo (for E.R.P. 1 KW)	1	+69.0 dB
Transmitting Antenna Gain	2	dB	Shadow Loss	2	0 dB
Transmitting Feeder Loss	3	dB	Phase Loss θ	3	0 dB
E.R.P. in Propagation Test Equip.	1+2+3	dBk	Field Strength E' (for E.R.P. 1 KW)	1+2+3=4	+69.0 dB
Receiving Antenna Gain	4	dB	E.R.P. Conversion	5	+10.0 dB
Receiving Feeder Loss	5	dB	Field Strength E	4+5	+79.0 dB
$\frac{\lambda}{\pi}$	6	dB			
Measured Level (Peak Value)	7	dB	Remark:		
Field Strength in Propagation Test	4+5+6+7=8	dB	Distance	78 km	
Necessary E.R.P.	9	dBk			
	9-(1+2+3)=10	dB			
Field Strength E	8+10	dB			
Remarks:					
Transmitting Antenna Type					
Transmitting Antenna Height		m			
Transmitting Feeder Type					
Transmitting Feeder Length		m			
Receiving Antenna Type					
Receiving Antenna Height		m			
Receiving Feeder Type					
Receiving Feeder Length		m			
Test Frequency		MHz			

2. Design Specifications for Transmitting System

Transmitter Output Power	-10 dBk		
Transmitting Antenna Gain	+22 dB	Type 3mϕ-GP	Height 10 m
Transmitting Feeder Loss	-2 dB		
E.R.P. in Transmission	+10 dBk		

3. Design Specifications for Receiving System

Field Strength (Calculated Level)	+79.0 dB		
Receiving Antenna Gain	+22.0 dB	Type 3mϕ-GP	Height 10 m
Receiving Feeder Loss	-2.0 dB		
$\frac{\lambda}{\pi}$	-19.0 dB		
Open-end/50 ohms Termination Loss	-6.0 dB		
Receiver Input Level (Terminated by 50 ohms)	+74.0 dB		

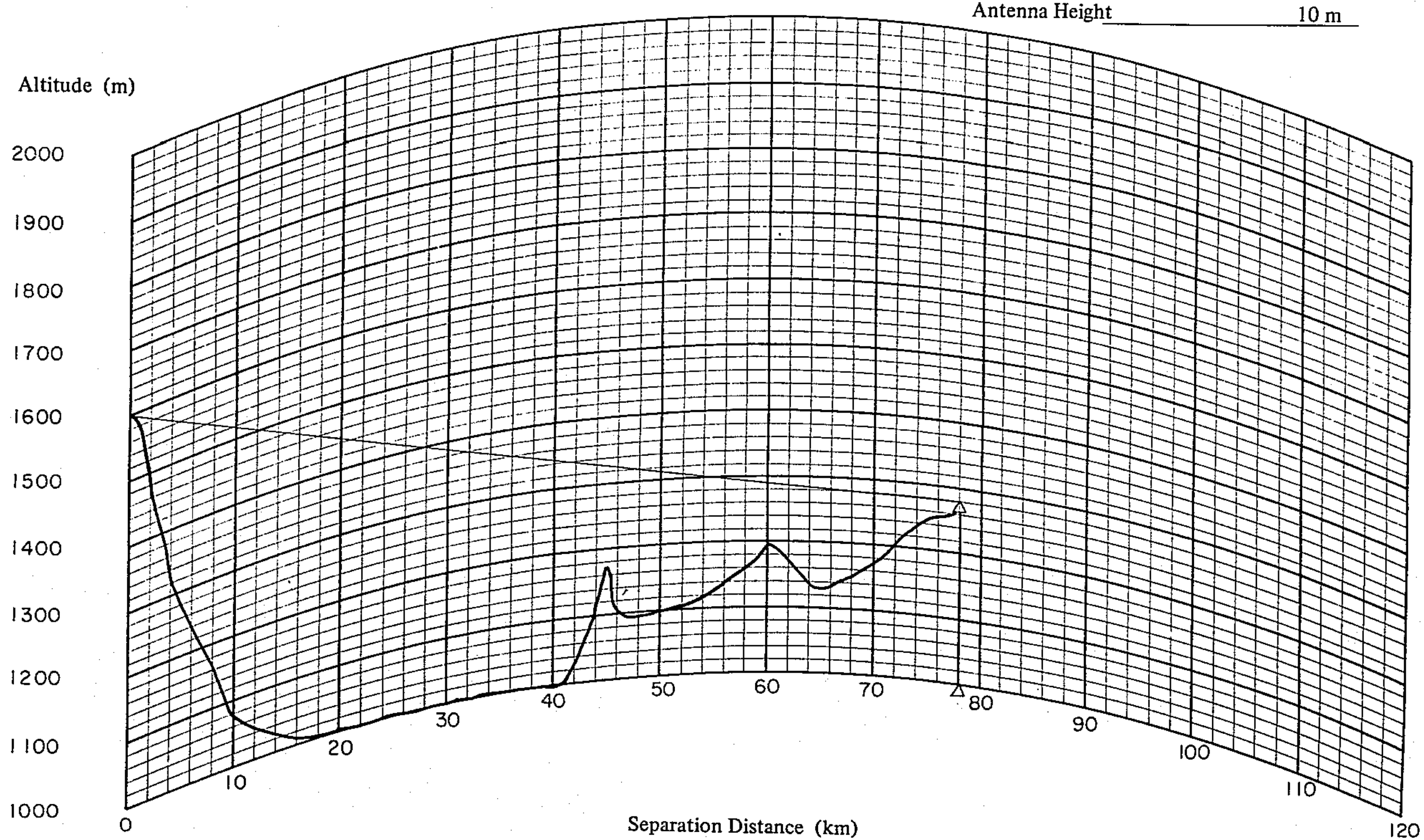
Altitude of Transmitting Station 1,590 m

Altitude of Transmitting Antenna 1,600 m

Separation Distance 78.0 km

Altitude of Receiving Point 1,280 m

Antenna Height 10 m



Profile ERUSI EAST – ARUA

Map Scale 1/50,000

Table 3-15 Design Specifications for Programme Relay Link from KAMPALA to NKIRAKIRA

Channel 5

1. Measured and Calculated Field Strength of Mother Station

Measured Values			Calculated Values		
Receiving Antenna Gain	1	-7.0 dB	Free Space Field Strength Eo (for E.R.P. 1 KW)	1	+69.5 dB
Receiving Feeder Loss	2	+2.4 dB	Shadow Loss S	2	-20.1 dB
$\frac{\lambda}{\pi}$	3	+6.4 dB	Phase Loss ϕ	3	0 dB
Peak to Mean Conversion Factor	4	+6.0 dB	Field Strength E' (for E.R.P. 1 KW)	1+2+3=4	+49.4 dB
Measured Level (Mean Value)	5	+59.5 dB	E.R.P. Conversion	5	+16.0 dB
Field Strength E	1+2+3+4+5	+67.3 dB	Field Strength E	4+5	+65.4 dB
Remarks:			Remarks:		
Receiving Antenna Type		7Y.1	Distance		74.4 km
Receiving Antenna Height		4 m			
Receiving Feeder Type and Length		5D-2V 20 m			

2. Design Specifications for Receiving System

Field Strength (Measured Level)	+67.3 dB		
Receiving Antenna Gain	+12.5 dB	Type 8Y·2	Height 8 m
Receiving Feeder Loss	-2.0 dB		
$\frac{\lambda}{\pi}$	-6.4 dB		
Open-end/50 ohms Termination Loss	-6.0 dB		
Receiver Input Level (Terminated by 50 ohms)	+65.4 dB		

3. Particular Considerations

A considerable degree of ghost image is present in picture transmitted from KAMPALA station, therefore, deversity method must be employed to reduce the ghost image.

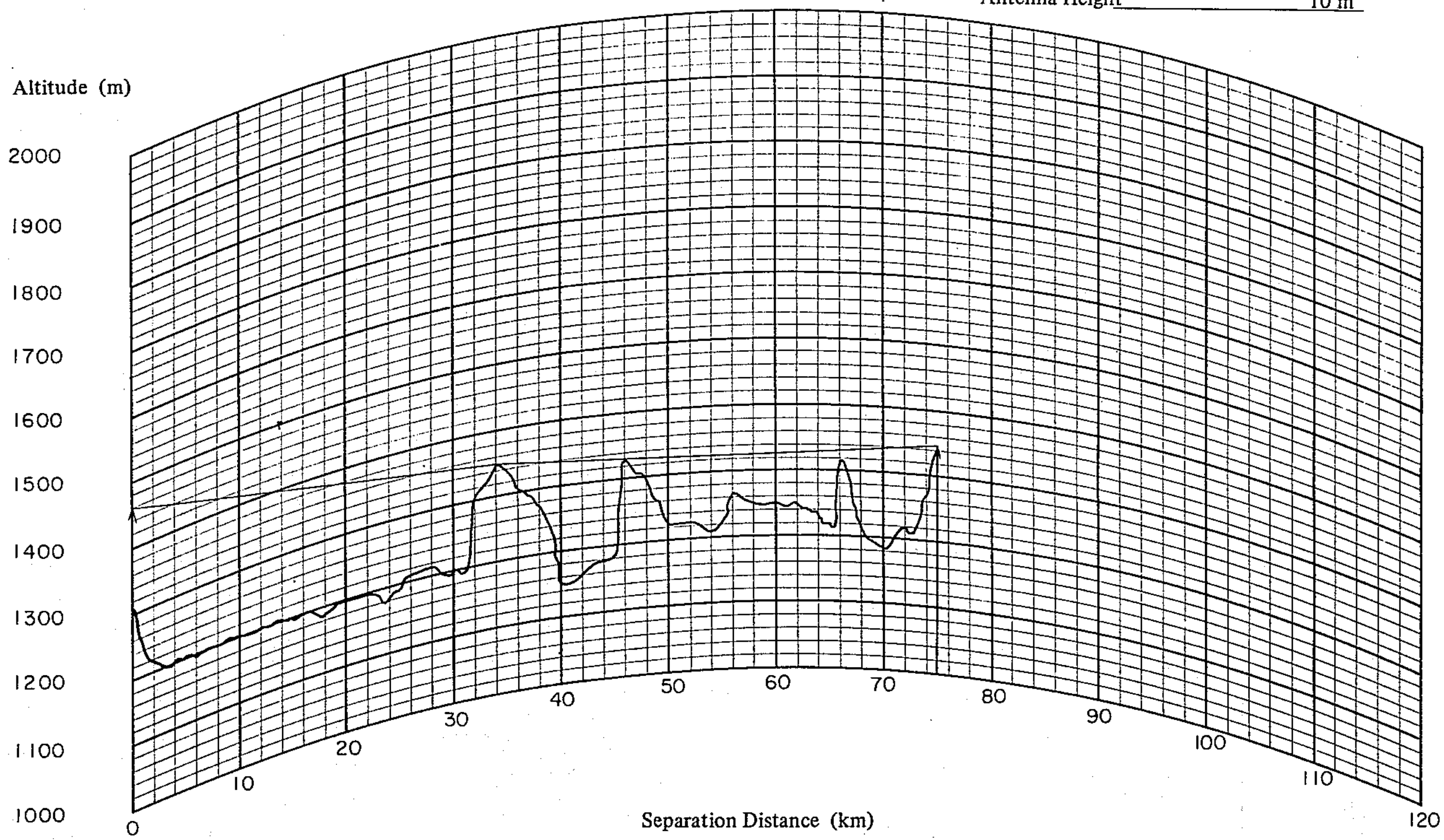
Altitude of Transmitting Station 1,310 m

Altitude of Transmitting Antenna 1,460 m

Separation Distance 74.4 km

Altitude of Receiving Point 1,340 m

Antenna Height 10 m



Profile KAMPALA – NKIRAKIRA

Map Scale 1/50,000

Table 3-16 Design Specifications for Programme Relay Link from NKIRAKIRA to MASAKA

Proposed Channel 65

1. Field Strength Measured and Calculated in Propagation Test

Measured Values			Calculated Values		
Output Power of Test Transmitter	1	-23.7dBk	Free Space Field Strength Eo (for E.R.P. 1 KW)	1	+70.8 dB
Transmitting Antenna Gain	2	+7.5 dB	Shadow Loss S	2	-9.0 dB
Transmitting Feeder Loss	3	-6.0 dB	Phase Loss θ	3	0 dB
E.R.P. in Propagation Test Equip.	1+2+3	-22.2dBk	Field Strength E' (for E.R.P. 1 KW)	1+2+3=4	+61.8 dB
Receiving Antenna Gain	4	-11.0 dB	E.R.P. Conversion	5	+13.0 dB
Receiving Feeder Loss	5	+12.2 dB	Field Strength E	4+5	+74.8 dB
$\frac{\lambda}{\pi}$	6	+16.8 dB			
Measured Level (Peak Value)	7	+21.5 dB	Remarks:		
Field Strength in Propagation Test	4+5+6+7=8	+39.5 dB	Distance	63.8 km	
Necessary E.R.P.	9	+13.0dBk			
	9-(1+2+3)=10	+35.2 dB			
Field Strength E 8+10		+74.7 dB			
Remarks:					
Transmitting Antenna Type		8Y·1			
Transmitting Antenna Height		10 m			
Transmitting Feeder Type		5D-2V			
Transmitting Feeder Length		20 m			
Receiving Antenna Type		5Y·2			
Receiving Antenna Height		63 m			
Receiving Feeder Type and Length		10D-2V, 60m 8D-2V, 10m			

2. Design Specifications for Transmitting System

Transmitter Output Power	-10 dBk		
Transmitting Antenna Gain	+25 dB	Type 4mϕ-GP	Height 10 m
Transmitting Feeder Loss	-2 dB		
E.R.P. in Transmission	+13 dBk		

3. Design Specifications for Receiving System

Field Strength (Measured Level)	+74.7 dB		
Receiving Antenna Gain	+20.0 dB	Type 2.4mϕ-GP	Height 100 m
Receiving Feeder Loss	-0.5 dB		
$\frac{\lambda}{\pi}$	-19.0 dB		
Open-end/50 ohms Termination Loss	-6.0 dB		
Receiving Input Level (Terminated by 50 ohms)	+69.2 dB		

4. Particular Considerations

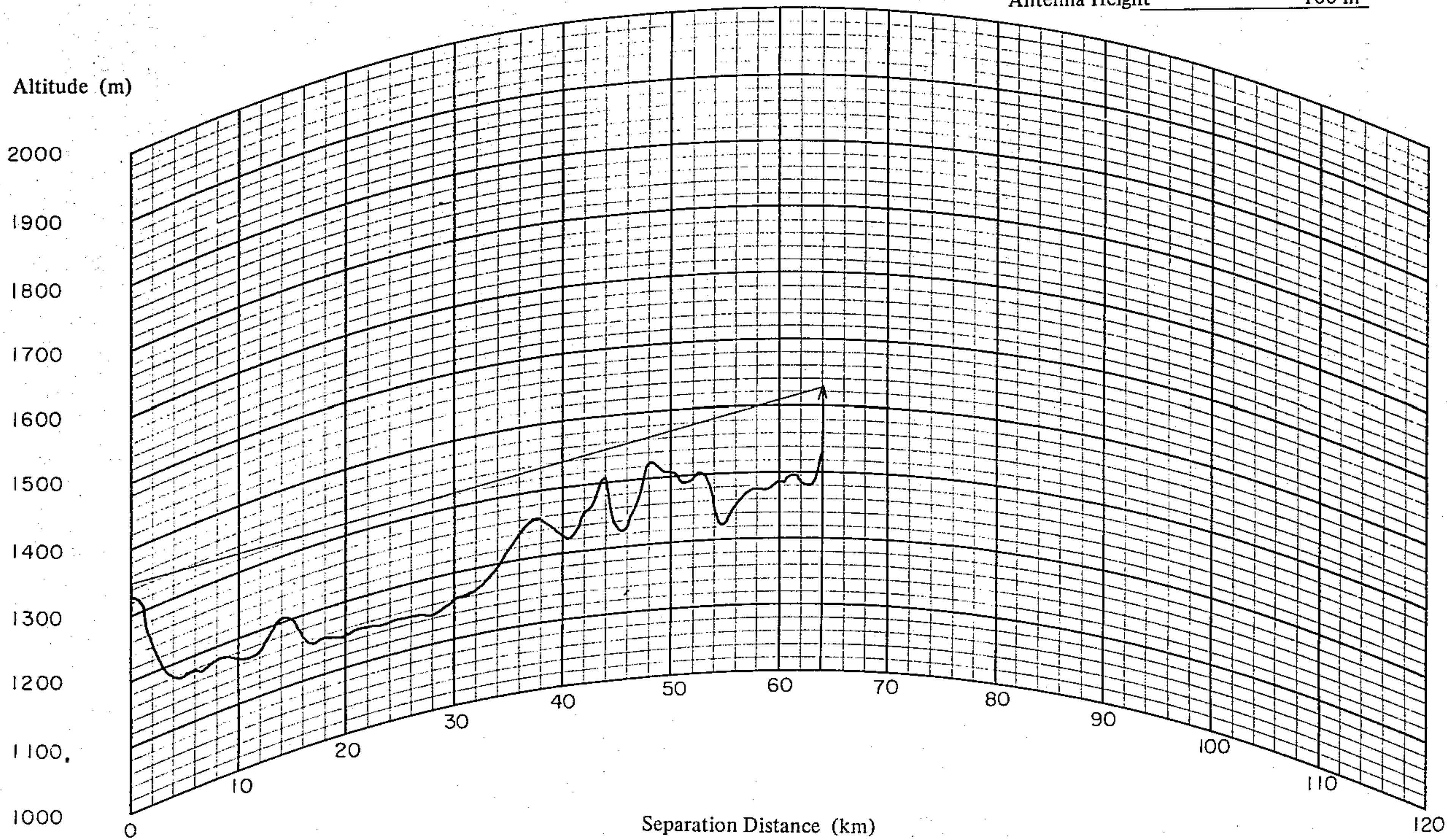
The propagation test was carried out from NKIRAKIRA to MASAKA station. The height of receiving antenna at MASAKA station was 63 m above ground. Under these conditions, the shadow-loss is estimated to be about 9 dB which was derived from map-calculation.

To avoid this shadow loss, the height of receiving antenna should be raised up to 100 m above ground.

The receiver equipment should be installed closely to the receiving antenna for the same reason as explained in page 52.

Altitude of Transmitting Station 1,340 m
Altitude of Transmitting Antenna 1,350 m

Separation Distance 63.8 m
Altitude of Receiving Point 1,330 m
Antenna Height 100 m



Profile NKIRAKIRA – MASAKA

Map Scale 1/50,000

Table 3-17 Design Specifications for Programme Relay Link from MASAKA to NAKISAJA

Channel 8

1. Measured and Calculated Field Strength of Mother Station

Measured Values			Calculated Values		
Receiving Antenna Gain	1	-7.0 dB	Free Space Field Strength Eo (for E.R.P. 1 KW)	1	+71.0 dB
Receiving Feeder Loss	2	+2.4 dB	Shadow Loss S	2	0 dB
$\frac{\lambda}{\pi}$	3	+6.4 dB	Phase Loss θ	3	0 dB
Peak to Mean Conversion Factor		+6.0 dB	Field Strength E' (for E.R.P. 1 KW)	1+2+3=4	+71.0 dB
Measured Level (Mean Value)	5	+66.0 dB	E.R.P. Conversion	5	+14.0 dB
Field Strength E	1+2+3+4+5	+73.8 dB	Field Strength E	4+5	+85.0 dB
Remarks:			Remark:		
Receiving Antenna Type		7Y.1	Distance	62.7 km	
Receiving Antenna Height		5 m			
Receiving Feeder Type and Length		5D-2V 20 m			

2. Design Specifications for Receiving System

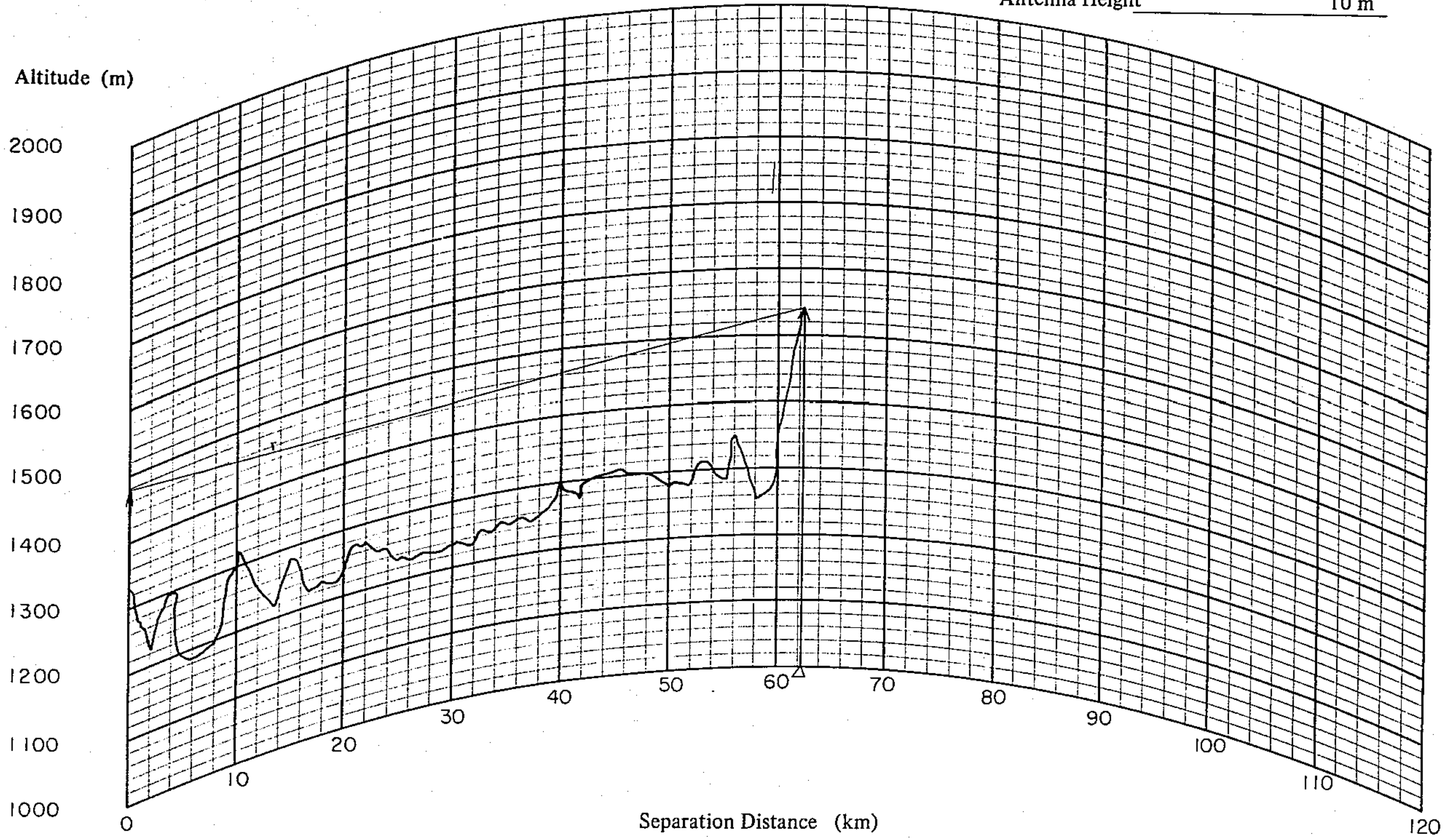
Field Strength (Measured Level)	+73.8 dB	
Receiving Antenna Gain	+12.5 dB	Type 8Y·2 Height 8 m
Receiving Feeder Loss	-2.0 dB	
$\frac{\lambda}{\pi}$	-6.4 dB	
Open-end/50 ohms Termination Loss	-6.0 dB	
Receiving Input Level (Terminated by 50 ohms)	+71.9 dB	

3. Particular Considerations

In this field strength measurement, the transmitting antenna in NAKISAJA was placed at a point considerably lower than the proposed site, therefore, a considerable difference is present between the measured and calculated levels of field strength in MASAKA. The proposed site of NAKISAJA will considerably increase the field strength in MASAKA. To reduce the ghost image, the diversity method should be employed.

Altitude of Transmitting Station 1,330 m
Altitude of Transmitting Antenna 1,480 m

Separation Distance 62.7 km
Altitude of Receiving Point 1,540 m
Antenna Height 10 m



Profile MASAKA – NAKISAJA

Map Scale 1/50,000

Table 3-18 Design Specifications for Programme Relay Link from NAKISAJA to KABUGA

Proposed Channel 61

1. Field Strength Measured and Calculated in Propagation Test

Measured Values			Calculated Values		
Output Power of Test Transmitter	1	dBk	Free Space Field Strength Eo (for E.R.P. 1 KW)	1	+67.5 dB
Transmitting Antenna Gain	2	dB	Shadow Loss S	2	0 dB
Transmitting Feeder Loss	3	dB	Phase Loss θ	3	0 dB
E.R.P. in Propagation Test Equip.	1+2+3	dBk	Field Strength E' (for E.R.P. 1 KW)	1+2+3=4	+67.5 dB
Receiving Antenna Gain	4	dB	E.R.P. Conversion	5	+7.0 dB
Receiving Feeder Loss	5	dB	Field Strength E	4+5	+74.5 dB
$\frac{\lambda}{\pi}$	6	dB			
Measured Level (Peak Value)	7	dB	Remark:		
Field Strength in Propagation Test	4+5+6+7=8	dB	Distance	94.5 km	
Necessary E.R.P.	9	dBk			
	9-(1+2+3)=10	dB			
Field Strength E	8+10	dB			
Remarks:					
Transmitting Antenna Type					
Transmitting Antenna Height		m			
Transmitting Feeder Type					
Transmitting Feeder Length		m			
Receiving Antenna Height		m			
Receiving Feeder Length		m			

2. Design Specifications for Transmitting System

Transmitter Output Power	-13 dBk		
Transmitting Antenna Gain	+22 dB	Type 3mϕ-GP	Height 10 m
Transmitting Feeder Loss	-2 dB		
E.R.P. in Transmission	+7 dBk		

3. Design Specifications for Receiving System

Field Strength (Calculated Level)	+74.5 dB		
Receiving Antenna Gain	+22.0 dB	Type 3mϕ-GP	Height 13.5 m
Receiving Feeder Loss	-2.0 dB		
$\frac{\lambda}{\pi}$	-19.0 dB		
Open-end/50 ohms Termination Loss	-6.0 dB		
Receiver Input Level (Terminated by 50 ohms)	+69.5 dB		

4. Particular Considerations

Output power (100W) of transmitter in NAKISAJA is to be branched in two directions, to KABUGA and to MBARARA.

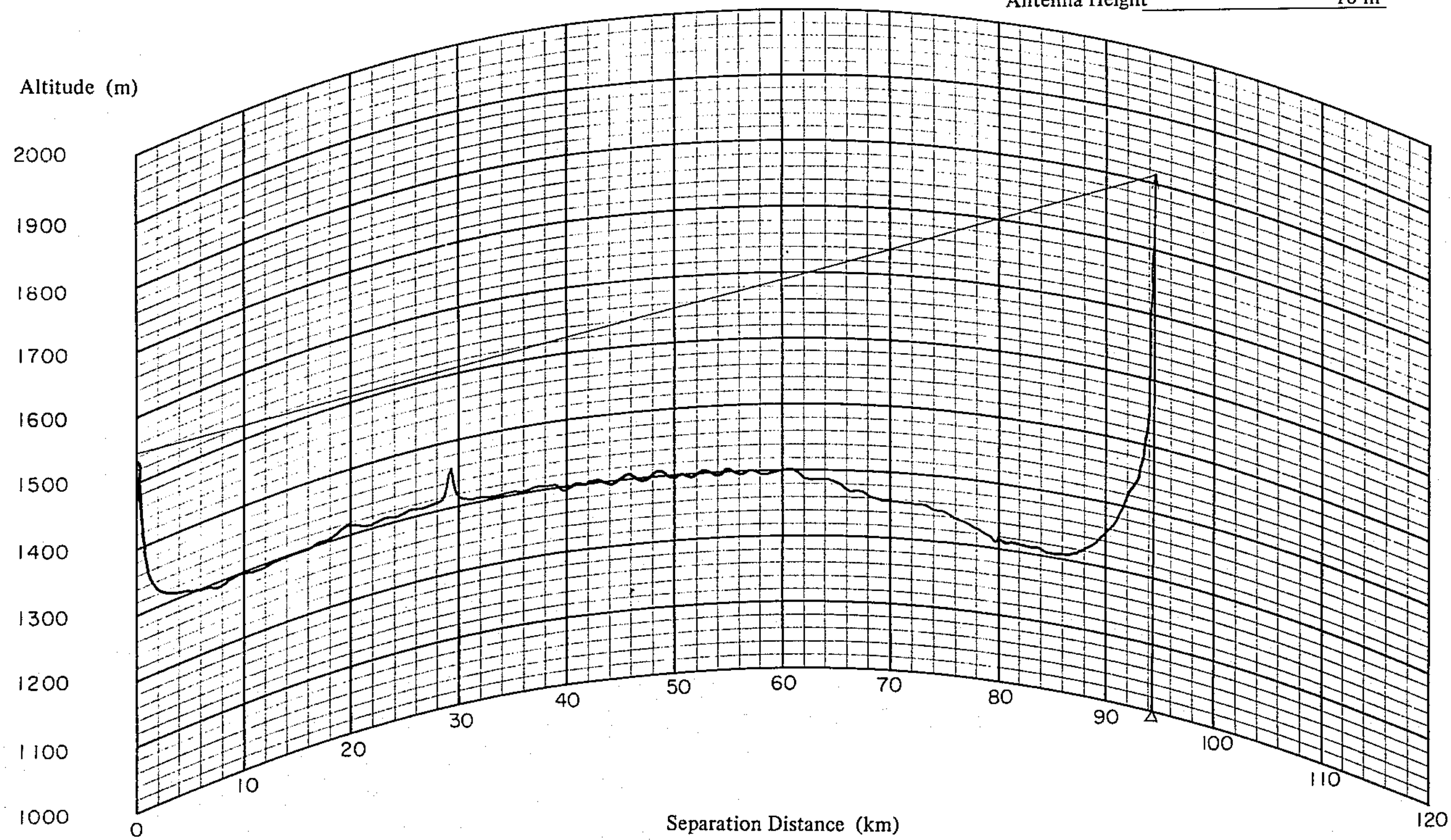
Altitude of Transmitting Station 1,540 m

Altitude of Transmitting Antenna 1,550 m

Separation Distance 94.5 km

Altitude of Receiving Point 1,810 m

Antenna Height 10 m



Profile NAKISAJA – KABUGA

Map Scale 1/50,000

Table 3-19 Design Specifications for Programme Relay Link from KABUGA to FORT PORTAL

Proposed Channel 65

1. Field Strength Calculated and Measured in Propagation Test

Measured Values			Calculated Values		
Output Power of Test Transmitter	1	dBk	Free Space Field Strength Eo (for E.R.P. 1 KW)	1	+72.2 dB
Transmitting Antenna Gain	2	dB	Shadow Loss S	2	0 dB
Transmitting Feeder Loss	3	dB	Phase Loss θ	3	0 dB
E.R.P. in Propagation Test Equip.	1+2+3	dBk	Field Strength E' (for E.R.P. 1 KW)	1+2+3=4	+72.2 dB
Receiving Antenna Gain	4	dB	E.R.P. Conversion	5	+10.0 dB
Receiving Feeder Loss	5	dB	Field Strength E	4+5	+82.2 dB
$\frac{\lambda}{\pi}$	6	dB			
Measured Level (Peak Value)	7	dB	Remark:		
			Distance	54.4 km	
Field Strength in Propagation Test	4+5+6+7=8	dB			
Necessary E.R.P.	9	dBk			
	9-(1+2+3)=10	dB			
Field Strength E	8+10	dB			
Remarks:					
Transmitting Antenna Type					
Transmitting Antenna Height		m			
Transmitting Feeder Type					
Transmitting Feeder Length		m			
Receiving Antenna Type					
Receiving Antenna Height		m			
Receiving Feeder Type					
Receiving Feeder Length		m			

2. Design Specifications for Transmitting System

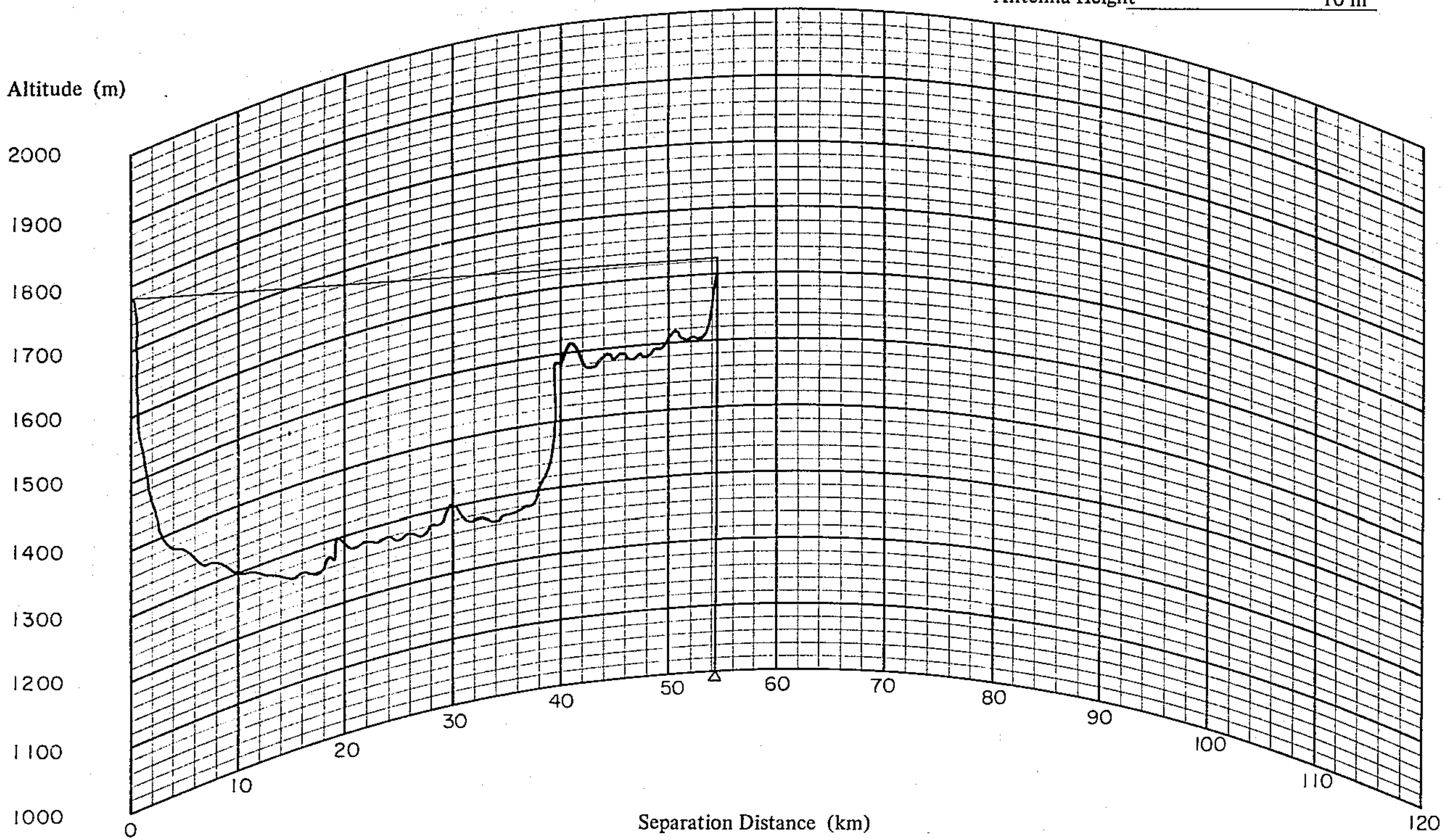
Transmitter Output Power	-10 dBk		
Transmitting Antenna Gain	+22 dB	Type 3mϕ-GP	Height 10 m
Transmitting Feeder Loss	-2 dB		
E.R.P. in Transmission	+10 dBk		

3. Design Specifications for Receiving System

Field Strength (Calculated Level)	+82.2 dB		
Receiving Antenna Gain	+20.0 dB	Type 2.4mϕ-GP	Height 10 m
Receiving Feeder Loss	-2.0 dB		
$\frac{\lambda}{\pi}$	-19.6 dB		
Open-end/50 ohms Termination Loss	-6.0 dB		
Receiver Input Level (Terminated by 50 ohms)	+75.2 dB		

Altitude of Transmitting Station 1,780 m
Altitude of Transmitting Antenna 1,790 m

Separation Distance 54.4 km
Altitude of Receiving Point 1,630 m
Antenna Height 10 m



Profile KABUGA – FORT PORTAL Map Scale 1/50,000

Table 3-20 Design Specifications for Programme Relay Link from FORT PORTAL to KASESE

Proposed Channel 6

1. Field Strength Measured and Calculated in Propagation Test

Measured Values			Calculated Values		
Output Power of Test Transmitter	1	-20 dBk	Free Space Field Strength Eo (for E.R.P. 1 KW)	1	+70.7 dB
Transmitting Antenna Gain	2	+9.0 dB	Shadow Loss S	2	-9.7 dB
Transmitting Feeder Loss	3	-1.8 dB	Phase Loss θ	3	0 dB
E.R.P. in Propagation Test Equip.	1+2+3	-12.8dBk	Field Strength E' (for E.R.P. 1 KW)	1+2+3=4	+61.0 dB
Receiving Antenna Gain	4	-9.0 dB	E.R.P. Conversion	5	+3.8 dB
Receiving Feeder Loss	5	+3.5 dB	Field Strength	4+5	+64.8 dB
$\frac{\lambda}{\pi}$	6	+4.0 dB			
Measured Level (Peak Value)	7	+51.5 dB	Remark:		
			Distance	70.7 km	
Field Strength in Transmission Test	4+5+6+7=8	+50.0 dB			
Necessary E.R.P.	9	+3.8 dBk			
	9-(1+2+3)=10	+16.6 dB			
Field Strength E	8+10	+66.6 dB			
Remarks:					
Transmitting Antenna Type		5Y·1			
Transmitting Antenna Height		10 m			
Transmitting Feeder Type		7C-2V			
Transmitting Feeder Length		20 m			
Receiving Antenna Type		5Y·1			
Receiving Antenna Height		4 m			
Receiving Feeder Type and Length		5D-2V, 20 m 5C-2V, 10 m			
Test Frequency		153,33 MHz			

2. Design Specifications for Transmitting System

Transmitter Output Power	-3 dBk		
Transmitting Antenna Gain	+7.8 dB	Type 3·2D·2	Height 25 m
Transmitting Feeder Loss	-1.0 dB		
E.R.P. in Transmission	+3.8 dBk		

3. Design Specifications for Receiving System

Field Strength (Measured Level)	+66.6 dB		
Receiving Antenna Gain	+10.5 dB	Type 8Y·1	Height 6 m
Receiving Feeder Loss	-2.0 dB		
$\frac{\lambda}{\pi}$	-6.4 dB		
Open-end/50 ohms Termination Loss	-6.0 dB		
Receiver Input Level (Terminated by 50 ohms)	+62.9 dB		

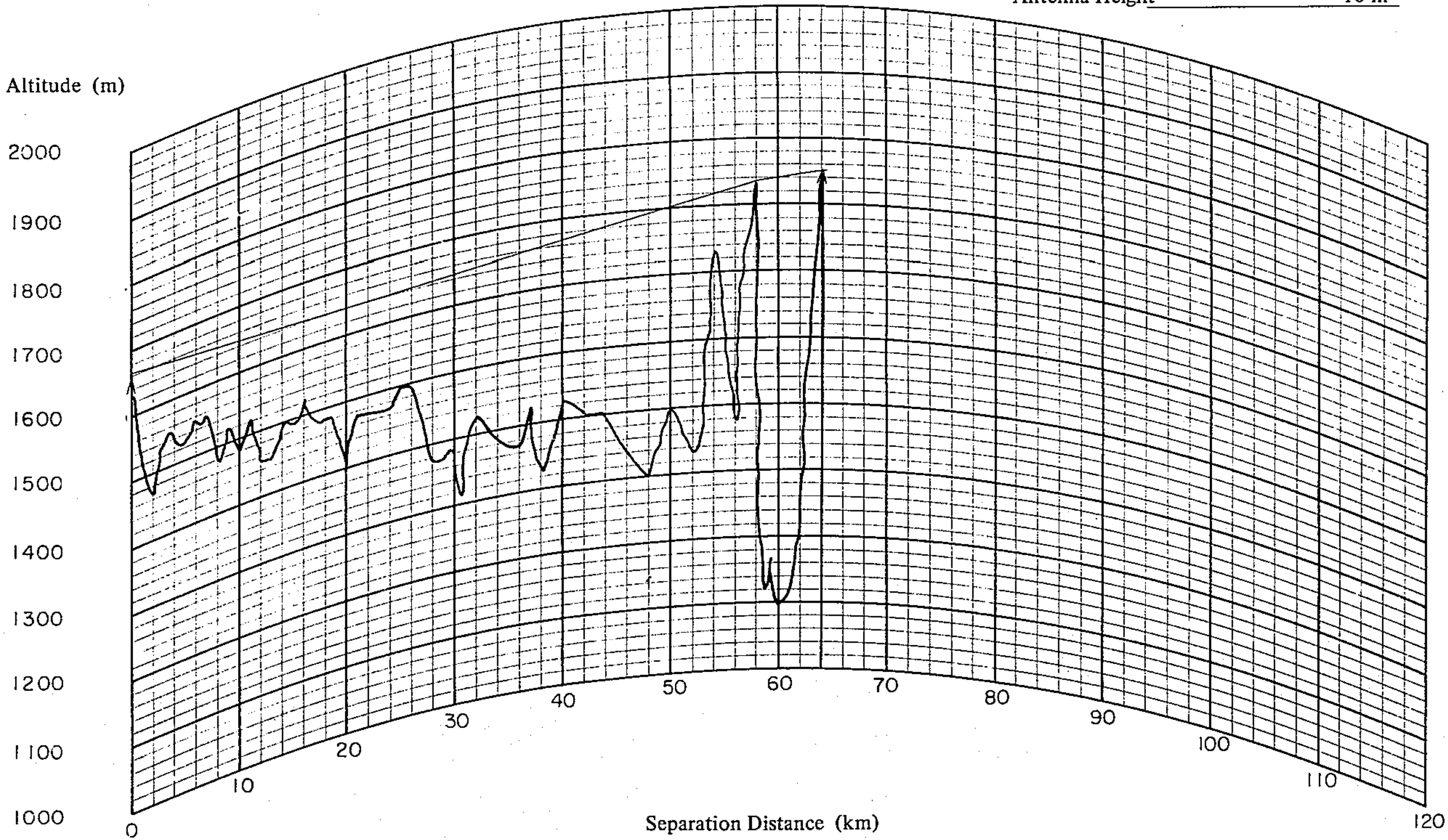
Altitude of Transmitting Station 1,630 m

Altitude of Transmitting Antenna 1,655 m

Separation Distance 64.3 km

Altitude of Receiving Point 1,740 m

Antenna Height 10 m



Profile FORT PORTAL – KASESE

Map Scale 1/50,000

Table 3-21 Design Specifications for Programme Relay Link from NAKISAJA to MBARARA

Proposed Channel 61

1. Field Strength Measured and Calculated in Transmission Test

Measured Values			Calculated Values		
Output Power of Test Transmitter	1	dBk	Free Space Field Strength Eo (for E.R.P. 1 KW)	1	+68.0 dB
Transmitting Antenna Gain	2	dB	Shadow Loss S	2	0 dB
Transmitting Feeder Loss	3	dB	Phase Loss θ	3	0 dB
E.R.P. in Propagation Test Equip.	1+2+3	dBk	Field Strength E' (for E.R.P. 1 KW)	1+2+3=4	+68.0 dB
Receiving Antenna Gain	4	dB	E.R.P. Conversion	5	+7.0 dB
Receiving Feeder Loss	5	dB	Field Strength	4+5	+75.0 dB
$\frac{\lambda}{\pi}$	6	dB			
Measured Level (Peak Value)	7	dB	Remarks:		
			Distance	88.2 km	
Field Strength in Transmission Test	4+5+6+7=8	dB			
Necessary E.R.P.	9	dBk			
	9-(1+2+3)=10	dB			
Field Strength E	8+10	dB			
Remarks:					
Transmitting Antenna Type					
Transmitting Antenna Height		m			
Transmitting Feeder Type					
Transmitting Feeder Length		m			
Receiving Antenna Type					
Receiving Antenna Height		m			
Receiving Feeder Type					
Receiving Feeder Length		m			
Test Frequency		MHz			

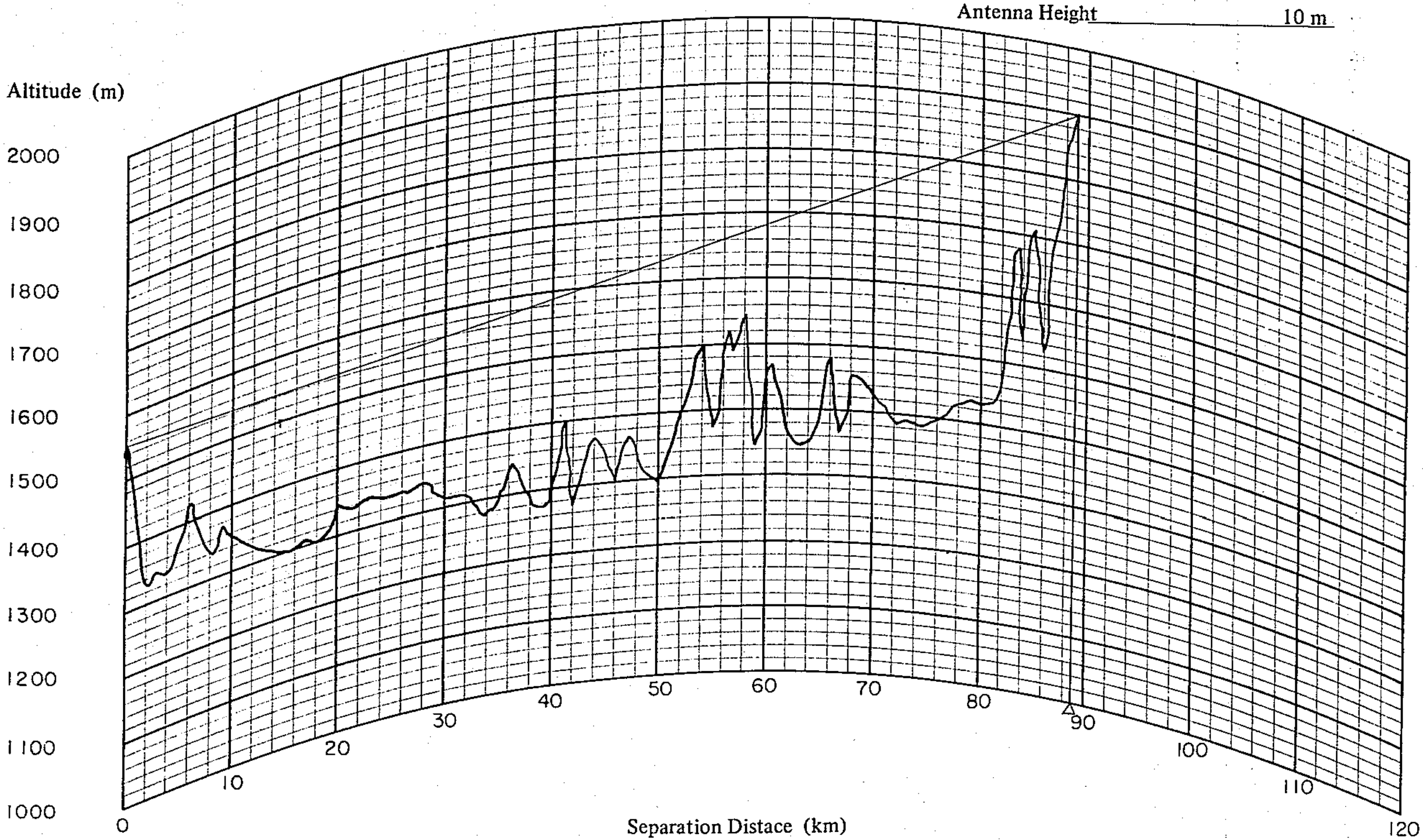
2. Design Specifications for Transmitting System

Transmitter Output Power	-13 dBk	
Transmitting Antenna Gain	+22 dB	Type 3mϕ. — GP Height 10 m
Transmitting Feeder Loss	-2 dB	
E.R.P. in Transmission	+7 dBk	

3. Design Specifications for Receiving System

Field Strength (Calculated Level)	+75.0 dB	
Receiving Antenna Gain	+20.0 dB	Type 2.4mϕ. — GP Height 10 m
Receiving Feeder Loss	-2.0 dB	
$\frac{\lambda}{\pi}$	-19.0 dB	
Open-end/50 ohms Termination Loss	-6.0 dB	
Receiver Input Level (Terminated by 50 ohms)	+68.0 dB	

Altitude of Transmitting Station	1,540 m	Separation Distance	88.2 km
Altitude of Transmitting Antenna	1,550 m	Altitude of Receiving Point	1,890 m
		Antenna Height	10 m



Profile NAKISAJA – MBARARA

Map Scale 1/50,000

Table 3-22 Design Specifications for Programme Relay Link from MBARARA to KABALE

Channel 10

1. Measured and Calculated Field Strength of Mother Station

Measured Values			Calculated Values		
Receiving Antenna Gain	1	-7.0 dB	Free Space Field Strength Eo (for E.R.P. 1 KW)	1	+68.1 dB
Receiving Feeder Loss	2	+1.1 dB	Shadow Loss	2	-12.1 dB
$\frac{\lambda}{\pi}$	3	+6.4 dB	Phase Loss θ	3	0 dB
Peak to Mean Conversion Factor	4	+6.0 dB	Field Strength E' (for E.R.P. 1 KW)	1+2+3=4	+56.0 dB
Measured Level (Mean Value)	5	+59.0 dB	E.R.P. Conversion	5	+6.5 dB
Field Strength E	1+2+3+4+5	+65.5 dB	Field Strength E	4+5	+62.5 dB
Remarks:			Remarks:		
Receiving Antenna Type		7Y-1	Distance		86.1 km
Receiving Antenna Height		5 m			
Receiving Feeder Type and Length		5D-2V, 5 m 5C-2V, 5 m			

2. Design Specifications for Receiving System

Field Strength (Measured Value)	+65.5 dB		
Receiving Antenna Gain	+12.5 dB	Type 8Y-2	Height 8 m
Receiving Feeder Loss	-2.0 dB		
$\frac{\lambda}{\pi}$	-6.4 dB		
Open-end/50 ohms Termination Loss	-6.0 dB		
Receiver Input Level (Terminated by 50 ohms)	+63.6 dB		

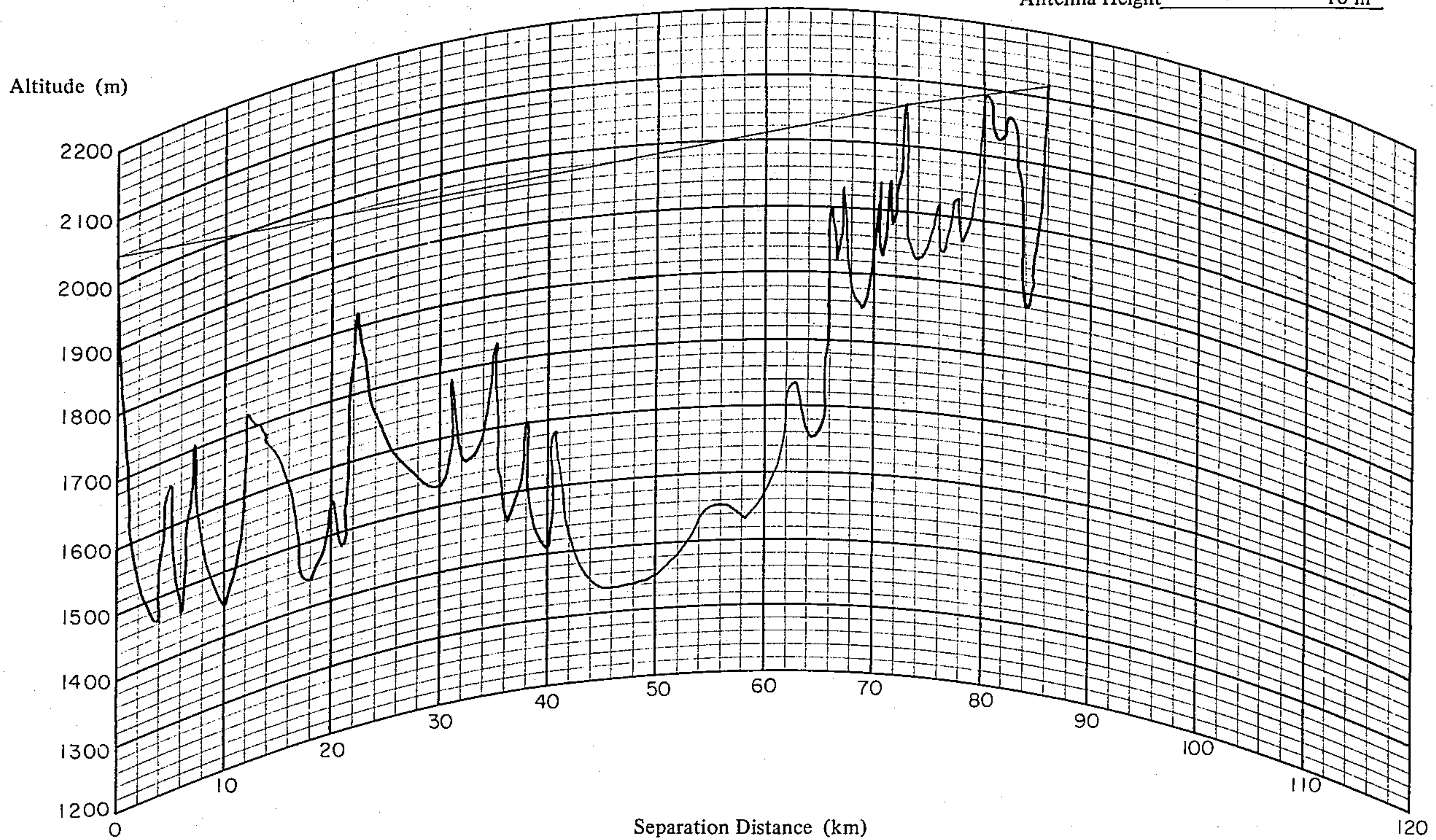
Altitude of Transmitting Station 1,890 m

Altitude of Transmitting Antenna 2,040 m

Separation Distance 86.1 km

Altitude of Receiving Point 2,120 m

Antenna Height 10 m



Profile MBARARA – KABALE

Map Scale 1/50,000

Table 3-23 S/N Ratio of Picture Output

→ No. of relaying

1	2	3	4	5	6
Jinja (59.4) 59.4	Kagulu (63.9) 58.0	Soroti (58.6) 55.4	Ongola (70.4) 55.2	Lira (58.8) 53.6	Gulu (60.5) 53.0
			Moroto (55.9) 52.6		
			Mbale (71.9) 55.2		
			Tororo (51.0) 49.6		
Biko (60.9) 60.9	Hoima (60.3) 57.9	Masindi (57.1) 54.7	Erusi-East (62.0) 54.1	Arua (62.0) 53.7	
Nkirakira (56.4) 56.4	Masaka (57.2) 53.8	Nakisaja (62.9) 53.4	Kabuga (57.5) 51.9	Fort Portal (63.2) 51.6	Kasese (53.7) 49.6
			Mbarara (56.0) 51.6	Kabale (64.6) 51.4	

Notes:
1. S/N ratio of Kampala station output is assumed to be infinite (∞).
2. Values shown in brackets ( ) represent S/N ratio of transmitter in individual stations.

Table 3-24 Antenna Gain (Compared to dipoles)

Multi-element YAGI (for V.H.F.)

Type	Gain (dB)
3-element	5.5 *
5-element	9.0
7-element	10.0 *
8-element	10.5 *
12-element	11.5

Parabola (for U.H.F.)

Type	Gain (dB)
2.4mφ Grid	20.0
3.0mφ Grid	22.0
4.0mφ Grid	25.0

* Because of the impedance matching device used for the propagation tests, values obtained during the tests are lower than these values.

Attenuation Loss of Coaxial Cables (dB/100m)

Characteristics Impedance 75Ω

Type of Cable	Attenuation at 150 MHz (dB)
5C-2V	11.0
7C-2V	9.0
10C-2V	6.0

Characteristics Impedance 50Ω

Type of Cable	Attenuation at 150 MHz (dB)	Attenuation at 700 MHz (dB)
5D-2V	12.0	30.0
8D-2V	8.0	20.0
10D-2V	6.4	17.0
20D-2V	2.0	—

3.2 Supervisory Network Plan

Expansion of the TV network necessitates reorganization of maintenance system. In order to minimize number of maintenance personnels, it is most advisable to operate all broadcasting and relaying stations, except the central station (Kampala) and the sub-central stations (Soroti, Mbarara, and Hoima), on the unattended basis.

The unattended operation of stations require concentrated supervision of individual unattended stations at the sub-central stations and a simultaneous supervision of entire stations at the central station.

To attain the supervisory purposes most economically, it is advisable to establish the supervisory network simultaneously with the construction of prospective broadcasting and relaying stations.

3.2.1 Network

A recommendable supervisory network is shown in Fig. 3-3. The "Supervisory Station" in this figure represents a station which is provided with the function to monitor signals sent from each supervised station to indicate its operating condition, while the "Supervised Station" functions to transmit signals indicating its operating condition to the supervisory network. To ease operation and maintenance, only the most fundamental condition, "Abnormal Transmitting Output Power" (decrease of output), will be supervised.

For this purpose, it will be advisable to employ a system to assign a particular pilot frequency for each supervised station so that its trouble may be indicated on the supervisory panel by the interruption of the pilot frequency signal.

According to the plan, operating conditions of Jinja, Tororo, Moroto, and Kasese stations will not be supervised since the operation of the small power transmitter at these three watts stations is quite stable and highly reliable. Regular maintenance for these station, to be conducted once or twice yearly, will be sufficient to maintain high quality performance and eliminate the need for the supervisory network.

The U.H.F. relaying stations in Kagulu, Biko, Kabuga, and Erusi East will function only to relay the supervised signals from Soroti, Hoima, Fort Portal, and Arua, respectively.

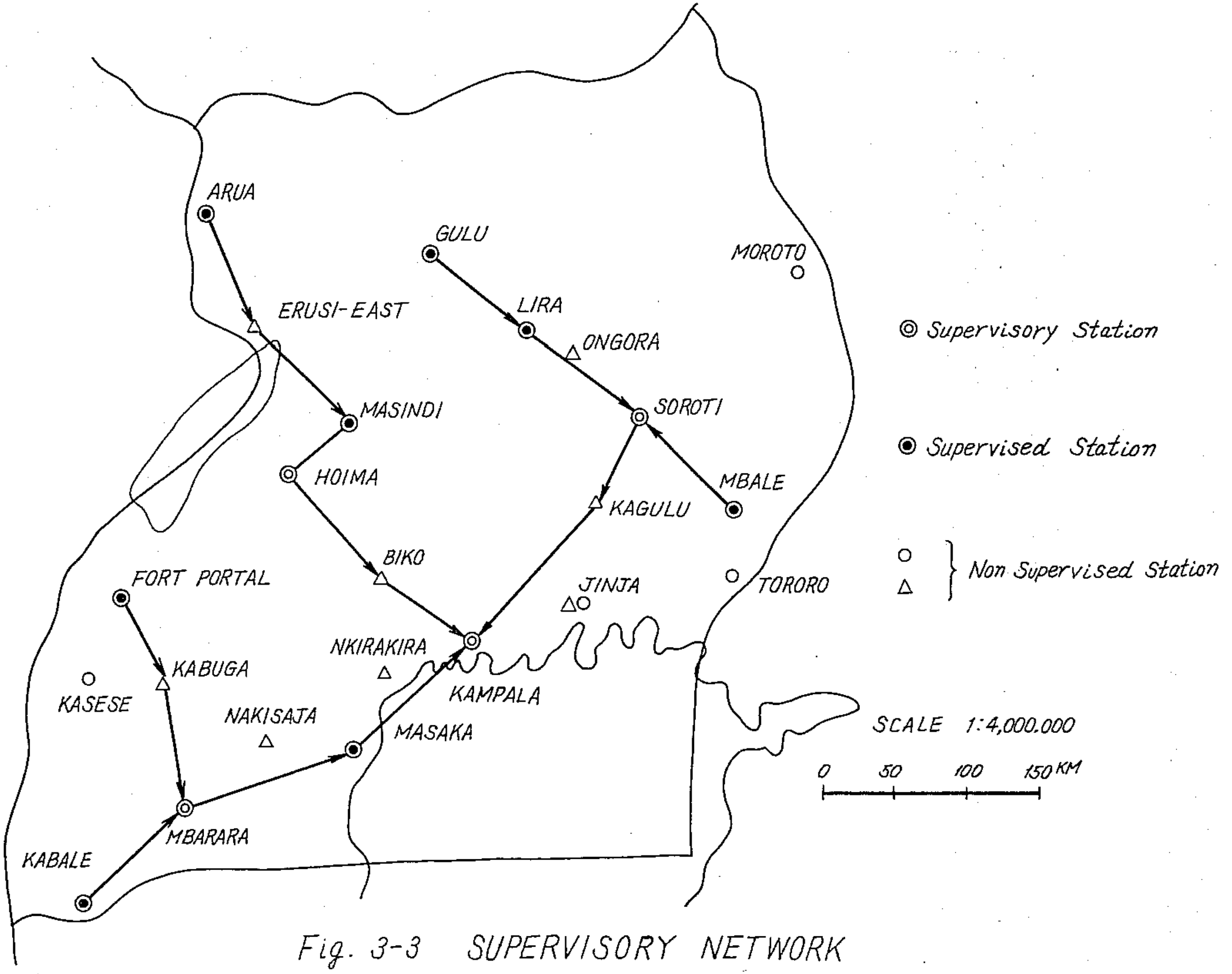


Fig. 3-3 SUPERVISORY NETWORK

3.2.2 Frequencies

Eight (8) frequencies in the 150 MHz band will be appropriate for the network. Example of frequency allocation is shown in Table 3-25

3.2.3 Design

For input level of the supervisory equipment, a field strength of 30 dB will be sufficient. Because of the sequential relaying system from the terminal station to the supervisory station, a frequency interval of 5 MHz will be sufficient for receiving and transmitting at a station. Design of the links measured or calculated based on the propagation test results is shown in Table 3-25.

Table 3-25 Supervisory Network System Designs

Site		Output Power of Transmitter (w)	Type of Antenna *1	Measured value of Field Strength at Propagation Tests (dB)	Frequency *3
Transmitting	Receiving				
Gulu	Lira	5	3Y	37.9	A
Lira	Soroti	50	8Y	(35.5)	F
Mbale	Soroti	10	3Y	44.3	H
Soroti	Kagulu	10	5Y	43.1	B
Kagulu	Kampala	50	5Y	36.4	G
Arua	Erusi-East	5	3Y	(48.5) *2	C
Erusi East	Masindi	5	3Y	(45.4)	H
Masindi	Hoima	5	3Y	(45.9)	B
Hoima	Biko	10	5Y	(52.3)	I
Biko	Kampala	10	5Y	43.8	C
Fort Portal	Kabuga	5	3Y	(49.5)	A
Kabuga	Mbarara	50	5Y	(37.5)	F
Kabale	Mbarara	10	5Y	40.5	H
Mbarara	Masaka	50	8Y	(36.1)	B
Masaka	Kampala	50	8Y	(40.5)	J

Notes: *1 Antennas shall be installed higher than the centre of tower height. Except for the following stations, 10D-2V will be appropriate for feeder.
For Lira, Mbarara, Masaka, and Kampala stations, use of 20D-2V which will reduce feeder loss is recommended.
Antennas for these stations shall also be installed as high as possible.

*2 Values in brackets ( ) are the calculated values.

*3 Example of Frequency Allocation

A	150.00 (MHz)
B	150.20
C	150.40
F	155.00
G	155.20
H	155.40
I	155.60
J	155.80

CHAPTER 4 IMPROVEMENT ON FACILITIES OF EXISTING TV BROADCASTING STATIONS

Chapter 4 Improvement on Facilities of Existing Television Broadcasting Stations

4.1 Modification of Receiving Equipment

Since the relay span of the existing network is excessively long to maintain stable and high quality transmission of programme, it will be necessary, as described in the previous chapter, to add UHF relay stations and to change relay routes for improvement in receiving conditions.

The change of relaying method will necessitate, except for Kampala station, the following modification of receiving equipment.

4.1.1 Soroti Station

According to this plan, the present receiving frequency of Soroti station which is CH. 8, the transmitting frequency of Mbale Station, will be changed to UHF sent from the prospective Kagulu Relay Station.

4.1.2 Mbale Station

The receiving frequency of this station, CH. 5 at present from Kampala Station, will be changed to receive CH. 10 from Soroti Station.

4.1.3 Lira Station

The present receiving frequency of Lira Station, CH. 10 for reception of Soroti Station, will be changed to receive UHF transmitted from the prospective Ongora Relay Station.

4.1.4 Masaka Station

The present receiving frequency of Masaka Station, CH. 5 for reception of Kampala Station, will be changed to receive UHF of the prospective Nkirakira Relay Station.

4.1.5 Mbarara Station

The receiving frequency of Mbarara Station, which is CH. 8 from Masaka Station at present, will be changed to receive UHF transmitted from the prospective Nakisaja Relay Station.

4.2 Improvement on the Existing Transmitting Facilities

Prior to the proposed improvement of the programme relay network, all the existing transmitting facilities will have to be re-adjusted and those facilities of which characteristic deterioration is obvious at present will have to be repaired.

The transmitting equipment of the following stations will require improvement.

4.2.1 Kampala Station

Because of the importance as the central station, a stand-by transmitter, which will minimize the occurrence of troubles, will be required for Kampala Station.

4.2.2 Soroti Station

A stand-by transmitter will also be necessary for this sub-central station.

4.2.3 Lira Station

The decreased output power of the sound transmitter of Lira Station will be unserviceable for relaying TV programmes to the prospective Gulu TV Broadcasting Station. The sound transmitter, filterplexer and antenna of this station will have to be repaired.

4.2.4 Mbarara Station

Picture quality of the present vision transmitter in this station is also obviously deteriorated. To assure high quality broadcasting of programmes and relaying to the prospective Kabale TV Broadcasting Station, the vision transmitter will require improvement of quality.

CHAPTER 5 IMPROVEMENT ON STUDIO FACILITIES

Chapter 5 Improvement on Studio Facilities

To increase the broadcasting hours and improve the programme quality, a drastic improvement of the existing studio facilities is required. However, the improvement must be supported by financial and personnel plans. It is therefore advisable to draw up a plan for the minimum required improvement and incorporate it into the nation-wide TV network project, and formulate another project for the desired thorough improvement including the construction of a new studio centre.

5.1 Necessities and Problems of New Studio Centre

Since the existing studio in Kampala is the one remodelled from a conventional type building, requirements for full-scale programme production are not satisfied. A new studio centre with three or four studios each equipped with all the necessary facilities will have to be built to meet the demand arising from the completion of the proposed network. However, the construction of the new centre entails a huge amount of expenses and requires a long construction period. Further, the programme production must be supported by many skilled staffs. Therefore, the construction of the new studio centre could start only under a firm and long-term scheme which is backed up by the financial plan, programme expansion schedules, and personnel training programme. For this reason, it is desirable to limit the improvement of studio facilities to the minimum as will be described later, and to give priority to the construction of the nation-wide TV broadcasting network, and to leave the construction of new studio centre until completion of the present project.

5.2 Enrichment of Recording Equipments

Under the existing circumstances, the most effective improvement that could be effected to the studio facilities, will be the addition of the following programme recording equipments. By these additions, the programme contents will be enriched considerably.

(1) One Outside Broadcasting Van

The outside broadcasting van is a mobile programme recording station with two TV cameras, a mixing console, a VTR and a complete set of power supply, and is designed for efficient operation by a comparatively small group of staffs. By using this van, outside-of-studio programmes can be produced and recorded at any town or village throughout the country.

(2) One Console Type VTR

The new console type VTR, which is installed in the existing studio, can be used for playing back the locally produced programmes which have been recorded by the outside broadcasting van. The console type VTR can also be used for recording the programmes produced in studios, and this serves to increase the efficiency of studio rotation.

CHAPTER 6 SPECIFICATIONS FOR TV BROADCASTING AND RELAYING STATIONS

Chapter 6 Specifications for TV Broadcasting and Relaying Stations

In accordance with the analysis and design described in Chapters 2 and 3, Part II of this report, basic specifications for each station are arranged in the following order.

Materials for Indivisual Stations

1. List of Facilities. (Major items related to construction plan of station)
2. Schematic Diagram.
3. Main Specifications.
4. Map of Site.
5. Antenna Pattern.
6. Floor Layout.
7. Scheme on Antenna Installation.

Common Materials

1. Summary of Specifications for Major Equipment.
2. List of Common Facilities.
3. Pattern of Common Antenna.
4. Antenna Structure.
5. Tower Structure.

The followings are notes on description for the list of facilities.

1. Spare parts for equipment marked "including spare parts" includes:

   100% (equal quantityto existing parts)······ of transistorized units, electron tubes, and transistors and other semi-conductors used in circuits other than transistorized units.

   One each for a group of identical type········ of high frequency parts, transformers, choke coils, resistors, capacitors, coils, relays, contactors, and meter indicators.

   300% ·· of lamps, fuses, fingers, and other consumable parts

2. Spare parts to be supplied with equipment not marked "including spare parts" are 300% of fuses and lamps.

3. Power supply equipment marked "Engine Generators" includes two sets of engine generators, an automatic starting equipment, and a distribution panel, etc.

4. The power supply equipment not particularly marked generally includes a distribution panel with an AVR (Automatic Voltage Regulator).

5. Materials to be used for installation of equipment are not specified in the table, but these materials are to be supplied with respective equipments.

Jinja Station

Table 6-1 List of Facilities

Item	Description	Q'ty	Remarks
1.	Building	1 set	
2.	Power Line	1 set	
1.	TV Antenna for Relaying	1 set	
2.	100W (V-U) Translator	1 set	including spare parts
3.	Receiving Antenna for Relaying	1 set	
4.	TV Antenna for Broadcasting	1 set	
5.	3W (V-V) Translator	1 set	including spare parts
6.	Receiving Antenna for Broad-casting	1 set	
7.	Tower	1 set	
8.	Power Supply Equipment	1 set	
9.	Accessories	1 set	

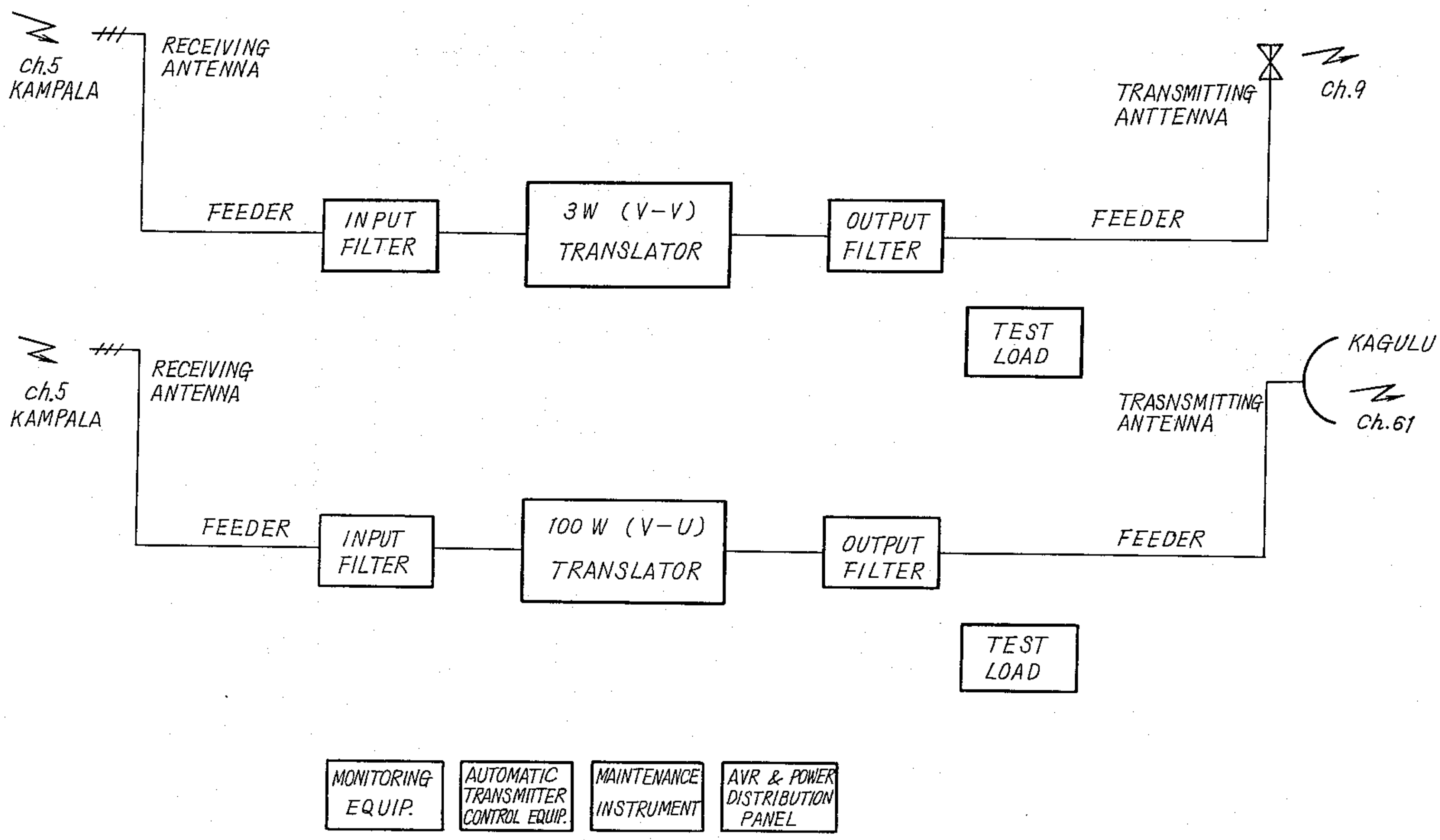


Fig. 6-1 SCHEMATIC DIAGRAM OF JINJA STATION

Table 6-2   Main Specifications for Jinja Station

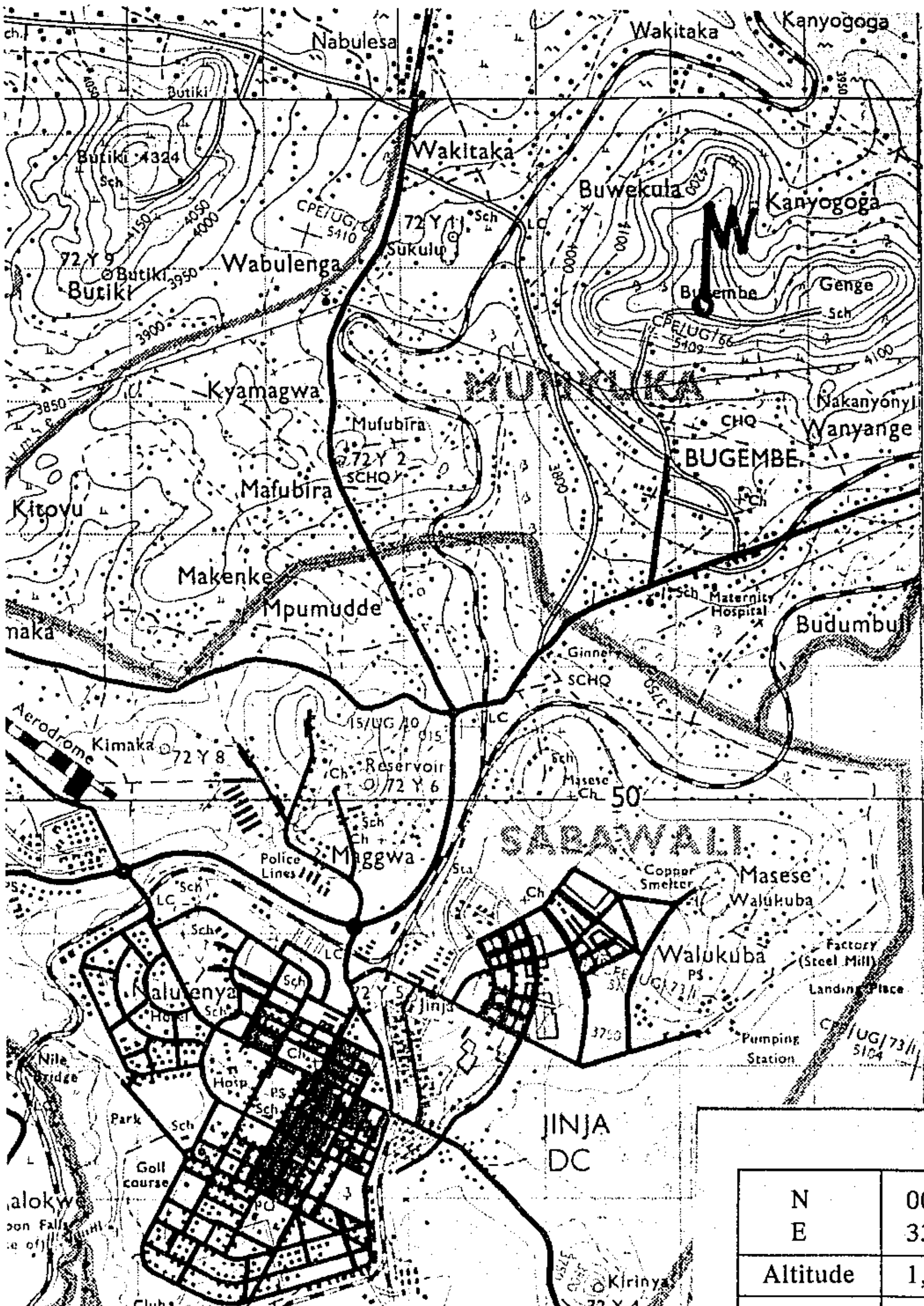
Name of Station		Jinja
Type of Station		Broadcasting (Translator)
Site of Station		Refer to Fig. 6-2
Transmitting Frequency		BAND III CH. 9
Transmitter Output Power		3W (Video Peak)
Transmitting Antenna	Type	3Y·1
	Height of Tower Top	20 m
Mother Station	Name of Station	Kampara
	Frequency	BAND III CH. 5
Receiving Antenna	Type	8Y·1
	Height of Mast Top	(10) m
Power Supply	Type of Power Supply	Lines
	Capacity	7.5 KVA
Supervisory Equipment	Frequency	
	Output Power	
	Transmitting Antenna	
	Receiving Antenna	
Note		

Note: Height described in brackets (   ) represents the receiving antenna height to be mounted on the transmitting antenna tower.

Table 6-3 Main Specifications for Jinja Station

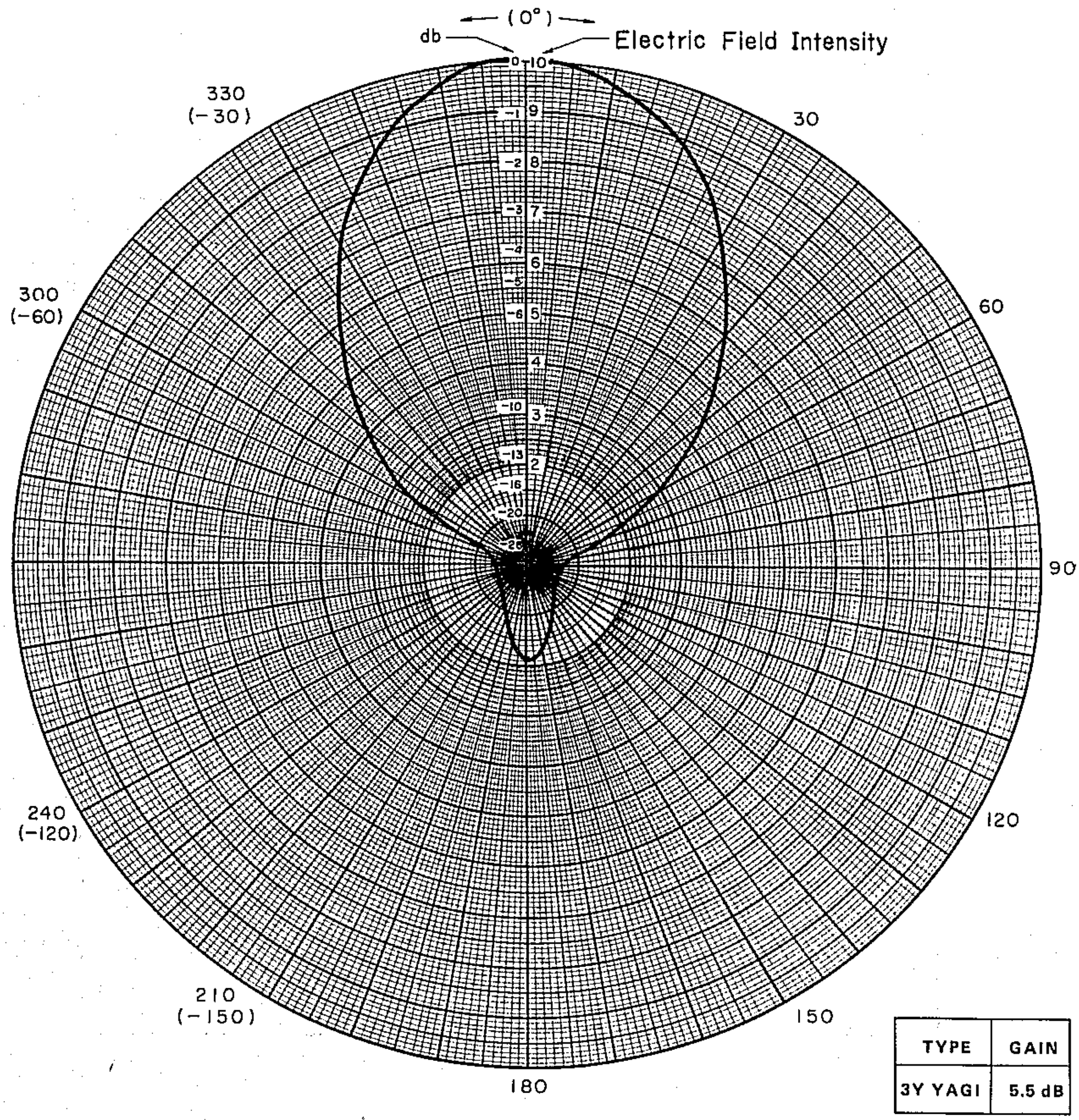
Name of Station		Jinja
Type of Station		Relaying
Site of Station		Refer to Fig. 6-2
Transmitting Frequency		BAND V CH. 61
Transmitter Output Power		100W (Video Peak)
Transmitting Antenna	Type	4mϕ•GP
	Height of Tower Top	20 m
Mother Station	Name of Station	Kampara
	Frequency	BAND III CH. 5
Receiving Antenna	Type	8Y.1
	Height of Mast Top	(10) m
Power Supply	Type of Power Supply	Lines
	Capacity	7.5 KVA
Supervisory Equipment	Frequency	
	Output Power	
	Transmitting Antenna	
	Receiving Antenna	
Note	Station Building, tower, and power supply and so on are common with those for the Jinja broadcasting Station.	

Note: Height described in brackets ( ) represents the receiving antenna height to be mounted on the transmitting antenna tower.



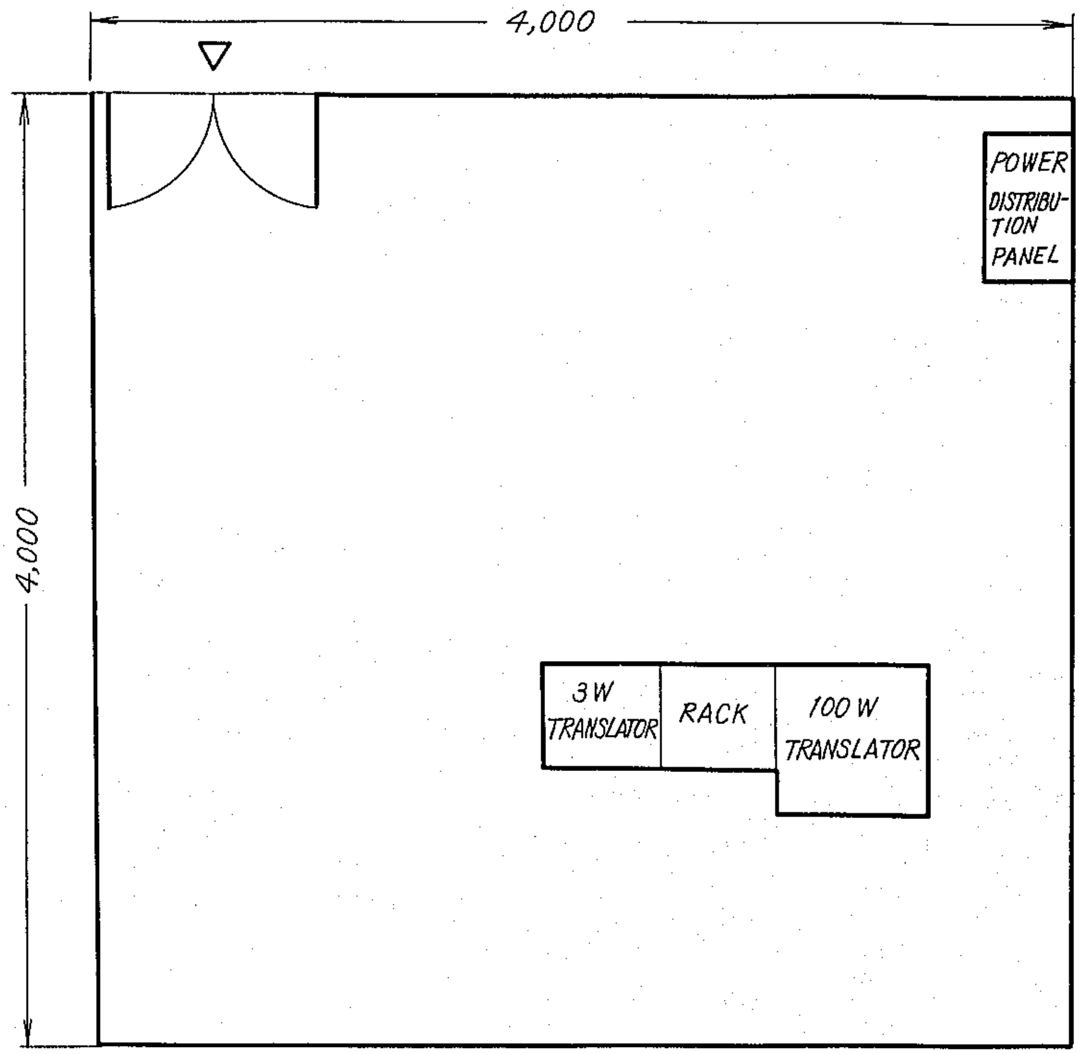
N E	00°29'07" 33°14'12"
Altitude	1,330 m
Map No.	72-1 62-3 62-4 72-2

Fig. 6-2 Location of Jinja Station



TYPE	GAIN
3Y YAGI	5.5 dB

Fig. 6-3 HORIZONTAL PATTERN OF JINJA STATION



Unit: mm

Fig. 6-4 TYPICAL FLOOR LAYOUT FOR JINJA STATION

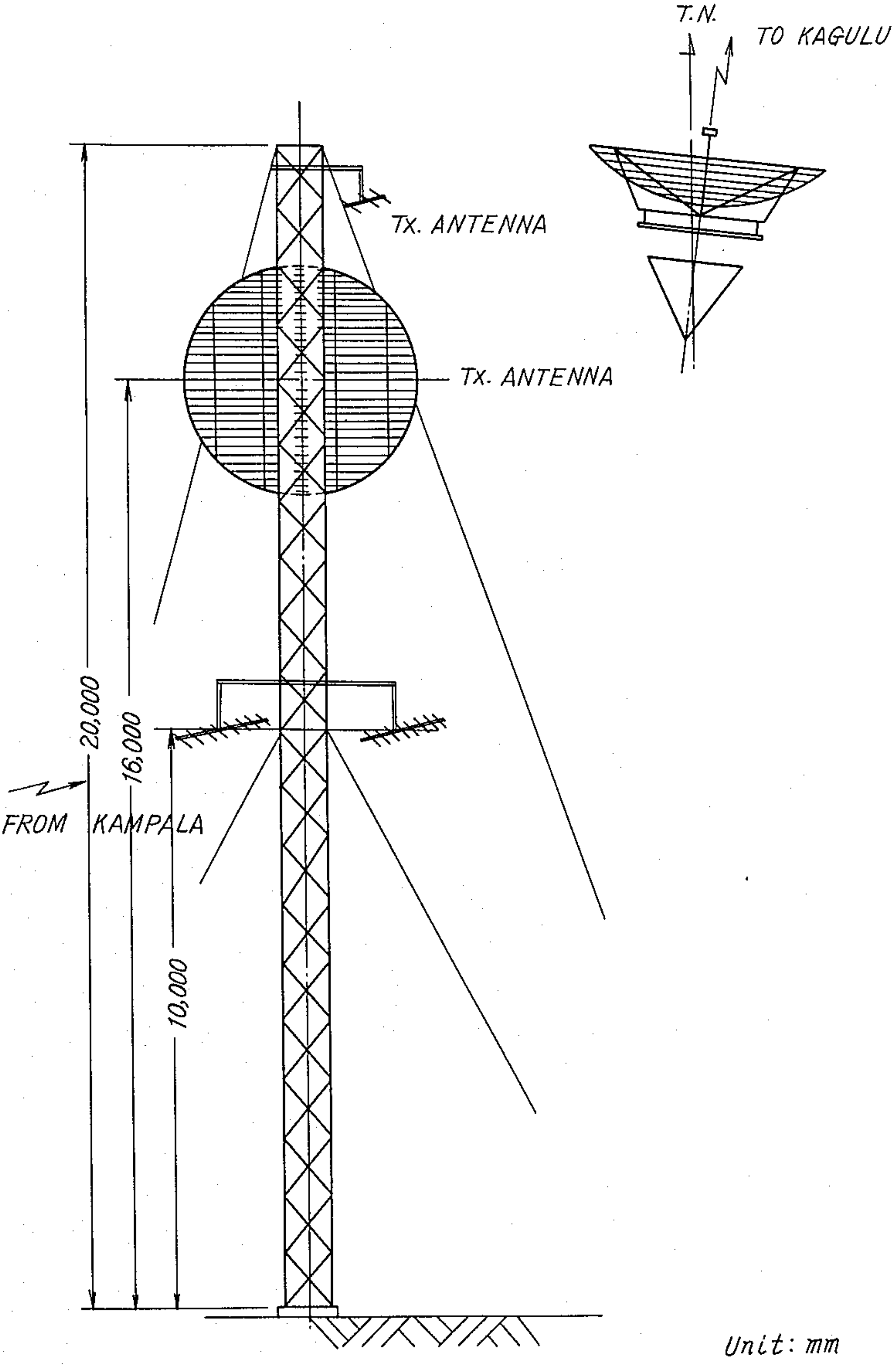


Fig. 6-5 JINJA STATION

Kagulu Station

Table 6-4 List of Facilities

Item	Description	Q'ty	Remarks
1.	Building	1 set	
2.	———	——	
1.	TV Antenna for Relaying	1 set	
2.	100W (U-U) Translator	1 set	including spare parts
3.	Receiving Antenna	1 set	
4.	Tower	1 set	
5.	Power Supply Equipment	1 set	Engine Generators
6.	Supervisory Equipment	1 set	
7.	Accessories	1 set	

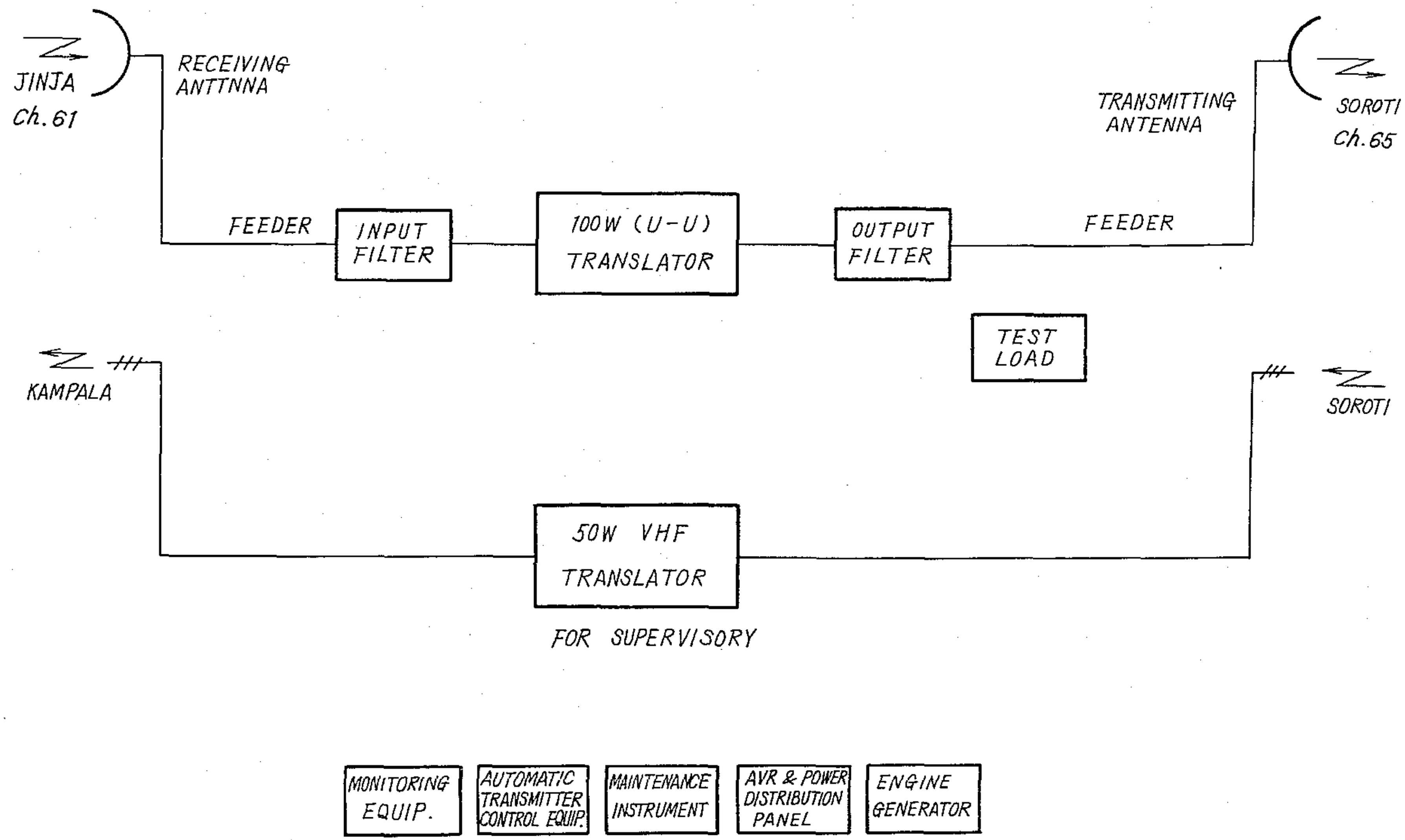
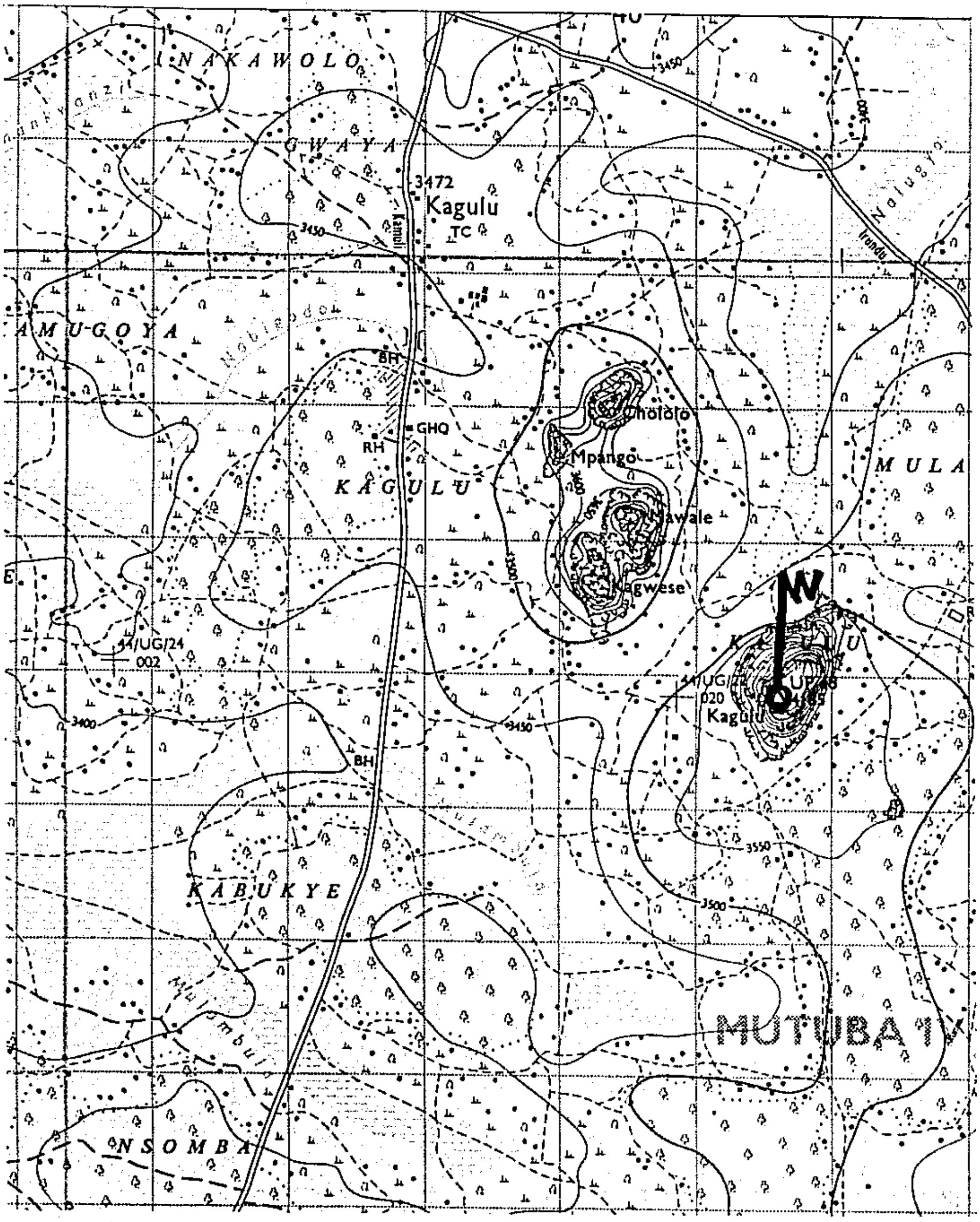


Fig. 6-6 SCHEMATIC DIAGRAM OF KAGULU STATION

Table 6-5 Main Specifications for Kagulu Station

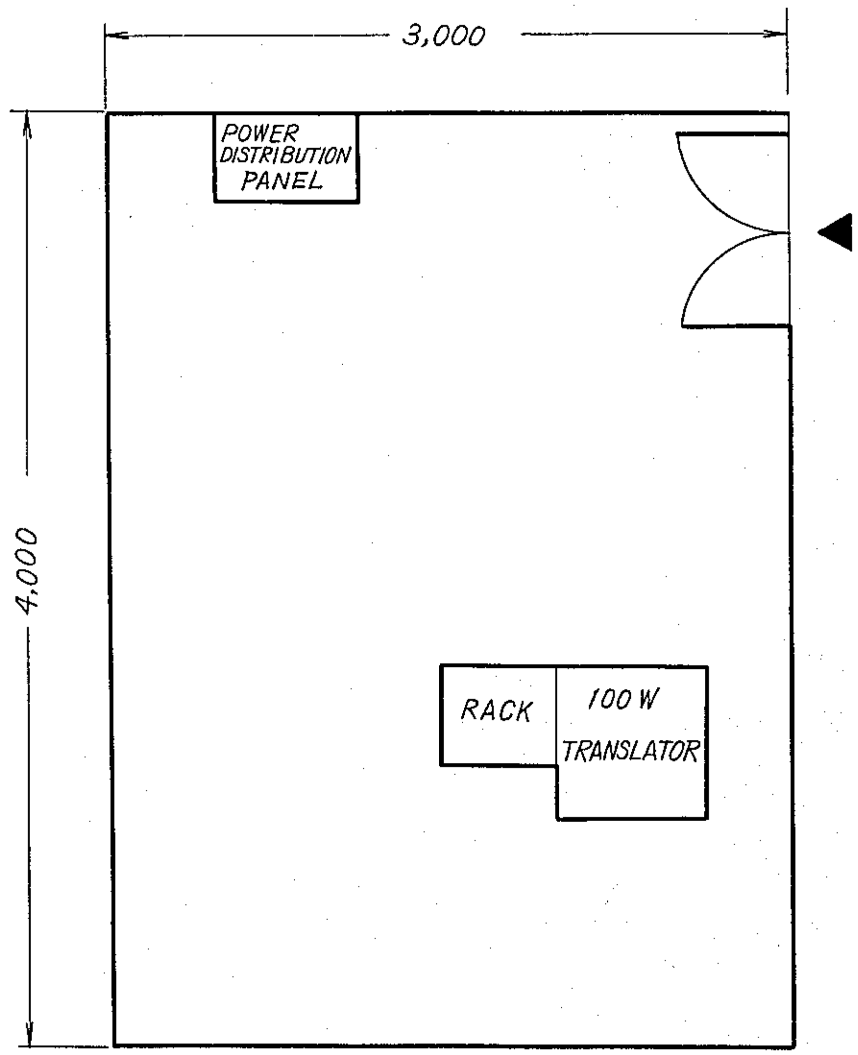
Name of Station		Kagulu
Type of Station		Relaying
Site of Station		Refer to Fig. 6-7
Transmitting Frequency		BAND V CH. 65
Transmitter Output Power		100W (Video Peak)
Transmitting Antenna	Type	4mϕ•GP
	Height of Tower Top	15 m
Mother Station	Name of Station	Jinja (Relay)
	Frequency	BAND V CH. 61
Receiving Antenna	Type	4mϕ.GP
	Height of Mast Top	(15) m
Power Supply	Type of Power Supply	Engine Generators
	Capacity	5 KVA
Supervisory Equipment	Frequency	150 MHz Band
	Output Power	50 W
	Transmitting Antenna	5Y·1
	Receiving Antenna	5Y·1
Note		

Note: Height described in brackets ( ) represents the receiving antenna height to be mounted on the transmitting antenna tower.



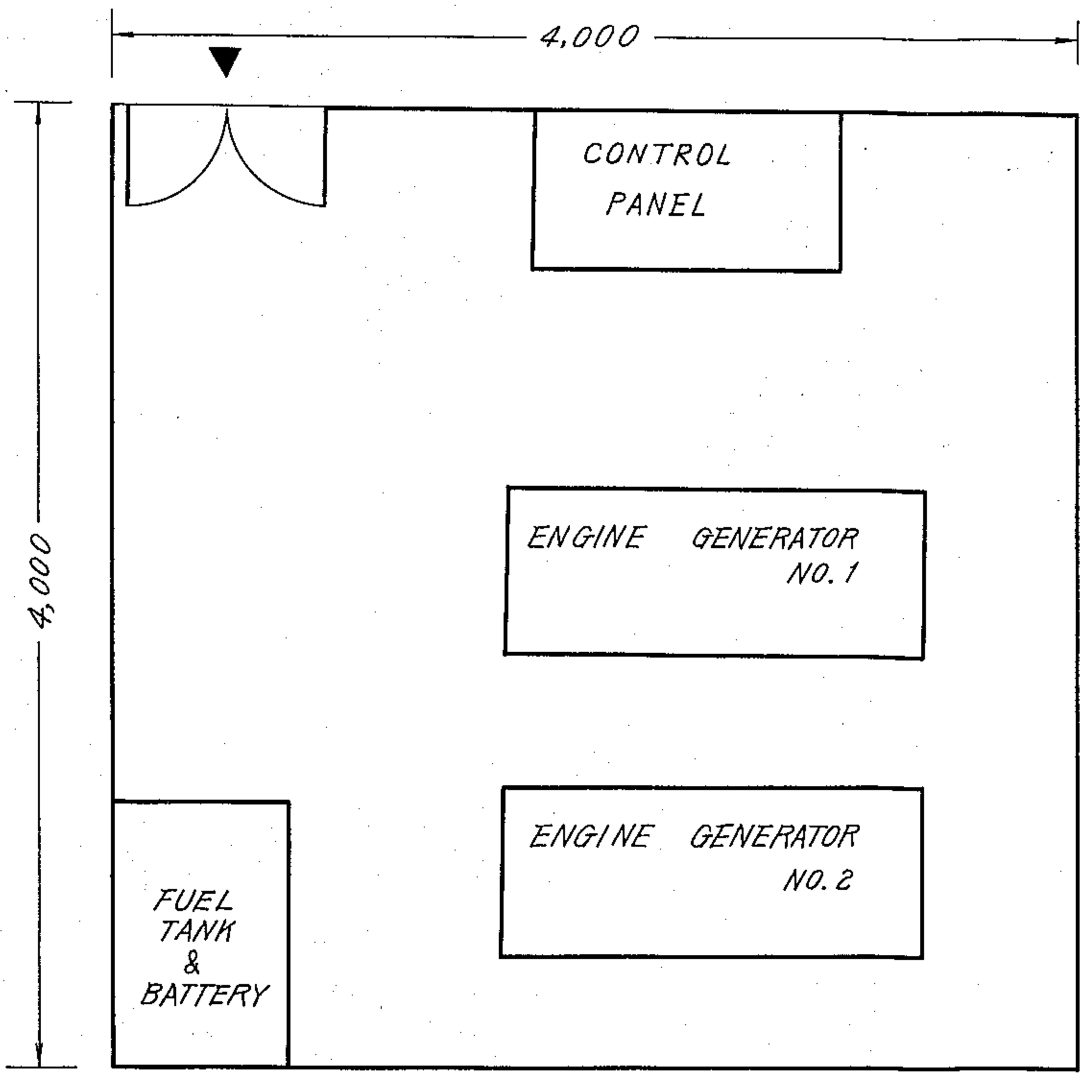
N E	01°13'13" 33°19'47"
Altitude	1,270 m
Map No.	52-4 52-2

Fig. 6-7 Location of Kagulu Station



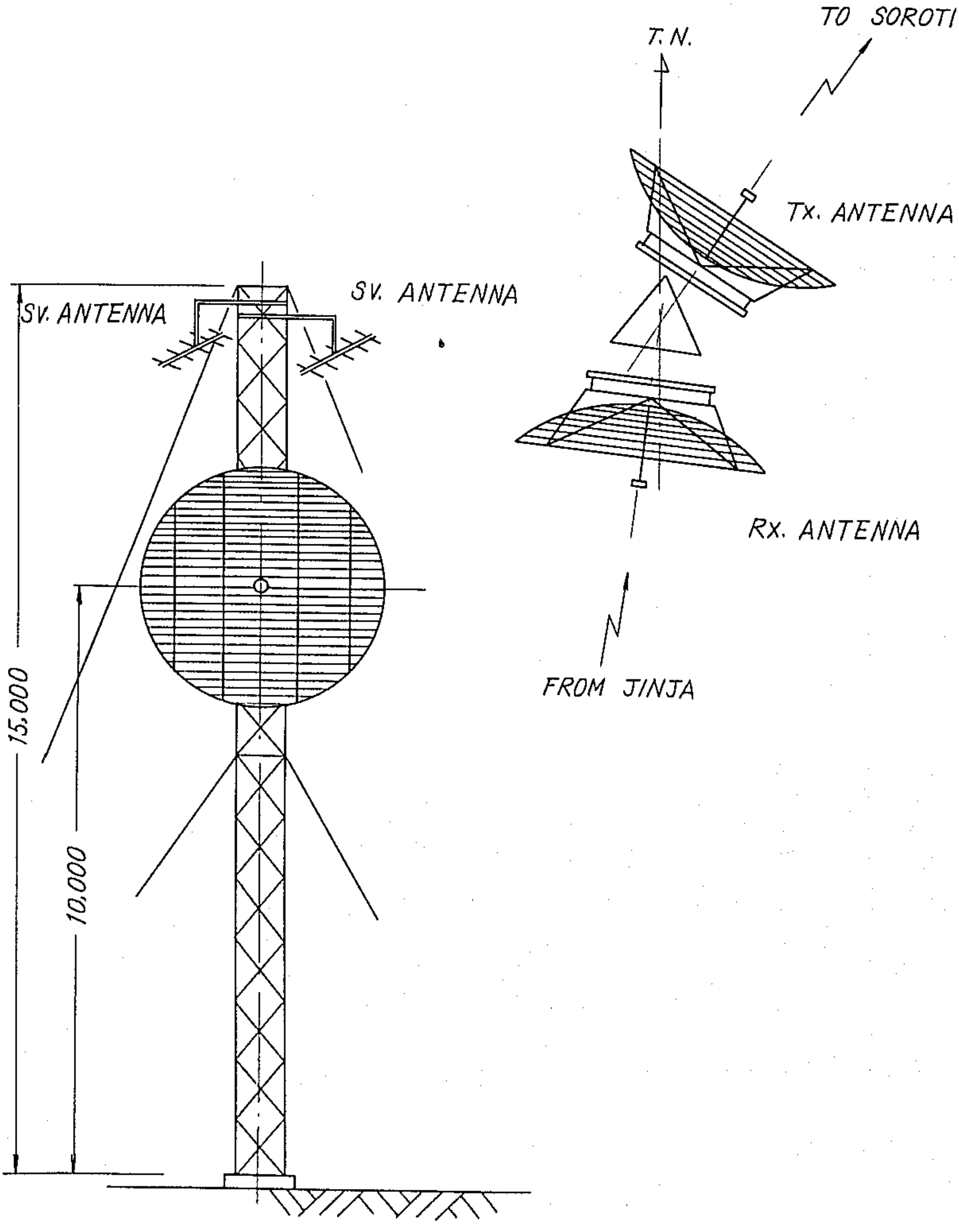
Unit : mm

Fig. 6-8 TYPICAL FLOOR LAYOUT FOR KAGULU STATION



Unit: mm

Fig. 6-9 TYPICAL FLOOR LAYOUT OF ENGINE GENERATORS



Unit : mm

Fig. 6–10 KAGULU STATION

Soroti Station

Table 6-6 List of Facilities

Item	Description	Q'ty	Remarks
1.	———	———	
2.	———	———	
1.	Video Input Equipment	1 set	including spare parts
2.	Receiver	1 set	- ditto -
3.	Auto-Start, Stop Equipment	1 set	- ditto -
4.	Receiving Antenna	1 set	
5.	KW Stand-by TV Transmitter	1 set	including spare parts
6.	Supervisory Equipment	1 set	
7.	Measuring Instrument	1 set	
8.	Accessories & Walky Talky	1 set	

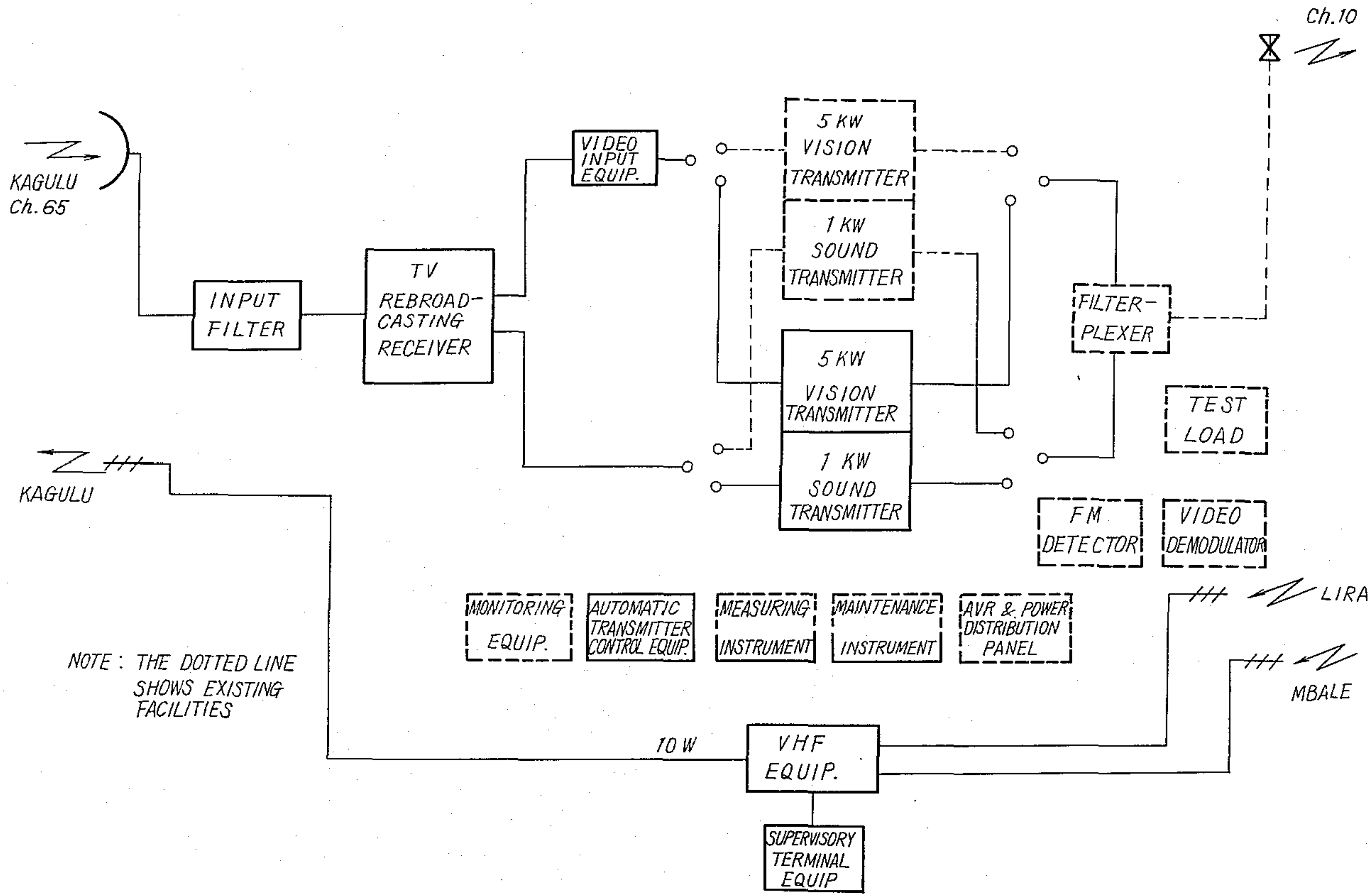


Fig. 6-11 SCHEMATIC DIAGRAM OF SOROTI STATION

Table 6-7 Main Specifications for Soroti Station

Name of Station		Soroti (Existing)
Type of Station		
Site of Station		Refer to Fig. 6-12
Transmitting Frequency		BAND III CH. 10
Transmitter Output Power		
Transmitting Antenna	Type	
	Height of Tower Top	
Mother Station	Name of Station	Kagulu
	Frequency	BAND V CH. 65
Receiving Antenna	Type	2.4mϕ-GP
	Height of Mast Top	(70) m
Power Supply	Type of Power Supply	
	Capacity	
Supervisory Equipment	Frequency	150 MHz Band
	Output Power	10 W
	Transmitting Antenna	5Y·1
	Receiving Antenna	3Y·1 (Mbale) and 8Y·1 (Lira)
Note		

Note: Height described in brackets ( ) represents the receiving antenna height to be mounted on the transmitting antenna tower.

N E	01°42'47" 33°39'03"
Altitude	1,100 m
Map No.	43-3 43-1

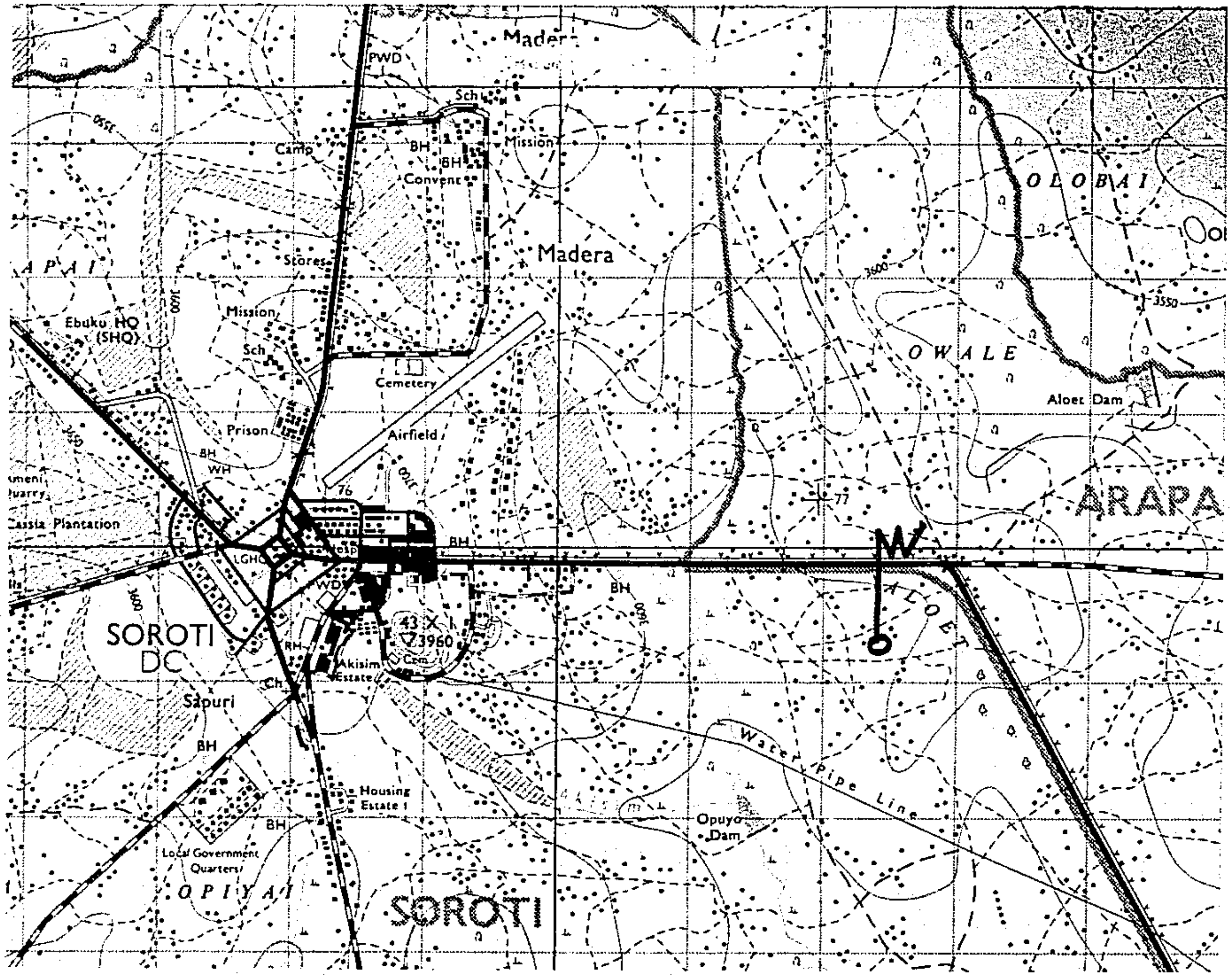
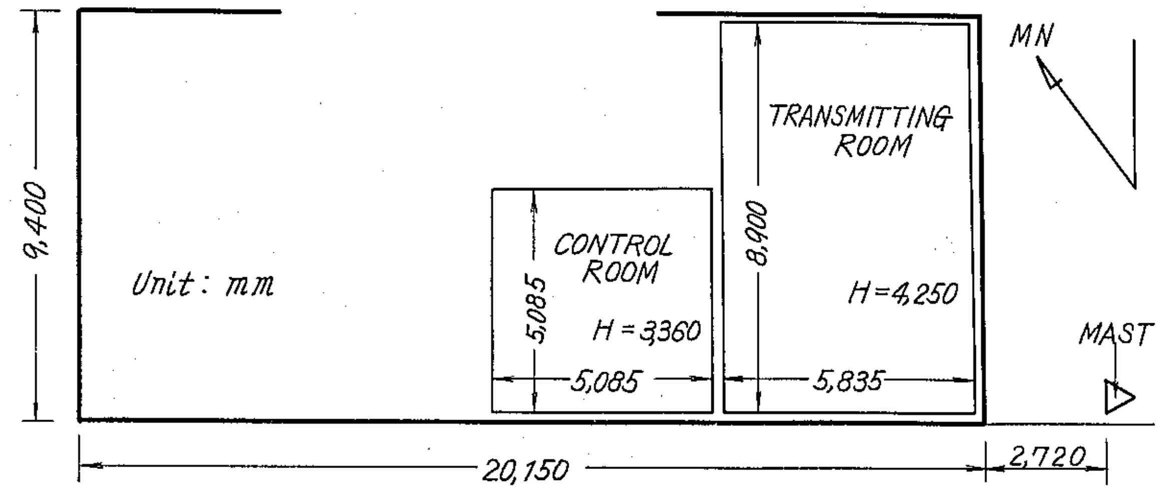
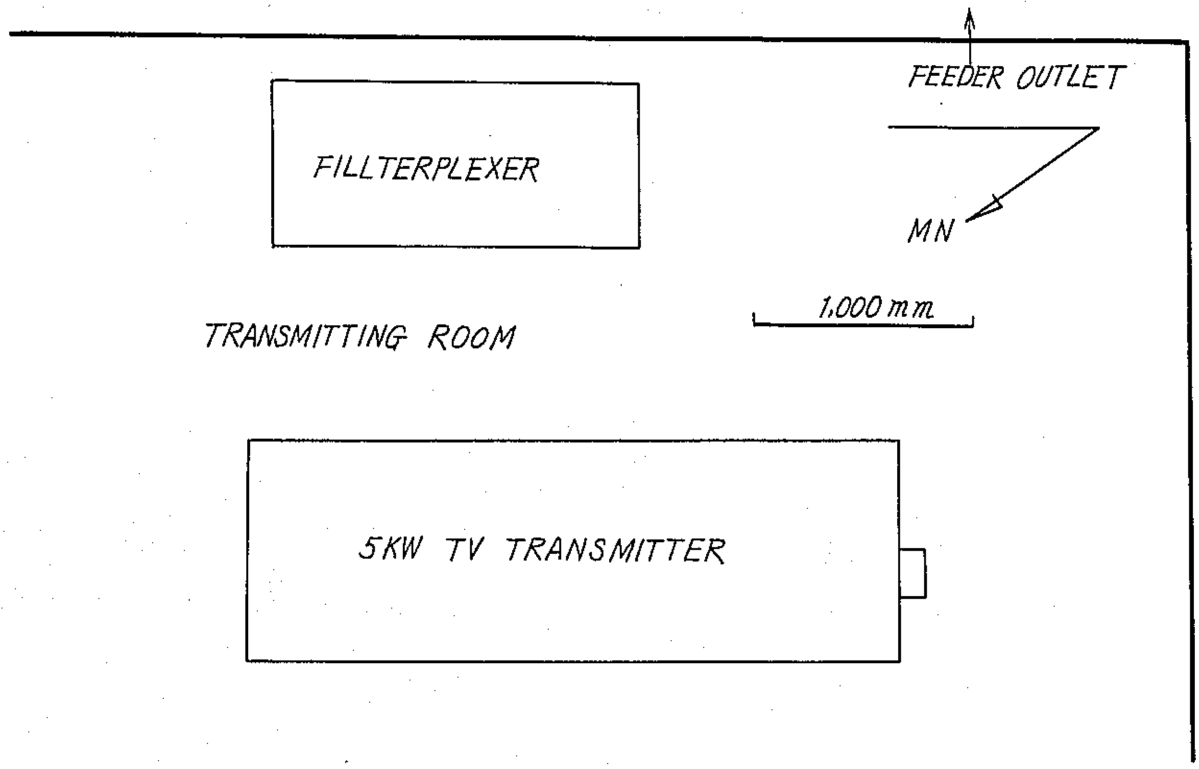


Fig. 6-12 Location of Soroti Station





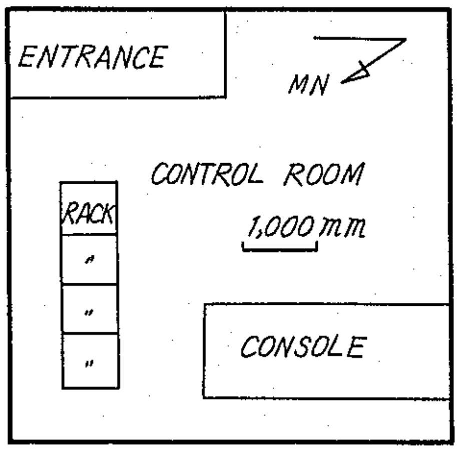
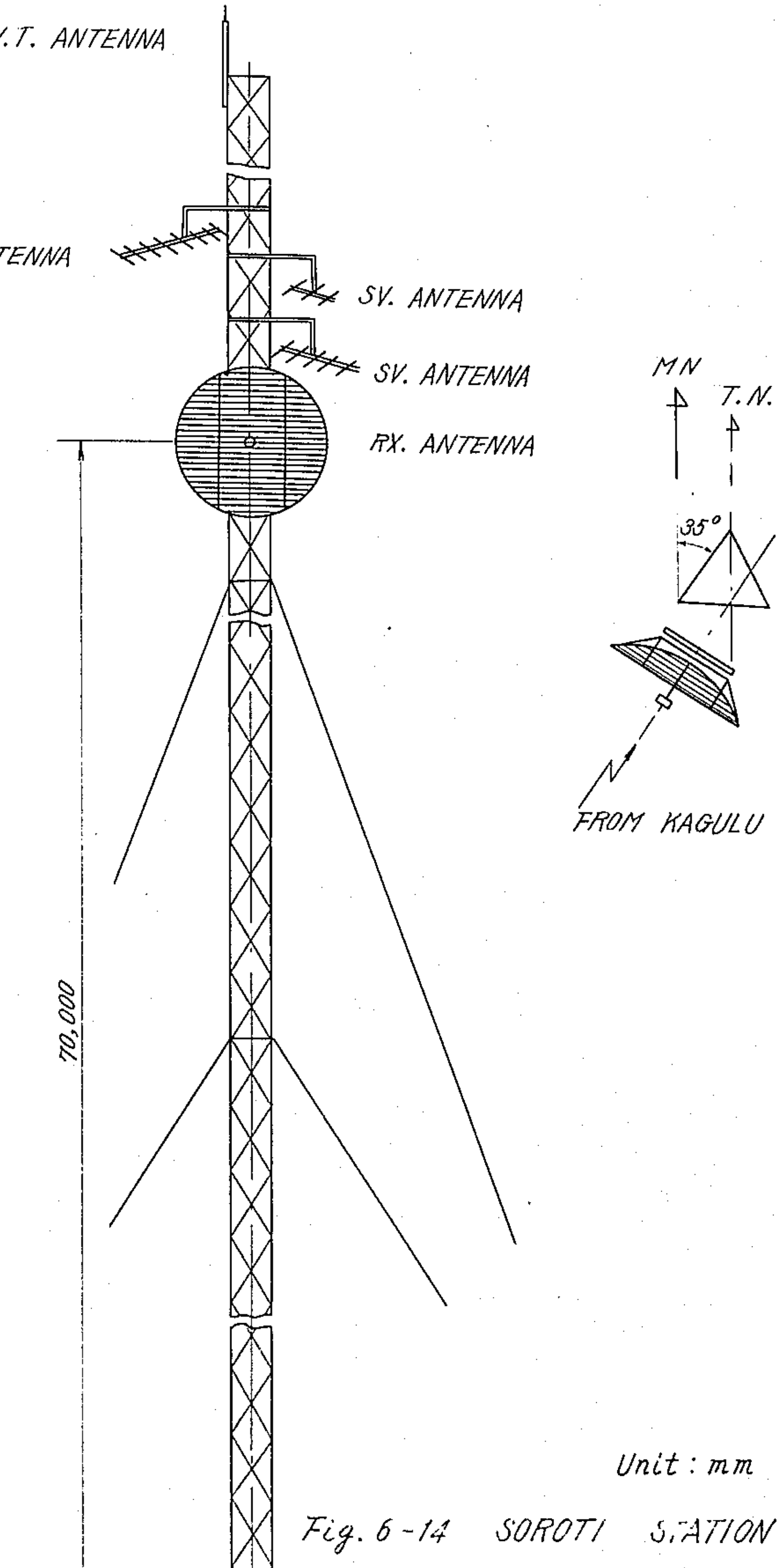


Fig. 6-13

FLOOR LAYOUT OF EXISTING FACILITIES AT SOROTI STATION



Unit : mm

Fig. 6-14 SOROTI STATION

Mbale Station

Table 6-8 List of Facilities

Item	Description	Q'ty	Remarks
1.	——	——	
2.	——	——	
1.	Receiver	1 set	including spare parts
2.	Auto-Start, Stop Equipment	1 set	- ditto -
3.	Receiving Antenna	1 set	
4.	Supervisory Equipment	1 set	
5.	Accessories	1 set	

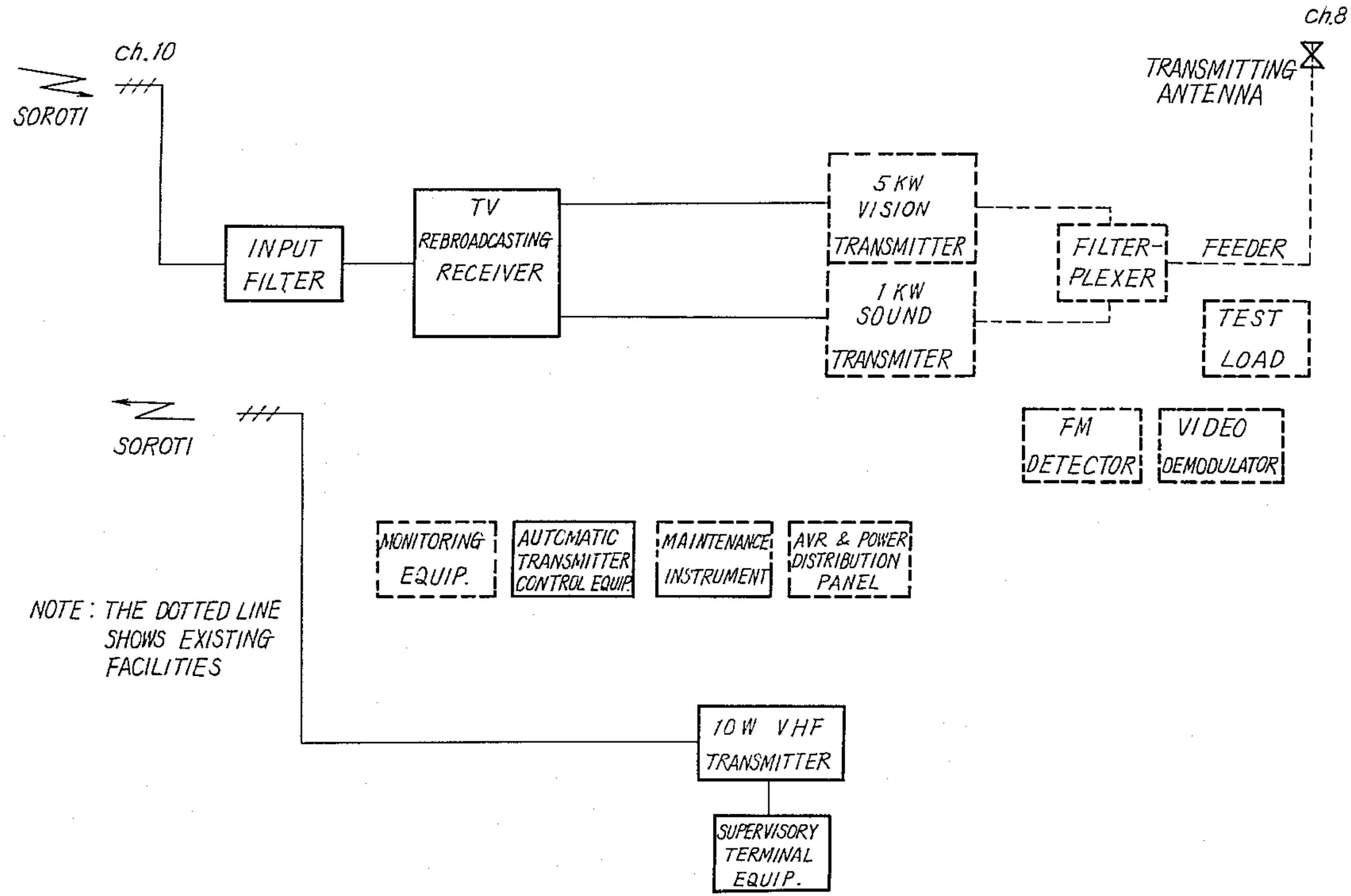
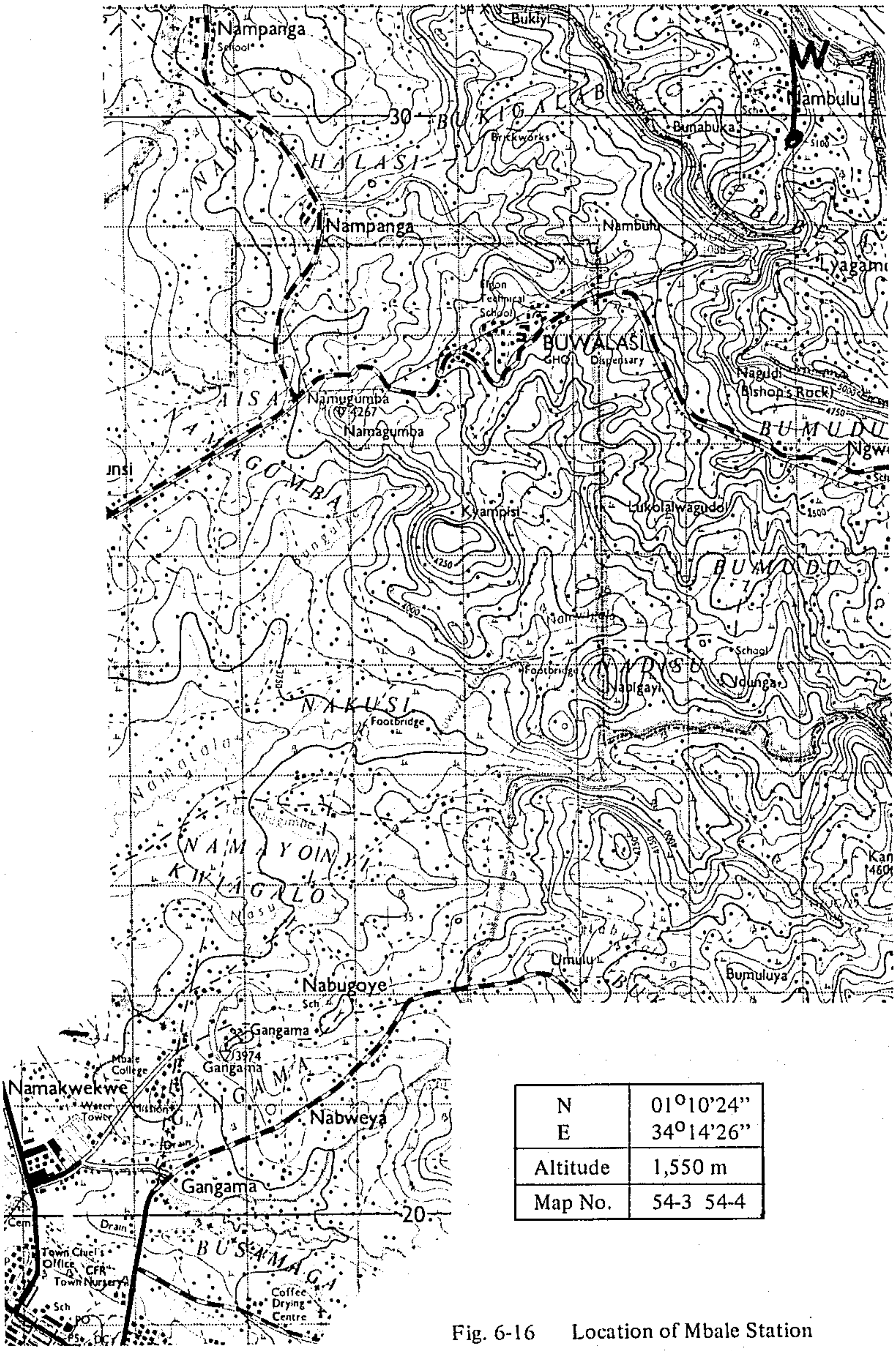


Fig 6-15 SCHEMATIC DIAGRAM OF MBALE STATION

Table 6-9 Main Specifications for Mbale Station

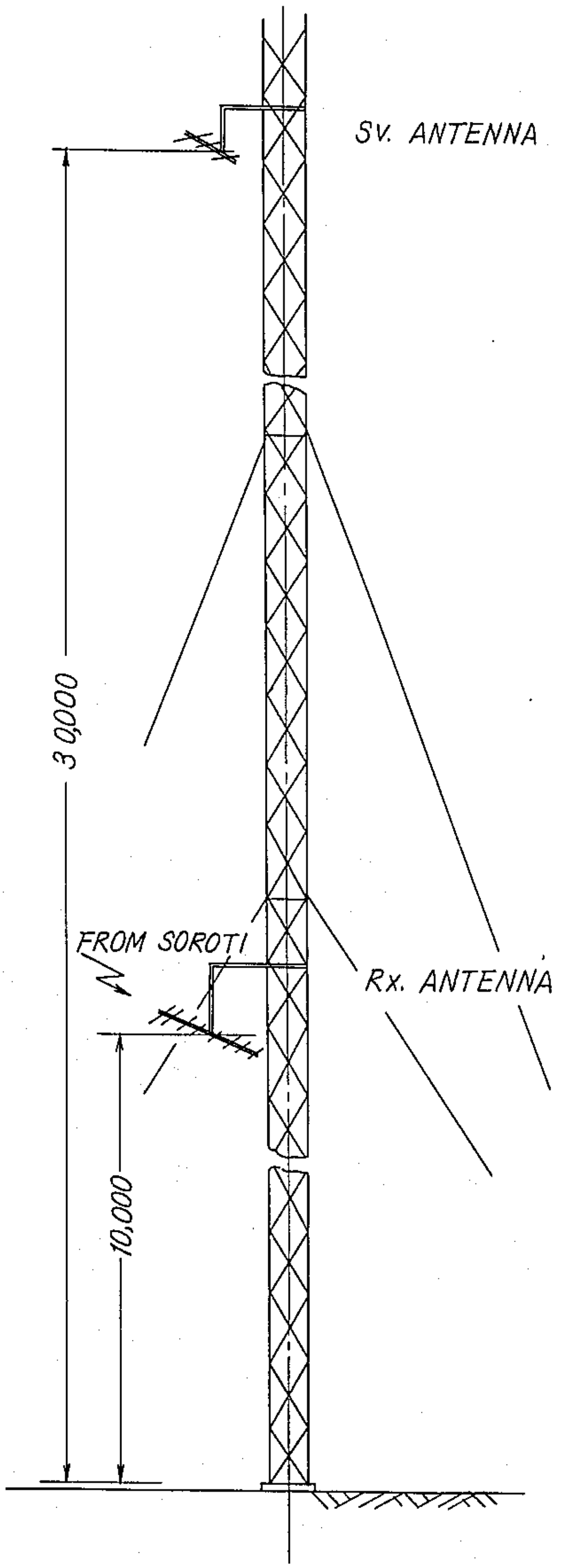
Name of Station		Mbale (Existing)
Type of Station		
Site of Station		Refer to Fig. 6-16
Transmitting Frequency		BAND III CH. 8
Transmitter Output Power		
Transmitting Antenna	Type	
	Height of Tower Top	
Mother Station	Name of Station	Soroti
	Frequency	BAND III CH. 10
Receiving Antenna	Type	8Y.1
	Height of Mast Top	(10) m
Power Supply	Type of Power Supply	
	Capacity	
Supervisory Equipment	Frequency	150 MHz Band
	Output Power	10 W
	Transmitting Antenna	3Y.1
	Receiving Antenna	
Note		

Note: Height described in brackets ( ) represents the receiving antenna height to be mounted on the transmitting antenna tower.



N E	01°10'24" 34°14'26"
Altitude	1,550 m
Map No.	54-3 54-4

Fig. 6-16 Location of Mbale Station



Unit : mm

Fig. 6-17 MBALE STATION

Ongora Station

Table 6-10 List of Facilities

Item	Description	Q'ty	Remarks
1.	Building	1 set	
2.	Power Line	1 set	
1.	TV Antenna	1 set	
2.	100W (V-U) Translator	1 set	including spare parts
3.	Receiving Antenna	1 set	
4.	Tower	1 set	
5.	Power Supply Equipment	1 set	
6.	Accessories	1 set	

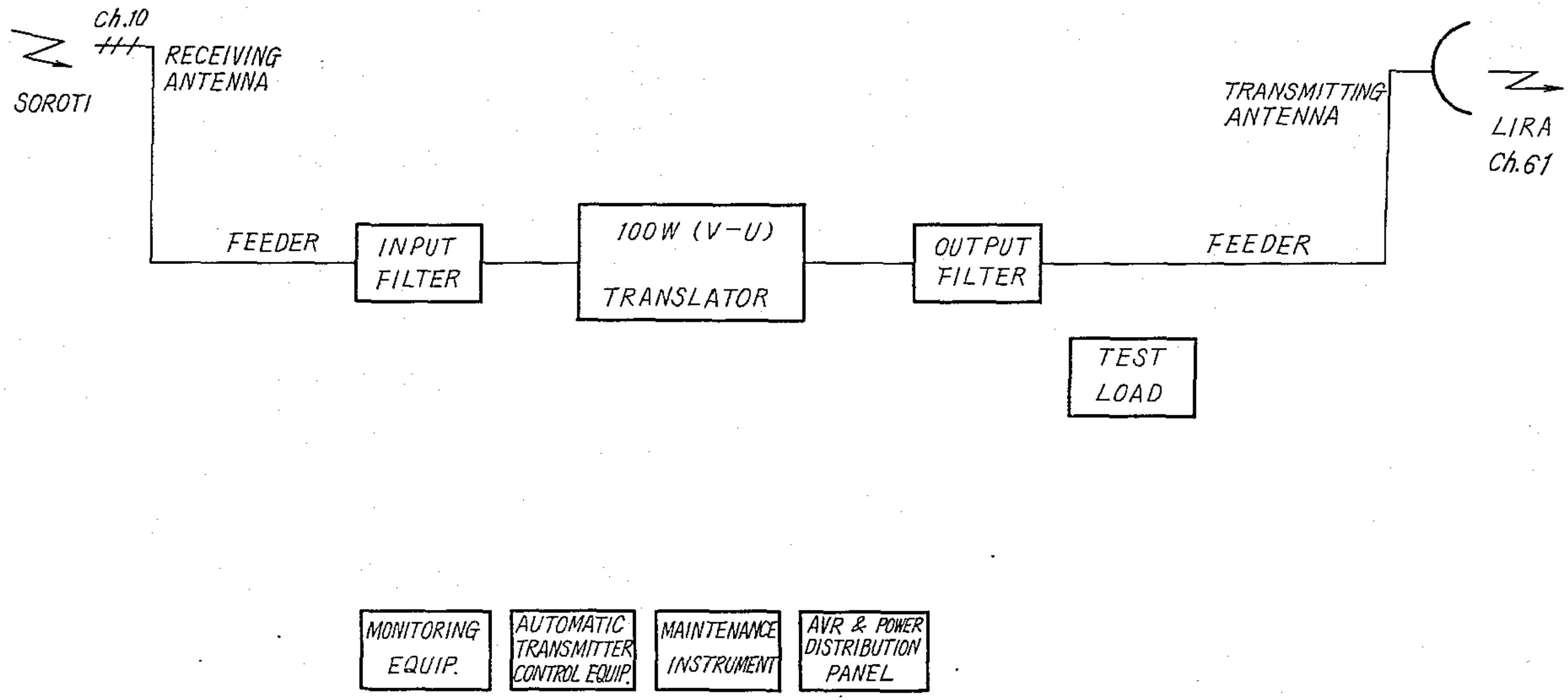
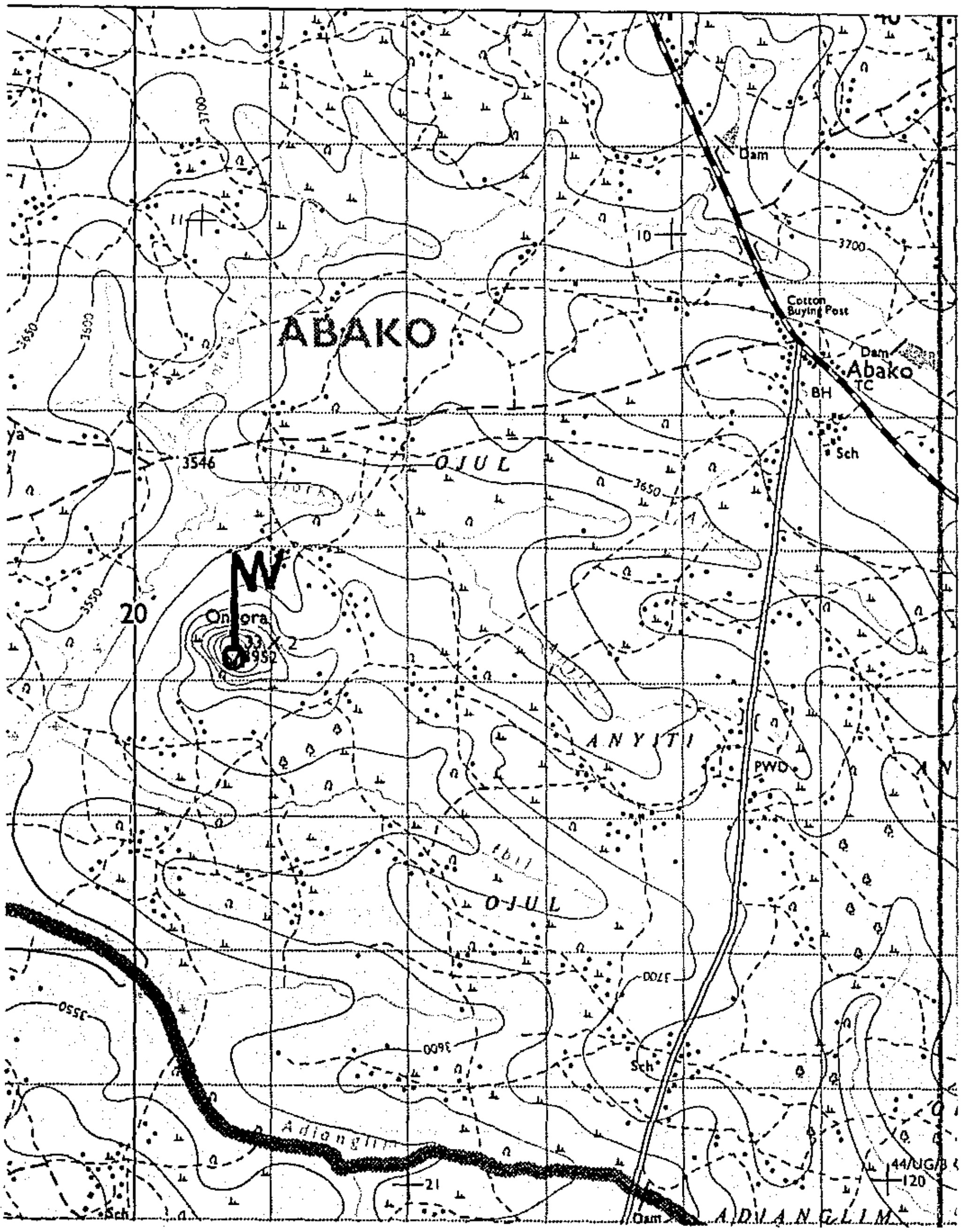


Fig. 6-18 SCHEMATIC DIAGRAM OF ONGORA STATION

Table 6-11 Main Specifications for Ongola Station

Name of Station		Ongola
Type of Station		Relaying
Site of Station		Refer to Fig. 6-19
Transmitting Frequency		BAND V CH. 61
Transmitter Output Power		100 W (Video Peak)
Transmitting Antenna	Type	3mϕ-GP
	Height of Tower Top	15 m
Mother Station	Name of Station	Soroti
	Frequency	BAND III CH. 10
Receiving Antenna	Type	8Y·1
	Height of Mast Top	(8) m
Power Supply	Type of Power Supply	Lines
	Capacity	7.5 KVA
Supervisory Equipment	Frequency	
	Output Power	
	Transmitting Antenna	
	Receiving Antenna	
Note		

Note: Height described in brackets ( ) represents the receiving antenna height to be mounted on the transmitting antenna tower.



N E	02°07'41" 33°11'11"
Altitude	1,210 m
Map No.	33-3

Fig. 6-19 Location of Ongora Station

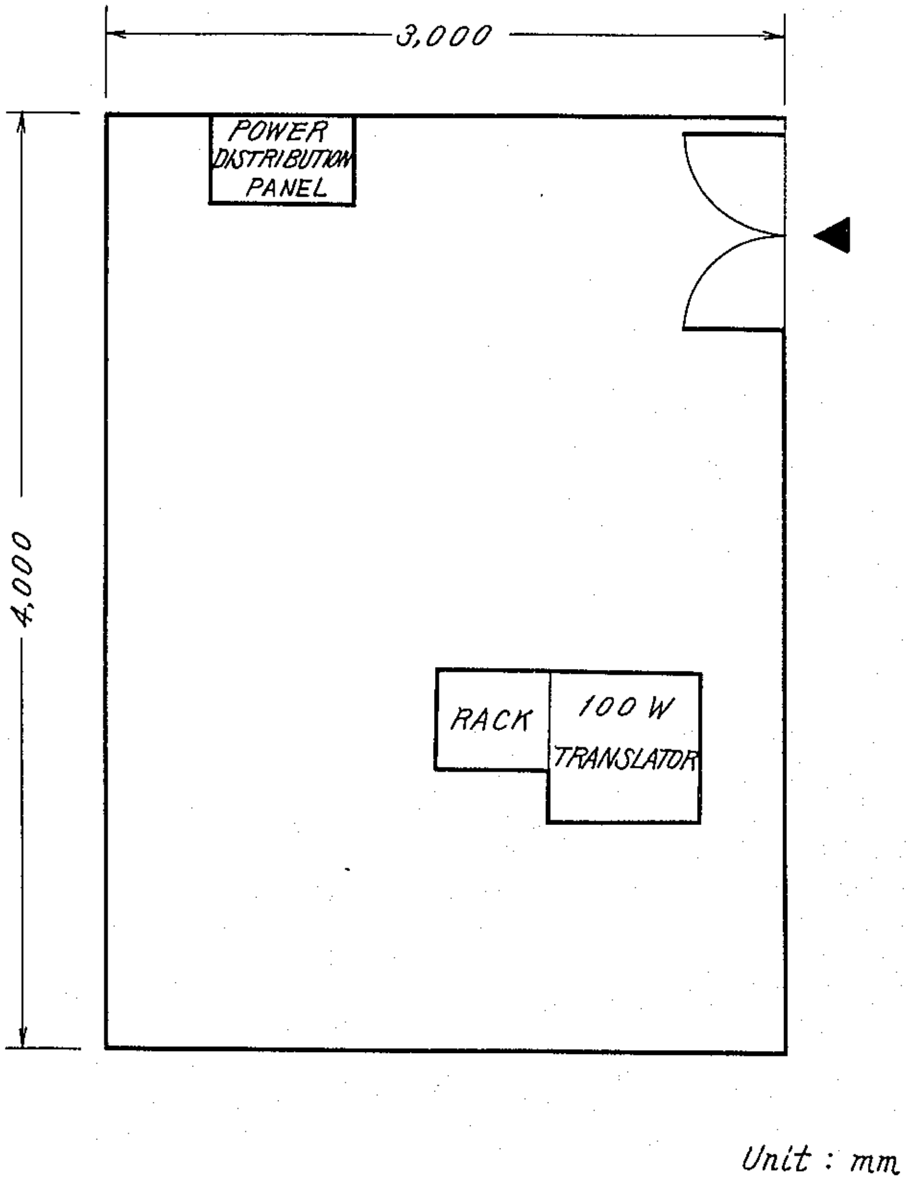


Fig. 6-20 TYPICAL FLOOR LAYOUT FOR ONGORA STATION

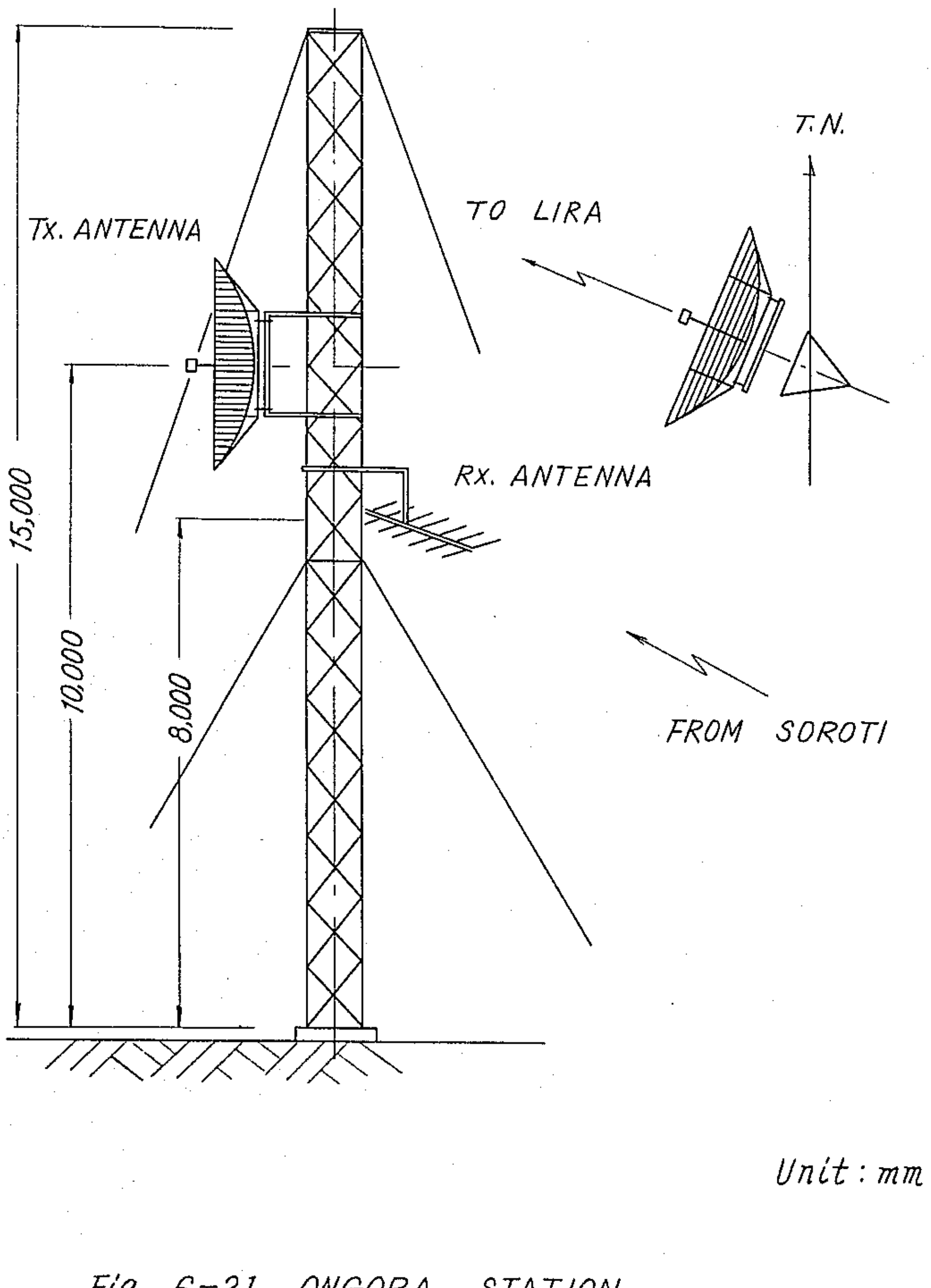
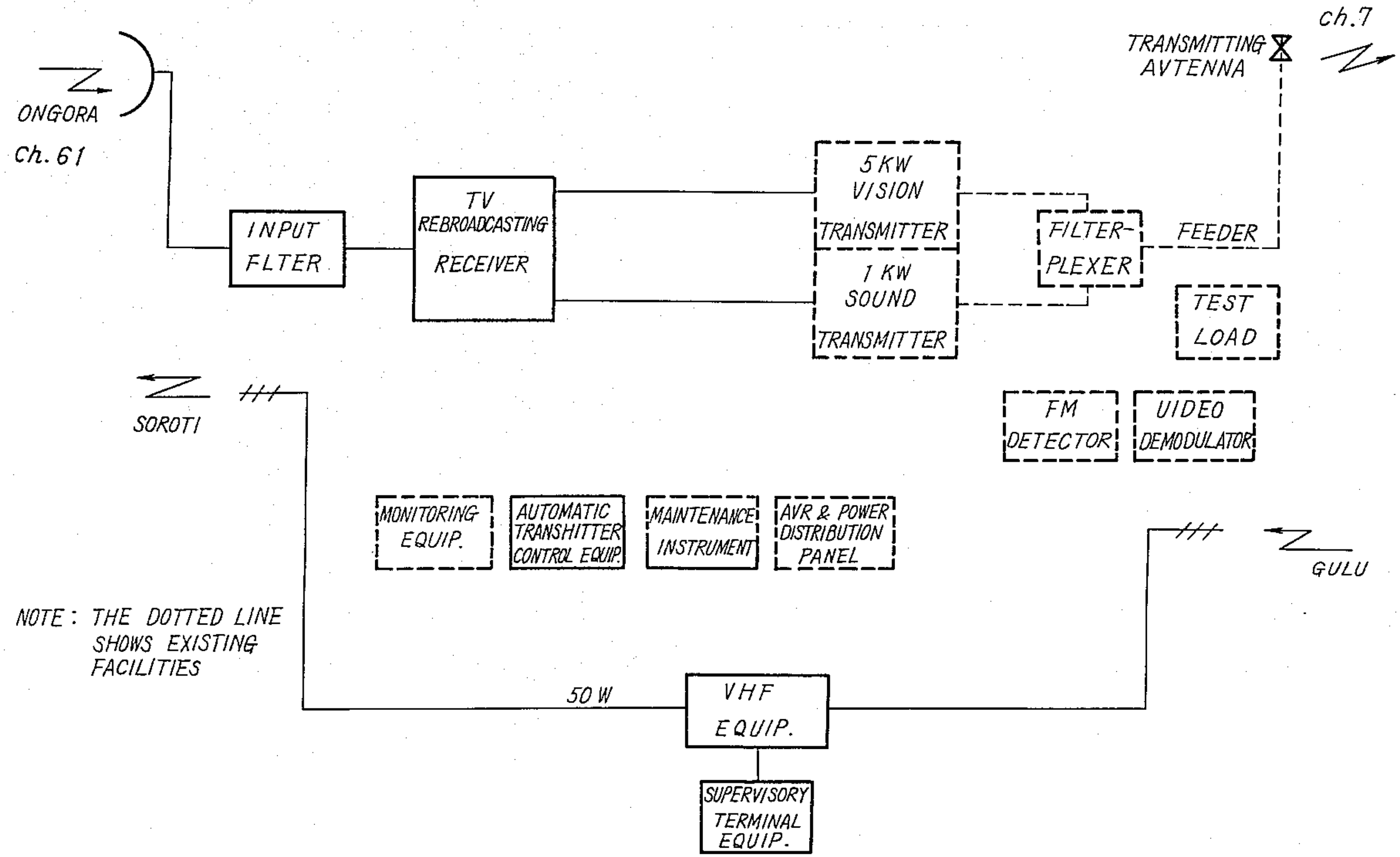


Fig. 6-21 ONGORA STATION

Lira Station

Table 6-12 List of Facilities

Item	Description	Q'ty	Remarks
1.	——	——	
2	——	——	
1.	Receiver	2 set	including spare parts
2.	Auto-Start, Stop Equipment	2 set	- ditto -
3.	Receiving Antenna	1 set	
4.	Supervisory Equipment	1 set	
5.	Accessories	1 set	



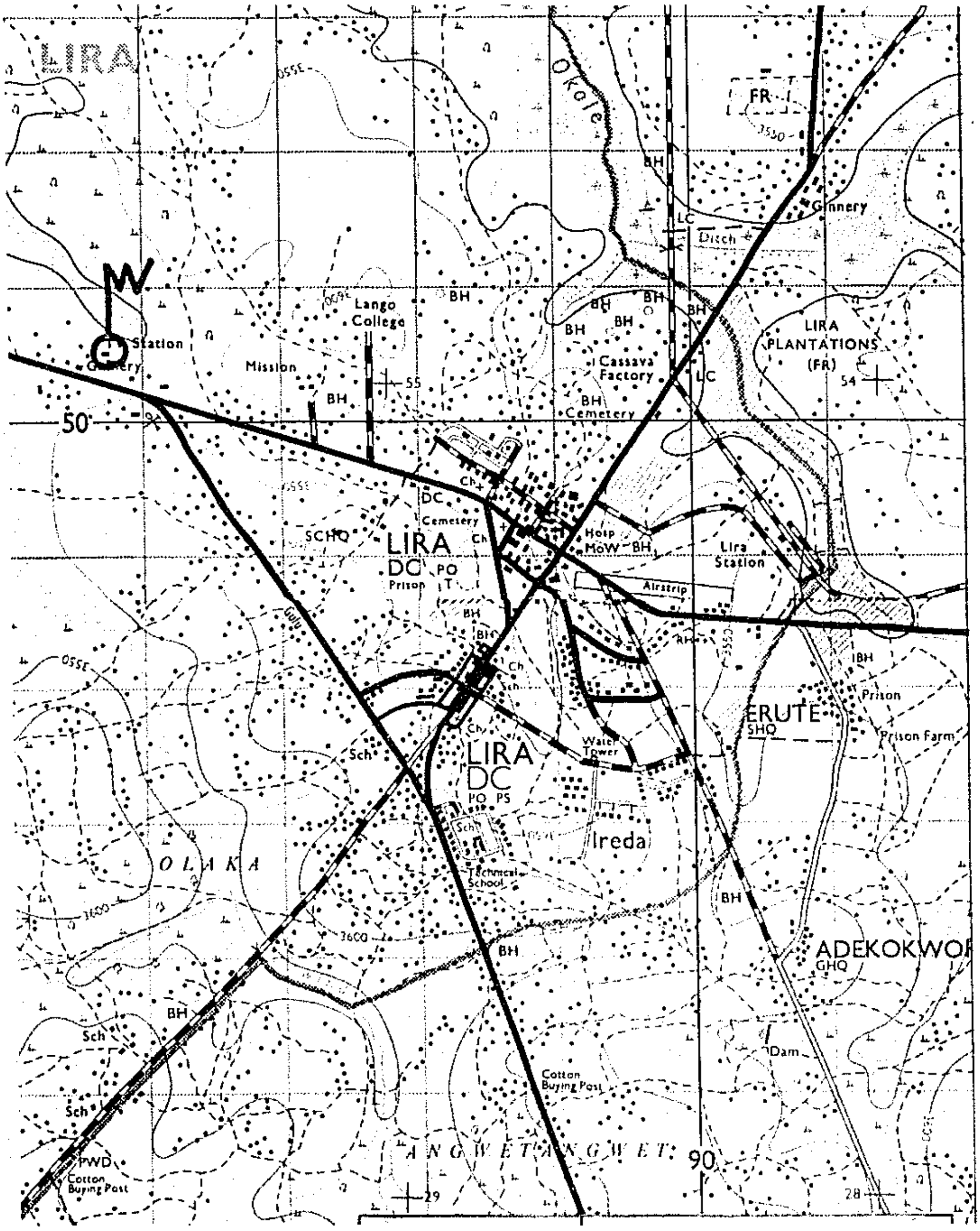
NOTE : THE DOTTED LINE SHOWS EXISTING FACILITIES

Fig. 6-22 SCHEMATIC DIAGRAM OF LIRA STATION

Table 6-13 Main Specifications for Lira Station

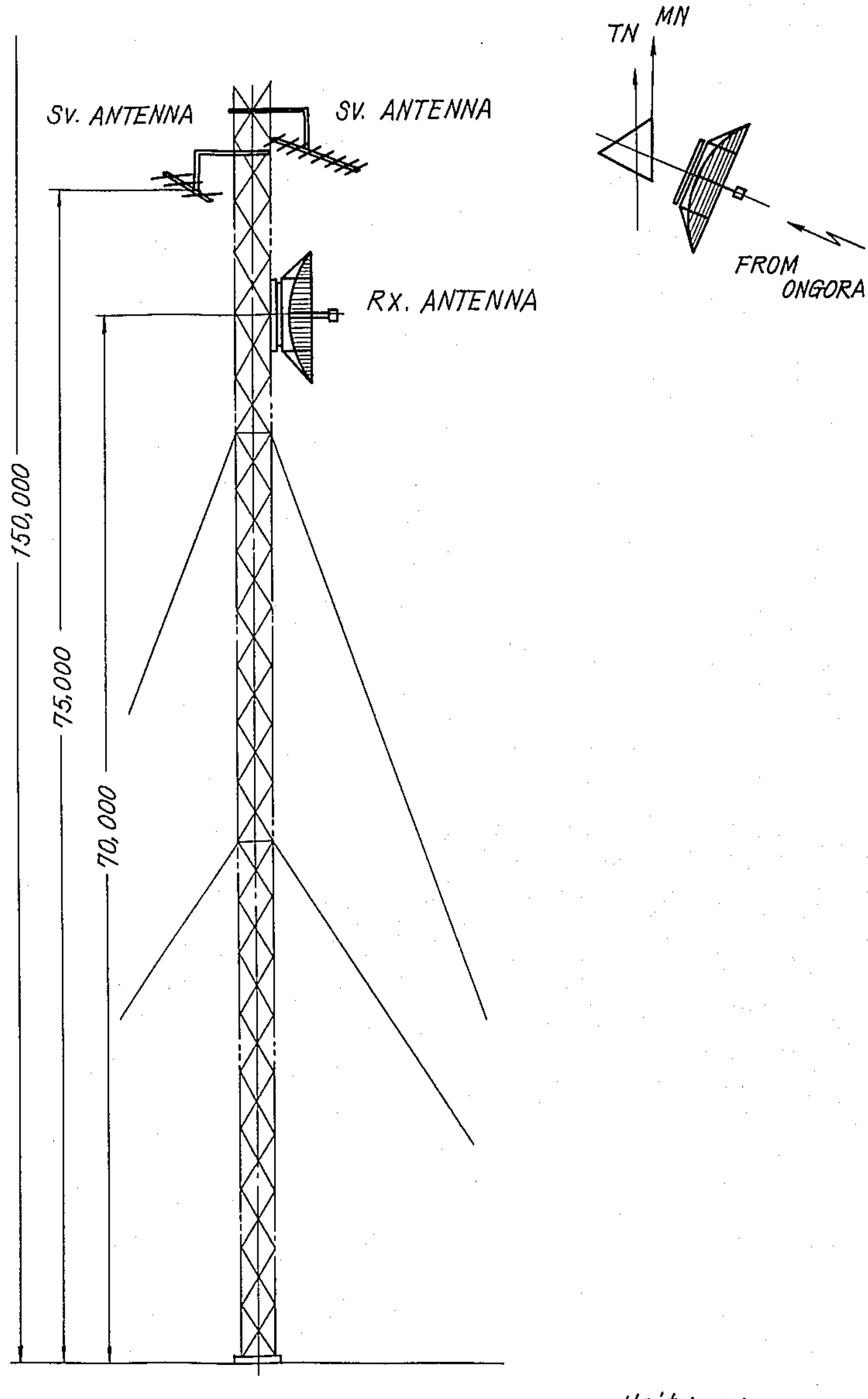
Name of Station		Lira (Existing)
Type of Station		
Site of Station		Refer to Fig. 6-23
Transmitting Frequency		BAND CH.
Transmitter Output Power		W (Video Peak)
Transmitting Antenna	Type	
	Height of Tower Top	m
Mother Station	Name of Station	Ongola
	Frequency	BAND V CH. 61
Receiving Antenna	Type	2.4mϕ-GP
	Height of Mast Top	(70) m
Power Supply	Type of Power Supply	
	Capacity	
Supervisory Equipment	Frequency	150 MHz Band
	Output Power	50 W
	Transmitting Antenna	8Y•1
	Receiving Antenna	3Y•1
Note		

Note: Height described in brackets ( ) represents the receiving antenna height to be mounted on the transmitting antenna tower.



N E	02°16'00" 32°52'19"
Altitude	1,080 m
Map No.	32-2 32-4

Fig. 6-23 Location of Lira Station



Unit : mm

Fig. 6-24 LIRA STATION

Nkirakira Station

Table 6-14 List of Facilities

Item	Description	Q'ty	Remarks
1.	Building	1 set	
2.	Power Line	1 set	
1.	TV Antenna for Relaying	1 set	
2.	100W (V-U) Translator	1 set	including spare parts
3.	Receiving Antenna	1 set	
4.	Tower	1 set	
5.	Power Supply Equipment	1 set	
6.	Accessories	1 set	

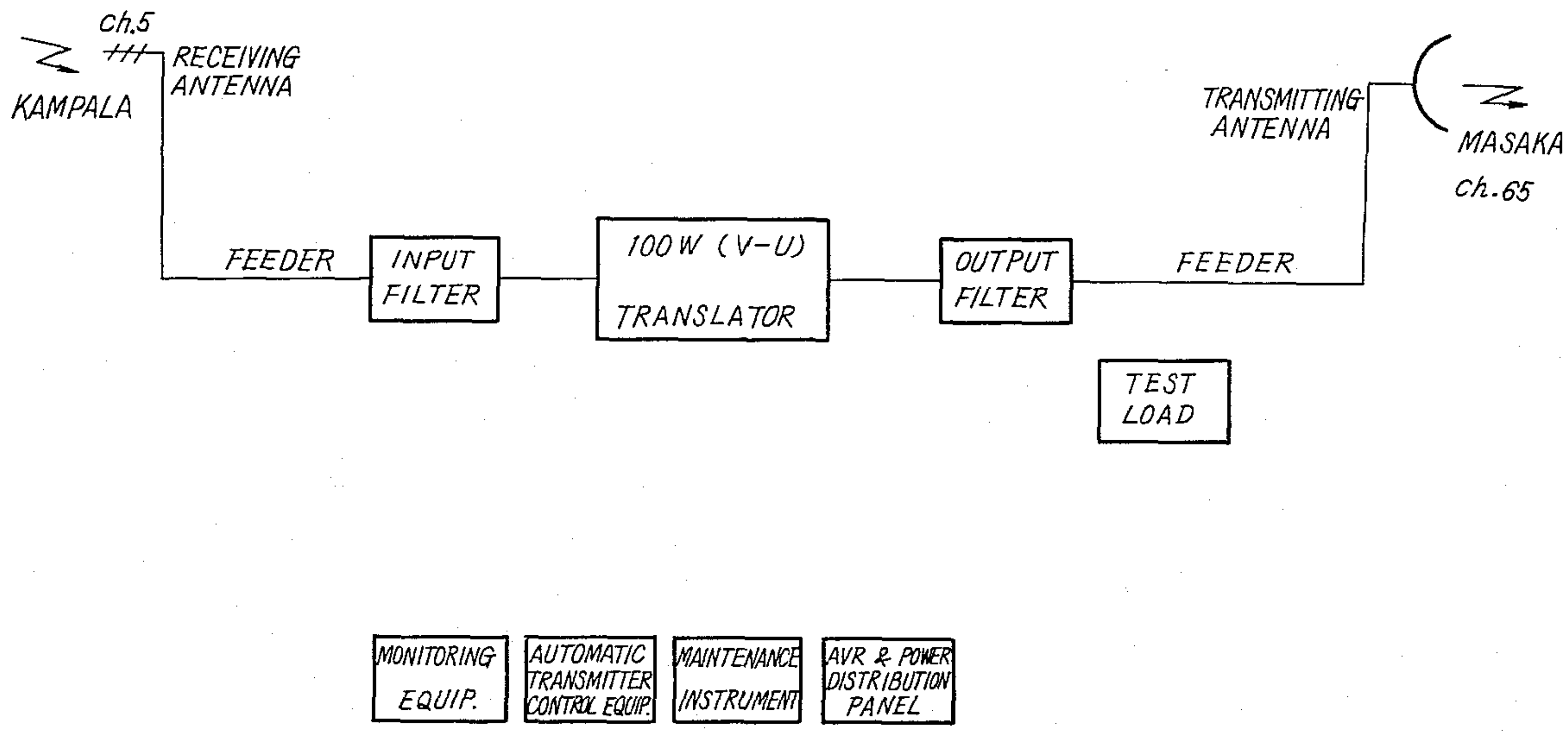
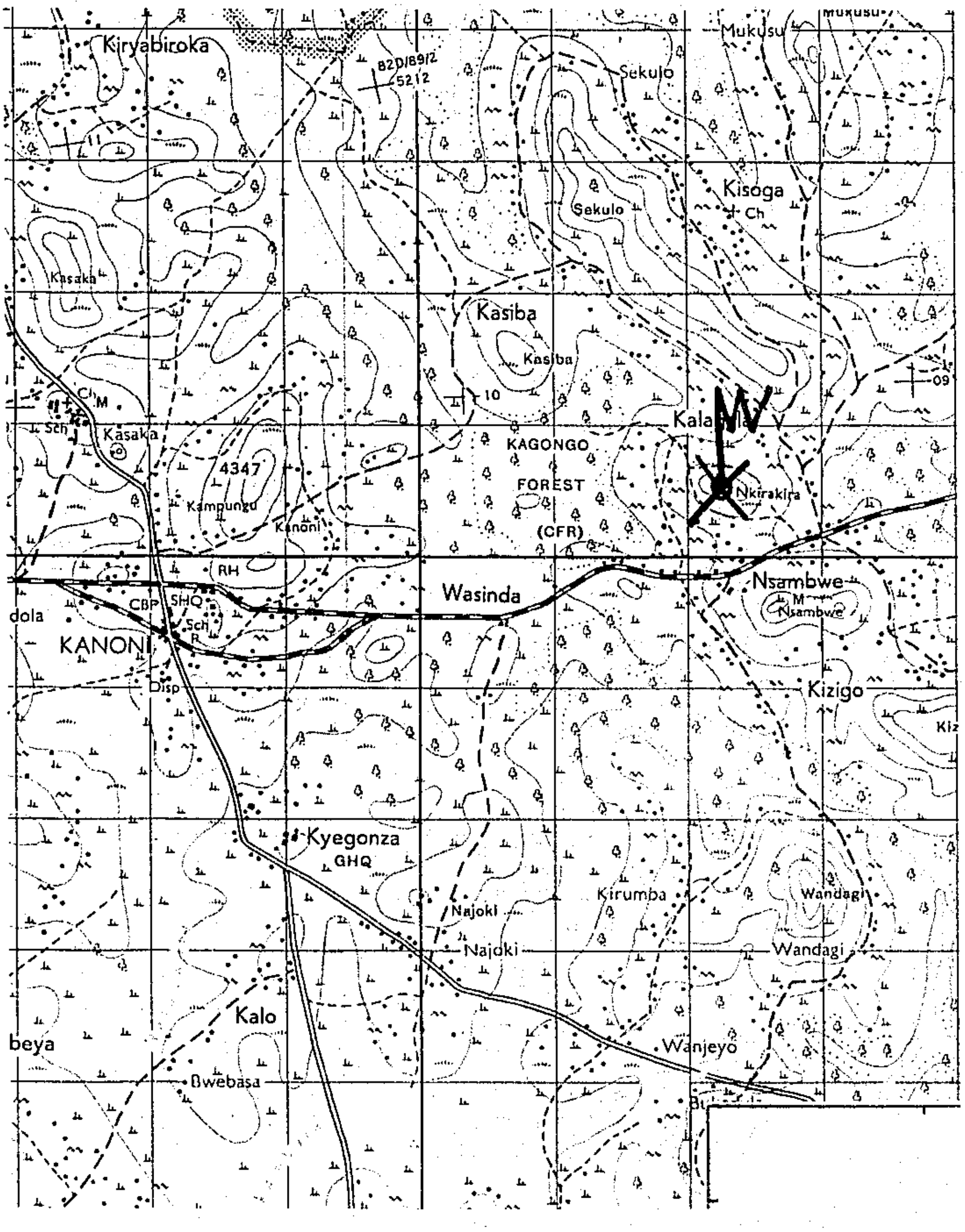


Fig. 6-25 SCHEMATIC DIAGRAM OF NKIRAKIRA STATION

Table 6-15 Main Specifications for Nkirakira Station

Name of Station		Nkirakira
Type of Station		Relaying
Site of Station		Refer to Fig. 6-26
Transmitting Frequency		BAND V CH. 65
Transmitter Output Power		100 W (Video Peak)
Transmitting Antenna	Type	4mϕ·GP
	Height of Tower Top	15 m
Mother Station	Name of Station	Kampala
	Frequency	BAND III CH. 5
Receiving Antenna	Type	8Y·2
	Height of Mast Top	(8) m and 10 m
Power Supply	Type of Power Supply	Lines
	Capacity	7.5 KVA
Supervisory Equipment	Frequency	
	Output Power	
	Transmitting Antenna	
	Receiving Antenna	
Note		

Note: Height described in brackets ( ) represents the receiving antenna height to be mounted on the transmitting antenna tower.



N E	$00^{o}11'08''$ $31^{o}56'30''$
Altitude	1,340 m
Map No.	69-4

Fig. 6-26 Location of Nkirakira Station

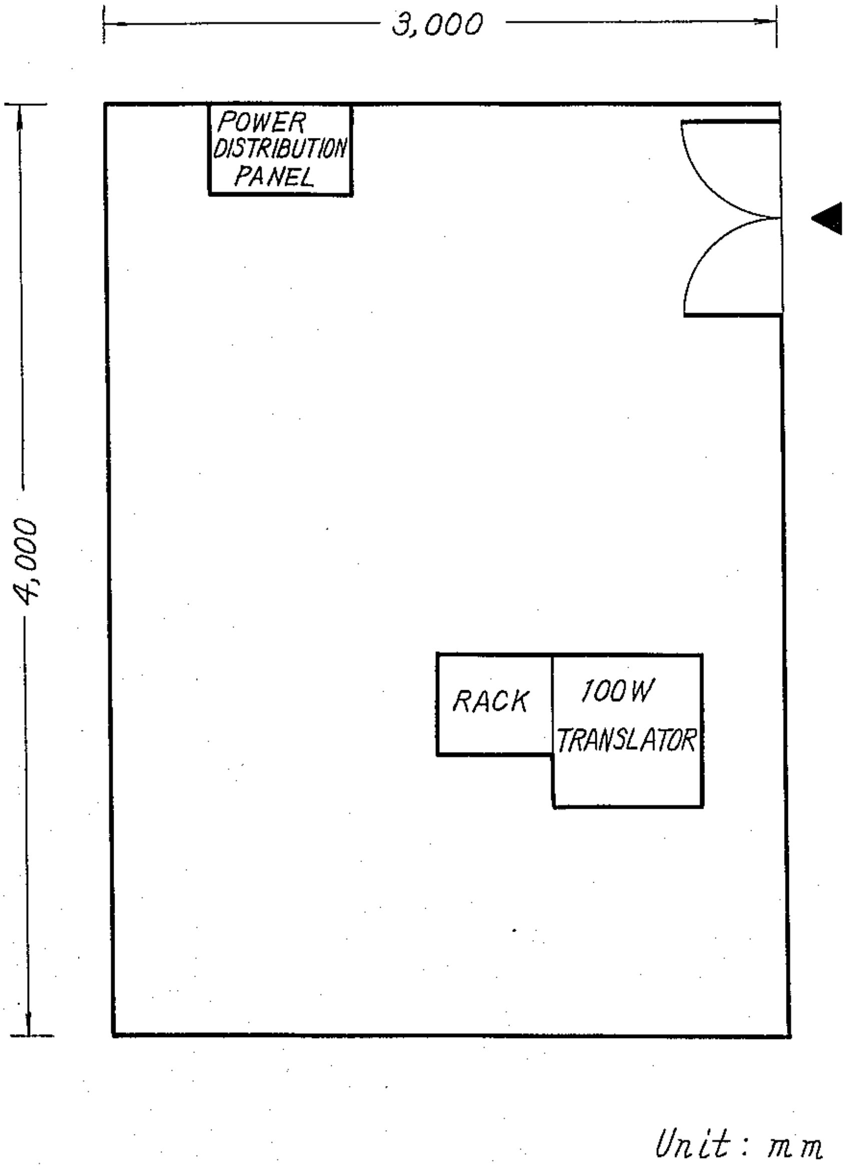


Fig. 6 – 27 TYPICAL FLOOR LAYOUT FOR NKIRAKIRA STATION

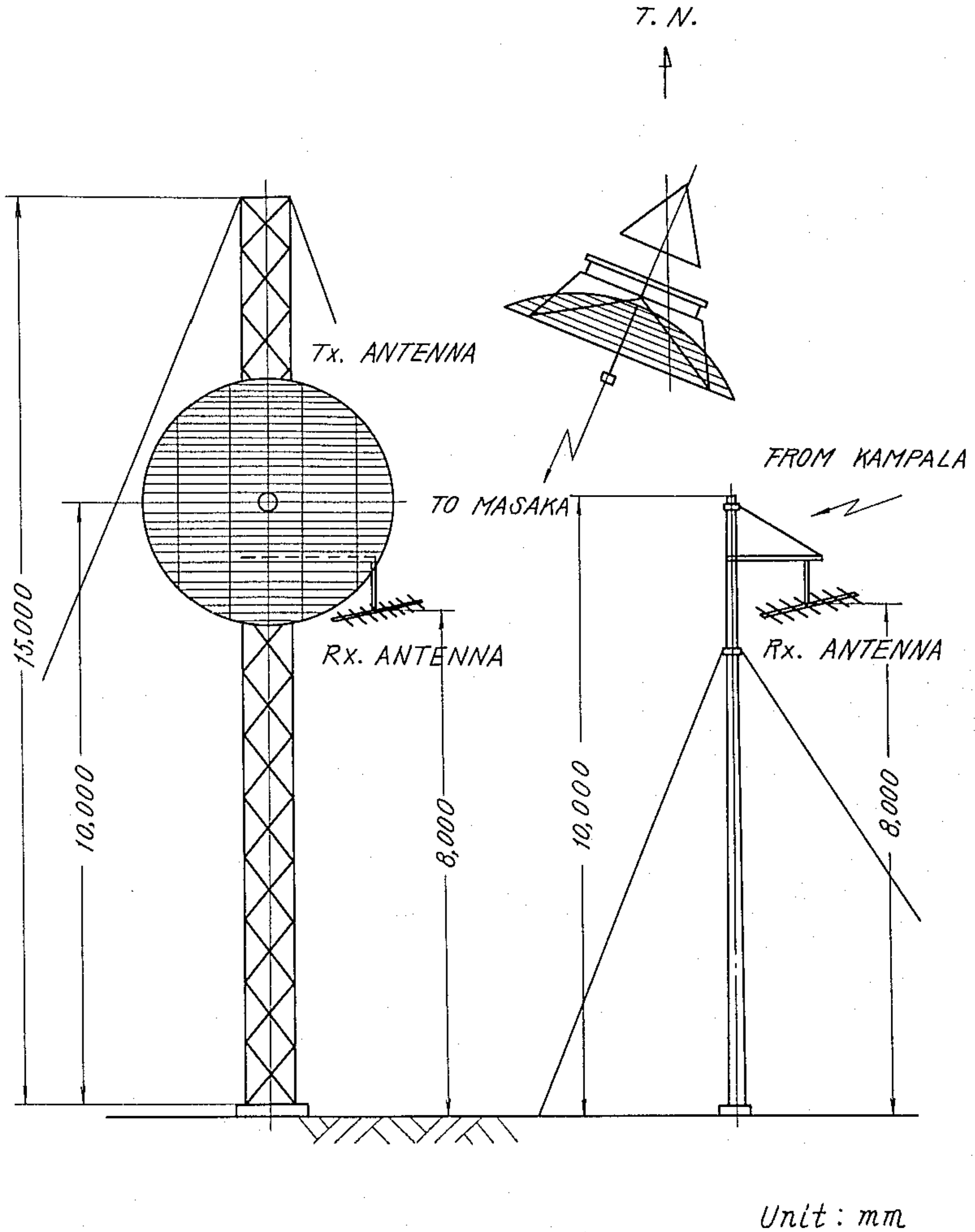


Fig. 6-28 NKIRAKIRA STATION

Masaka Station

Table 6-16 List of Facilities

Item	Description	Q'ty	Remarks
1.	-	-	
2.	-	-	
1.	Video Input Equipment	2 sets	including spare parts
2.	Receiver	1 set	- ditto -
3.	Auto-Start, Stop Equipment	1 set	- ditto -
4.	Receiving Antenna	1 set	
5.	Supervisory Equipment	1 set	
6.	Accessories	1 set	

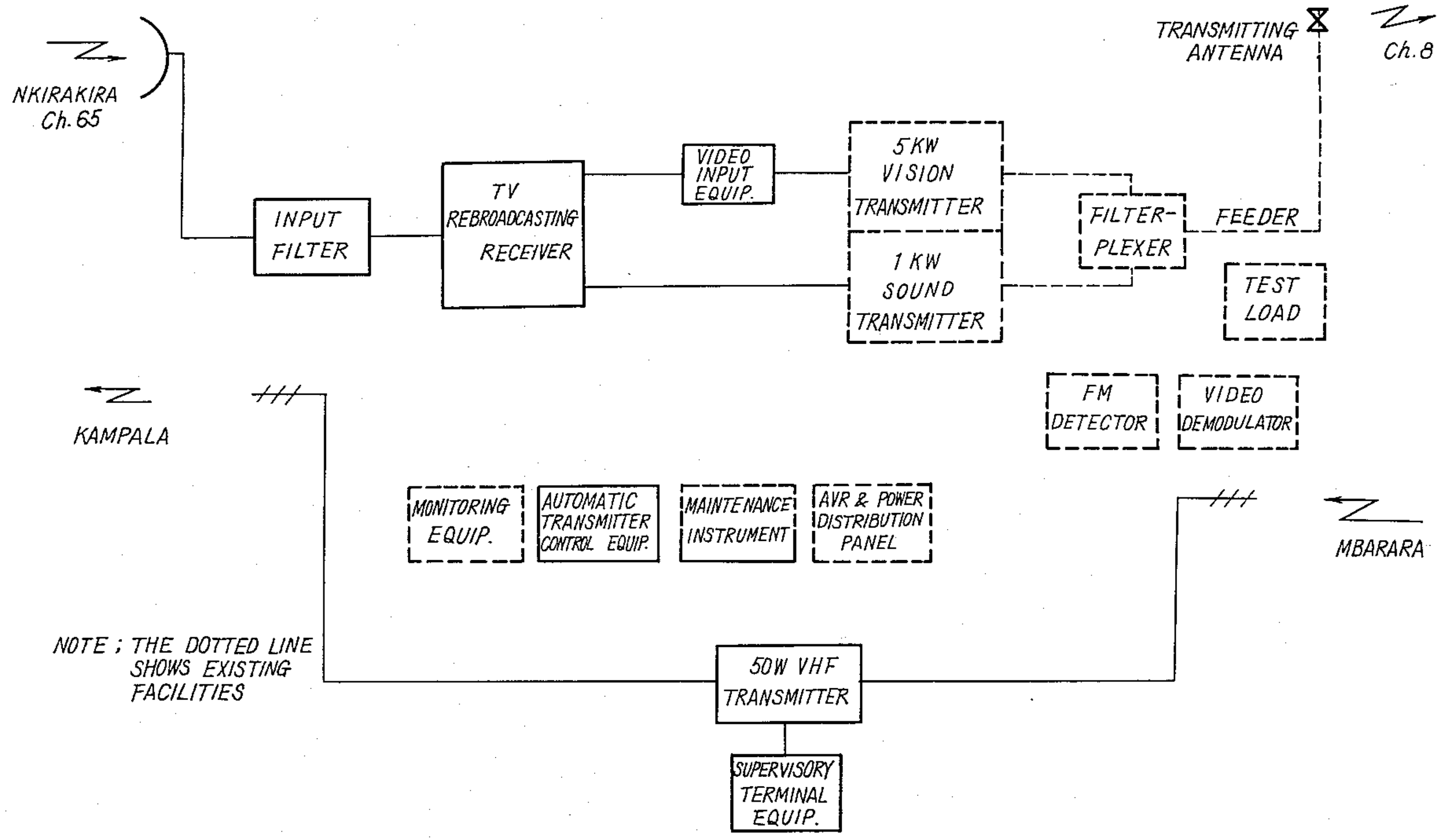
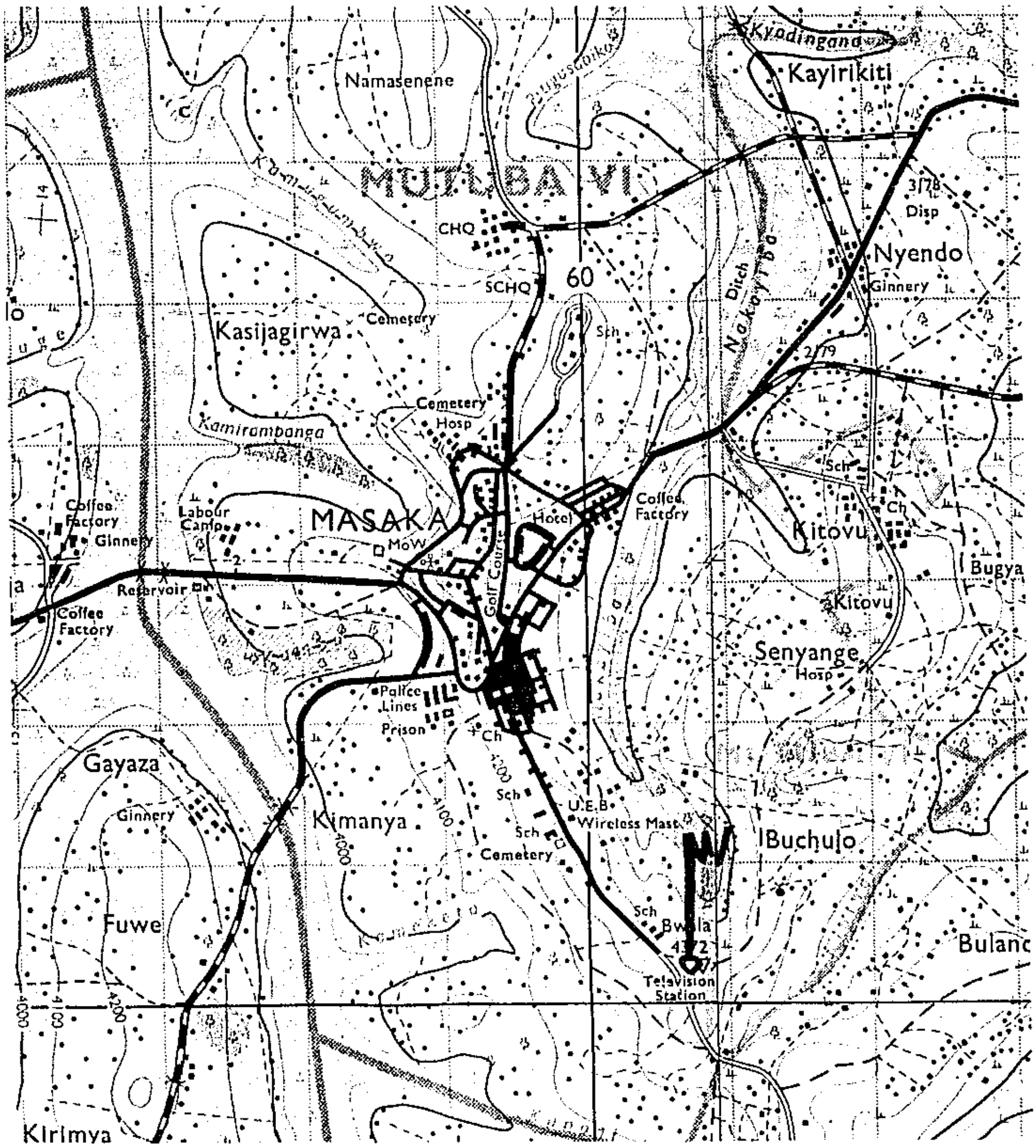


Fig. 6-29 SCHEMATIC DIAGRAM OF MASAKA STATION

Table 6-17 Main Specifications for Masaka Station

Name of Station		Masaka (Existing)
Type of Station		
Site of Station		Refer to Fig. 6-30
Transmitting Frequency		BAND III CH. 8
Transmitter Output Power		
Transmitting Antenna	Type	
	Height of Tower Top	
Mother Station	Name of Station	Nkirakira
	Frequency	BAND V CH. 65
Receiving Antenna	Type	2.4mϕ·GP
	Height of Mast Top	(100) m
Power Supply	Type of Power Supply	-
	Capacity	
Supervisory Equipment	Frequency	150 MHz
	Output Power	50 W
	Transmitting Antenna	8Y·1
	Receiving Antenna	8Y·1
Note		

Note: Height described in brackets ( ) represents the receiving antenna height to be mounted on the transmitting antenna tower.



S E	00°21'34" 31°44'51"
Altitude	1,330 m
Map No.	79-3 79-4

Fig. 6-30 Location of Masaka Station

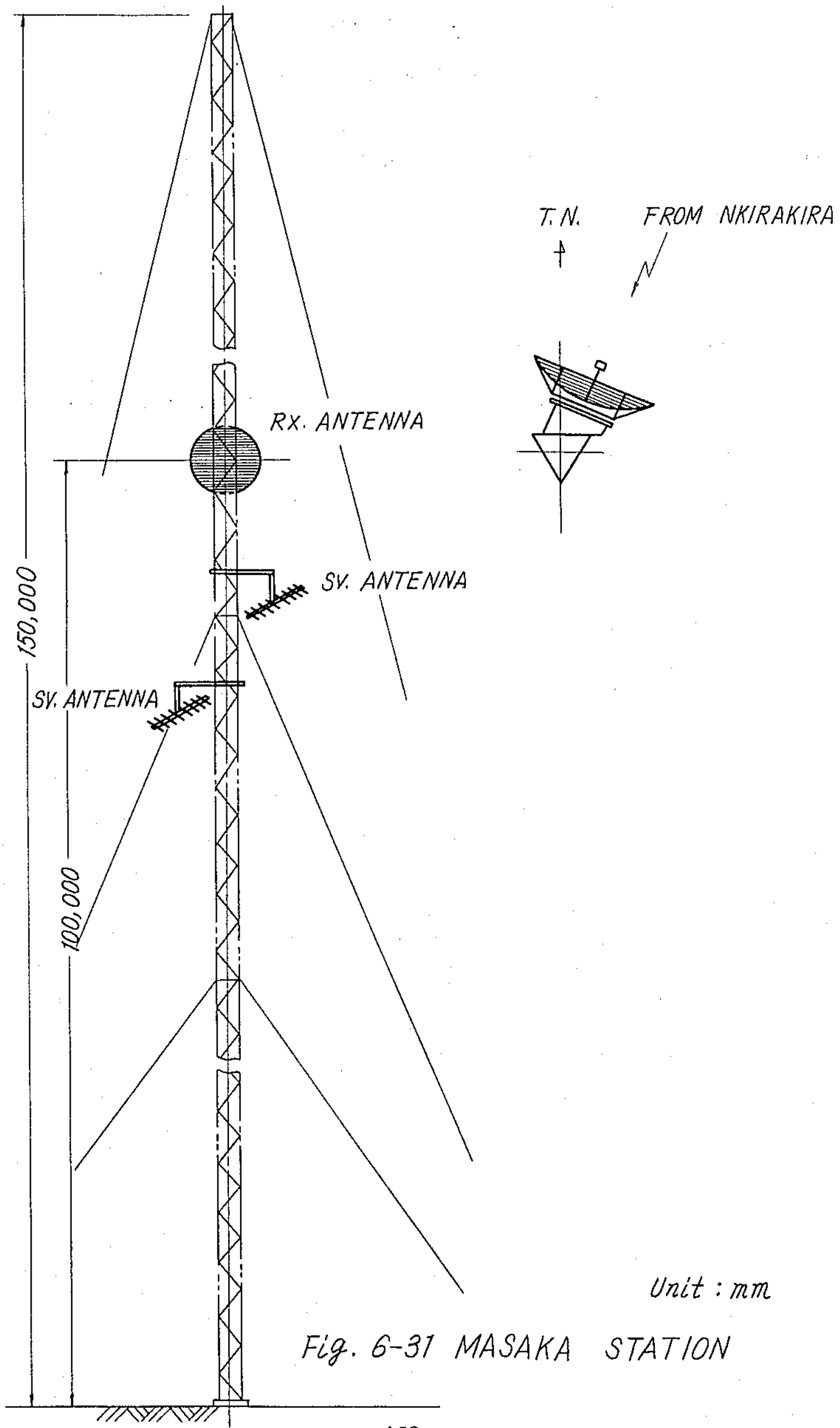


Fig. 6-31 MASAKA STATION

Nakisaja Station

Table 6-18 List of Facilities

Item	Description	Q'ty	Remarks
1.	Building	1 set	
2.	——	—	
1.	TV Antenna for Relaying	2 sets	
2.	100 W (V-U) Translator	1 set	including spare parts
3.	Receiving Antenna	1 set	
4.	Tower	1 set	
5.	Power Supply Equipment	1 set	Engine Generators
6.	Accessories	1 set	

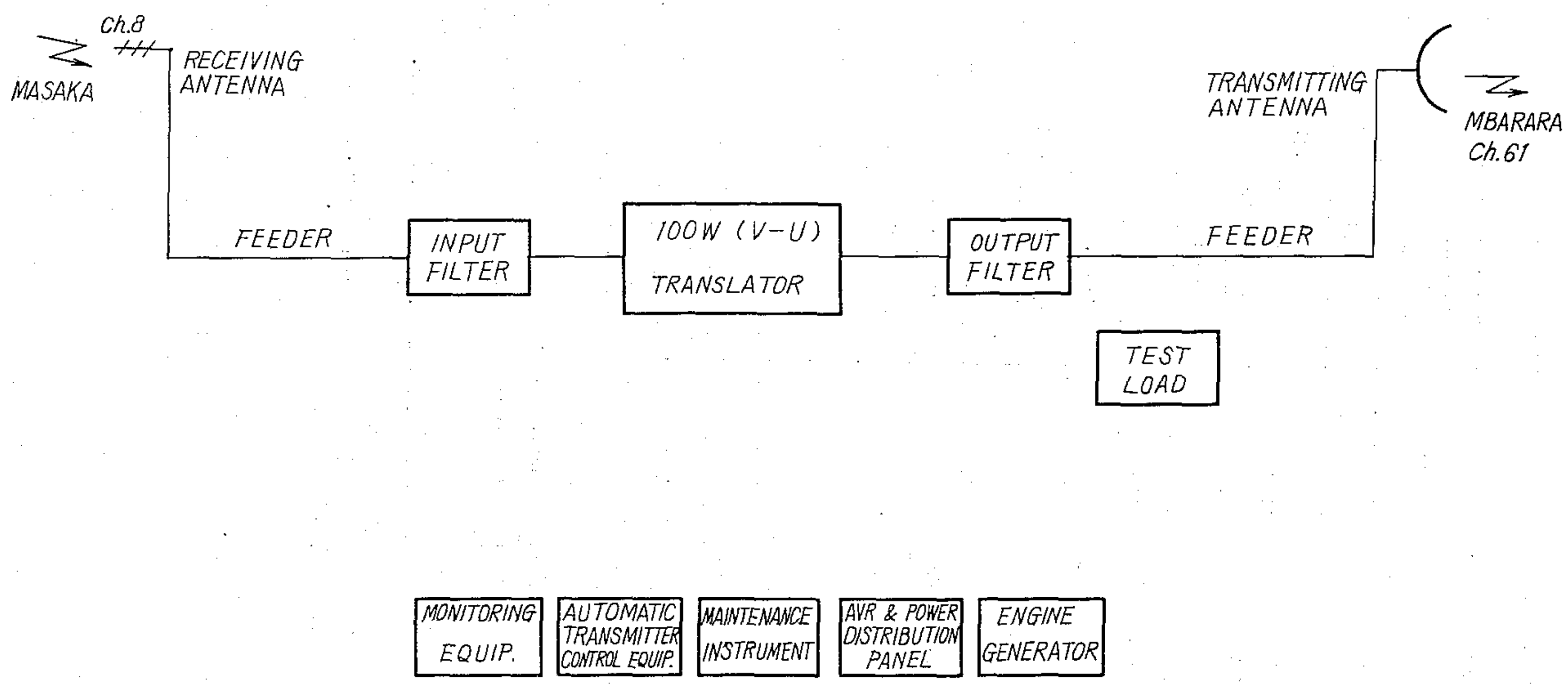
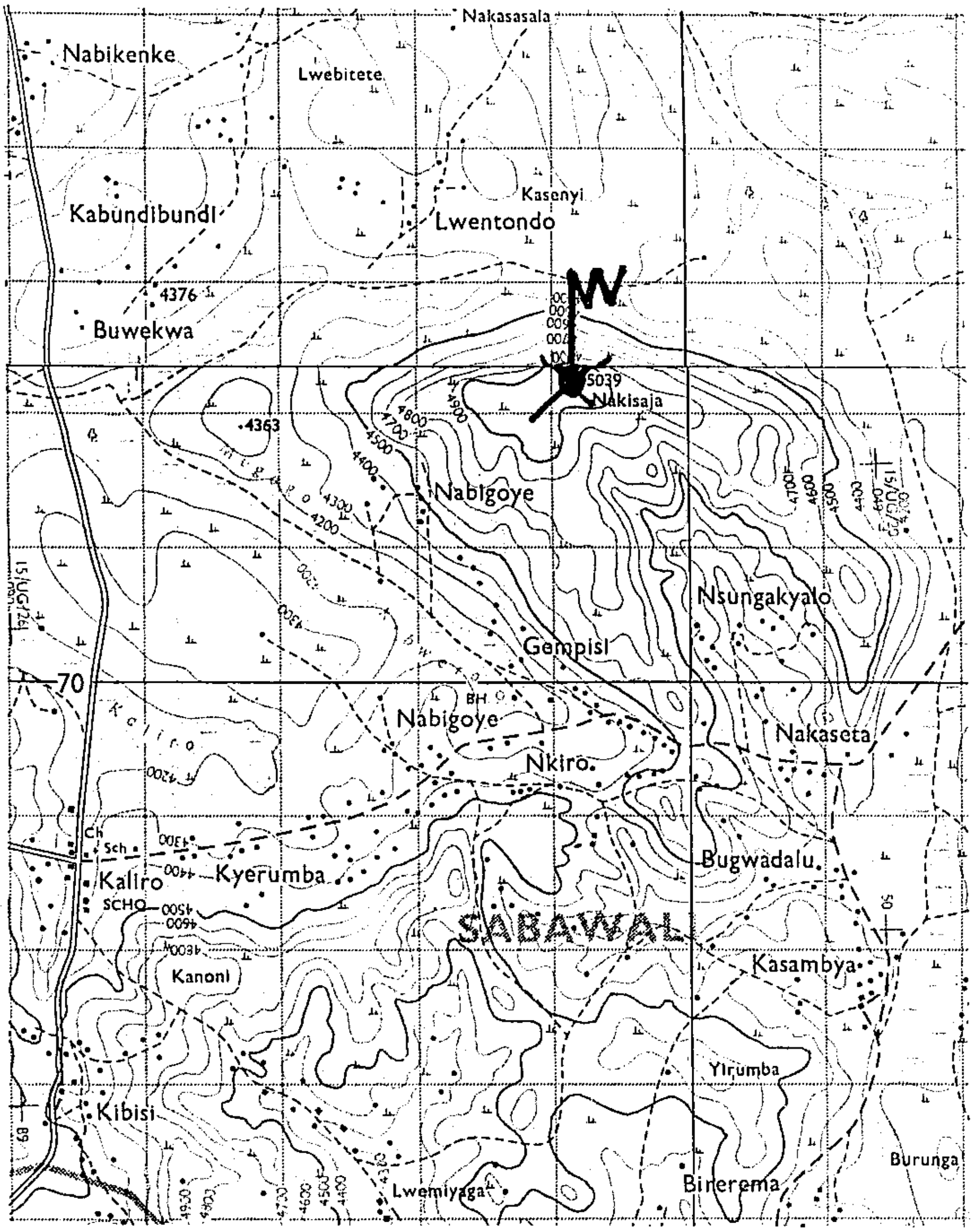


Fig. 6−32 SCHEMATIC DIAGRAM OF NAKISAJA STATION

Table 6-19 Main Specifications for Nakisaja Station

Name of Station		Nakisaja
Type of Station		Relaying
Site of Station		Refer to Fig. 6-33
Transmitting Frequency		BAND V CH. 61
Transmitter Output Power		100 W (Video Peak)
Transmitting Antenna	Type	3mϕ.GP.2
	Height of Tower Top	15 m
Mother Station	Name of Station	Masaka
	Frequency	BAND V CH. 8
Receiving Antenna	Type	8Y:2
	Height of Mast Top	(8) m and 10 m
Power Supply	Type of Power Supply	Engine Generators
	Capacity	5 KVA
Supervisory Equipment	Frequency	
	Output Power	
	Transmitting Antenna	
	Receiving Antenna	
Note	For relaying to Mbarara and Kabuga, the transmitter output is branched into two directions.	

Note: Height described in brackets ( ) represents the receiving antenna height to be mounted on the transmitting antenna tower.



S E	00°15'33" 31°11'43"
Altitude	1,540 m
Map No.	78-3 78-1

Fig. 6-33 Location of Nakisaja Station

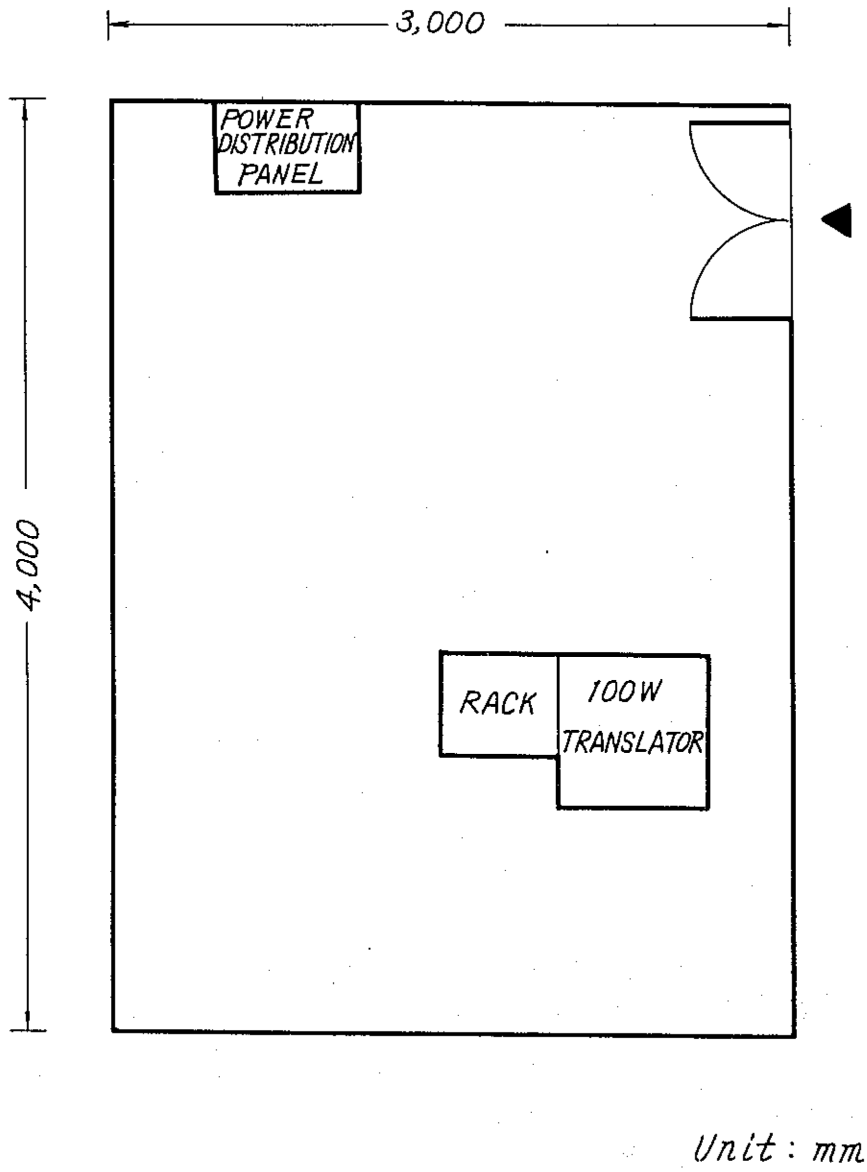
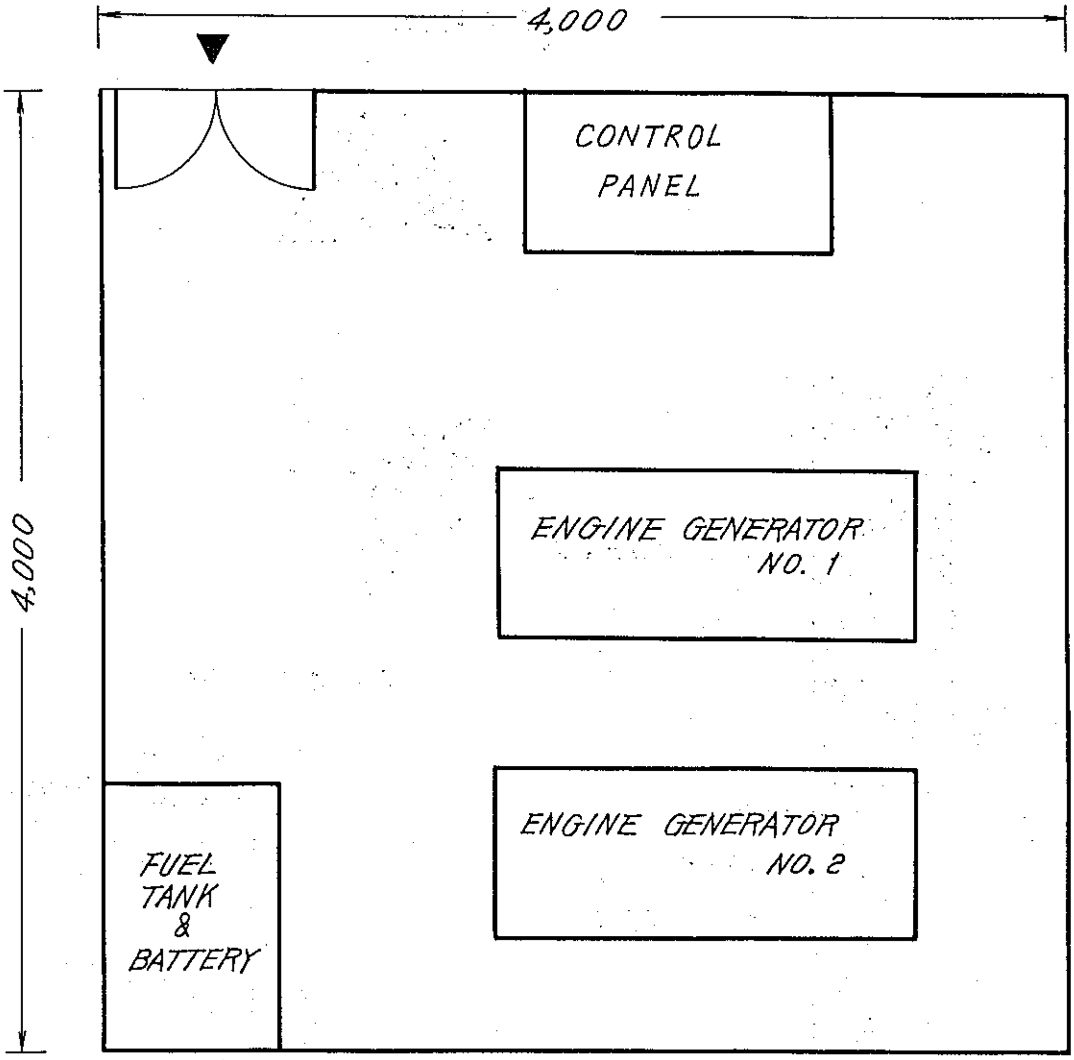


Fig. 6-34 TYPICAL FLOOR LAYOUT FOR NAKISAJA STATION



Unit : mm

Fig. 6-35 TYPICAL FLOOR LAYOUT OF ENGINE GENERATORS

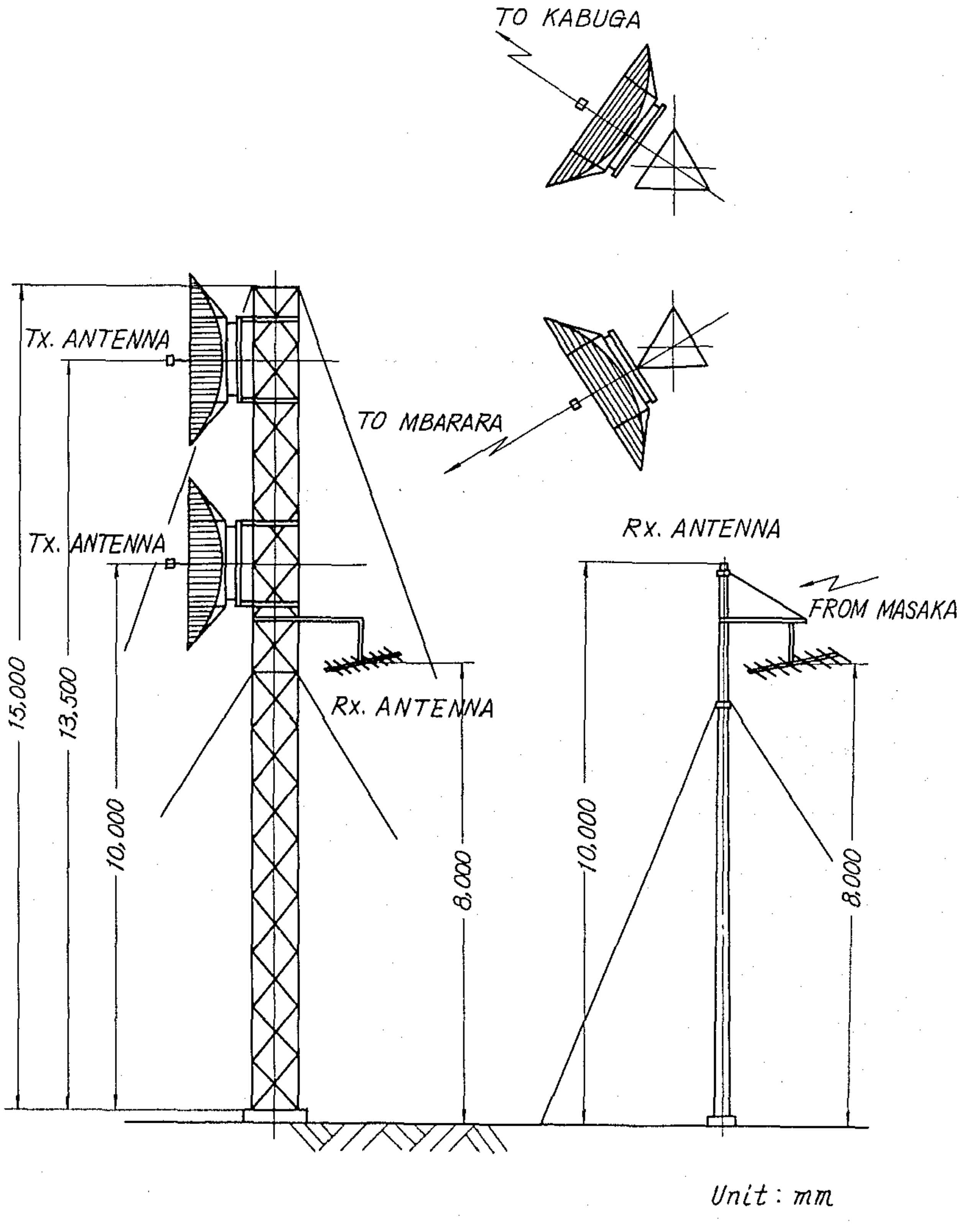
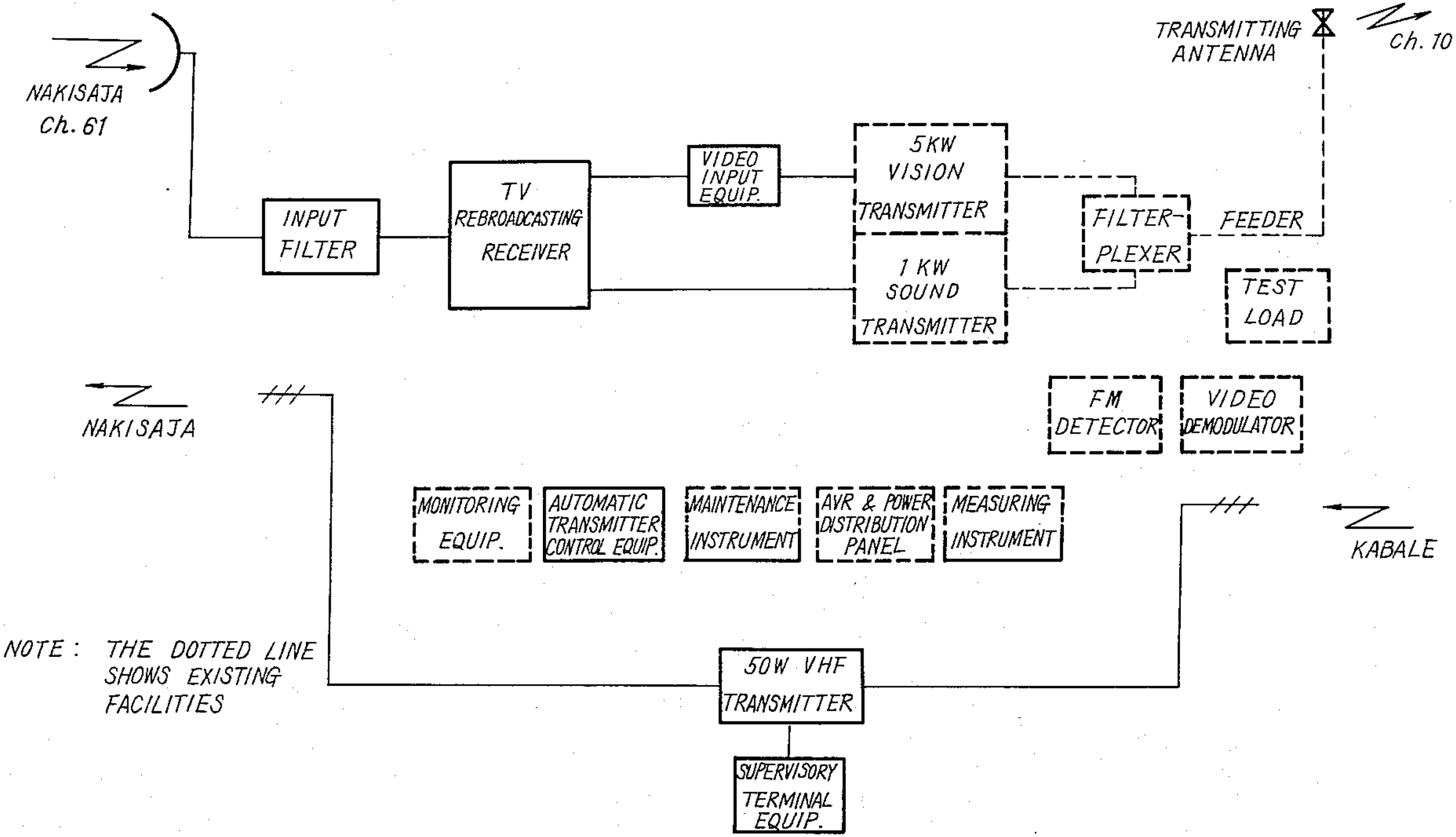


Fig 6-36 NAKISAJA STATION

Mbarara Station

Table 6-20 List of Facilities

Item	Description	Q'ty.	Remarks
1.	Building	1 set	Office
2.	———	———	
1.	Video Input Equipment	1 set	including spare parts
2.	Receiver	1 set	- ditto -
3.	Auto-Start, Stop Equipment	1 set	- ditto -
4.	Receiving Antenna	1 set	
5.	Power Supply Equipment for RX	1 set	
6.	Supervisory Equipment	1 set	
7.	Measuring Instrument	1 set	
8.	Accessories & Walky Talky	1 set	



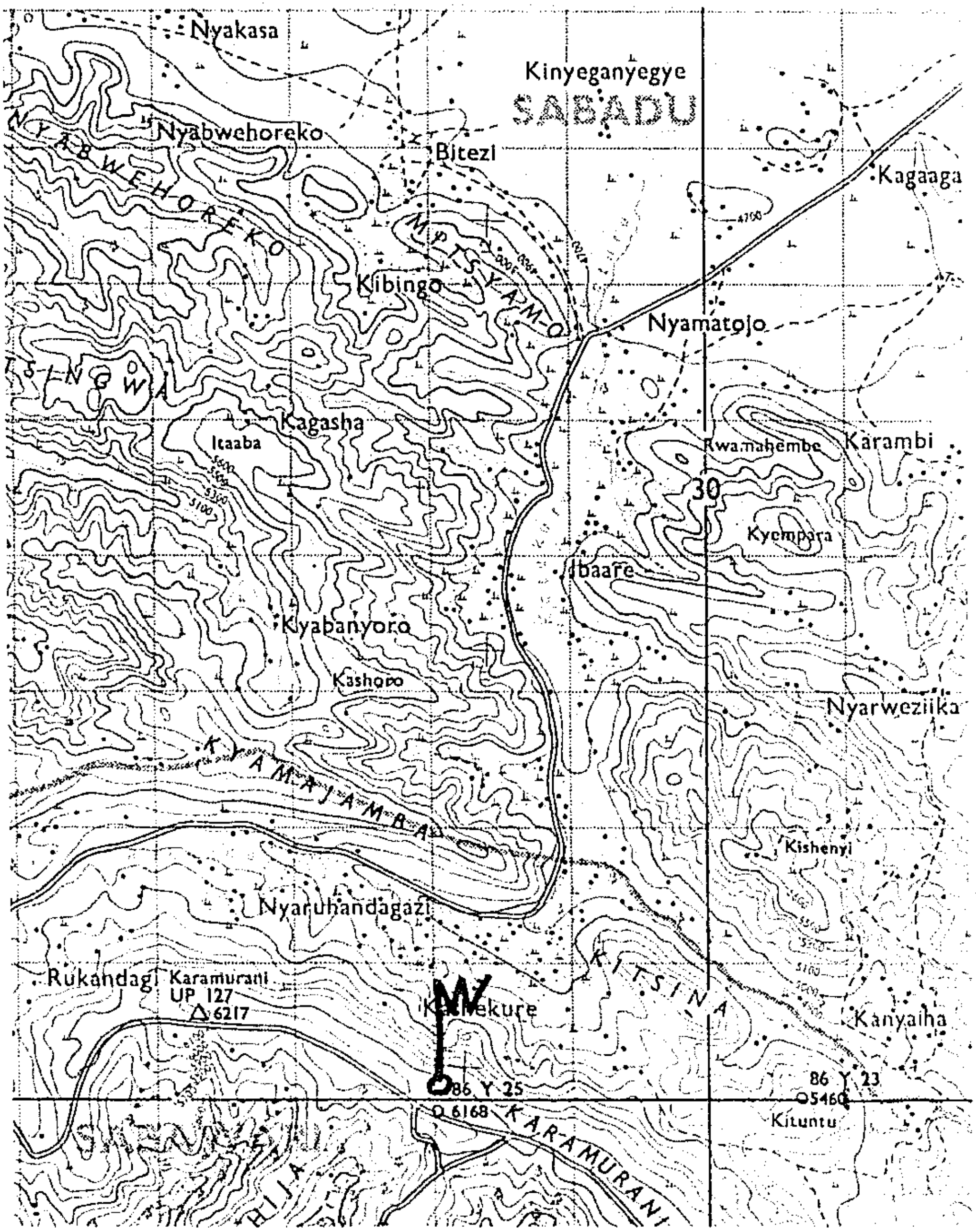
NOTE : THE DOTTED LINE SHOWS EXISTING FACILITIES

Fig. 6 - 37 SCHEMATIC DIAGRAM OF MBARARA STATION

Table 6-21 Main Specifications for Mbarara Station

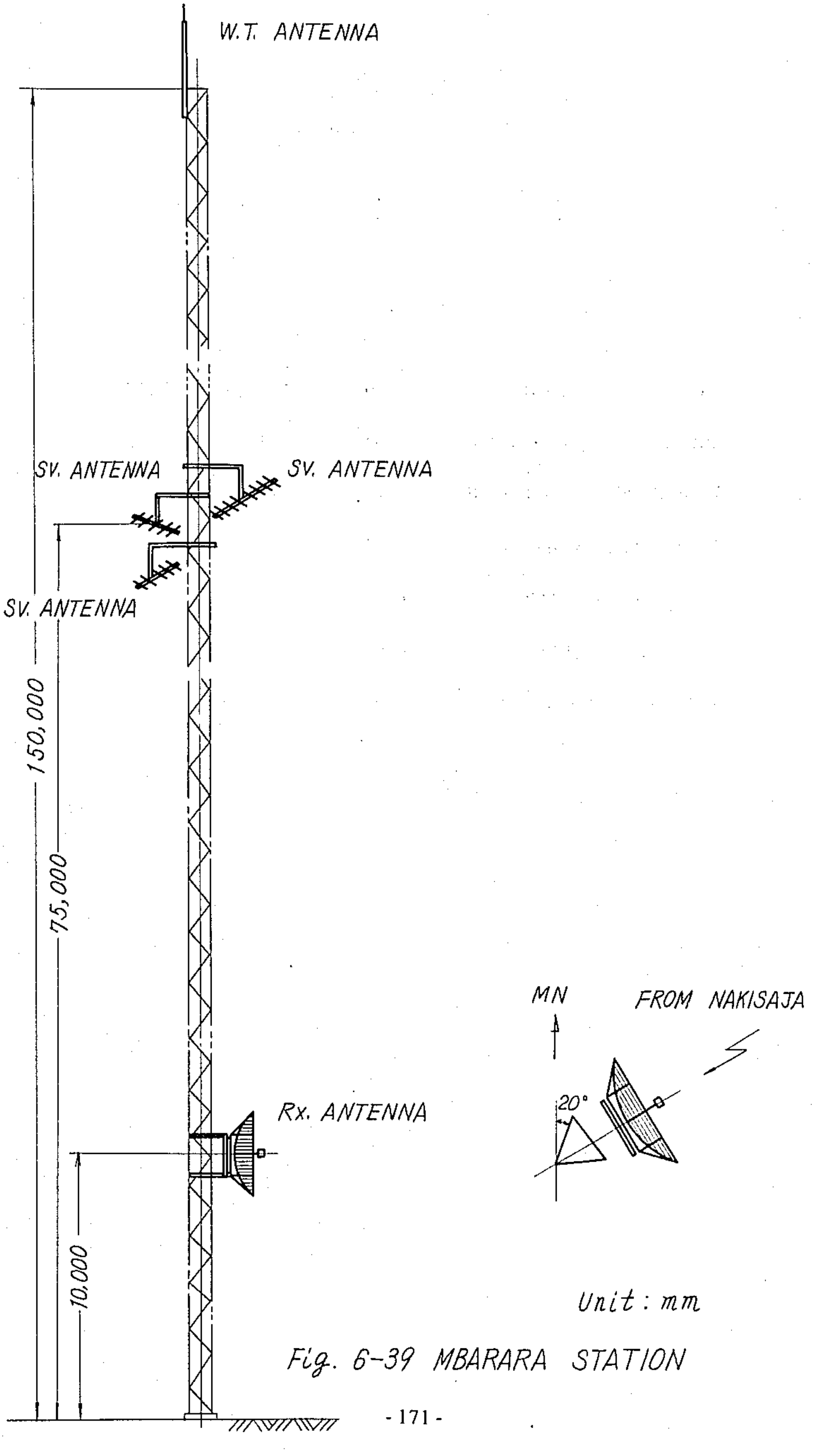
Name of Station		Mbarara (Existing)
Type of Station		
Site of Station		Refer to Fig. 6-38
Transmitting Frequency		BAND III CH. 10
Transmitter Output Power		W (Video Peak)
Transmitting Antenna	Type	
	Height of Tower Top	
Mother Station	Name of Station	Nakisaja
	Frequency	BAND V CH. 61
Receiving Antenna	Type	2.4mϕ·GP
	Height of Mast Top	(10) m
Power Supply	Type of Power Supply	
	Capacity	
Supervisory Equipment	Frequency	150 MHz Band
	Output Power	50 W
	Transmitting Antenna	8Y·1
	Receiving Antenna	5Y·1
Note		

Note: Height described in brackets ( ) represents the receiving antenna height to be mounted on the transmitting antenna tower.



S E	00°43'21" 30°33'24"
Altitude	1,860 m
Map No	86-1 86-3

Fig 6-38 Location of Mbarara Station



Unit : mm

Fig. 6-39 MBARARA STATION

6-11 Kampala Station

Table 6-22 List of Facilities

Item	Description	Q'ty	Remarks
1.	————	——	
2.	————	——	
1.	Video Input Equipment	1 set	including spare parts
2.	Auto-Start, Stop Equipment	1 set	- ditto -
3.	5 KW Stand-by TV Transmitter	1 set	- ditto -
4.	Power Supply Equipment	1 set	
5.	Supervisory Equipment	1 set	
6.	Measuring Instruments	1 set	
7.	Accessories & Walky Talky	1 set	

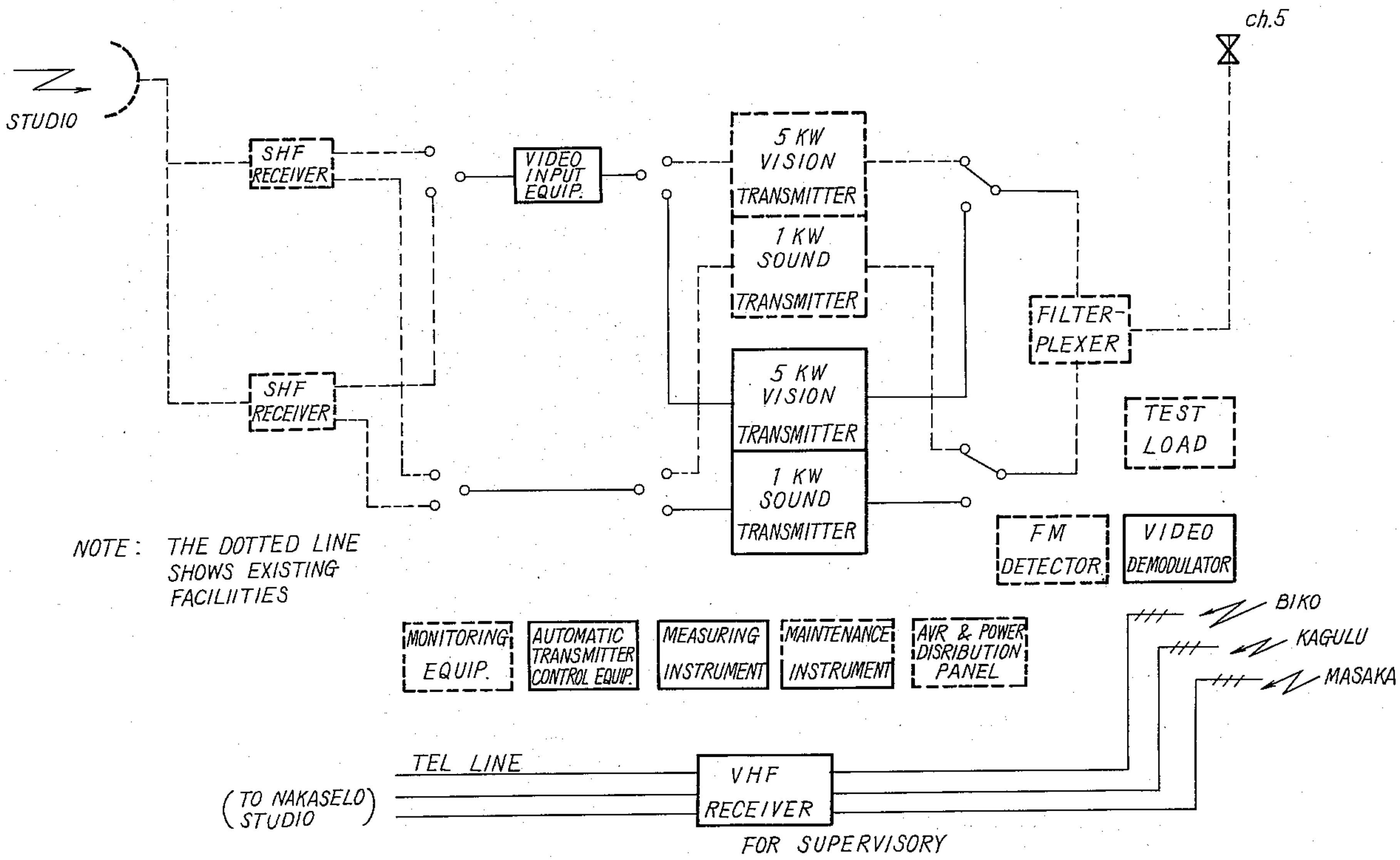
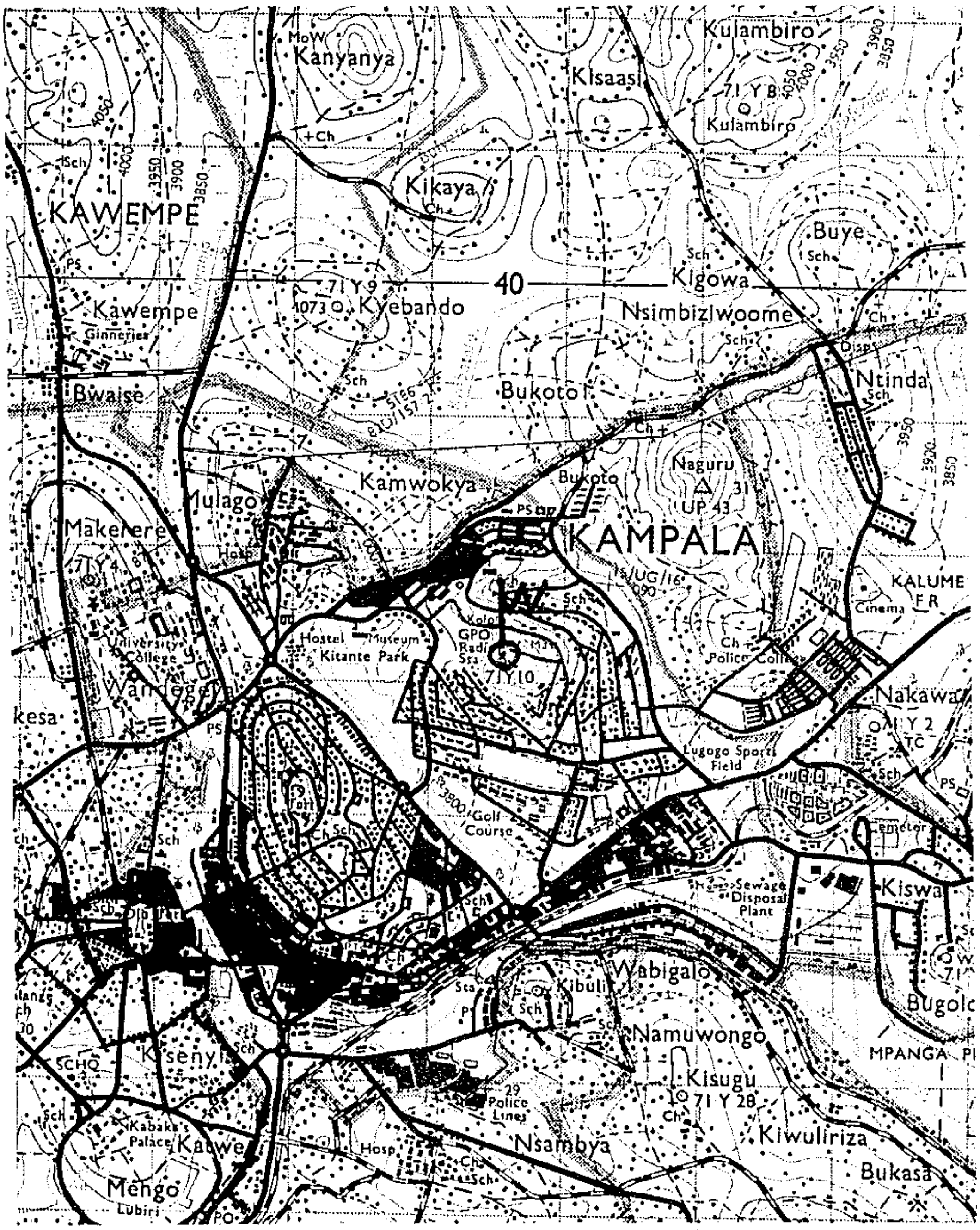


Fig 6-40 SCHEMATIC DIAGRAM OF KAMPALA STATION



N E	00°20'14" 32°35'29"
Altitude	1,310 m
Map No.	71-1

Fig. 6-41 Location of Kampala Station

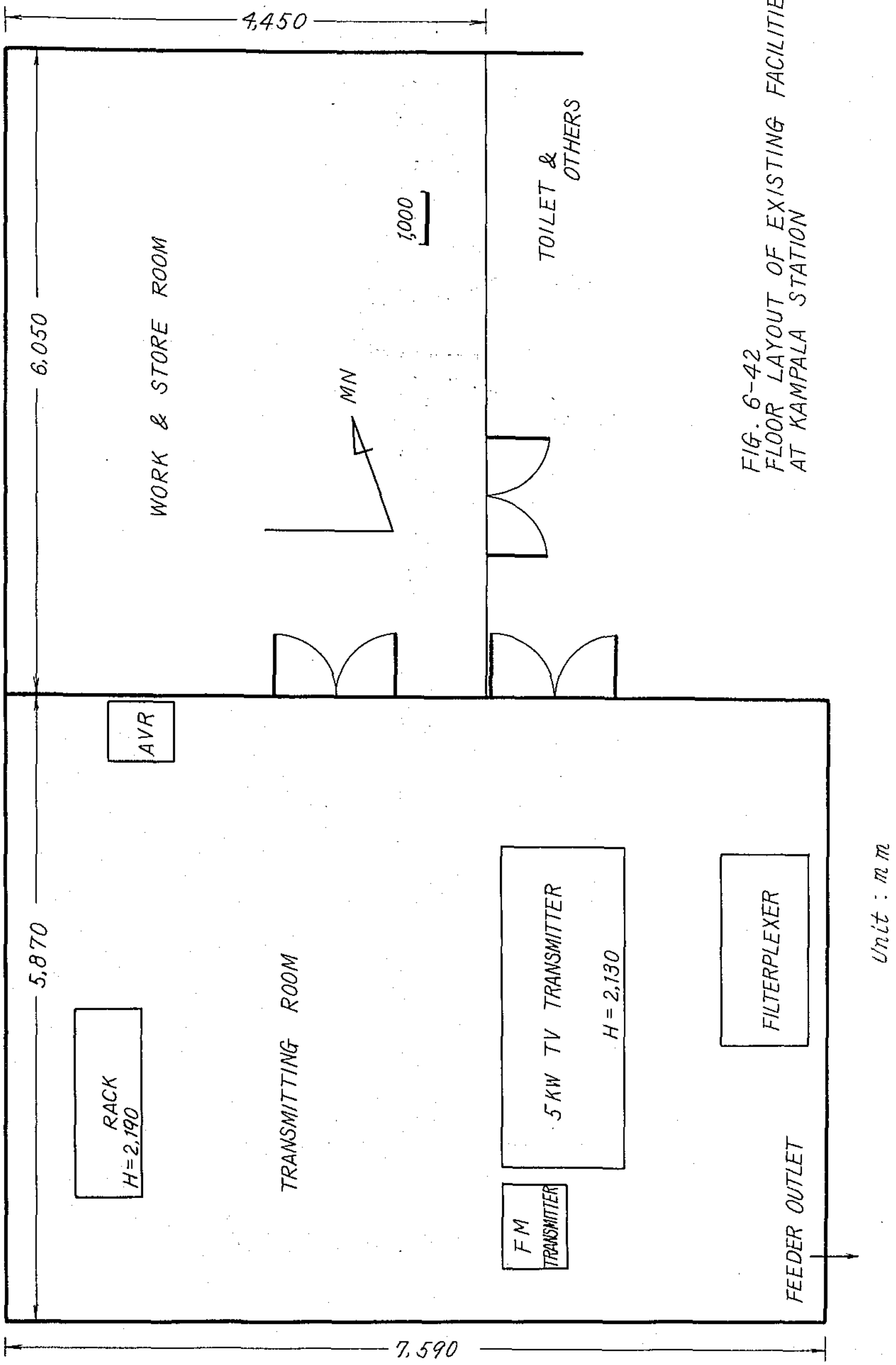
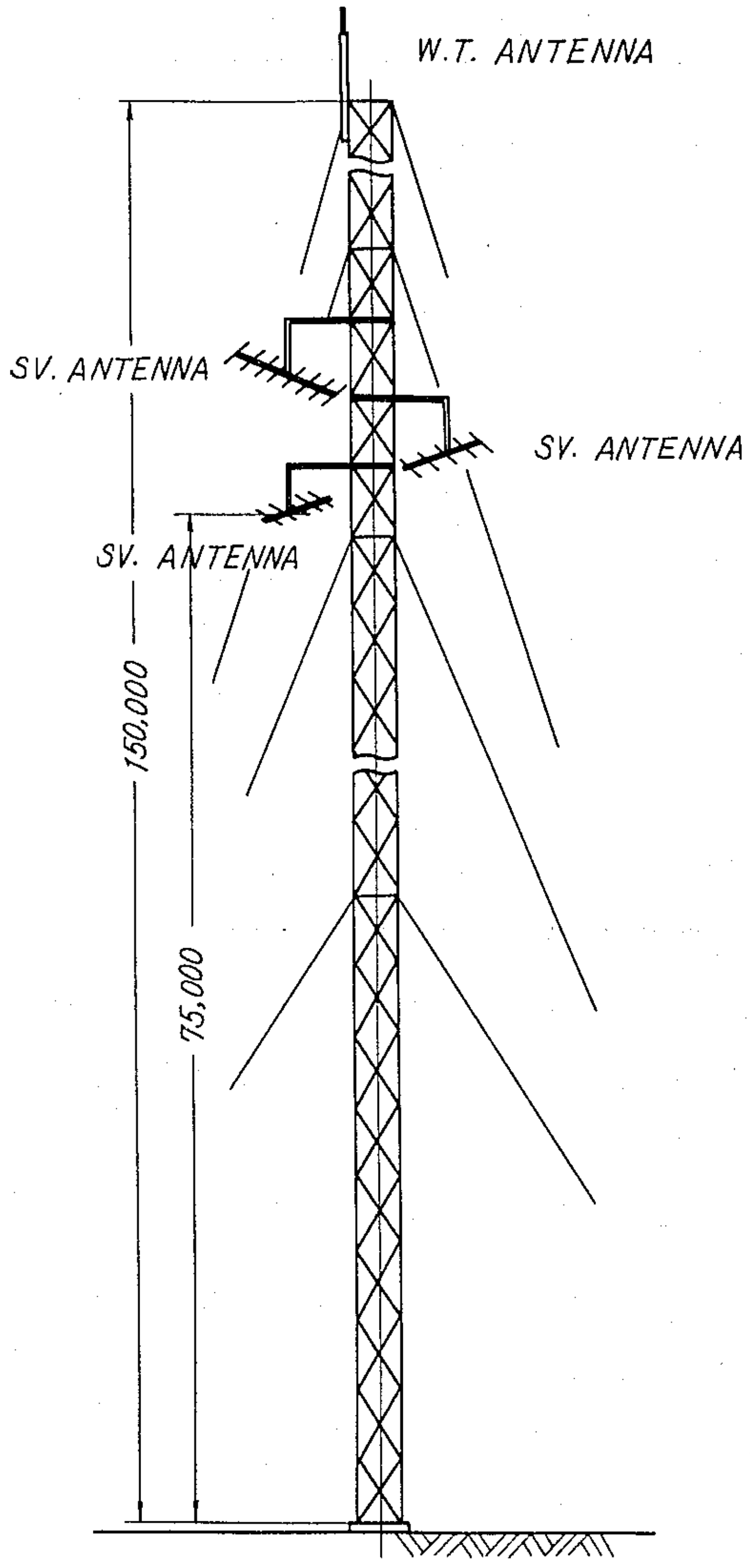


FIG. 6-42
FLOOR LAYOUT OF EXISTING FACILITIES
AT KAMPALA STATION



Unit: mm

Fig. 6-43 KAMPALA STATION

6-12 Gulu Station

Table 6-23 List of Facilities

Item	Description	Q'ty	Remarks
1.	Building:	1 set	
2.	Power Line	1 set	
1.	TV Antenna	1 set	
2.	5 KW TV Transmitter	1 set	including spare parts
3.	Programme Input Equipment	1 set	- ditto -
4.	Receiver	1 set	- ditto -
5.	Auto-Start, Stop Equipment	1 set	- ditto -
6.	Receiving Antenna	1 set	
7.	Tower	1 set	
8.	Power Supply Equipment	1 set	
9.	Supervisory Equipment	1 set	
10.	Monitor & Measuring Instrument	1 set	
11.	Accessories	1 set	

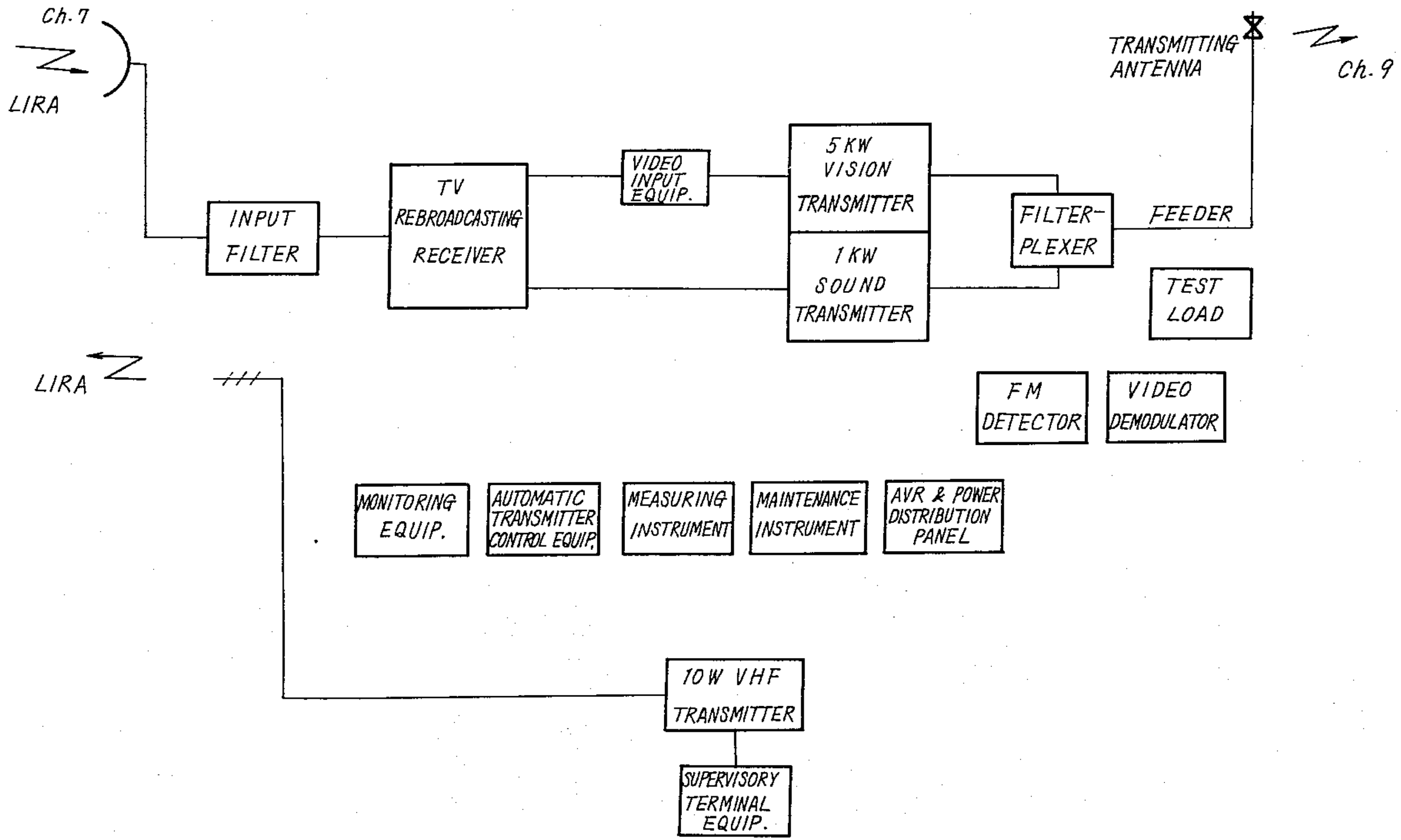
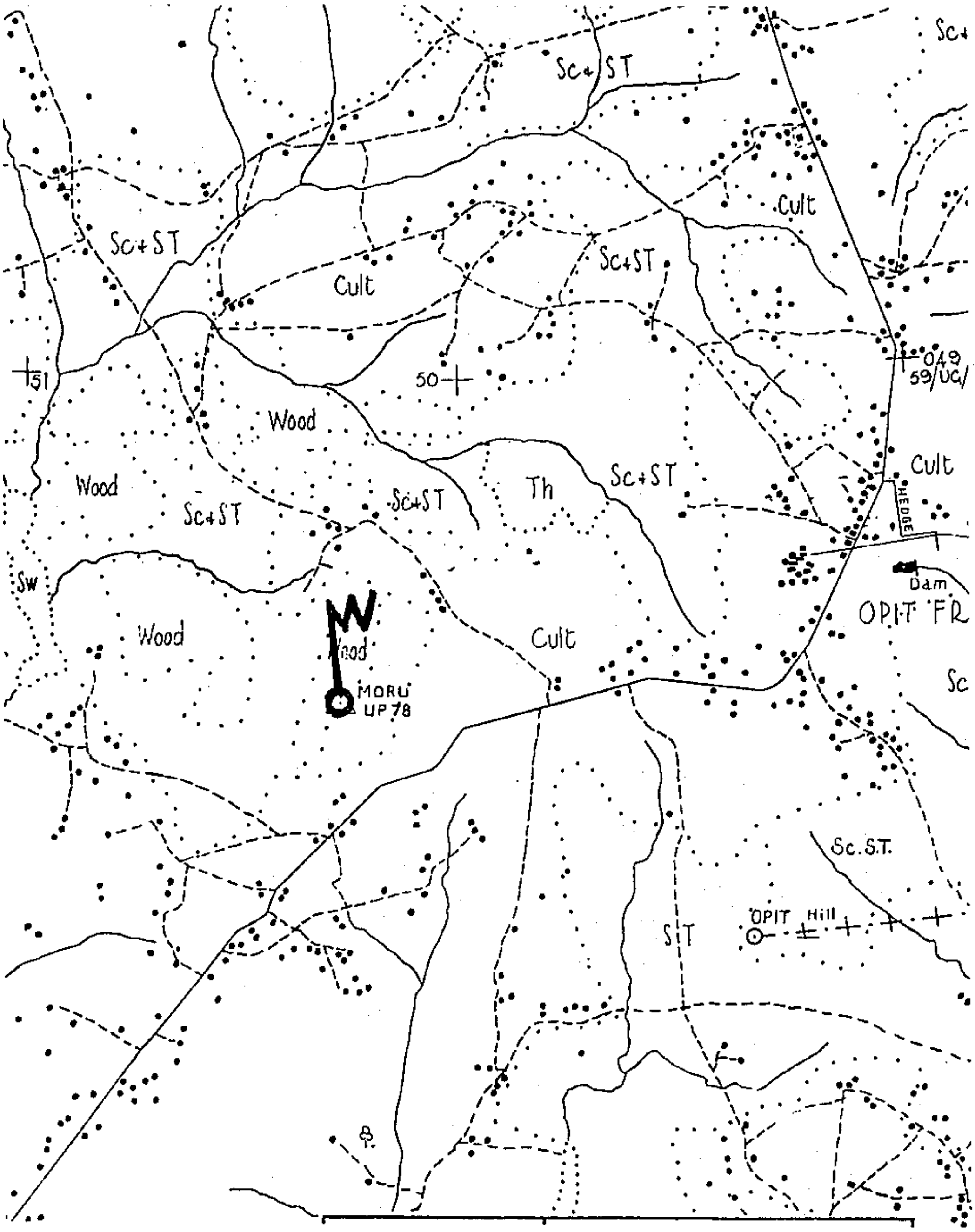


Fig. 6-44 SCHEMATIC DIAGRAM OF GULU STATION

Table 6-24 Main Specifications for Gulu Station

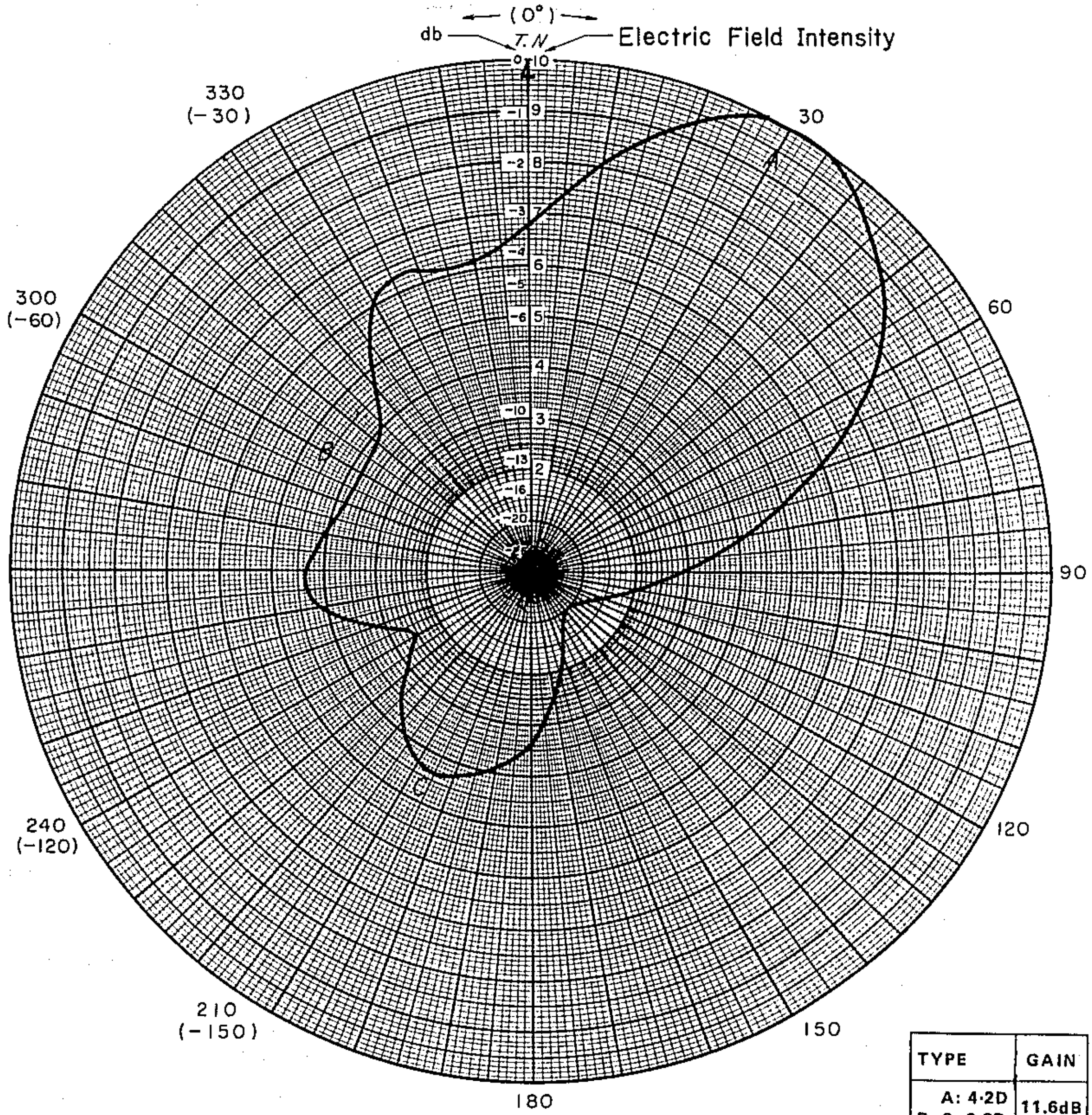
Name of Station		Gulu
Type of Station		Broadcasting
Site of Station		Refer to Fig. 6-45
Transmitting Frequency		BAND III CH. 9
Transmitter Output Power		5000 W (Video Peak)
Transmitting Antenna	Type	4·2D·1 and 2·2D·2
	Height of Tower Top	30 m
Mother Station	Name of Station	Lira
	Frequency	BAND III CH. 7
Receiving Antenna	Type	8Y·1
	Height of Mast Top	(10) m
Power Supply	Type of Power Supply	Lines
	Capacity	40 KVA
Supervisory Equipment	Frequency	150 MHz Band
	Output Power	5 W
	Transmitting Antenna	3Y·1
	Receiving Antenna	
Note		

Note: Height described in brackets ( ) represents the receiving antenna height to be mounted on the transmitting antenna tower.



N E	02°36'26" 32°26'35"
Altitude	1,220 m
Map No.	22-4

Fig. 6-45 Location of Gulu Staton



TYPE	GAIN
A: 4·2D B, C: 2·2D	11.6dB

Fig. 6-46. HORIZONTAL PATTERN OF GULU STATION

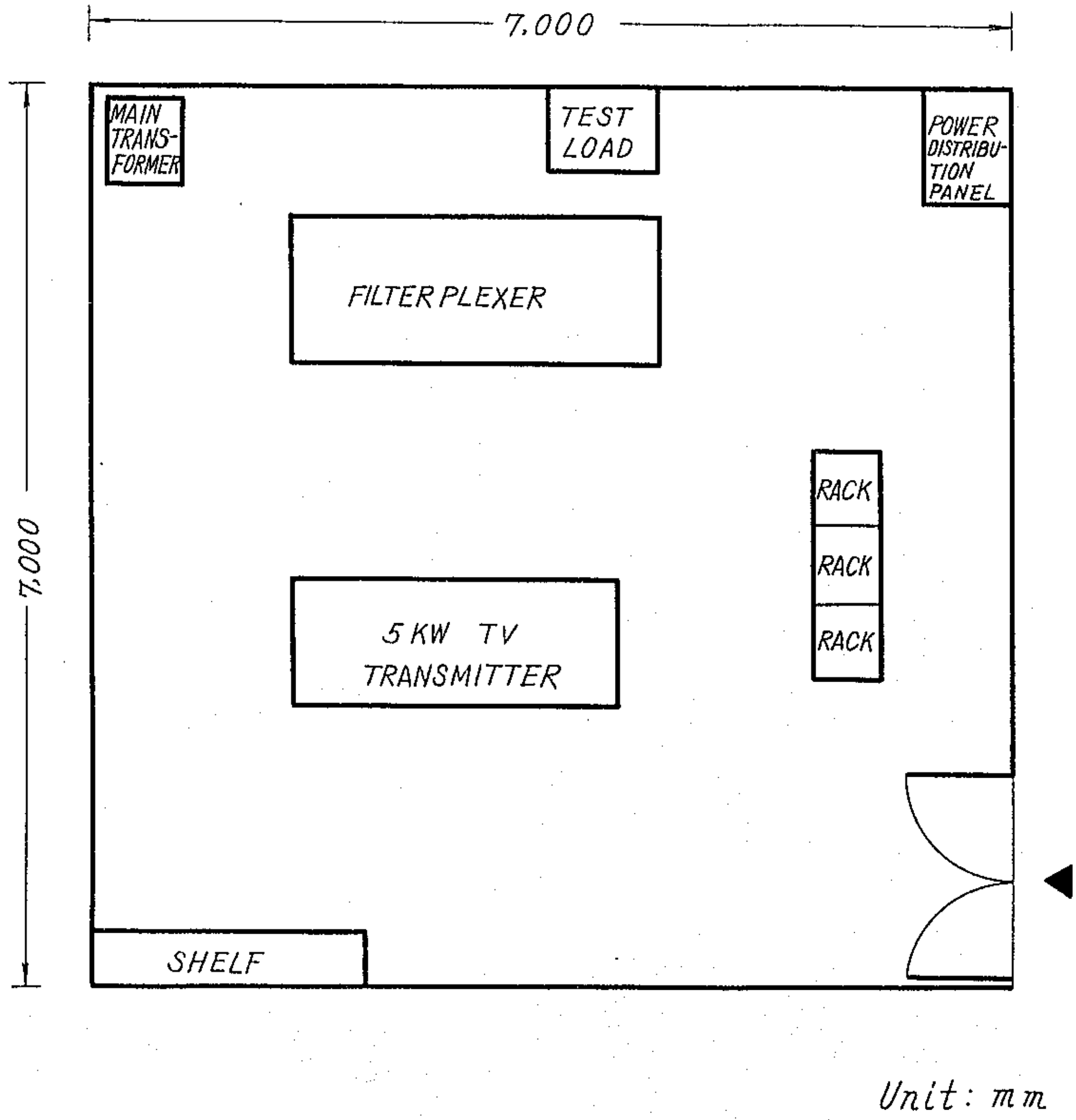
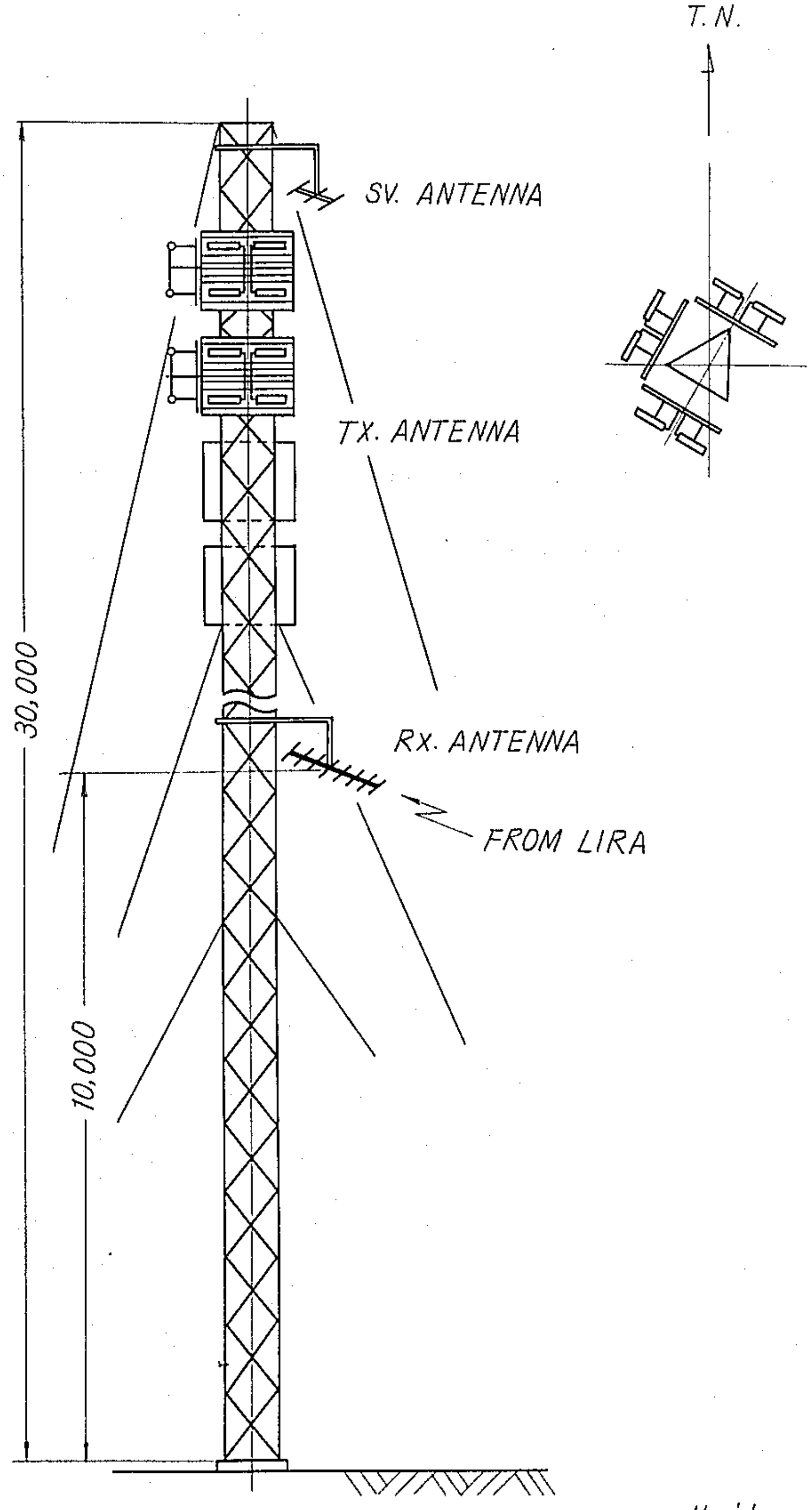


Fig. 6-47 TYPICAL FLOOR LAYOUT FOR GULU STATION



Unit: mm

Fig. 6-48 GULU STATION

6-24 Kabale Station

Table 6-25 List of Facilities

Item	Description	Q'ty	Remarks
1.	Building	1 set	
2.	Power Line	1 set	
1.	TV Antenna	1 set	
2.	500 W (V-V) Translator	1 set	including spare parts
3.	Receiving Antenna	1 set	
4.	Tower	1 set	
5.	Power Supply Equipment	1 set	
6.	Supervisory Equipment	1 set	
7.	Accessories	1 set	

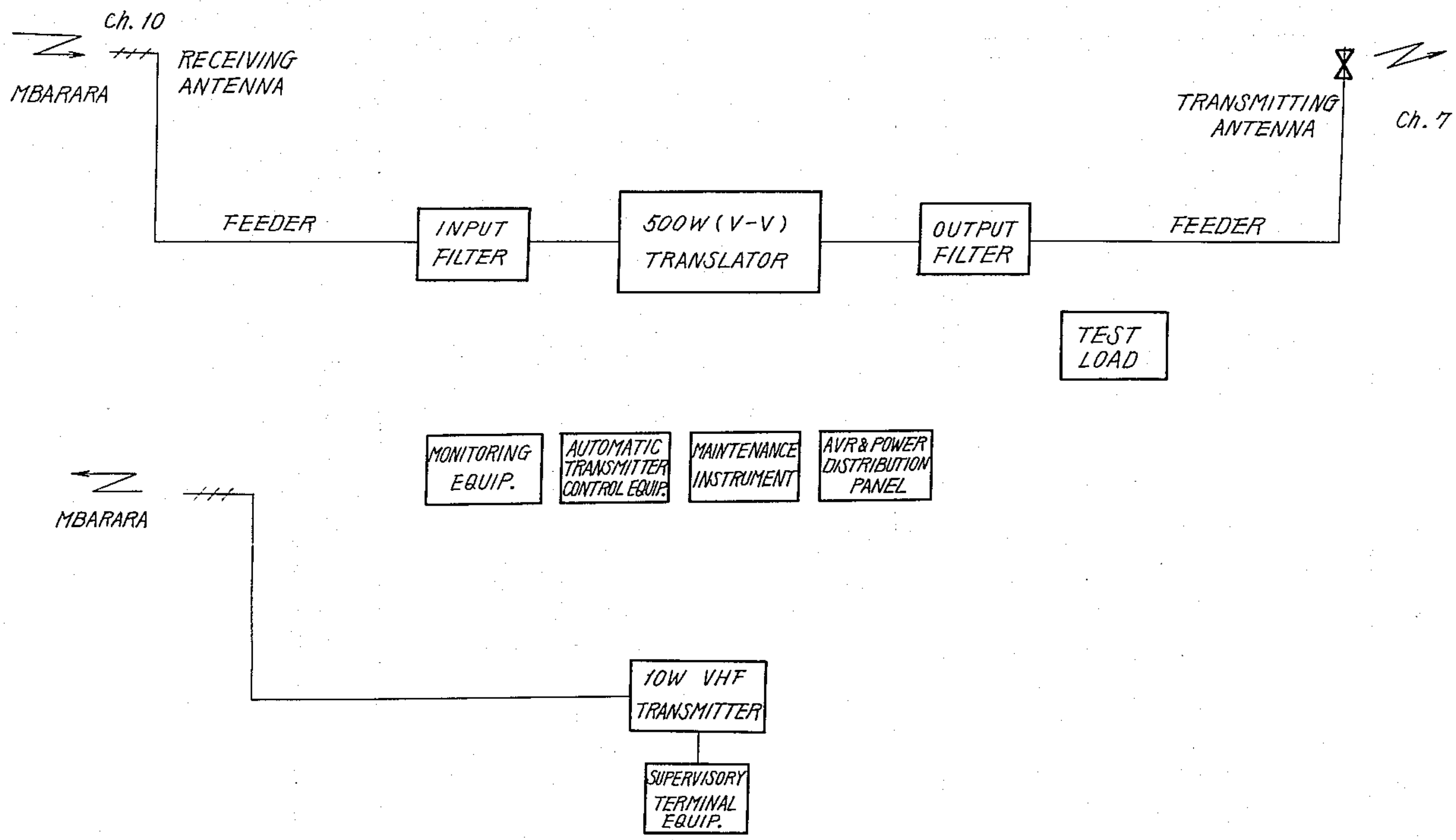


Fig. 6-49 SCHEMATIC DIAGRAM OF KABALE STATION

Table 6-26 Main Specifications for Kabale Station

Name of Station		Kabale
Type of Station		Broadcasting (Translator)
Site of Station		Refer to Fig. 6-50
Transmitting Frequency		BAND III CH. 7
Transmitter Output Power		500 W (Video Peak)
Transmitting Antenna	Type	2.2·D·4
	Height of Tower Top	20 m
Mother Station	Name of Station	Mbarara
	Frequency	BAND III CH. 10
Receiving Antenna	Type	8Y·1
	Height of Mast Top	(8) m and 10 m
Power Supply	Type of Power Supply	Lines
	Capacity	15 KVA
Supervisory Equipment	Frequency	150 MHz Band
	Output Power	10 W
	Transmitting Antenna	5Y·1
	Receiving Antenna	
Note		

Note: Height described in brackets ( ) represents the receiving antenna height to be mounted on the transmitting antenna tower.

S E	$01^{o}23'30''$ $29^{o}58'24''$
Altitude	2,120 m
Map No.	94-3 93-2 93-4 94-1

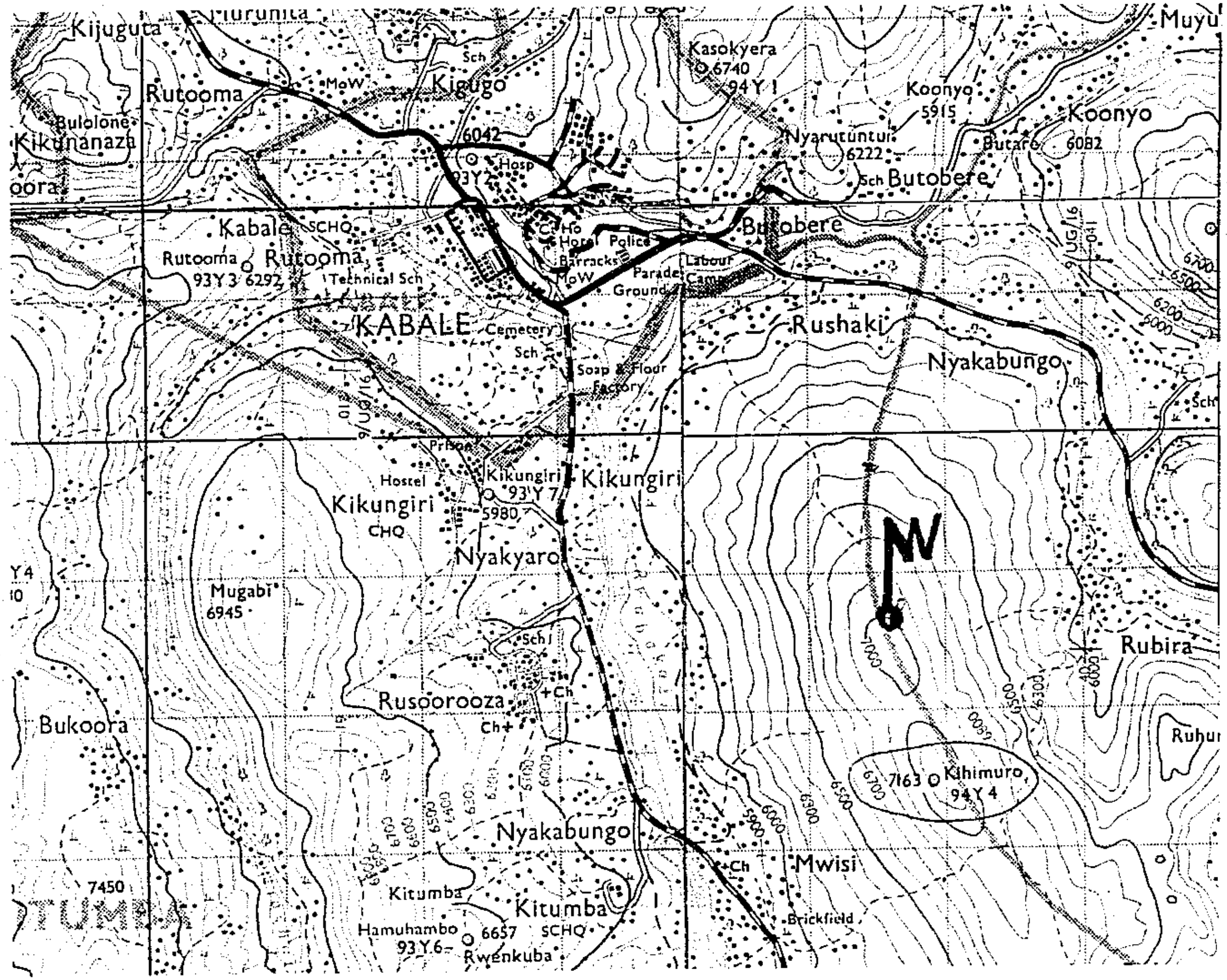
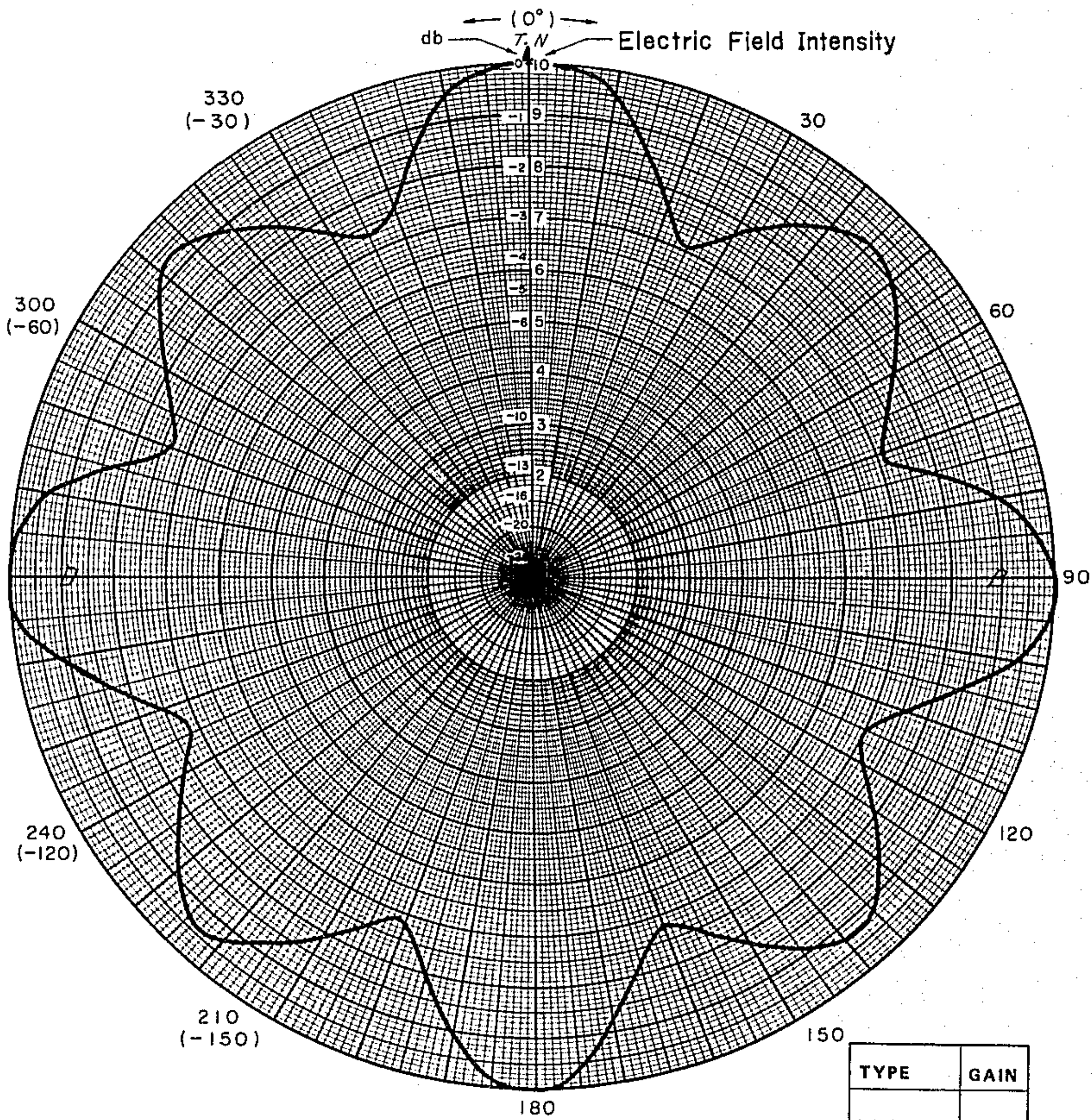
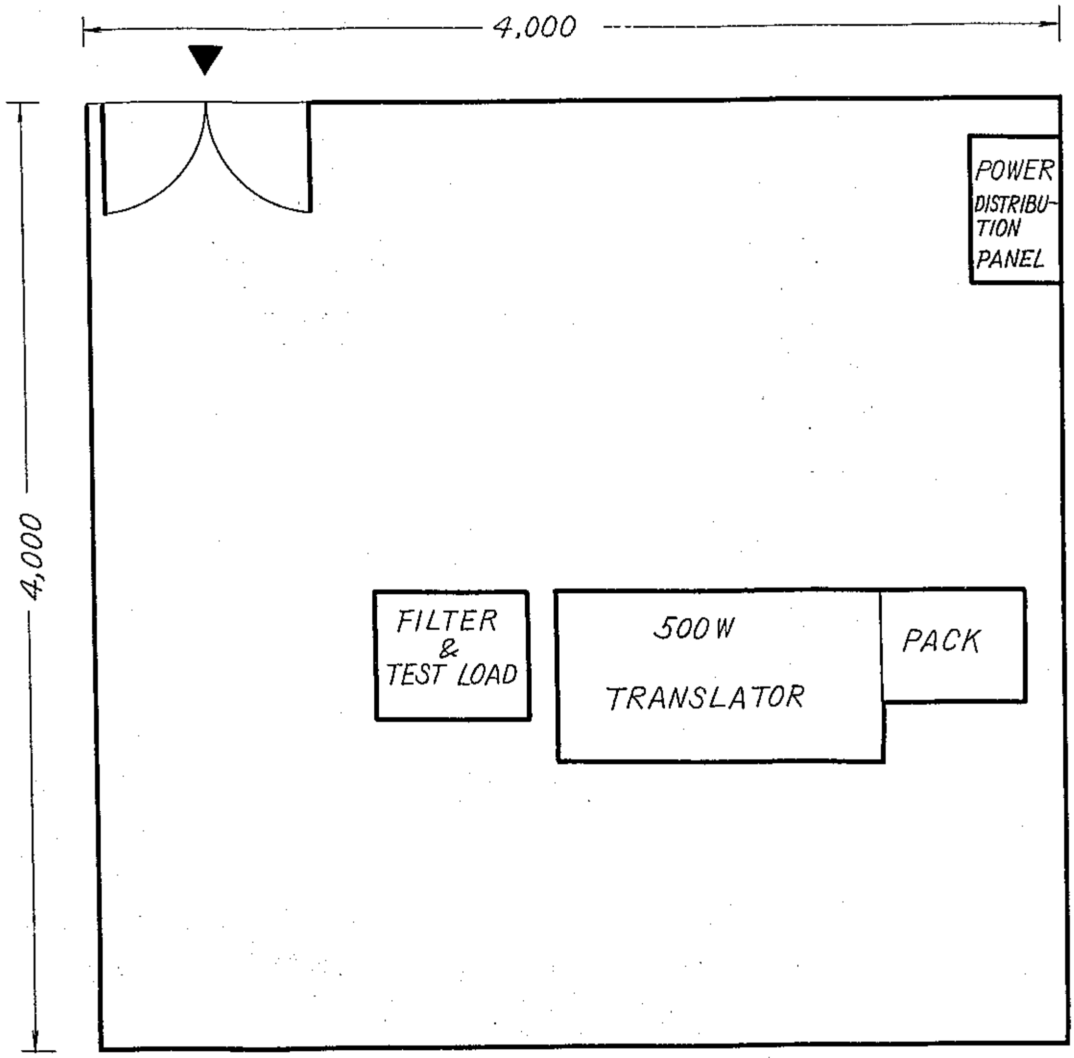


Fig. 6-50 Location of Kabale Station



TYPE	GAIN
A,B,C,D:2-2D	4.8 dB

Fig. 6-51 HORIZONTAL PATTERN OF KABALE STATION



Unit: mm

Fig. 6-52 TYPICAL FLOOR LAYOUT FOR KABALE STATION

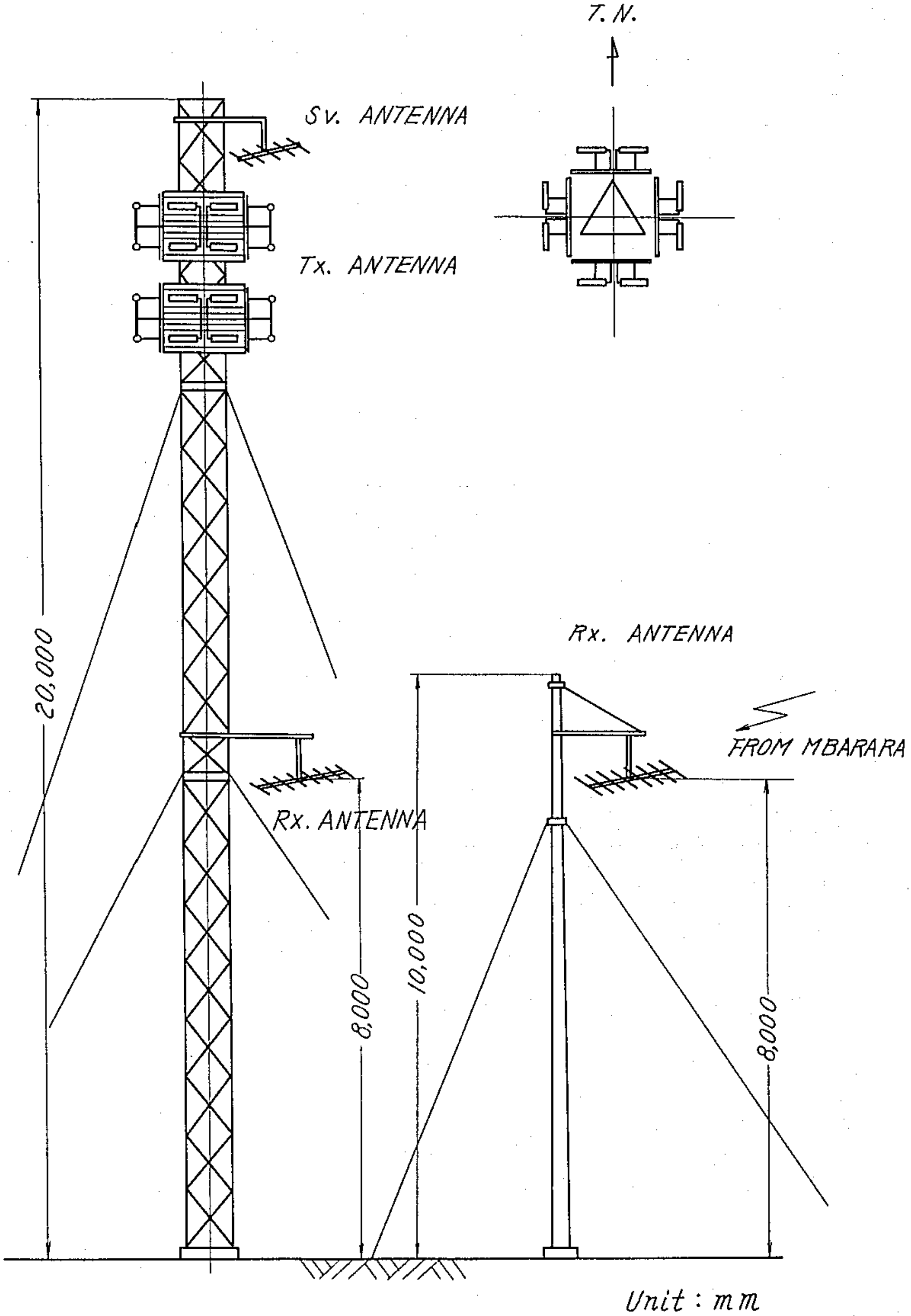


Fig. 6-53 KABALE STATION

Biko Station

Table 6-27 List of Facilities

Item	Description	Q'ty	Remarks
1.	Building	1 set	
2.	Power Line	1 set	
1.	TV Antenna for Relaying	1 set	
2.	100 W (V-U) Translator	1 set	including spare parts
3.	Receiving Antenna	1 set	
4.	Tower	1 set	
5.	Power Supply Equipment	1 set	
6.	Supervisory Equipment	1 set	
7.	Accessories	1 set	

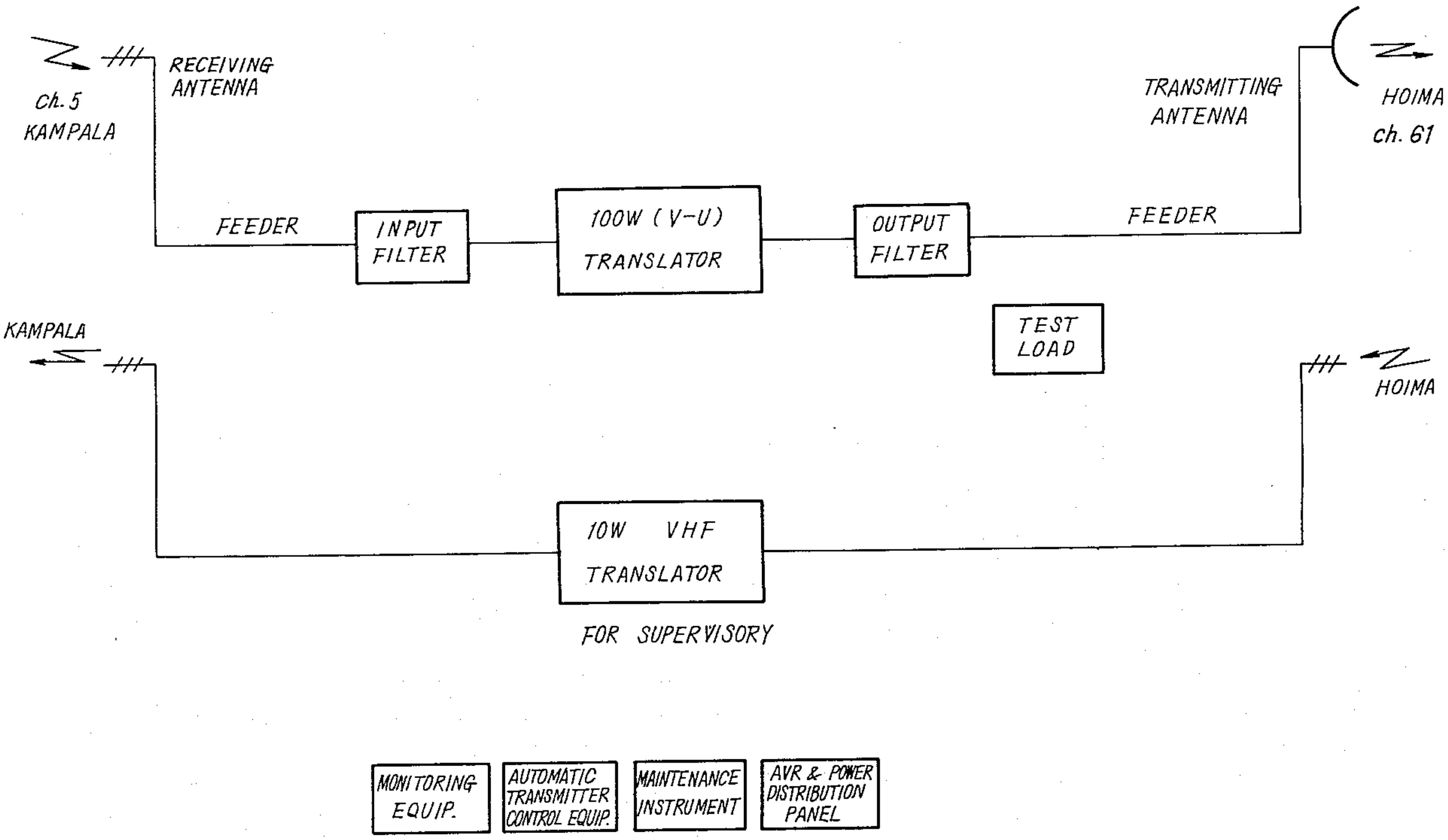


Fig. 6-54 SCHEMATIC DIAGRAM OF BIKO STATION

Table 6-28 Main Specifications for Biko Station

Name of Station		Biko
Type of Station		Relaying
Site of Station		Refer to Fig. 6-55
Transmitting Frequency		BAND V CH. 61
Transmitter Output Power		100 W (Video Peak)
Transmitting Antenna	Type	3mϕ-GP
	Height of Tower Top	15 m
Mother Station	Name of Station	Kampala
	Frequency	BAND III CH. 5
Receiving Antenna	Type	8Y-1
	Height of Mast Top	(6) m
Power Supply	Type of Power Supply	Lines
	Capacity	7.5 KVA
Supervisory Equipment	Frequency	150 MHz Band
	Output Power	10 W
	Transmitting Antenna	5Y-1
	Receiving Antenna	5Y-1
Note		

Note: Height described in brackets ( ) represents the receiving antenna height to be mounted on the transmitting antenna tower.

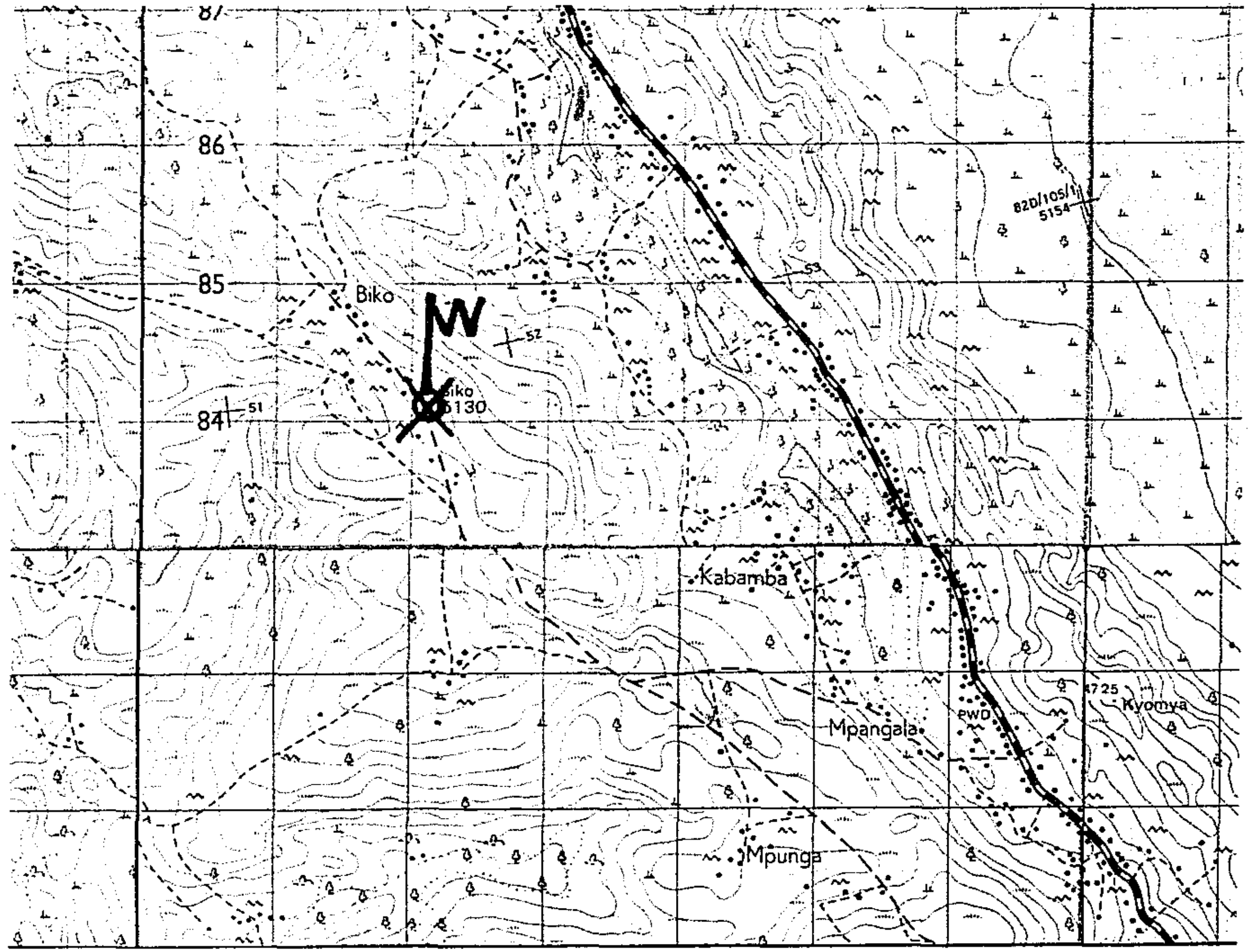


Fig. 6-55 Location of Biko Station

N E	00°45'38" 31°56'26"
Altitude	1,560 m
Map No.	59-2 59-4

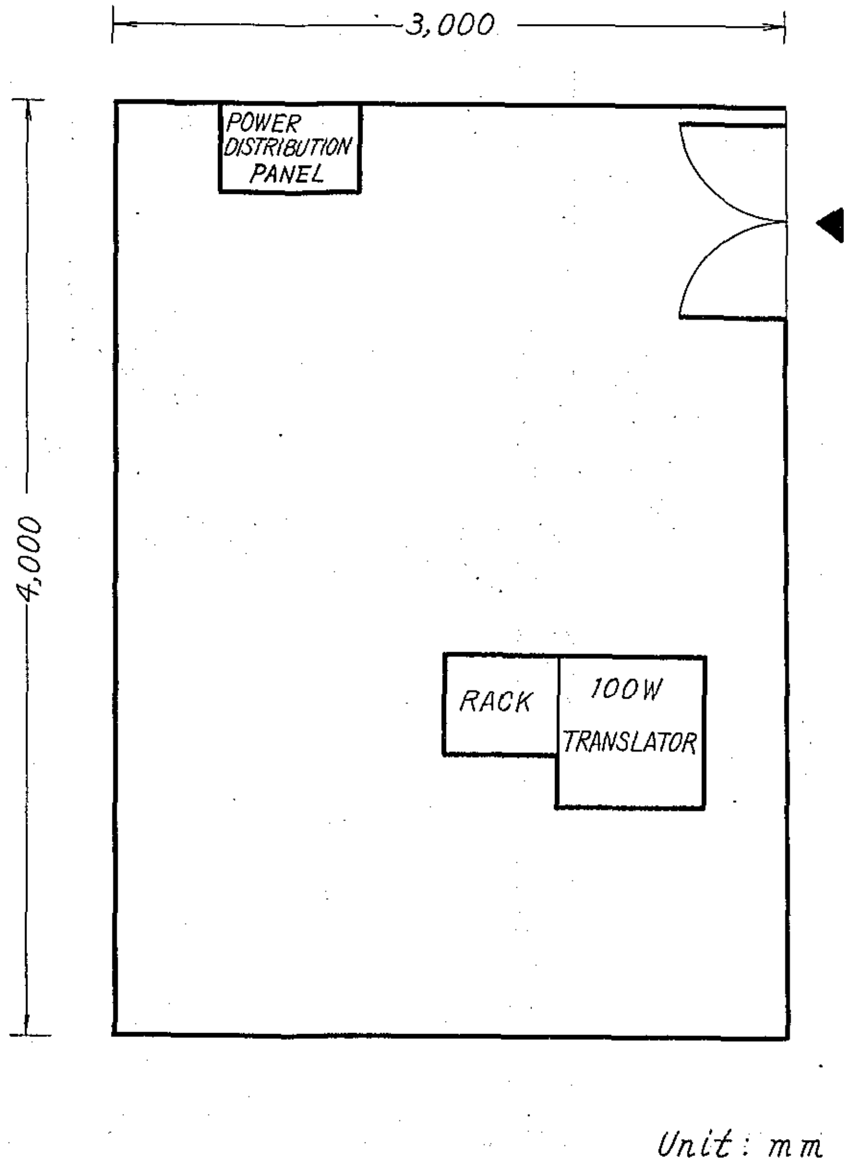
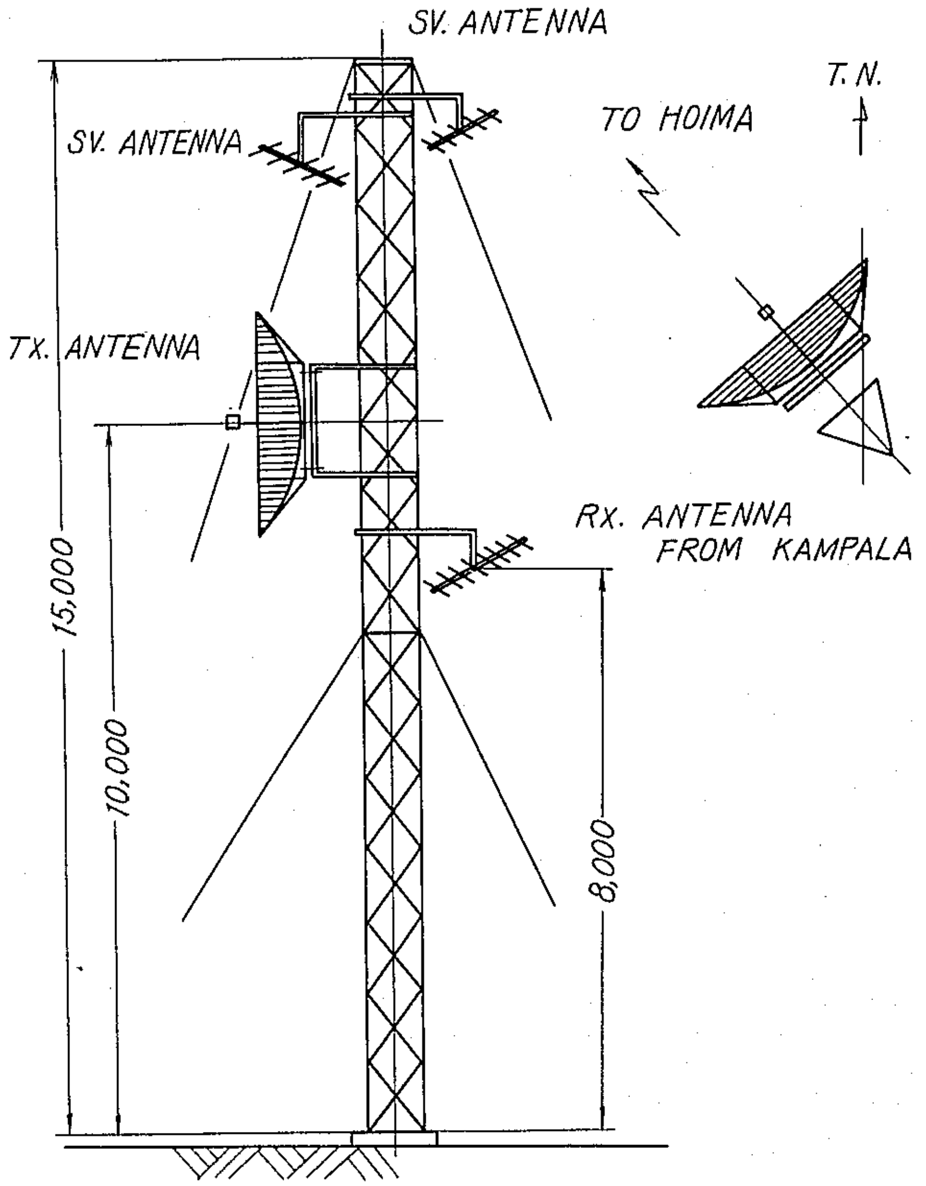


Fig. 6-56 TYPICAL FLOOR LAYOUT FOR BIKO STATION



Unit: mm

Fig. 6-57 BIKO STATION

Hoima Station

Table 6-29 List of Facilities

Item	Description	Q'ty	Remarks
1.	Building	1 set	
2.	Power Line	1 set	
1.	TV Antenna	1 set	
2.	500 W (U-V) Translator	1 set	including spare parts
3.	Receiving Antenna	1 set	
4.	Tower	1 set	
5.	Power Supply Equipment	1 set	
6.	Supervisory Equipment	1 set	
7.	Measuring Instrument	1 set	
8.	Accessories & Walky Talky	1 set	

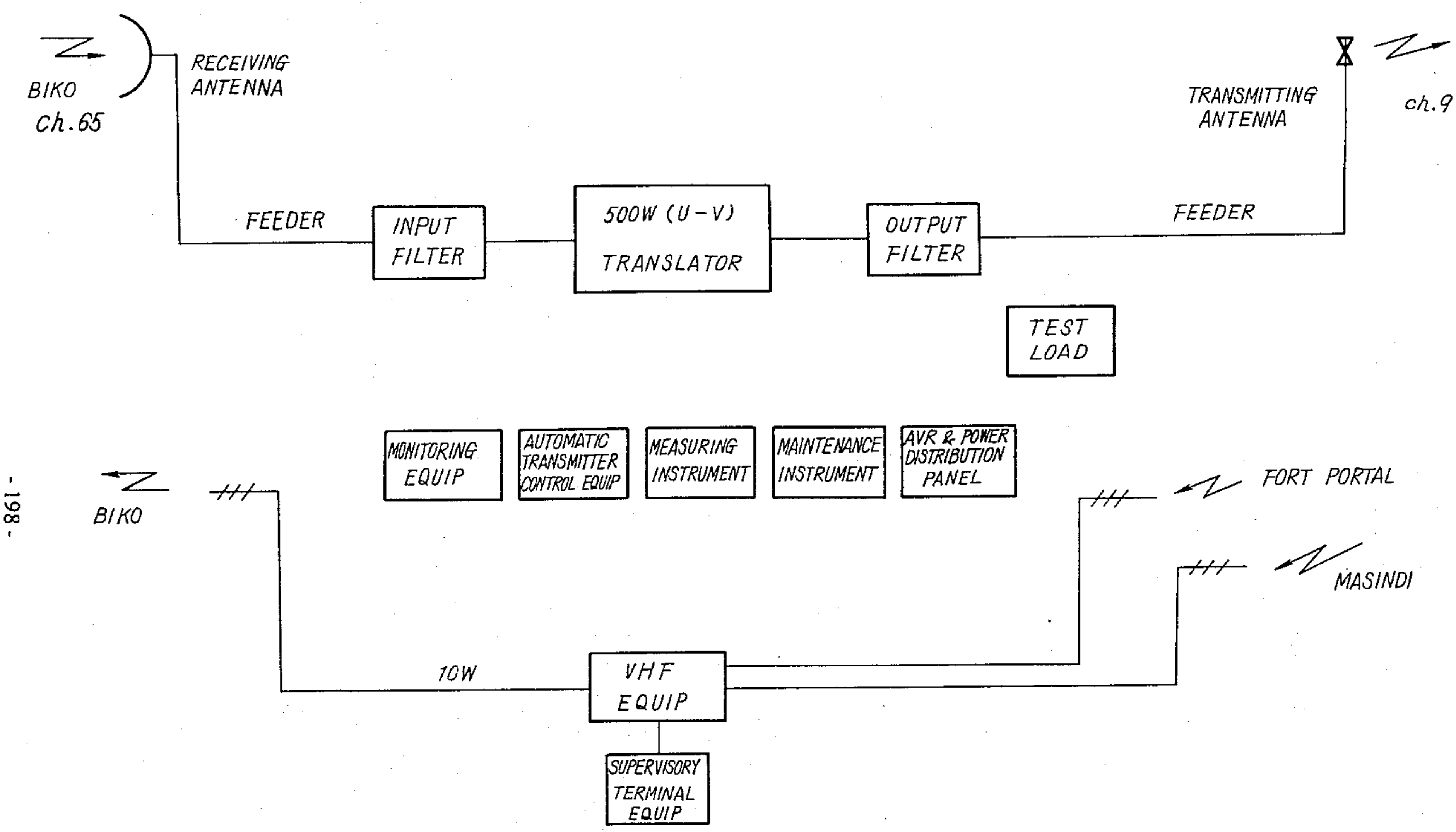


Fig. 6-58 SCHEMATIC DIAGRAM OF HOIMA STATION

Table 6-30 Main Specifications for Hoima Station

Name of Station		Hoima
Type of Station		Broadcasting (Translator)
Site of Station		Refer to Fig. 6-59
Transmitting Frequency		BAND III CH. 9
Transmitter Output Power		500 W (Video Peak)
Transmitting Antenna	Type	2·2D·4
	Height of Tower Top	30 m
Mother Station	Name of Station	Biko
	Frequency	BAND V CH. 61
Receiving Antenna	Type	3mϕ·GP
	Height of Mast Top	(10) m
Power Supply	Type of Power Supply	Lines
	Capacity	20 KVA
Supervisory Equipment	Frequency	150 MHz Band
	Output Power	10 W
	Transmitting Antenna	5Y·1
	Receiving Antenna	3Y·1
Note		

Note: Height described in brackets ( ) represents the receiving antenna height to be mounted on the transmitting antenna tower.

N E	01°25'37" 31°24'28"
Altitude	1,420 m
Map No.	48-2

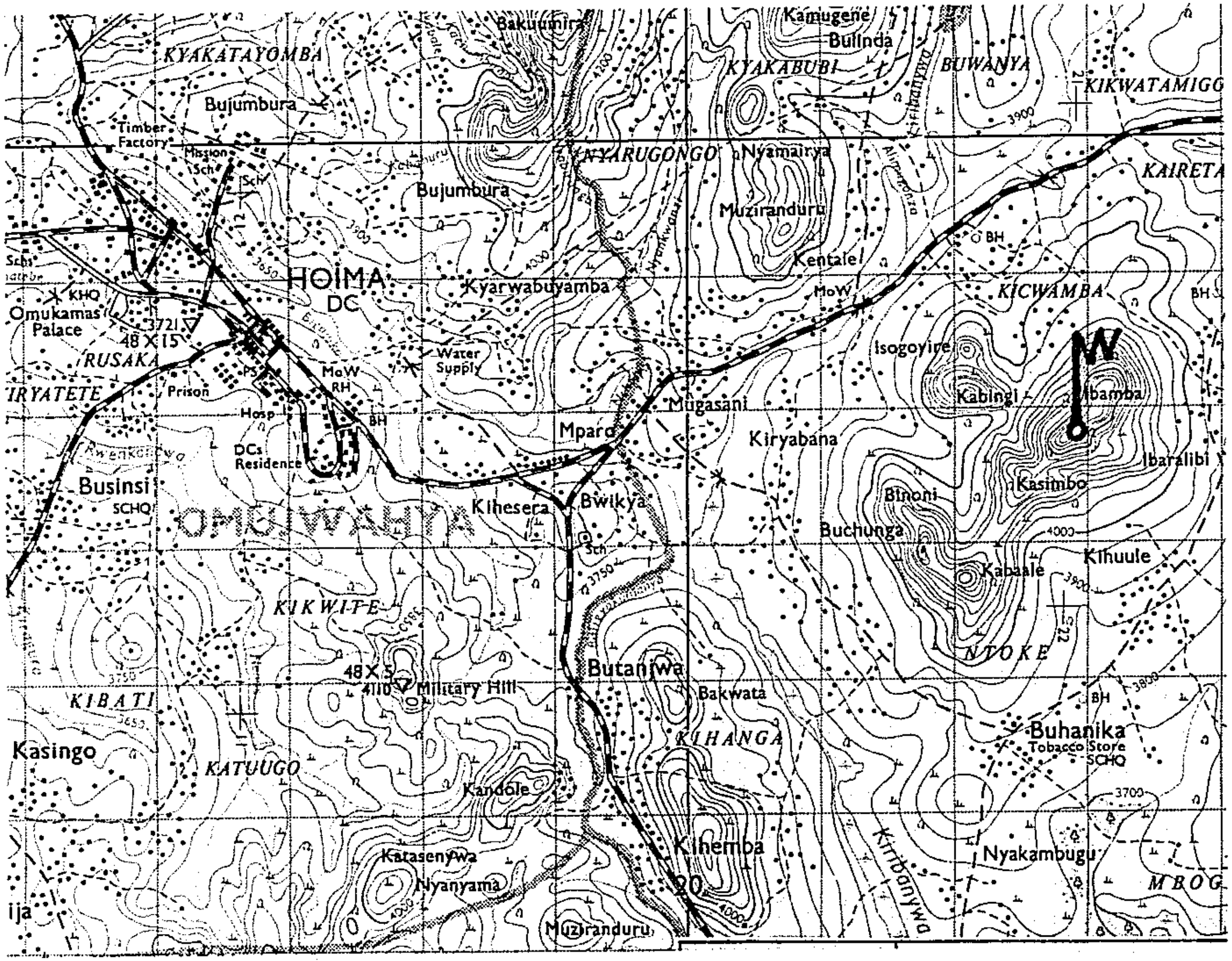
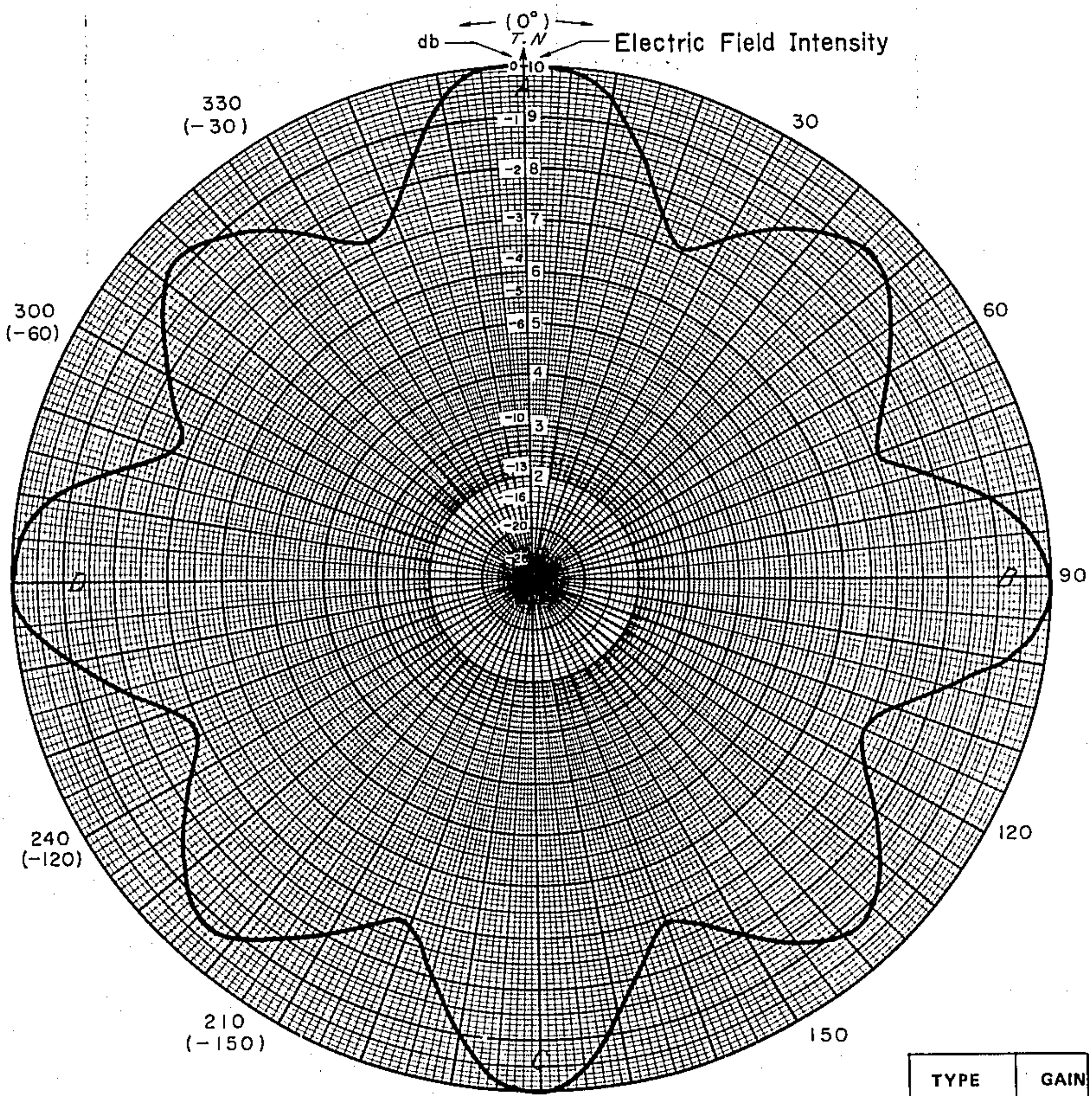


Fig. 6-59 Location of Hoima Station



TYPE	GAIN
A,B,C,D: 2·2D	4.8 dB

Fig. 6-60 HORIZONTAL PATTERN OF HOIMA STATION

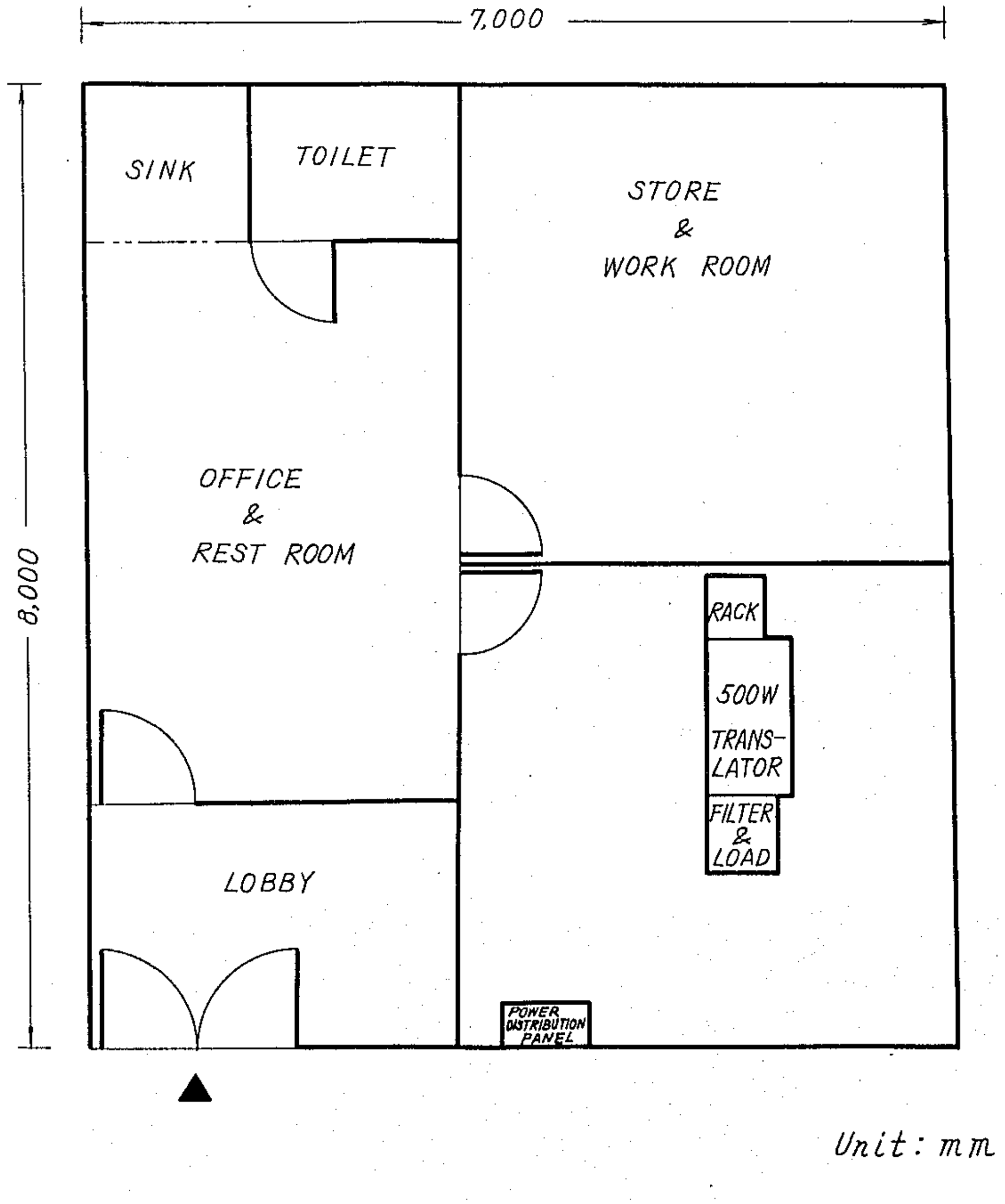


Fig. 6-61 TYPICAL FLOOR LAYOUT FOR HOIMA STATION

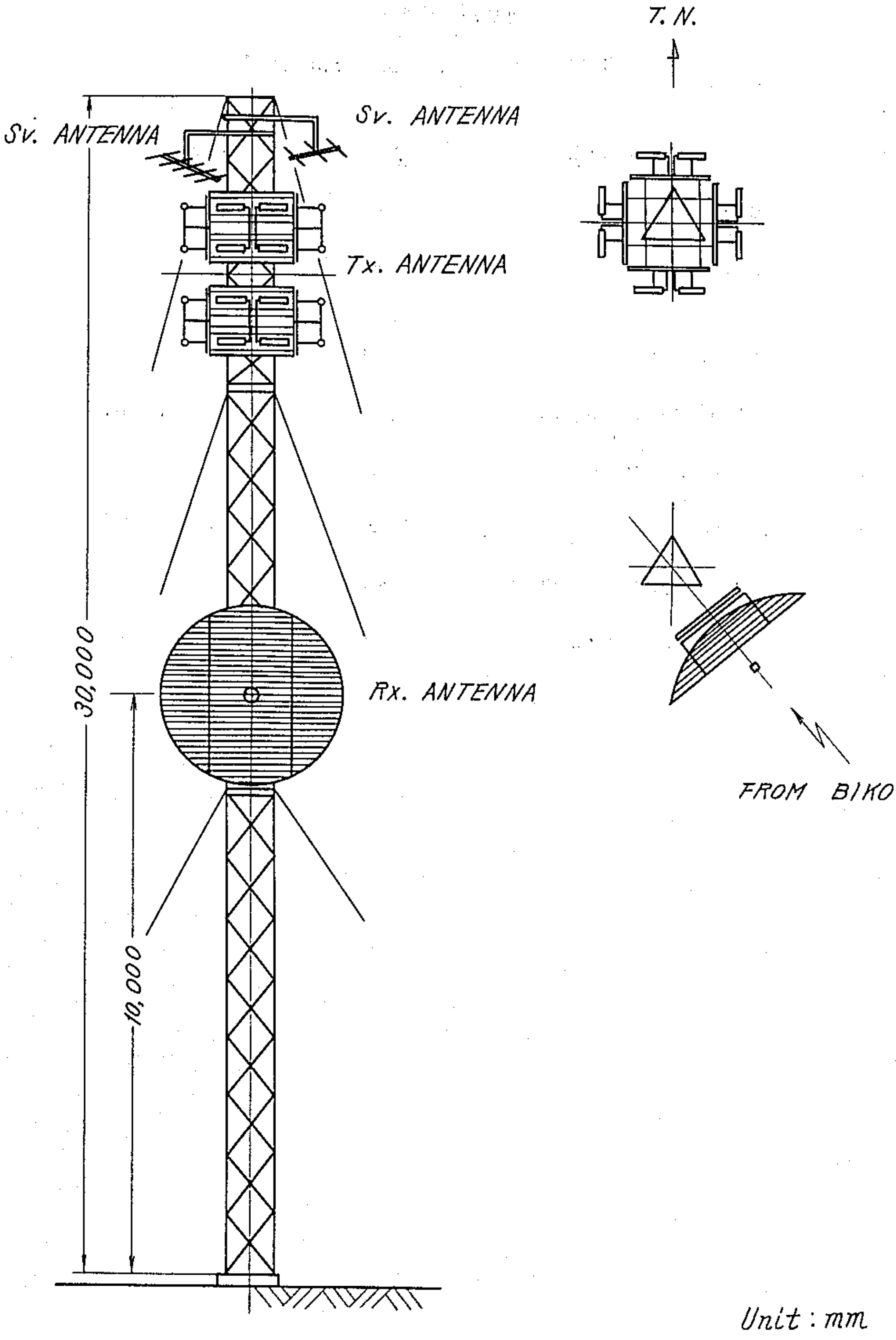


Fig. 6-62 HOIMA STATION

Masindi Station

Table 6-31 List of Facilities

Item	Description	Q'ty	Remarks
1.	Building	1 set	
2.	Power Line	1 set	
1.	TV Antenna	1 set	
2.	500 W (V-V) Translator	1 set	including spare parts
3.	Receiving Antenna	1 set	
4.	Tower	1 set	
5.	Power Supply Equipment	1 set	
6.	Supervisory Equipment	1 set	
7.	Accessories	1 set	

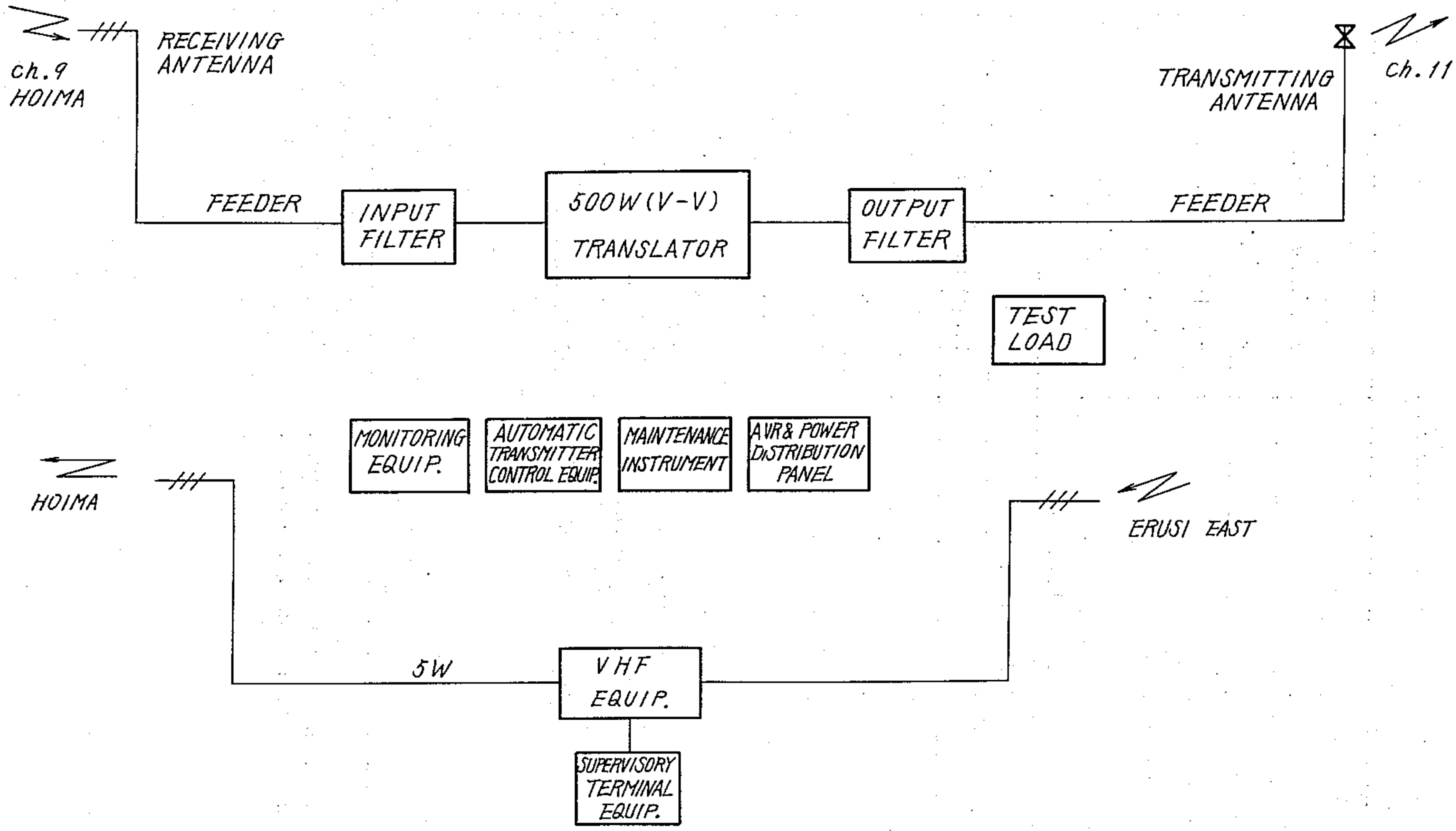


Fig. 6-63 SCHEMATIC DIAGRAM OF MASINDI STATION

Table 6-32 Main Specifications for Masindi Station

Name of Station		Masindi
Type of Station		Broadcasting (Translator)
Site of Station		Refer to Fig: 6-64
Transmitting Frequency		BAND III CH. 11
Transmitter Output Power		500 W (Video Peak)
Transmitting Antenna	Type	4·2D·1 and 2·2D·1
	Height of Tower Top	20 m
Mother Station	Name of Station	Hoima
	Frequency	BAND III CH. 9
Receiving Antenna	Type	8Y·1
	Height of Mast Top	(10) m
Power Supply	Type of Power Supply	Lines
	Capacity	15 KVA
Supervisory Equipment	Frequency	150 MHz Band
	Output Power	5 W
	Transmitting Antenna	3Y·1
	Receiving Antenna	3Y·1
Note		

Note: Height described in brackets ( ) represents the receiving antenna height to be mounted on the transmitting antenna tower.

N E	01°41'34" 31°45'00"
Altitude	1,375 m
Map No.	39-4 39-3

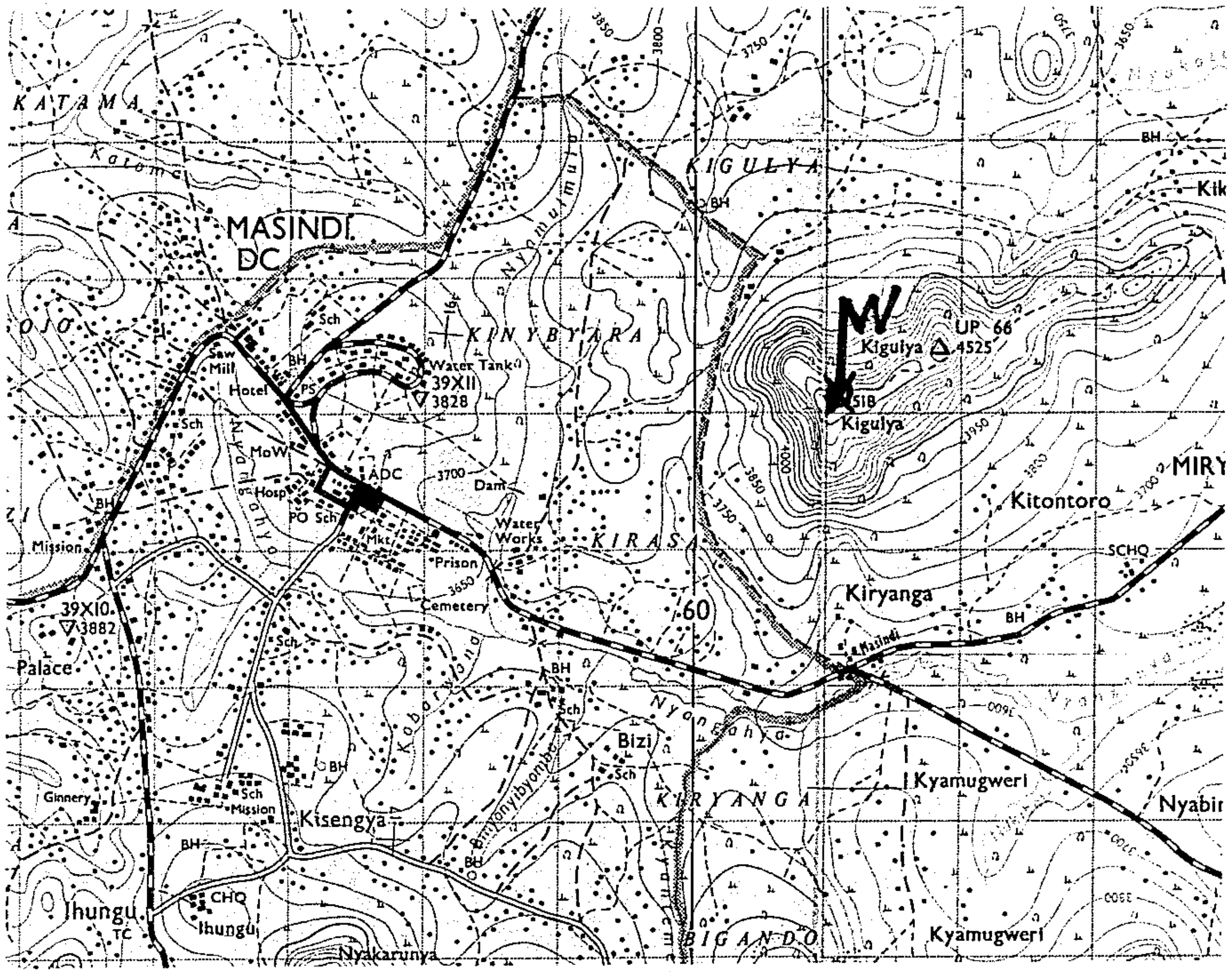
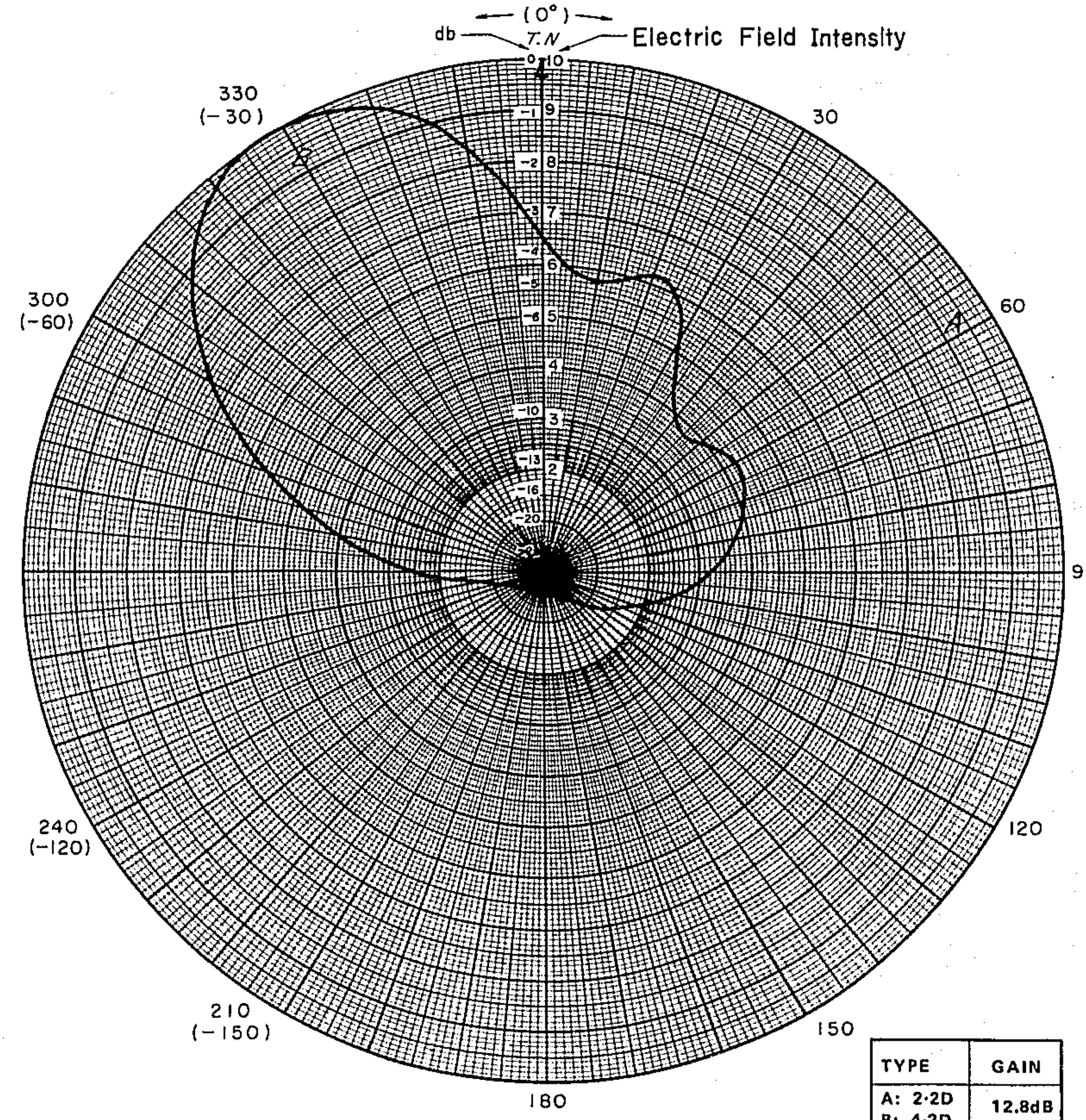
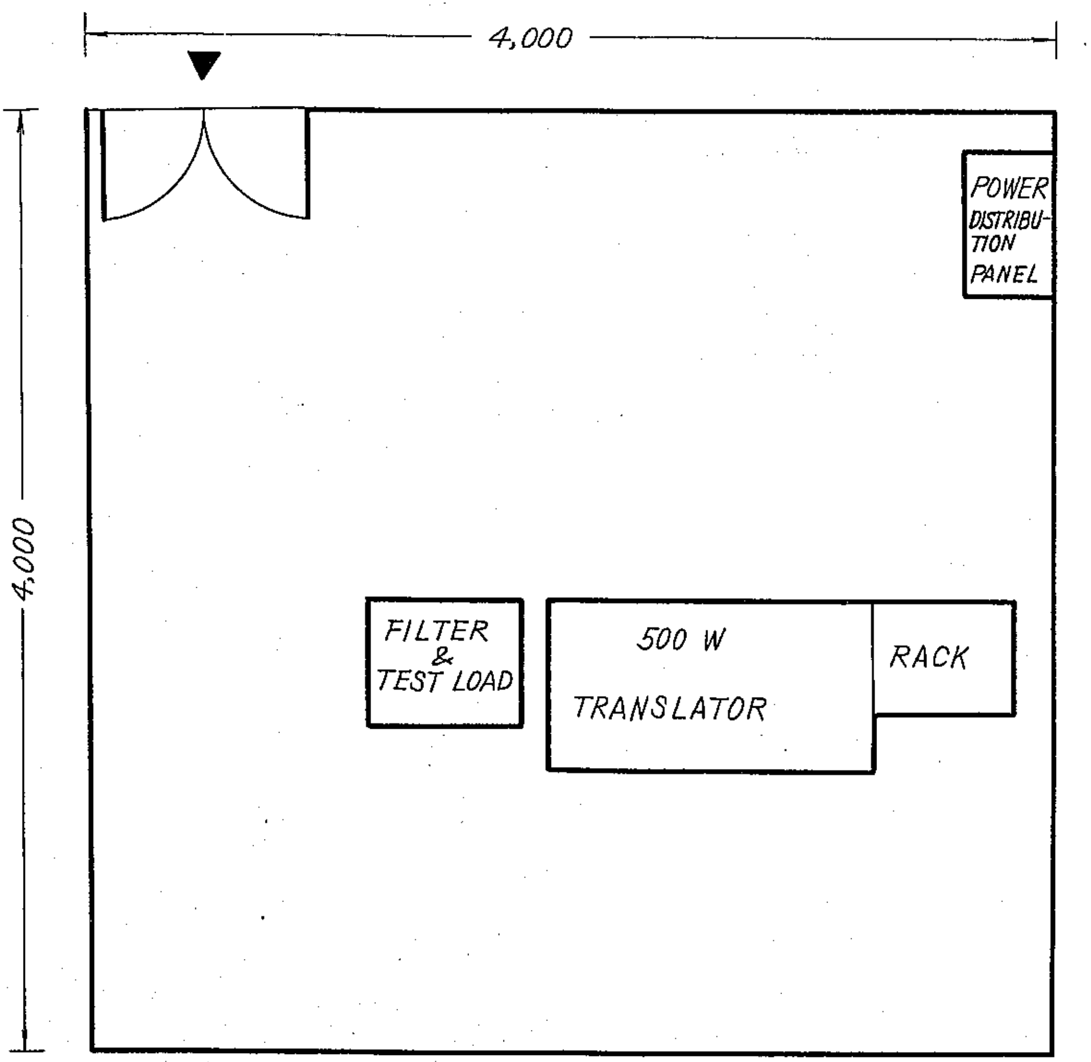


Fig. 6-64 Location of Masindi Station



TYPE	GAIN
A: 2·2D B: 4·2D	12.8dB

Fig. 6-65 HORIZONTAL PATTERN OF MASINDI STATION



Unit: mm

Fig. 6-66 TYPICAL FLOOR LAYOUT FOR MASINDI STATION

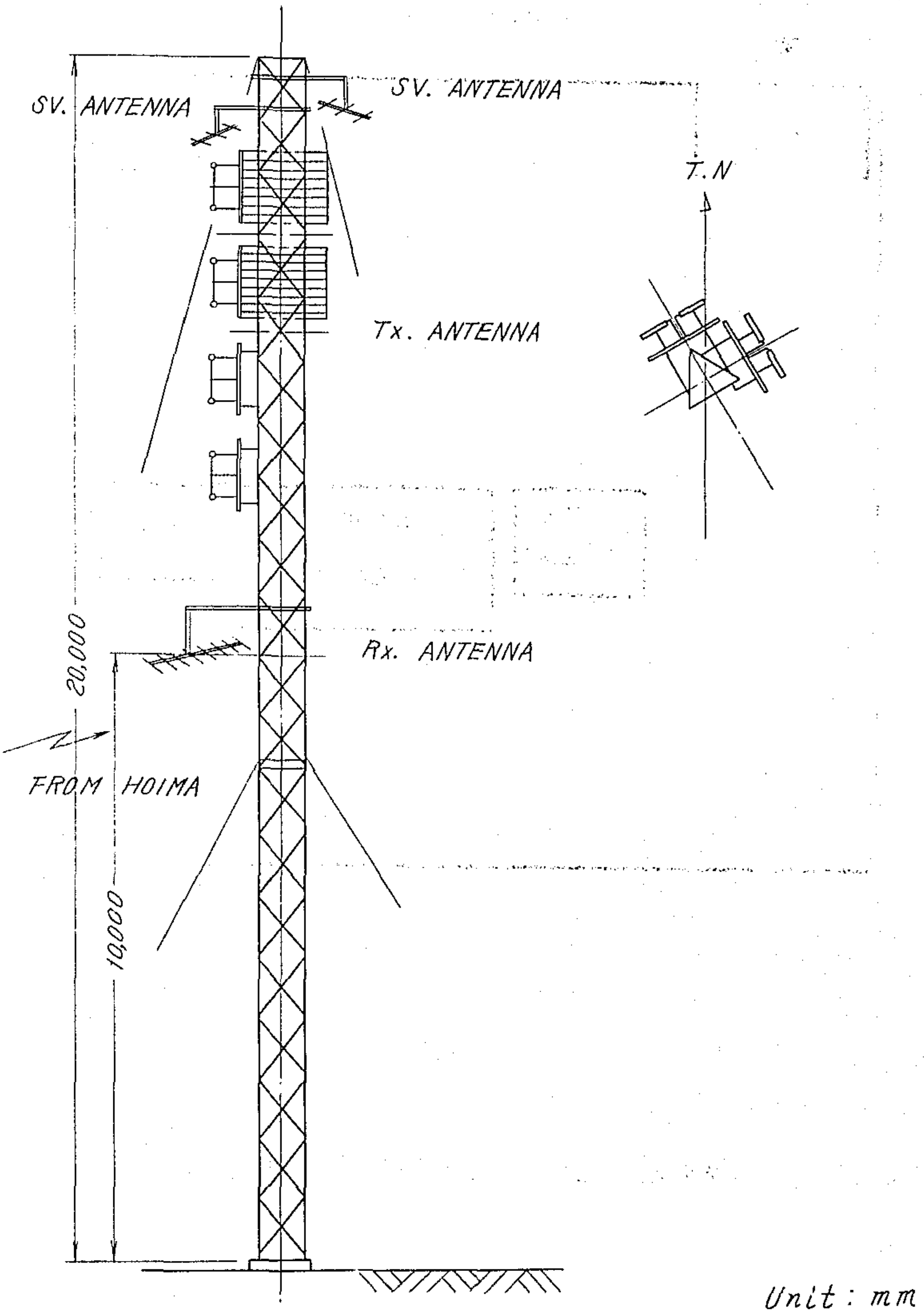


Fig. 6-67 MASINDI STATION

Kabuga Station

Table 6-33 List of Facilities

Item	Description	Q'ty	Remarks
1.	Building	1 set	
2.	——	——	
1.	TV Antenna for Relaying	1 set	
2.	100 W (U-U) Translator	1 set	including spare parts
3.	Receiving Antenna	1 set	
4.	Tower	1 set	
5.	Power Supply Equipment	1 set	Engine Generators
6.	Supervisory Equipment	1 set	
7.	Accessories	1 set	

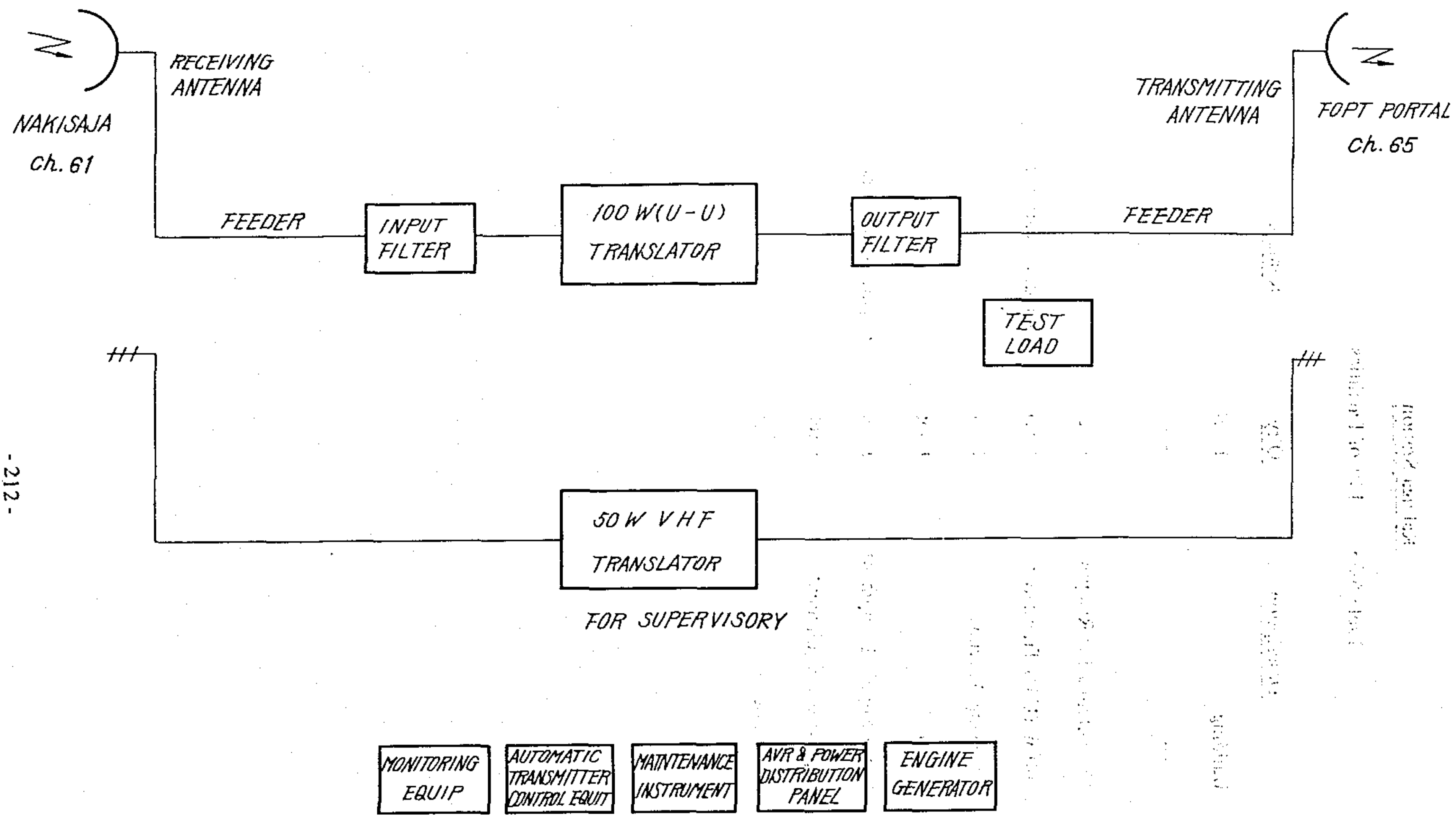
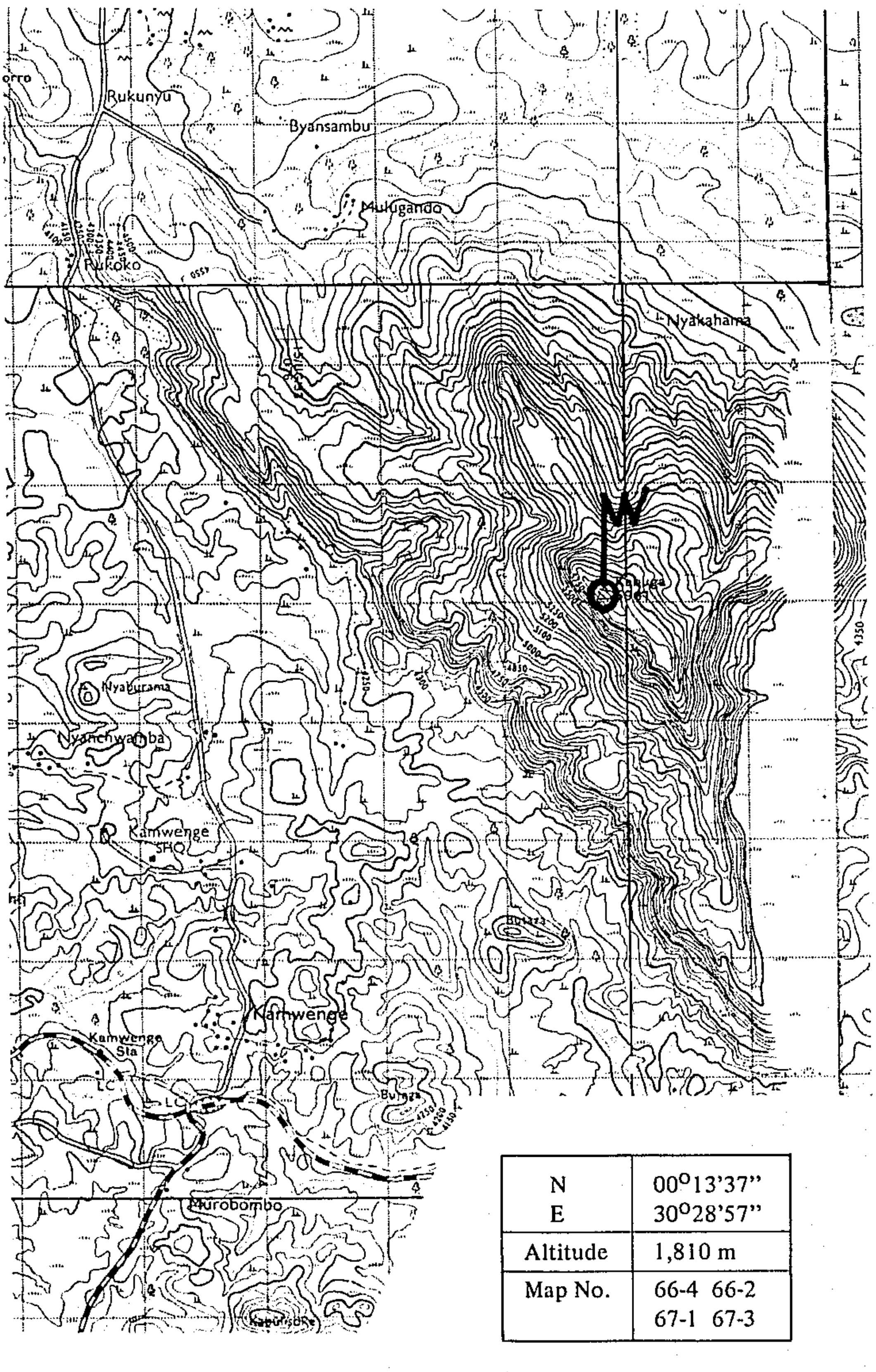


Fig. 6-68 SCHEMATIC DIAGRAM OF KABUGA STATION

Table 6-34 Main Specifications for Kabuga Station

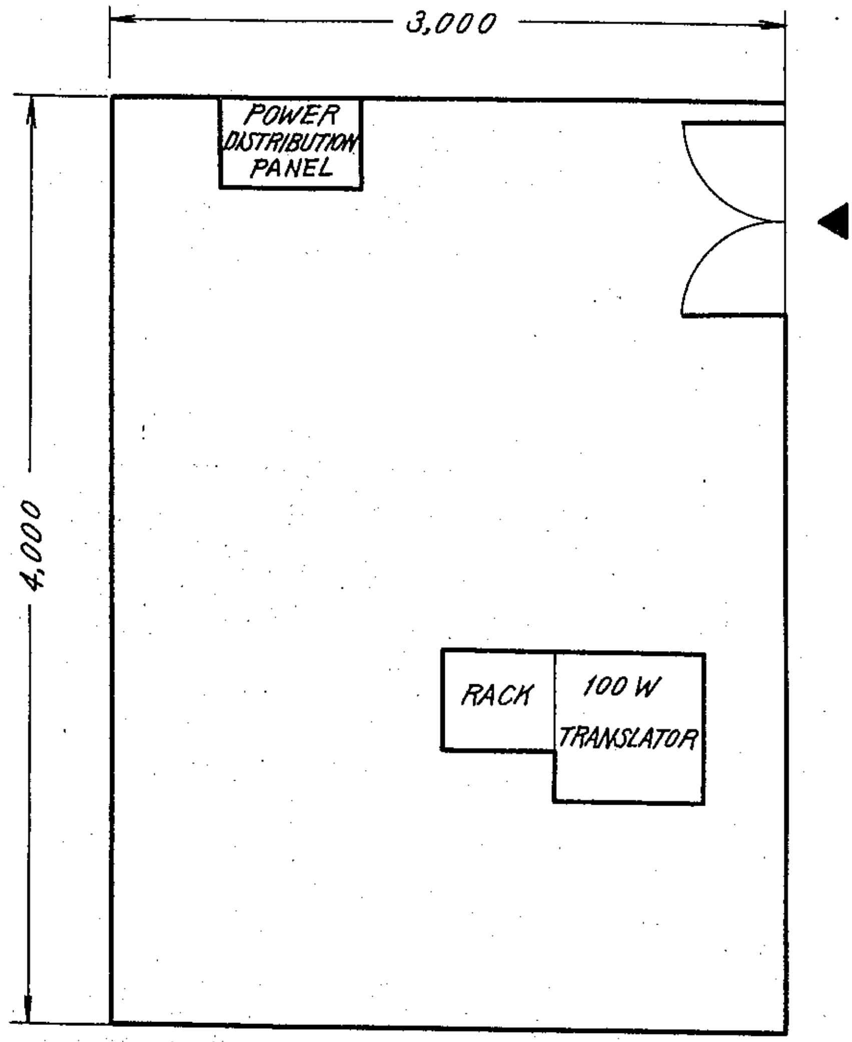
Name of Station		Kabuga
Type of Station		Relaying
Site of Station		Refer to Fig. 6-69
Transmitting Frequency		BAND V CH. 65
Transmitter Output Power		100 W (Video Peak)
Transmitting Antenna	Type	3mϕ-GP
	Height of Tower Top	15 m
Mother Station	Name of Station	Nakisaga
	Frequency	BAND V CH. 61
Receiving Antenna	Type	3mϕ-GP
	Height of Mast Top	(13.5) m
Power Supply	Type of Power Supply	Engine Generators
	Capacity	5 KVA
Supervisory Equipment	Frequency	150 MHz Band
	Output Power	50 W
	Transmitting Antenna	5Y·1
	Receiving Antenna	3Y·1
Note		

Note: Height described in brackets ( ) represents the receiving antenna height to be mounted on the transmitting antenna tower.



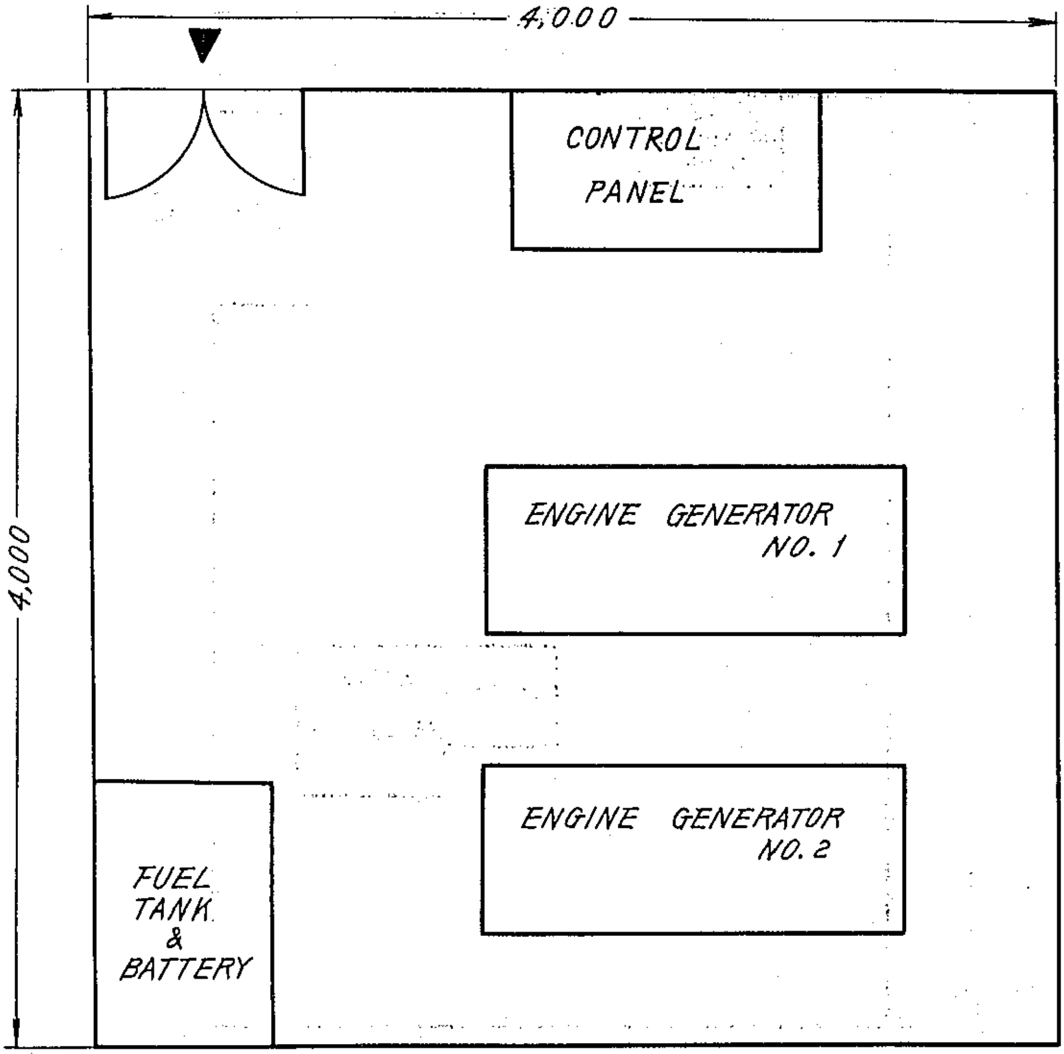
N E	00°13'37" 30°28'57"
Altitude	1,810 m
Map No.	66-4 66-2 67-1 67-3

Fig. 6-69 Location of Kabuga Station



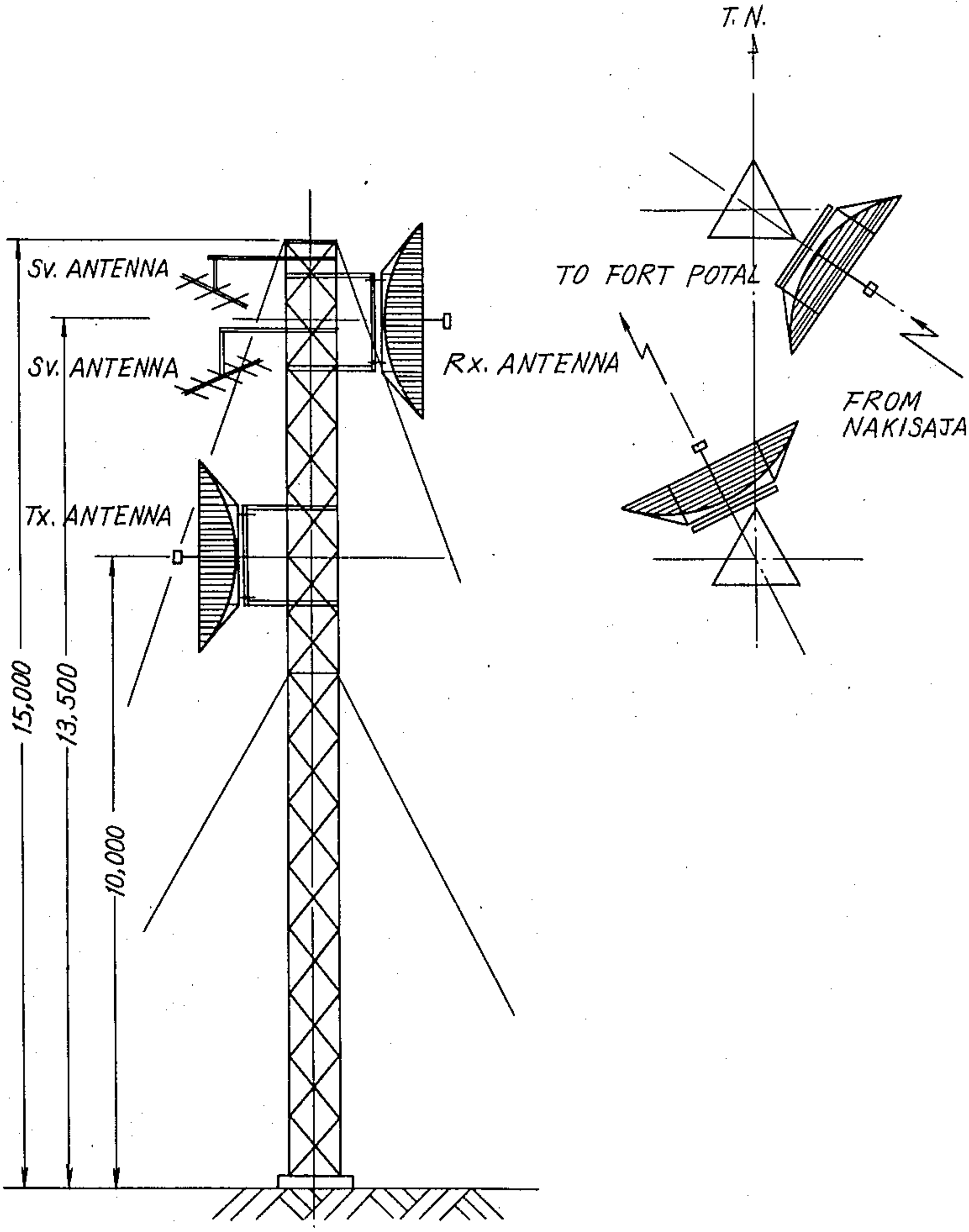
Unit : mm

Fig. 6-70 TYPICAL FLOOR LAYOUT FOR KABUGA STATION



Unit : mm

Fig. 6-71 TYPICAL FLOOR LAYOUT OF ENGINE GENERATOR



Unit: mm

Fig. 6-72 KABUGA STATION

Fort Portal Station

Table 6-35 List of Facilities

Item	Description	Q'ty	Remarks
1.	Building	1 set	
2.	Power Line	1 set	
1.	TV Antenna	1 set	
2.	500 W (U-V) Translator	1 set	including spare parts
3.	Receiving Antenna	1 set	
4.	Tower	1 set	
5.	Power Supply Equipment	1 set	
6.	Supervisory Equipment	1 set	
7.	Accessories	1 set	

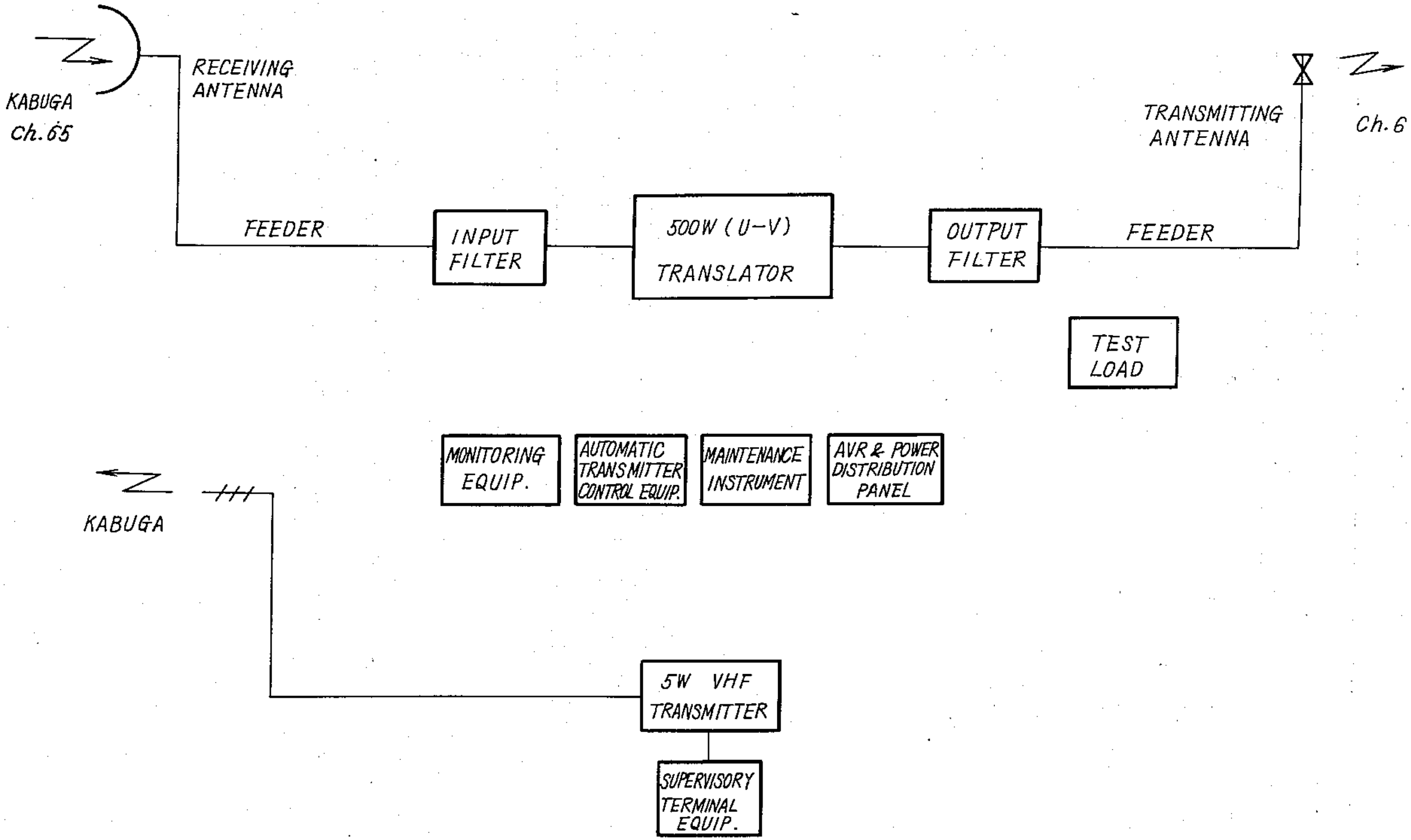
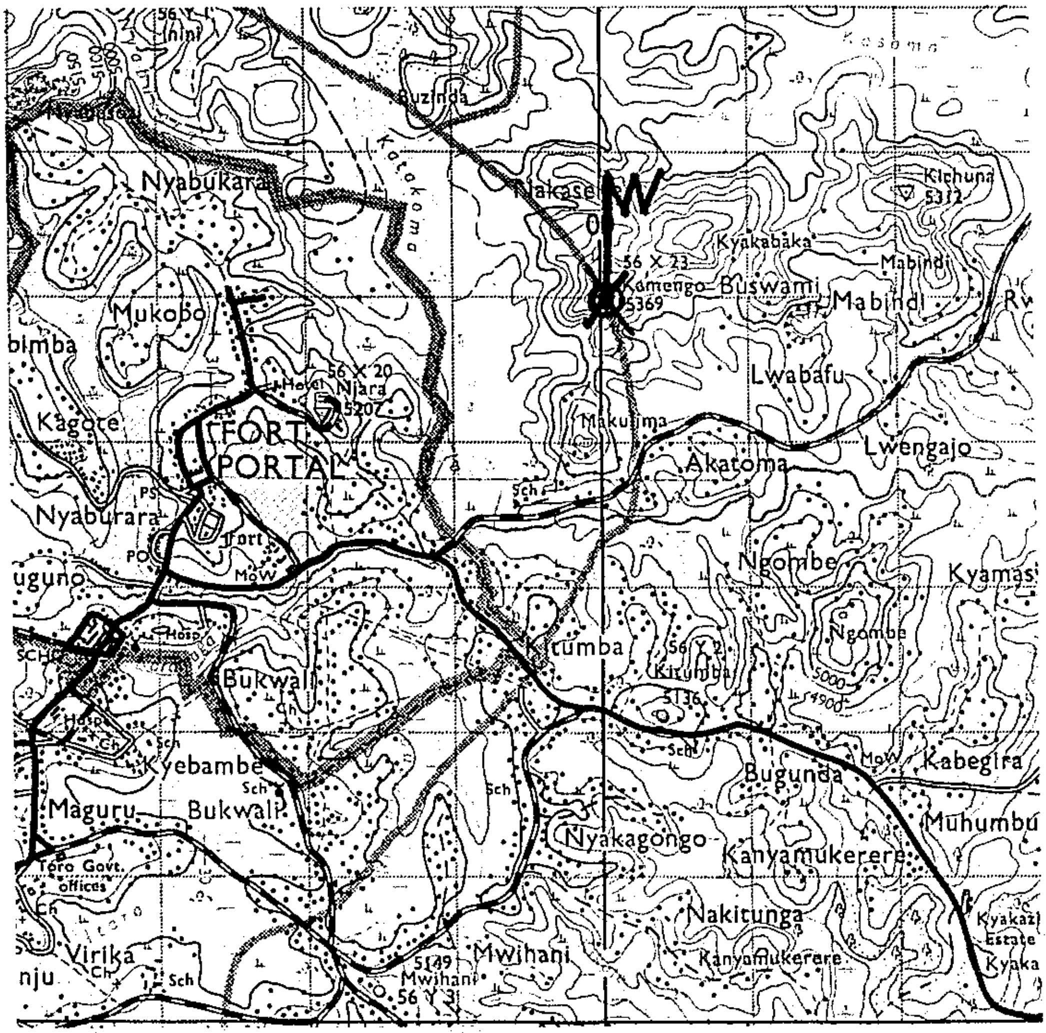


Fig. 6-73 SCHEMATIC DIAGRAM OF FORT PORTAL STATION

Table 6-36 Main Specifications for Fort Portal Station

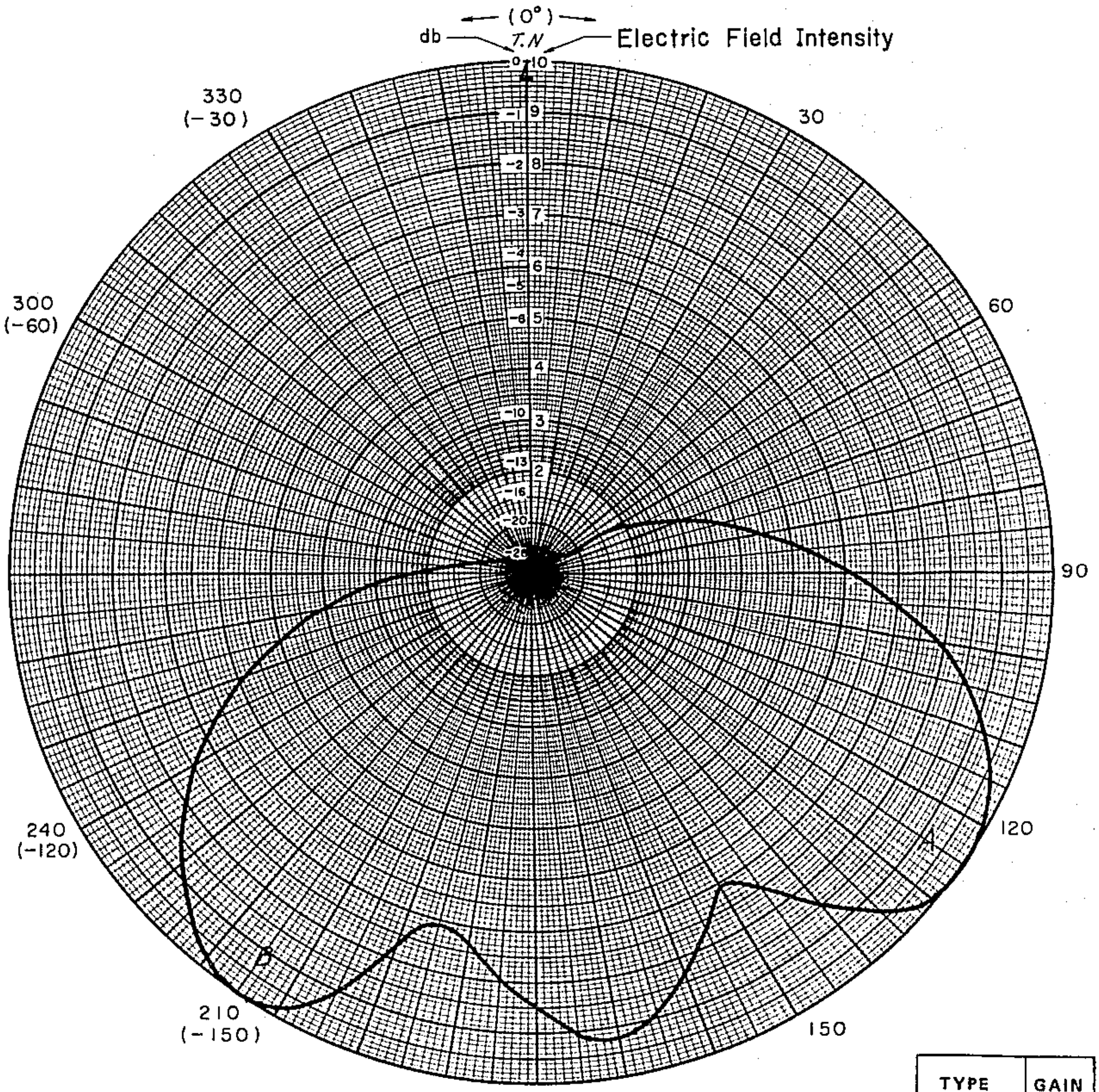
Name of Station		Fort Portal
Type of Station		Broadcasting (Translator)
Site of Station		Refer to Fig. 6-74
Transmitting Frequency		BAND III CH. 6
Transmitter Output Power		500 W (Video Peak)
Transmitting Antenna	Type	3·2D·2
	Height of Tower Top	30 m
Mother Station	Name of Station	Kabuga
	Frequency	BAND V CH. 65
Receiving Antenna	Type	2.4mϕ·GP
	Height of Mast Top	(10) m
Power Supply	Type of Power Supply	Lines
	Capacity	15 KVA
Supervisory Equipment	Frequency	150 MHz Band
	Output Power	5 W
	Transmitting Antenna	3Y·1
	Receiving Antenna	
Note		

Note: Height described in brackets ( ) represents the receiving antenna height to be mounted on the transmitting antenna tower.



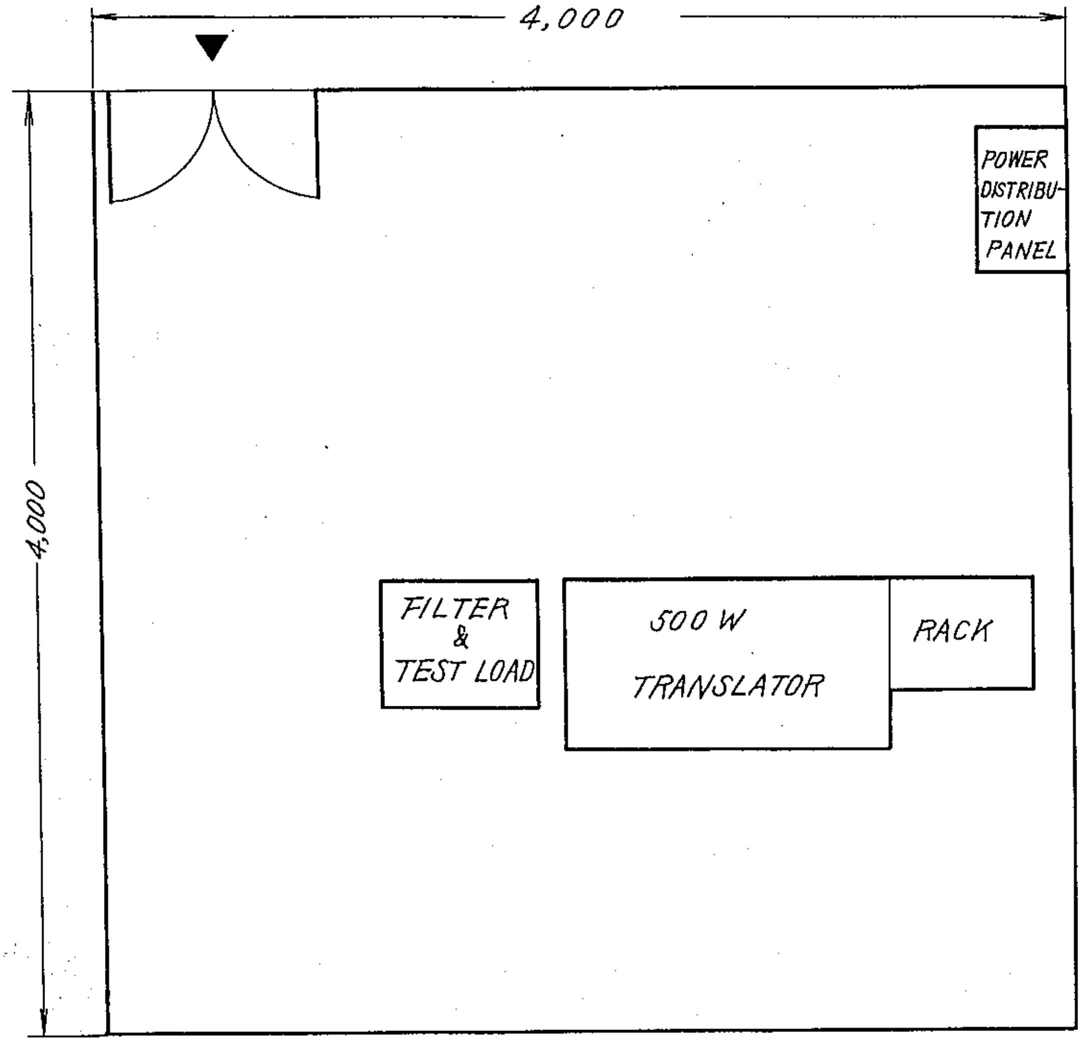
N E	00°40'41" 30°18'19"
Altitude	1,630 m
Map No.	56-4 56-3

Fig. 6-74 Location of Fort Portal Station



TYPE	GAIN
A, B: 3-2D	7.8 dB

Fig. 6-75 HORIZONTAL PATTERN OF FORT PORTAL STATION



Unit : mm

Fig. 6-76 TYPICAL FLOOR LAYOUT FOR FORT PORTAL STATION

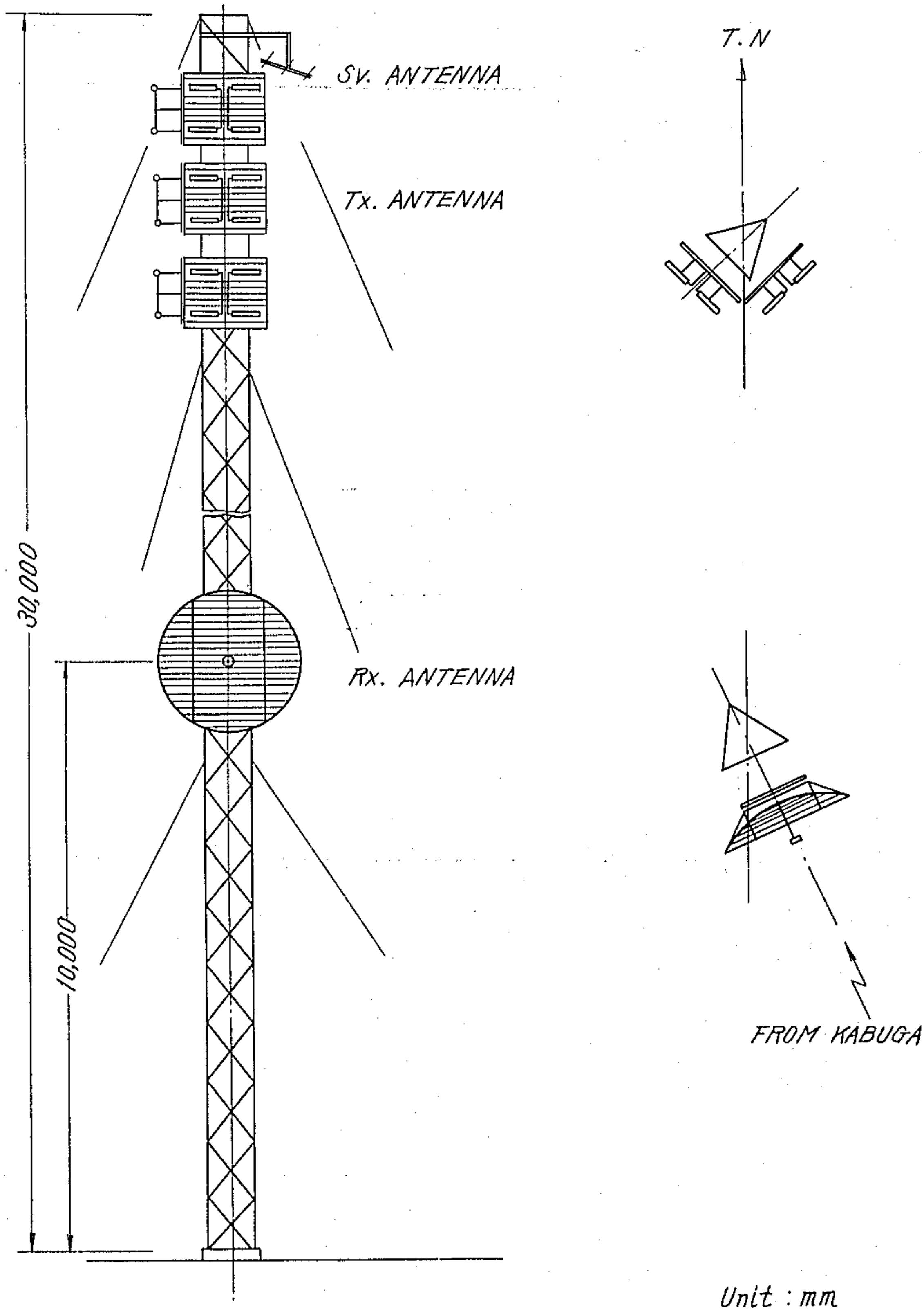


Fig. 6-77 FORT PORTAL STATION

Kasese Station

Table 6-37 List of Facilities

Item	Description	Q'ty	Remarks
1.	Building	1 set	
2.	Power Line	1 set	
1.	TV Antenna	1 set	
2.	3W (V-V) Translator	1 set	including spare parts
3.	Receiving Antenna	1 set	
4.	Tower	1 set	
5.	Power Supply Equipment	1 set	
6.	Accessories	1 set	

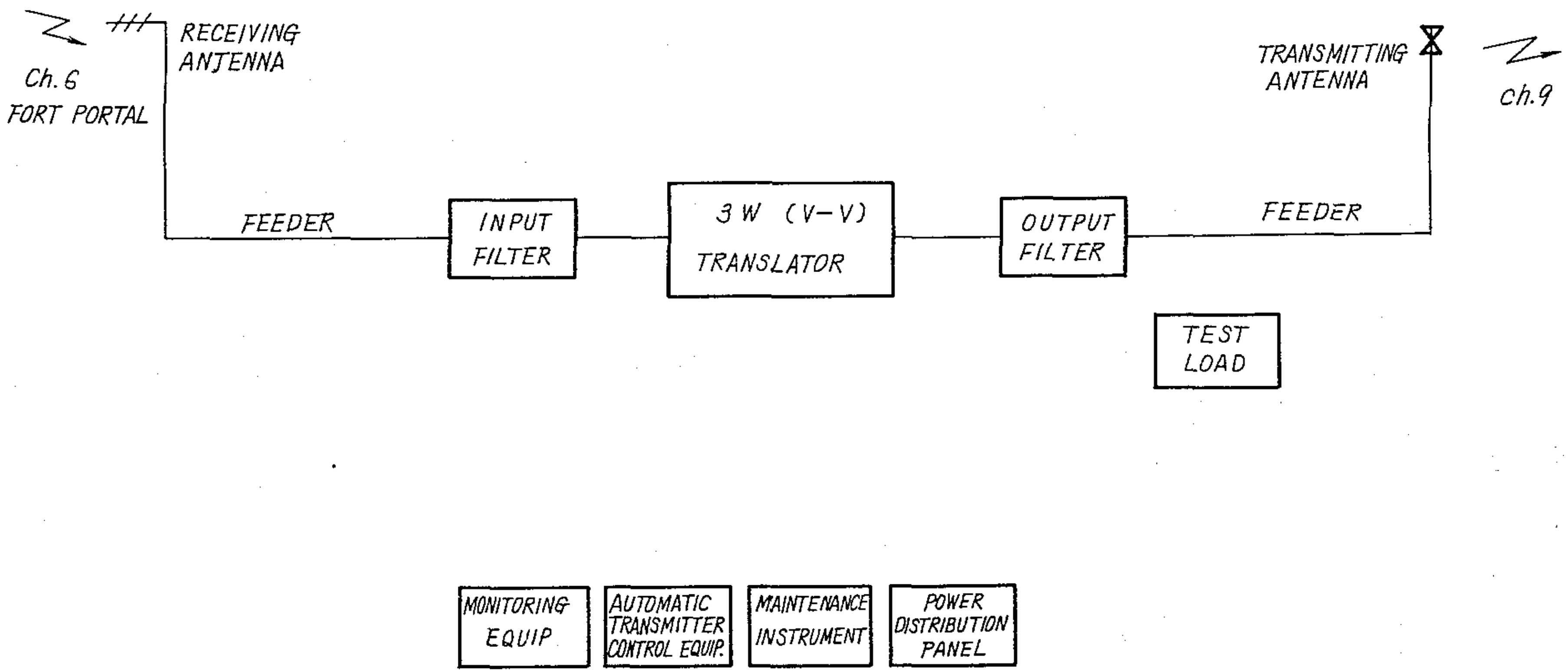


Fig 6−78 SCHEMATIC DIAGRAM OF KASESE STATION

Table 6-38 Main Specifications for Kasese Station

Name of Station		Kasese
Type of Station		Broadcasting (Translator)
Site of Station		Refer to Fig. 6-79
Transmitting Frequency		BAND III CH. 9
Transmitter Output Power		3 W (Video Peak)
Transmitting Antenna	Type	5Y·2
	Height of Tower Top	10 m
Mother Station	Name of Station	Fort Portal
	Frequency	BAND III CH. 6
Receiving Antenna	Type	8Y·1
	Height of Mast Top	(6) m
Power Supply	Type of Power Supply	Lines
	Capacity	2 KVA
Supervisory Equipment	Frequency	
	Output Power	
	Transmitting Antenna	
	Receiving Antenna	
Note		

Note: Height described in brackets ( ) represents the receiving antenna height to be mounted on the transmitting antenna tower.

N E	00°10'00" 30°01'51"
Altitude	1,740 m
Map No.	66-3

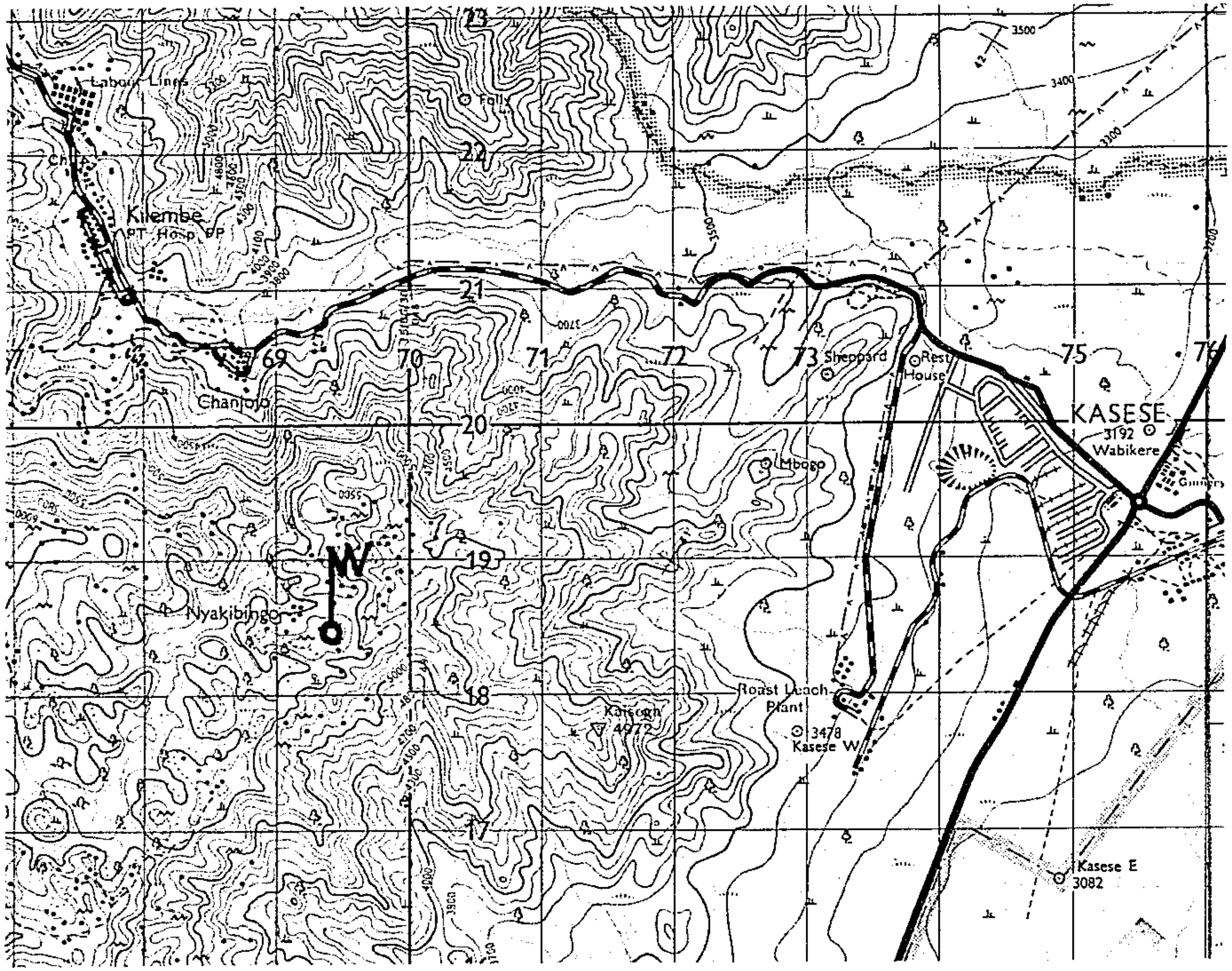
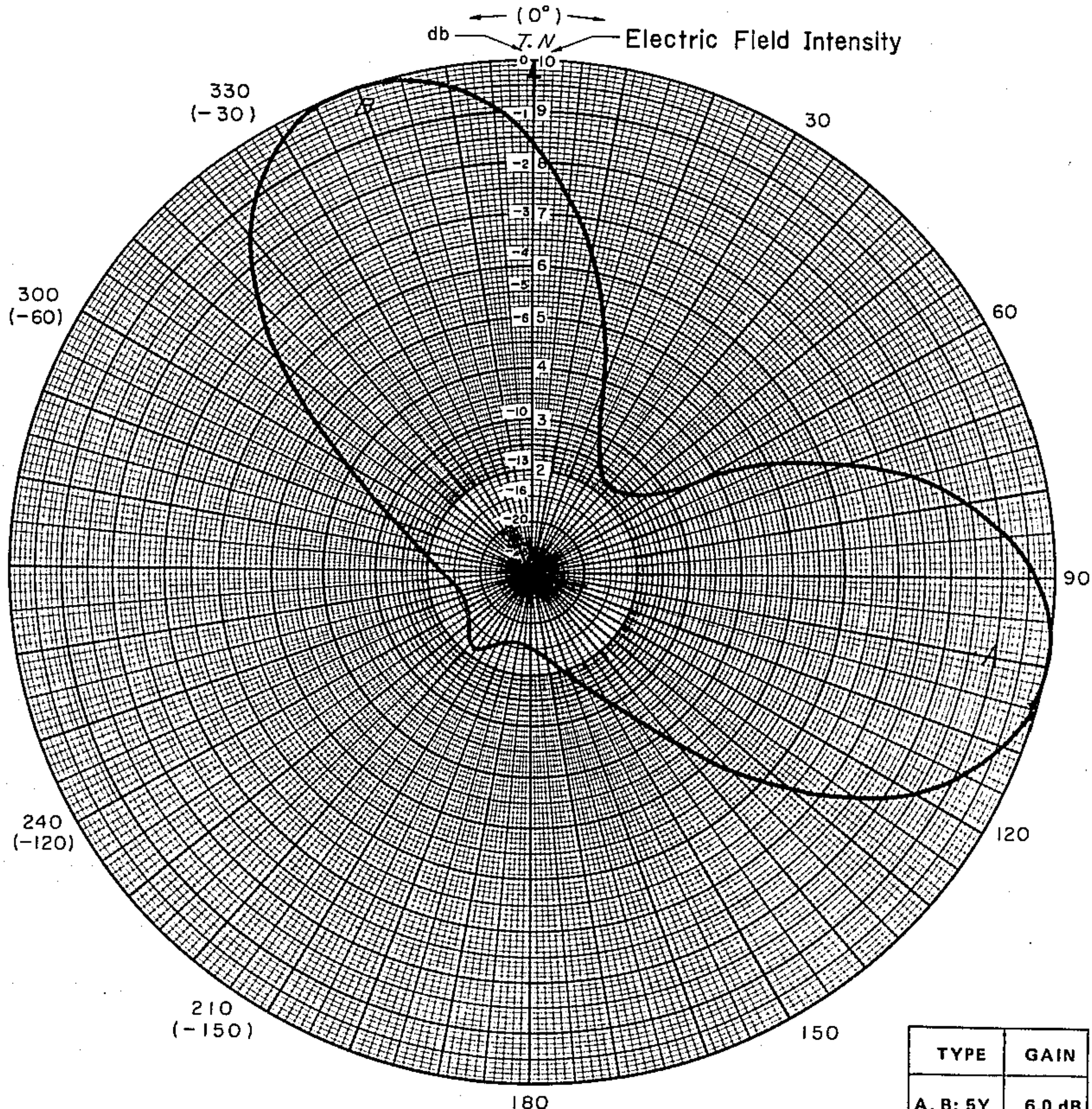


Fig. 6-79 Location of Kasese Station



TYPE	GAIN
A, B: 5Y	6.0 dB

Fig. 6-80 HORIZONTAL PATTERN OF KASESE STATION

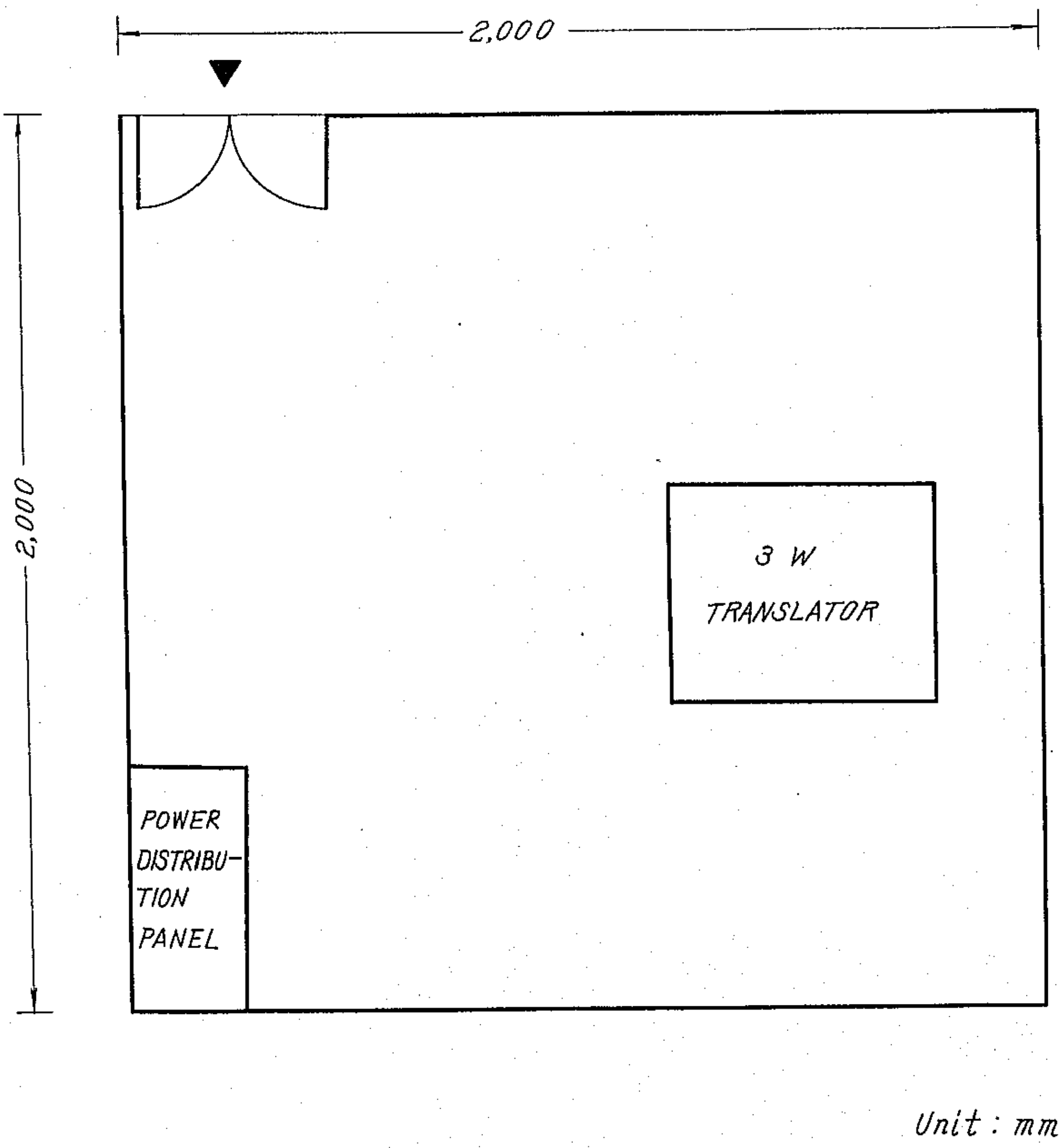


Fig. 6-81 TYPICAL FLOOR LAYOUT FOR KASESE STATION

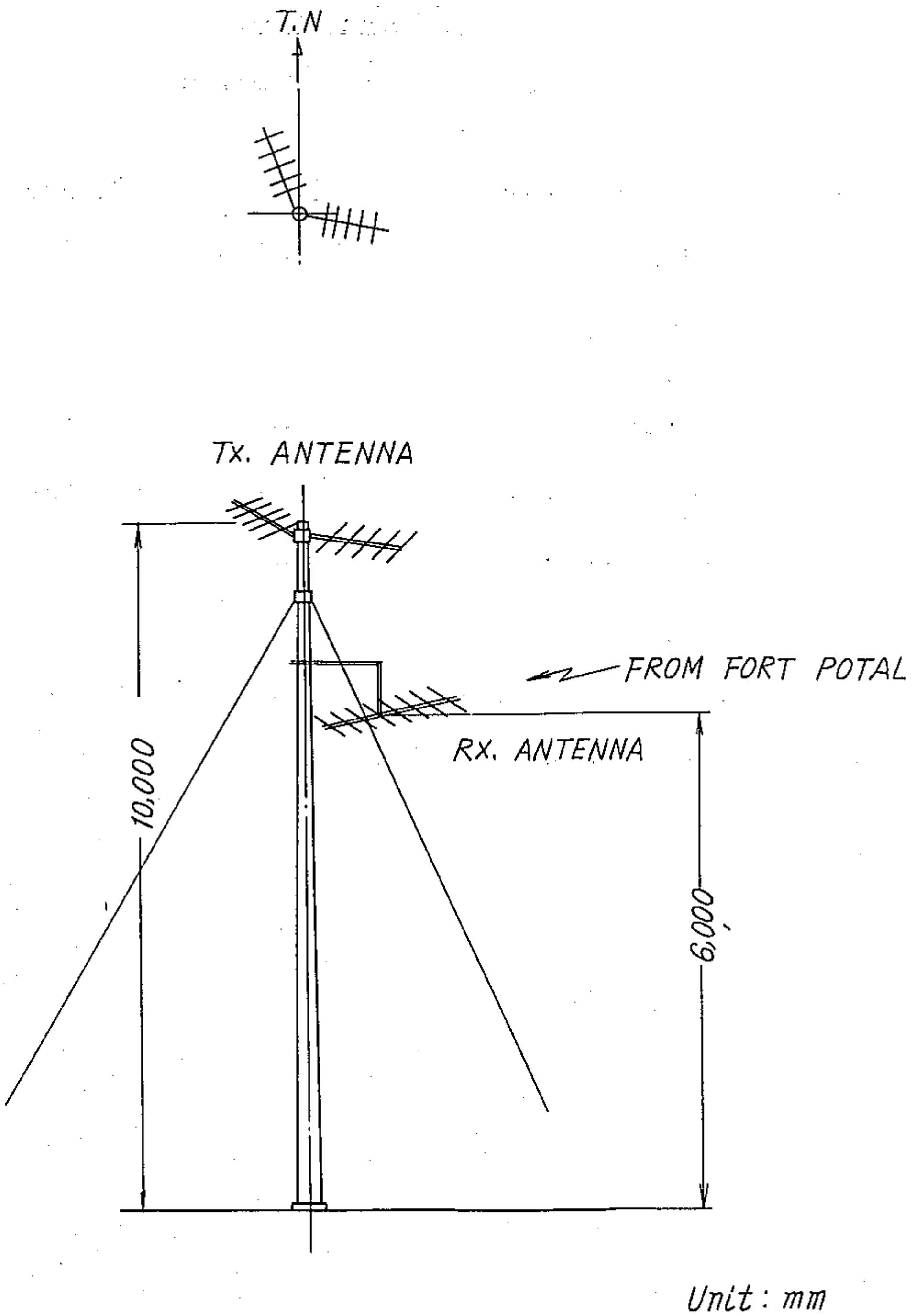


Fig. 6-82 KASESE STATION

Erusi-East Station

Table 6-39 List of Facilities

Item	Description	Q'ty	Remarks
1.	Building	1 set	
2.	——	——	
1.	TV Antenna	1 set	
2.	100 W (V-U) Translator	1 set	including spare parts
3.	Receiving Antenna	1 set	
4.	Tower	1 set	
5.	Power Supply Equipment	1 set	Engine Generators
6.	Supervisory Equipment	1 set	
7.	Accessories	1 set	

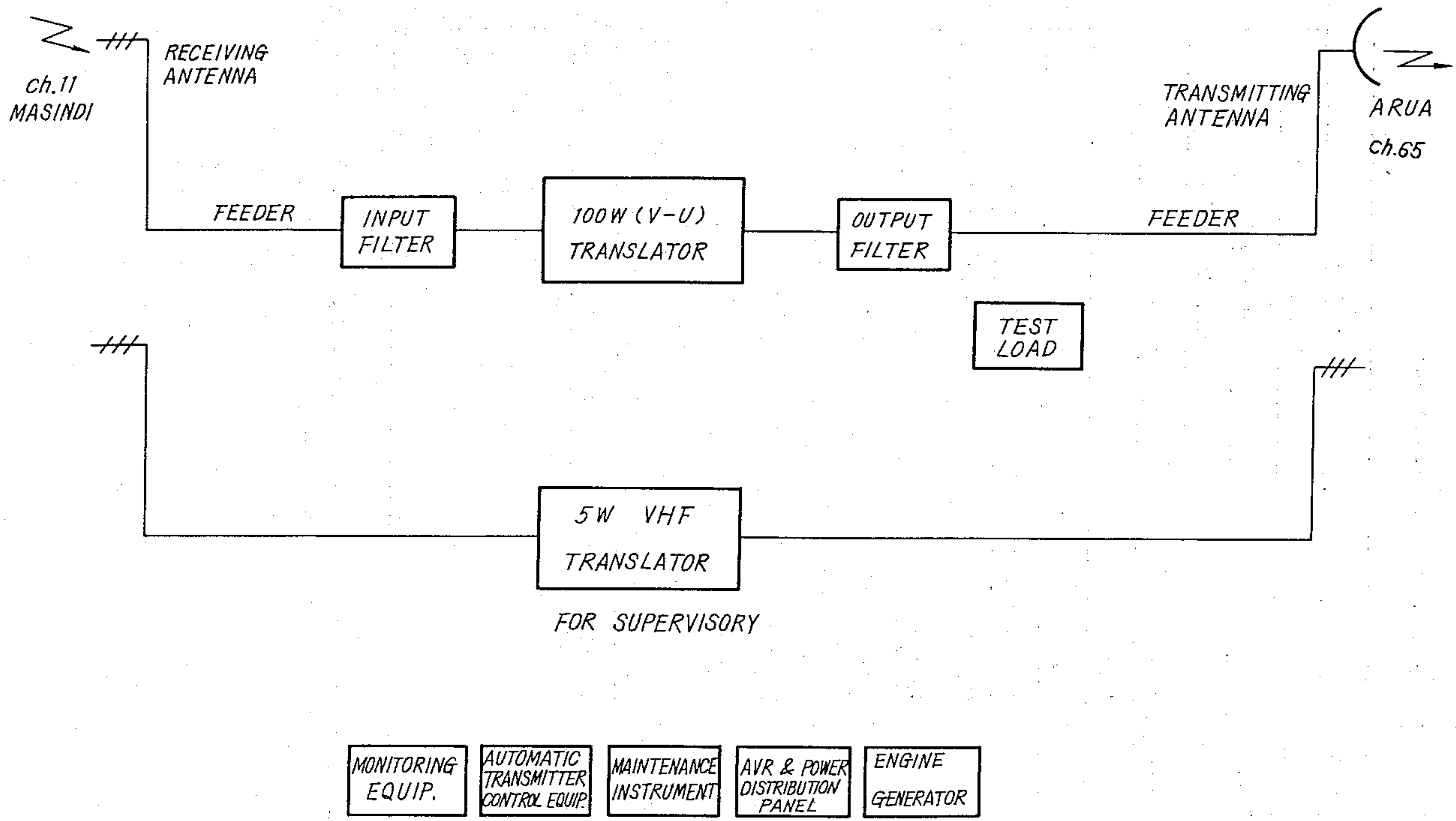
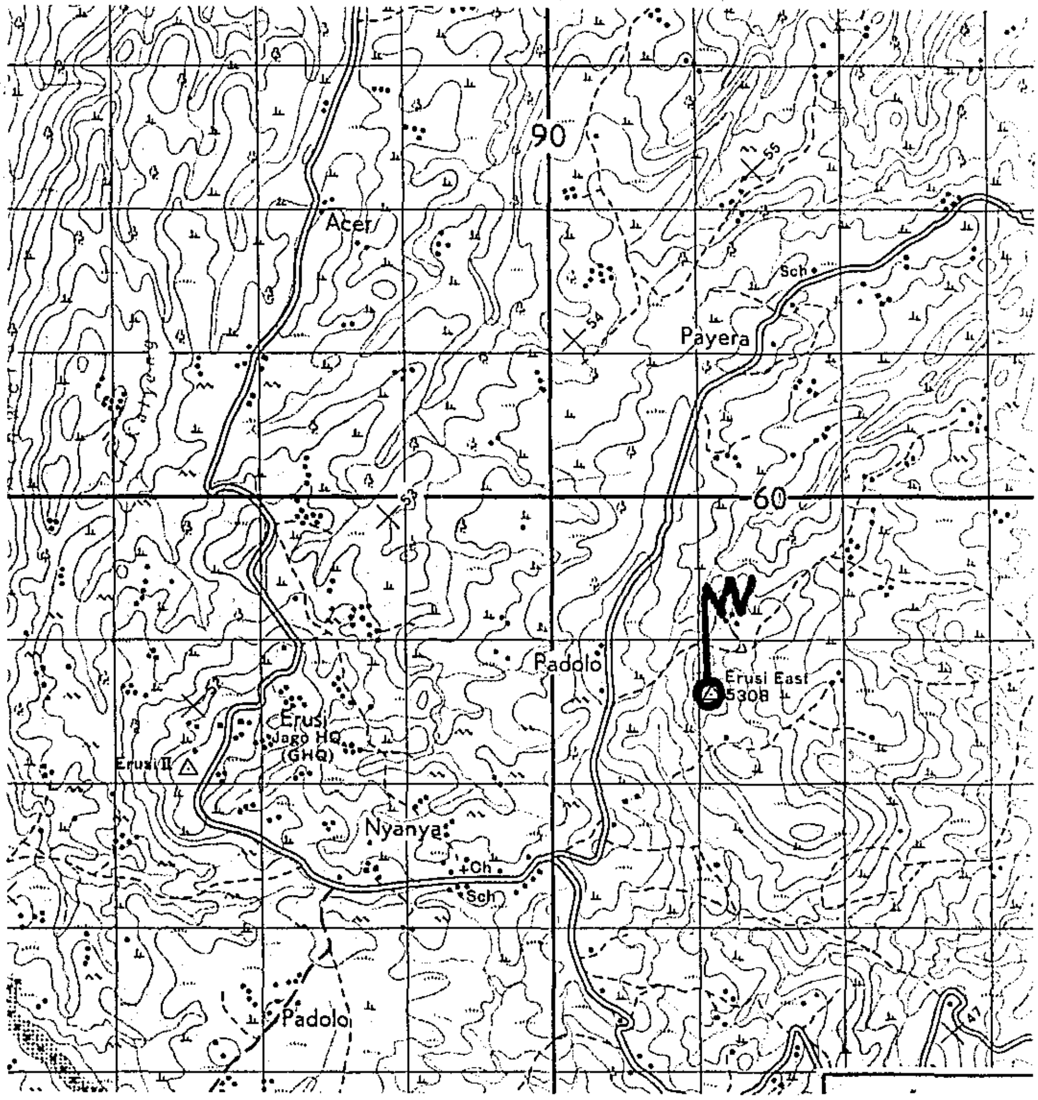


Fig. 6-83 SCHEMATIC DIAGRAM OF ERUSI EAST STATION

Table 6-40 Main Specifications for Erusi East Station

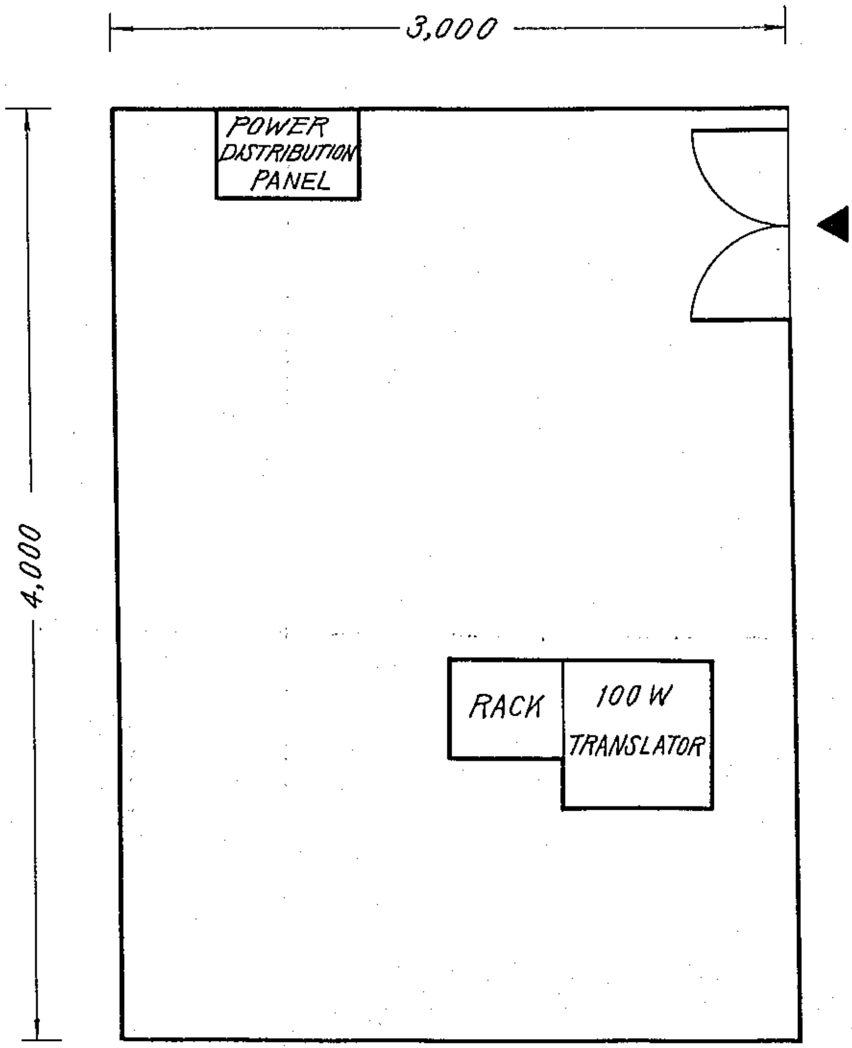
Name of Station		Erusi East
Type of Station		Relaying
Site of Station		Refer to Fig. 6-84
Transmitting Frequency		BAND V CH. 65
Transmitter Output Power		100 W (Video Peak)
Transmitting Antenna	Type	3mϕ.GP
	Height of Tower Top	15 m
Mother Station	Name of Station	Masindi
	Frequency	BAND III CH. 11
Receiving Antenna	Type	8Y·1
	Height of Mast Top	(8) m
Power Supply	Type of Power Supply	Engine Generators
	Capacity	5 KVA
Supervisory Equipment	Frequency	150 MHz Band
	Output Power	5 W
	Transmitting Antenna	3Y·1
	Receiving Antenna	3Y·1
Note		

Note: Height described in brackets ( ) represents the receiving antenna height to be mounted on the transmitting antenna tower.



N E	02°20'19" 31°07'17"
Altitude	1,610 m
Map No.	29-1

Fig. 6-84 Location of Erusi East Station



Unit : mm

Fig. 6-85 TYPICAL FLOOR LAYOUT FOR ERUSI EAST STATION

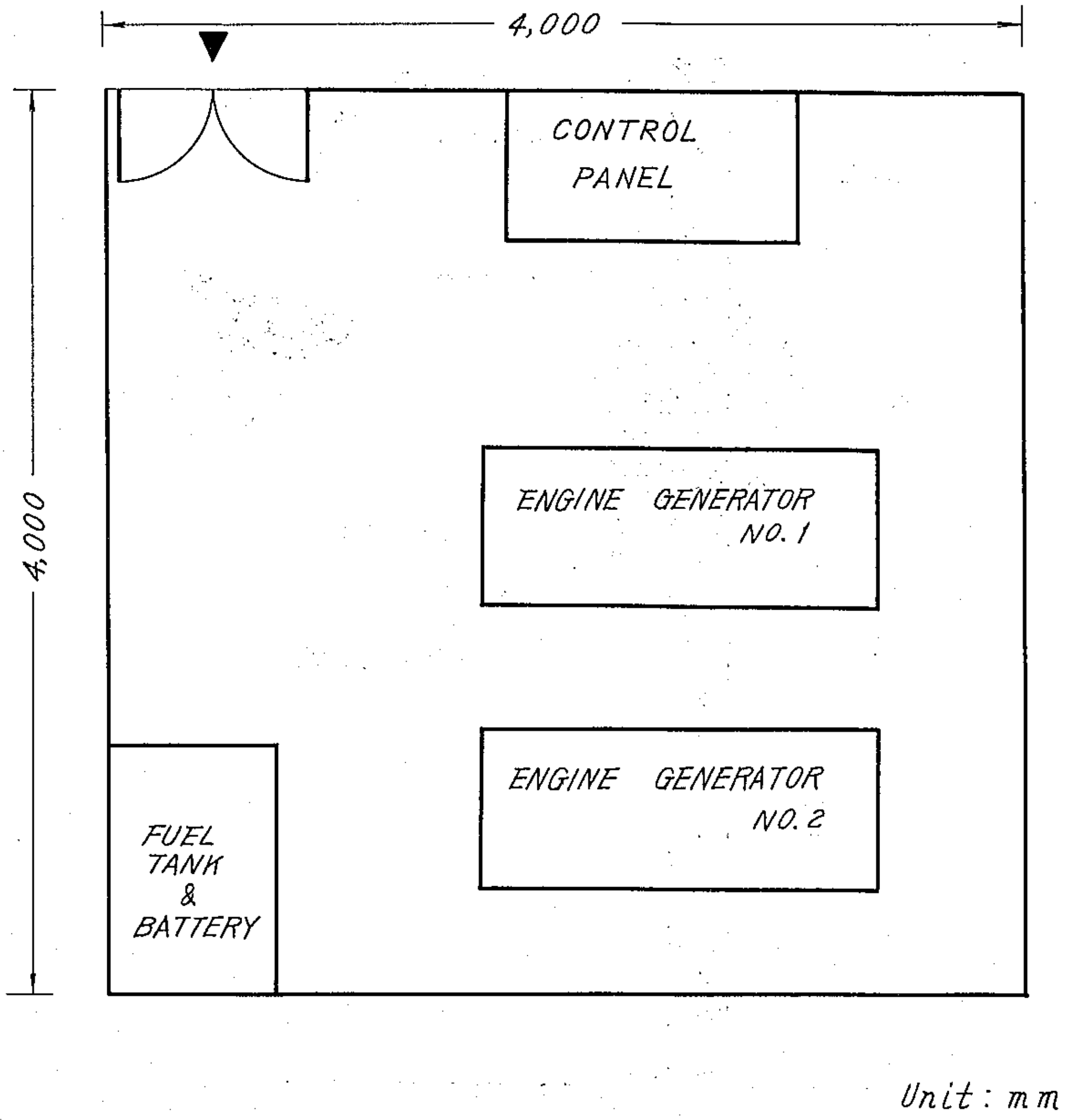
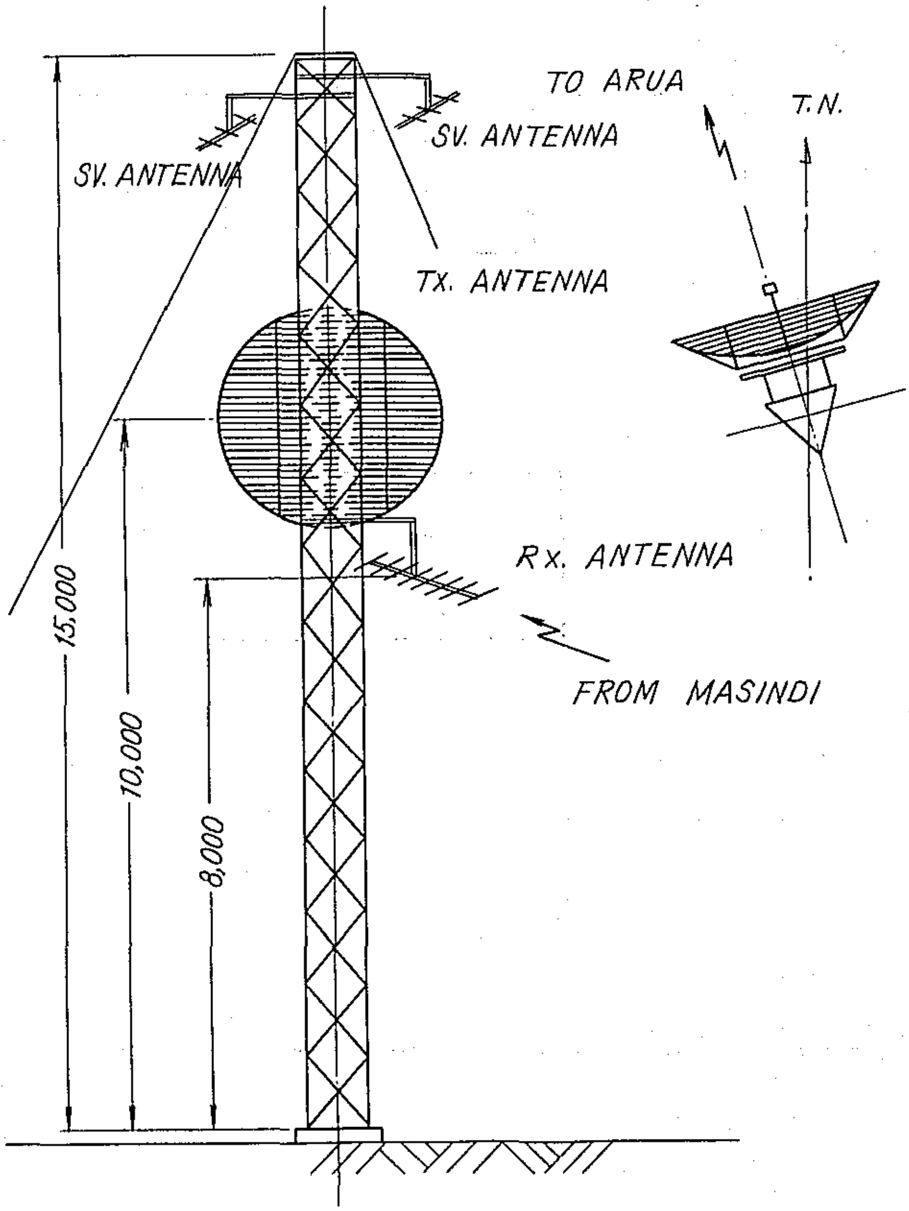


Fig. 6-86 TYPICAL FLOOR LAYOUT OF ENGINE GENERATER



Unit : mm

Fig. 6-87 ERUSI-EAST STATION

Arua Station

Table 6-41 List of Facilities

Item	Description	Q'ty	Remarks
1.	Building	1 set	
2.	Power Line	1 set	
1.	TV Antenna	1 set	
2.	100 W (U-V) Translator	1 set	including spare parts
3.	Receiving Antenna	1 set	
4.	Tower	1 set	
5.	Power Supply Equipment	1 set	
6.	Supervisory Equipment	1 set	
7.	Accessories	1 set	

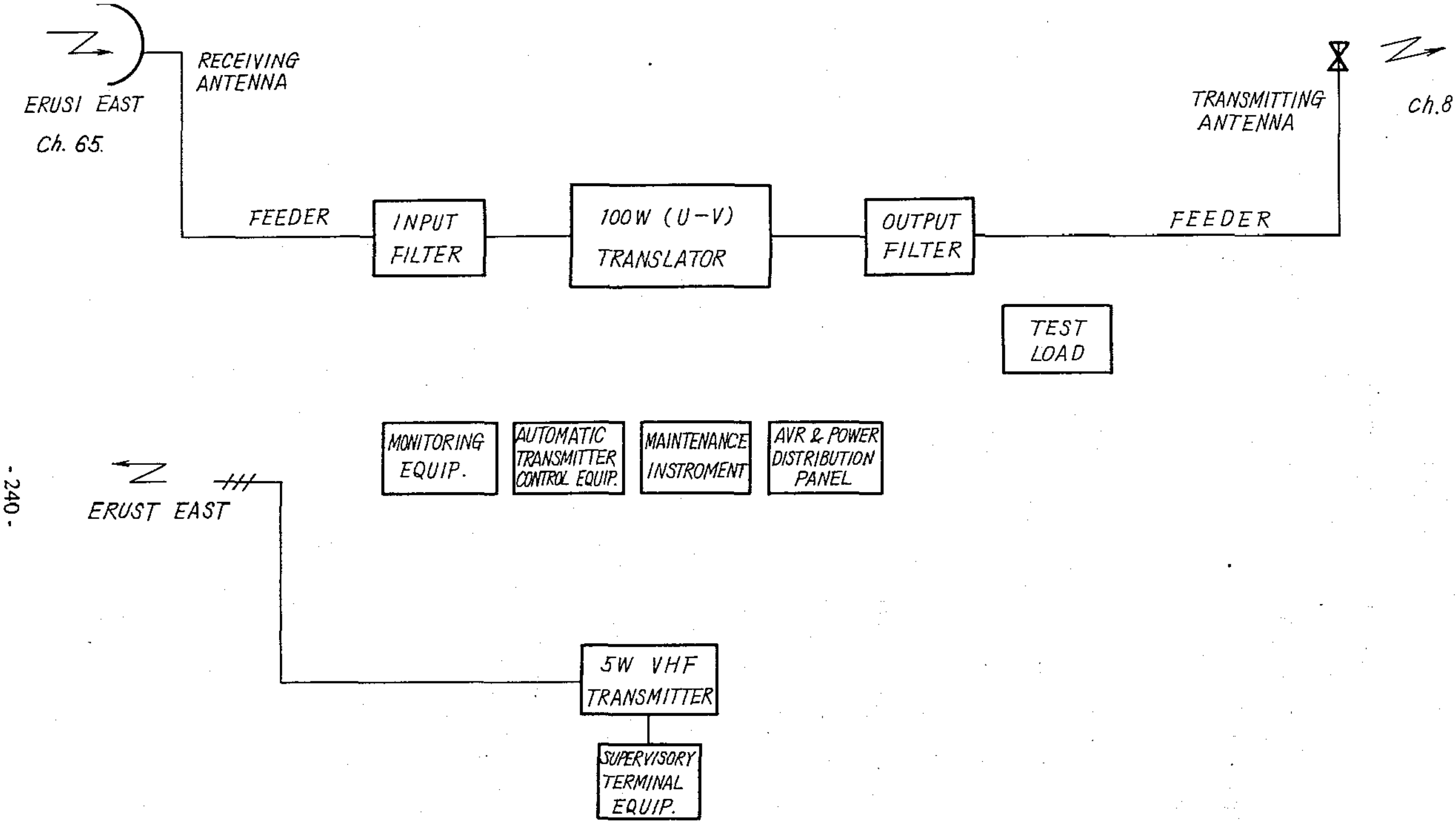
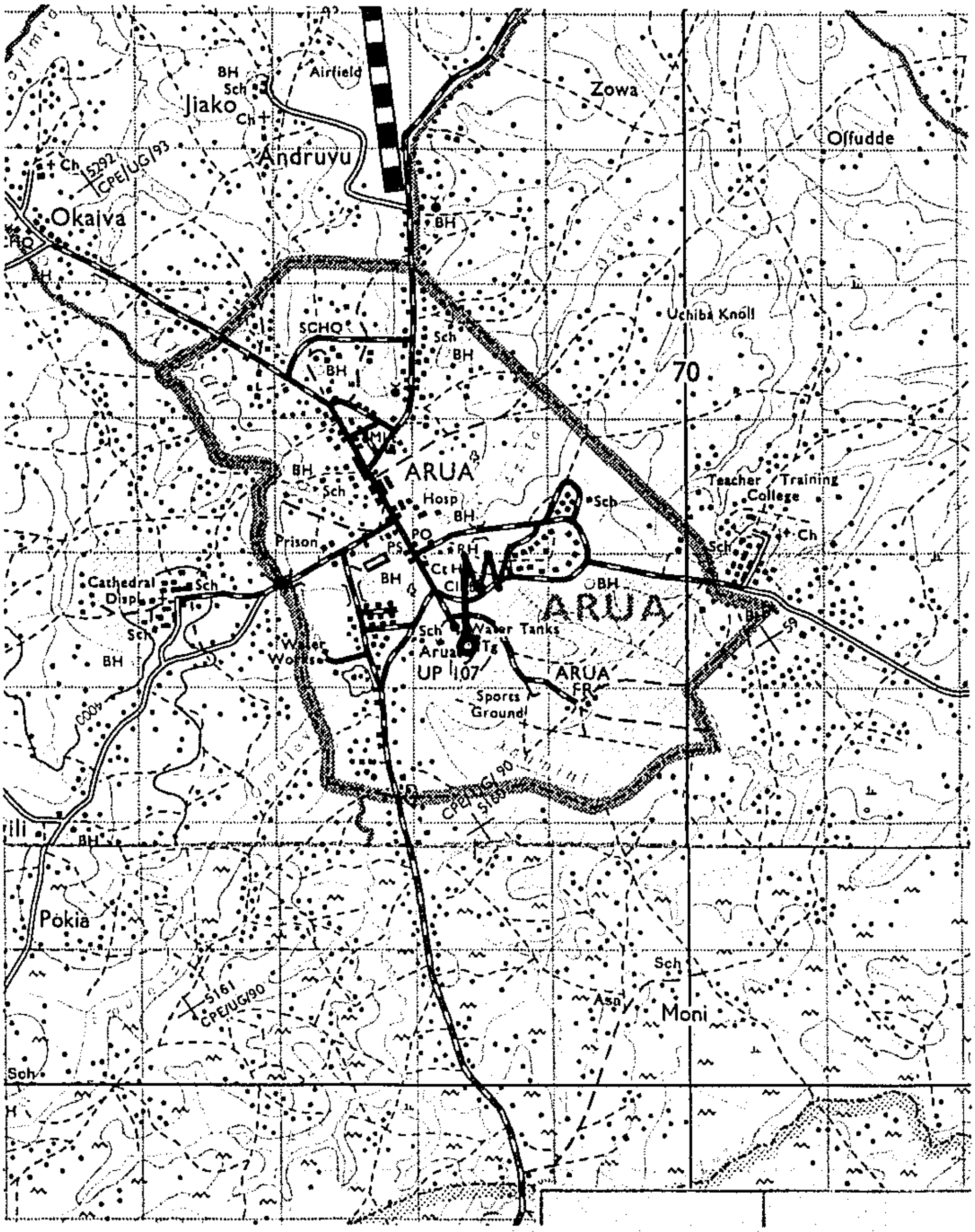


Fig. 6-88 SCHEMATIC DIAGRAM OF ARUA STATION

Table 6-42 Main Specifications for Arua Station

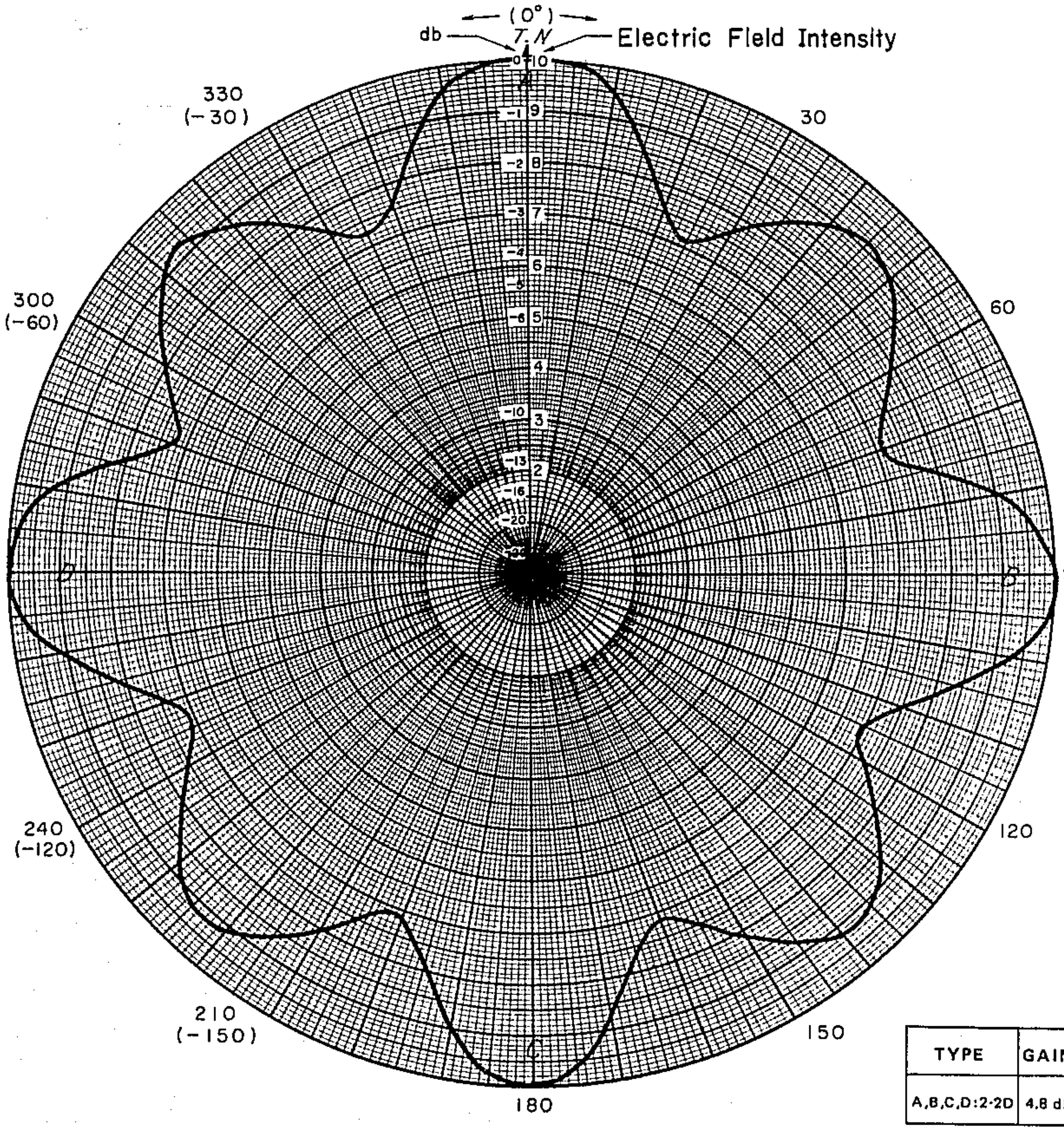
Name of Station		Arua
Type of Station		Broadcasting (Translator)
Site of Station		Refer to Fig. 6-89
Transmitting Frequency		BAND III CH. 5 or 8
Transmitter Output Power		100 W (Video Peak)
Transmitting Antenna	Type	2·2D·4
	Height of Tower Top	20 m
Mother Station	Name of Station	Erusi East
	Frequency	BAND V CH. 65
Receiving Antenna	Type	3mϕ•GP
	Height of Mast Top	(10) m
Power Supply	Type of Power Supply	Lines
	Capacity	10 KVA
Supervisory Equipment	Frequency	150 MHz Band
	Output Power	5 W
	Transmitting Antenna	3Y·1
	Receiving Antenna	
Note		

Note: Height described in brackets ( ) represents the receiving antenna height to be mounted on the transmitting antenna tower.



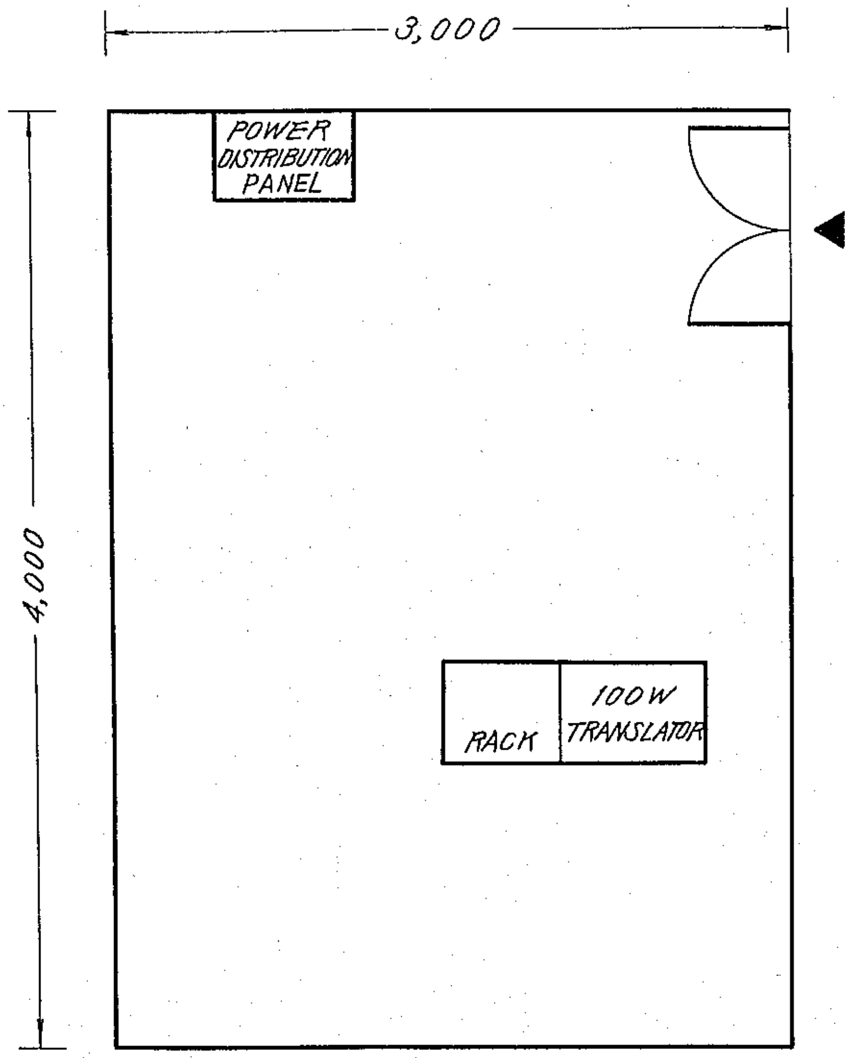
N E	03°00'51" 30°55'00"
Altitude	1,280 m
Map No.	11-4 19-2

Fig. 6-89 Location of Arua Station



TYPE	GAIN
A,B,C,D:2-2D	4.8 dB

Fig. 6-90 HORIZONTAL PATTERN OF ARUA STATION



Unit : mm

Fig. 6-91 TYPICAL FLOOR LAYOUT FOR ARUA STATION

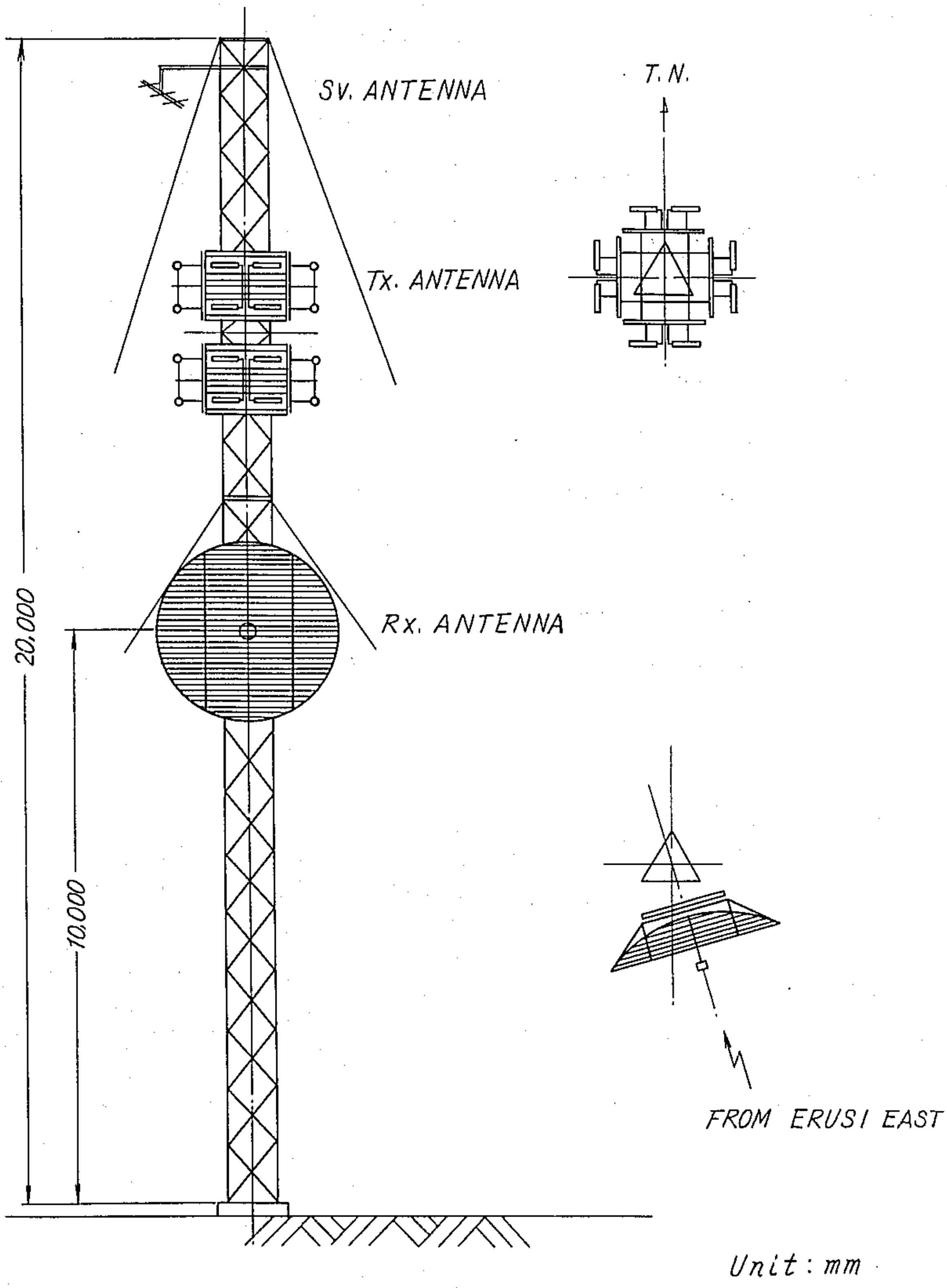


Fig. 6-92 ARUA STATION

Tororo Station

Table 6-43 List of Facilities

Item	Description	Q'ty	Remarks
1.	Building	1 set	
2.	Power Line	1 set	
1.	TV Antenna	1 set	
2.	3W (V-V) Translator	1 set	including spare parts
3.	Receiving Antenna	1 set	
4.	Tower	1 set	
5.	Power Supply Equipment	1 set	
6.	Accessories	1 set	

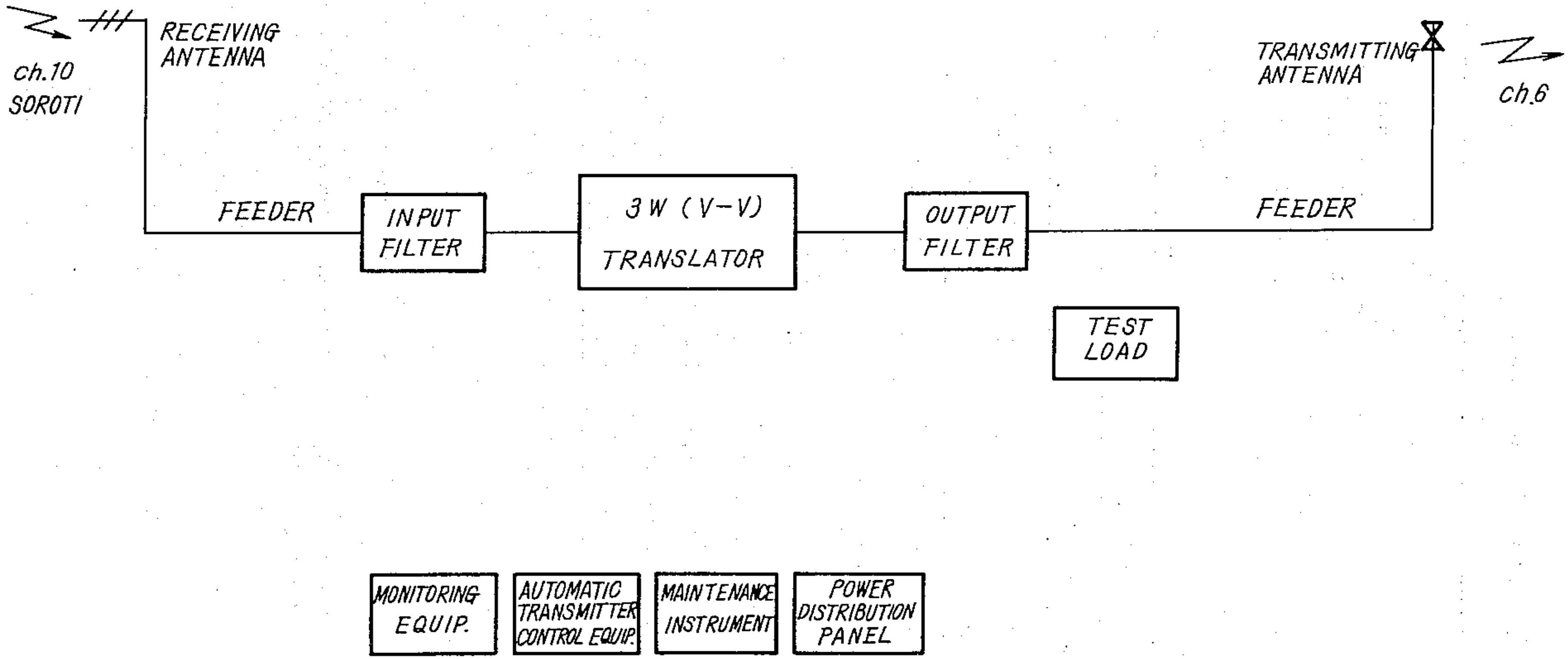
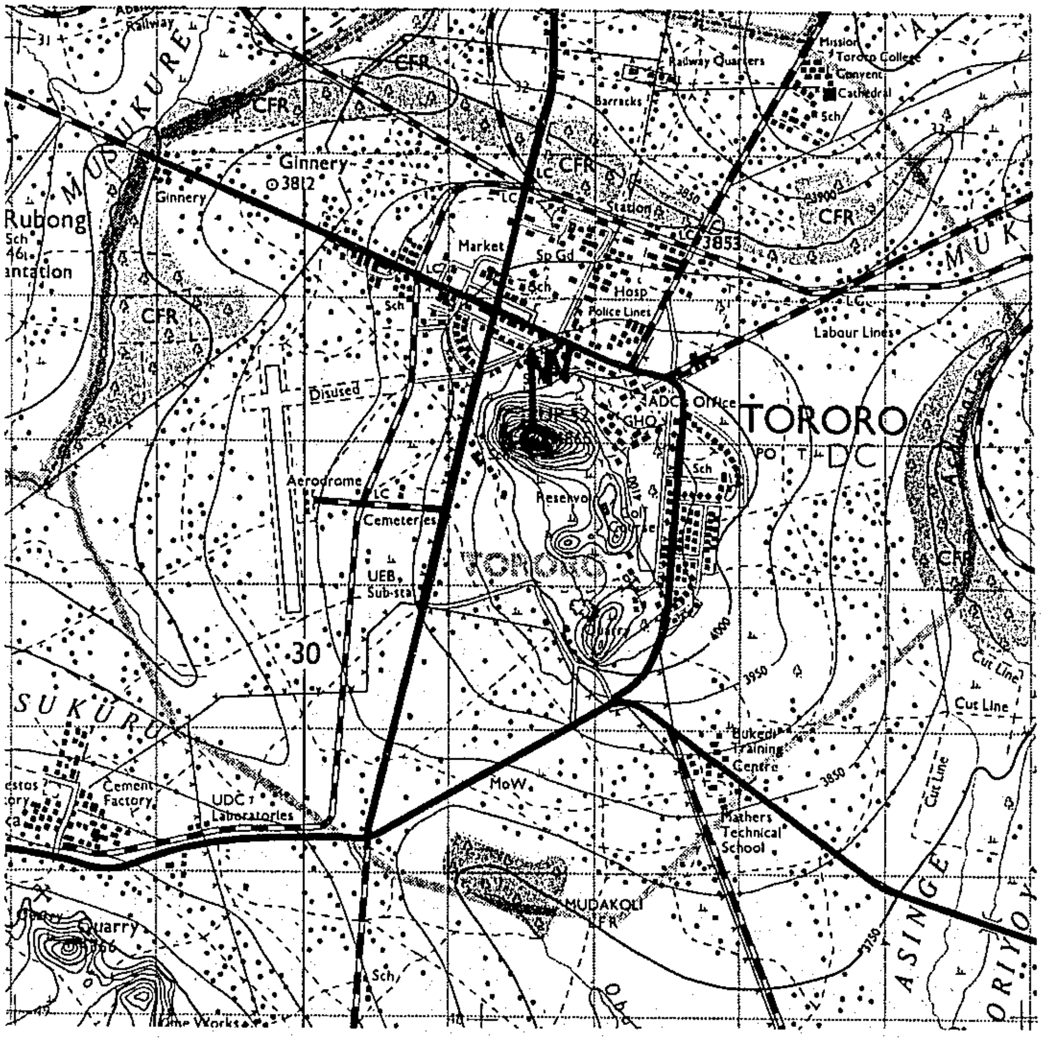


Fig. 6-93 SCHEMATIC DIAGRAM OF TORORO STATION

Table 6-44　Main Specifications for Tororo Station

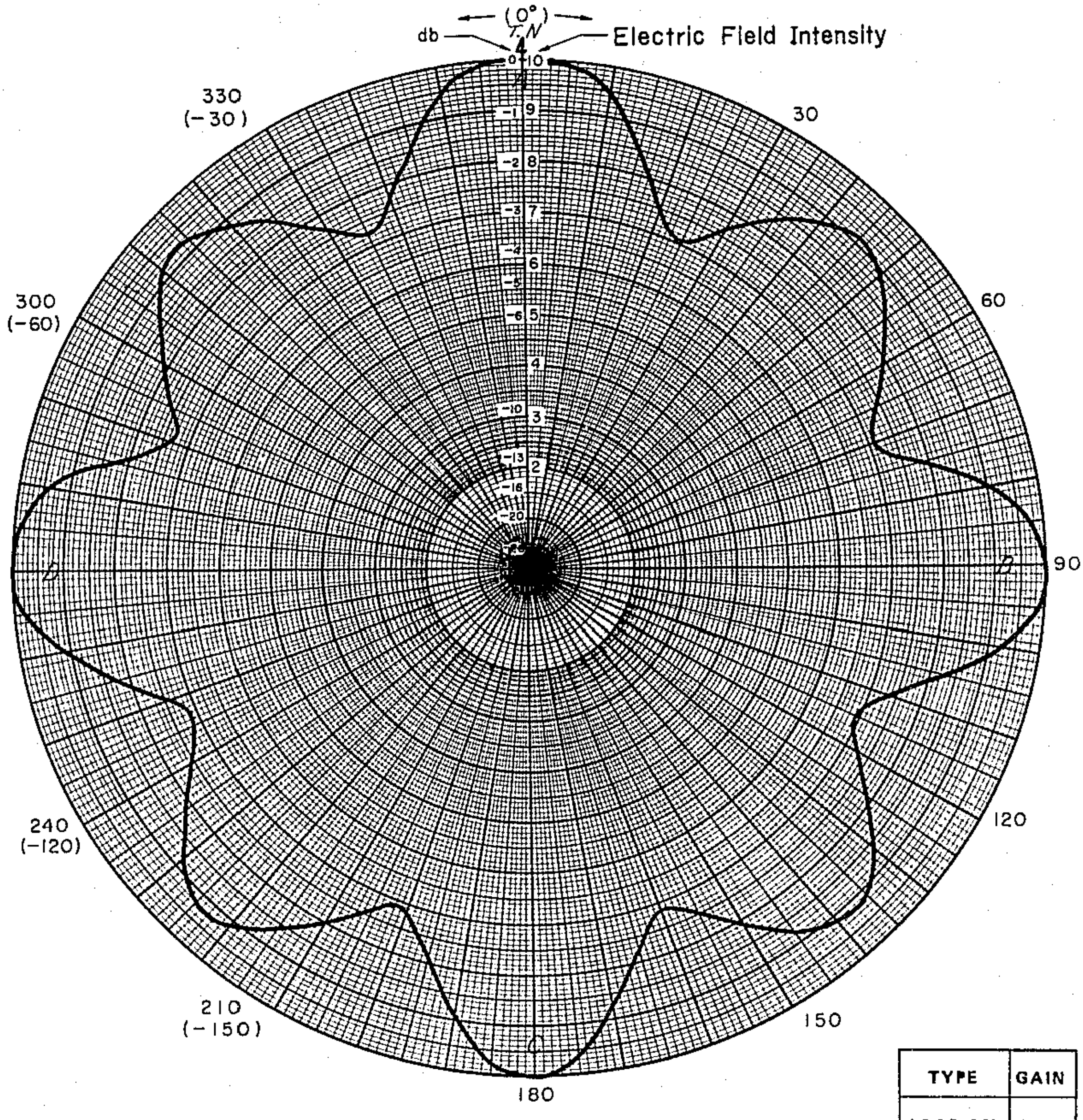
Name of Station		Tororo
Type of Station		Broadcasting (Translator)
Site of Station		Refer to Fig. 6-94
Transmitting Frequency		BAND III　CH. 6
Transmitter Output Power		3 W (Video Peak)
Transmitting Antenna	Type	3·2D·4
	Height of Tower Top	20 m
Mother Station	Name of Station	Soroti
	Frequency	BAND III　CH. 10
Receiving Antenna	Type	8Y·2
	Height of Mast Top	(8) m and 10 m
Power Supply	Type of Power Supply	Lines
	Capacity	2 KVA
Supervisory Equipment	Frequency	
	Output Power	
	Transmitting Antenna	
	Receiving Antenna	
Note		

Note:　Height described in brackets (　) represents the receiving antenna height to be mounted on the transmitting antenna tower.



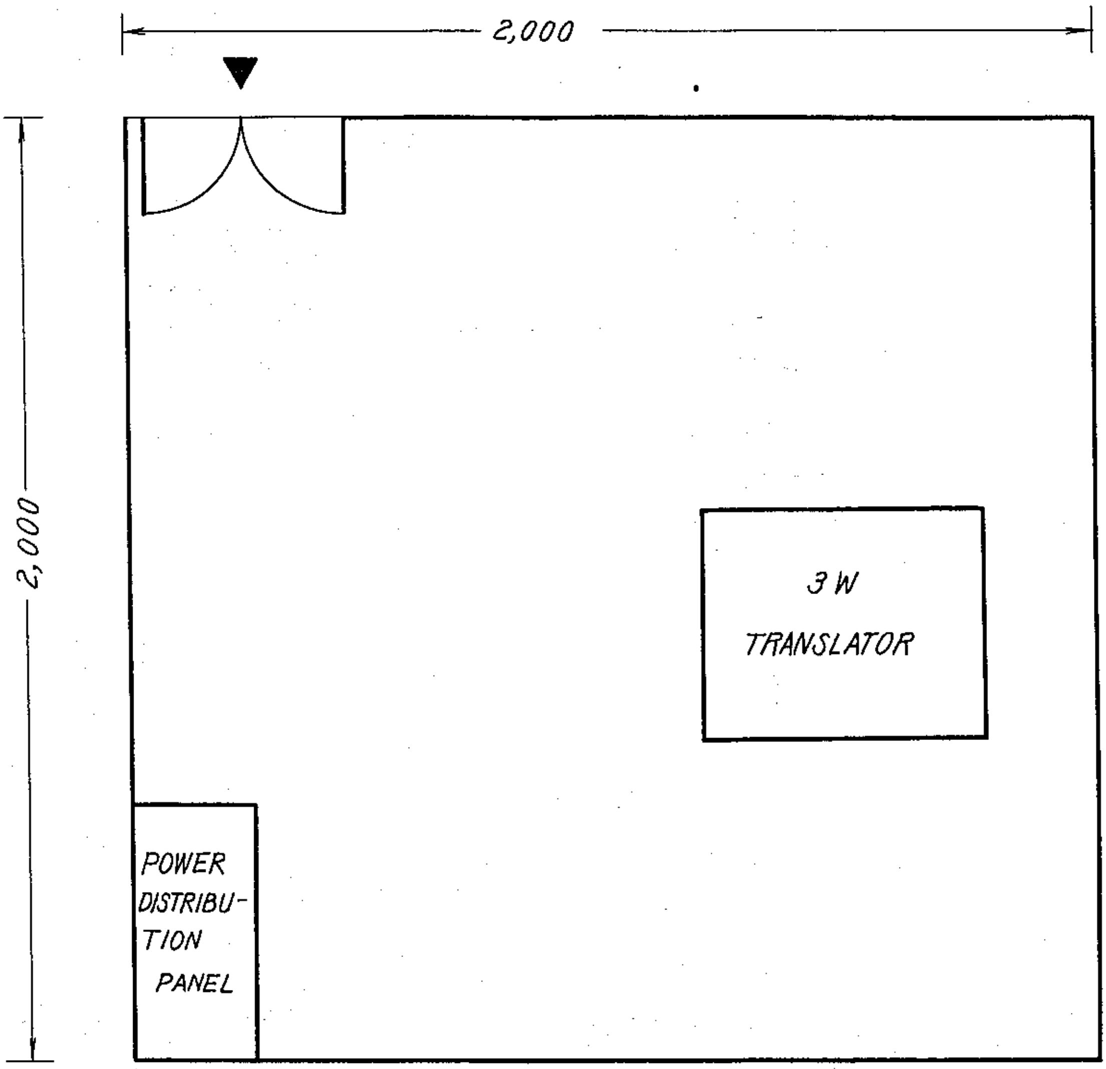
N E	00°41'17" 34°10'59"
Altitude	1,480 m
Map No.	64-3

Fig. 6-94 Location of Tororo Station



TYPE	GAIN
A,B,C,D: 3·2D	6.6 dB

Fig. 6-95 HORIZONTAL PATTERN OF TORORO STATION



Unit : mm

Fig. 6-96 TYPICAL FLOOR LAYOUT FOR TORORO STATION

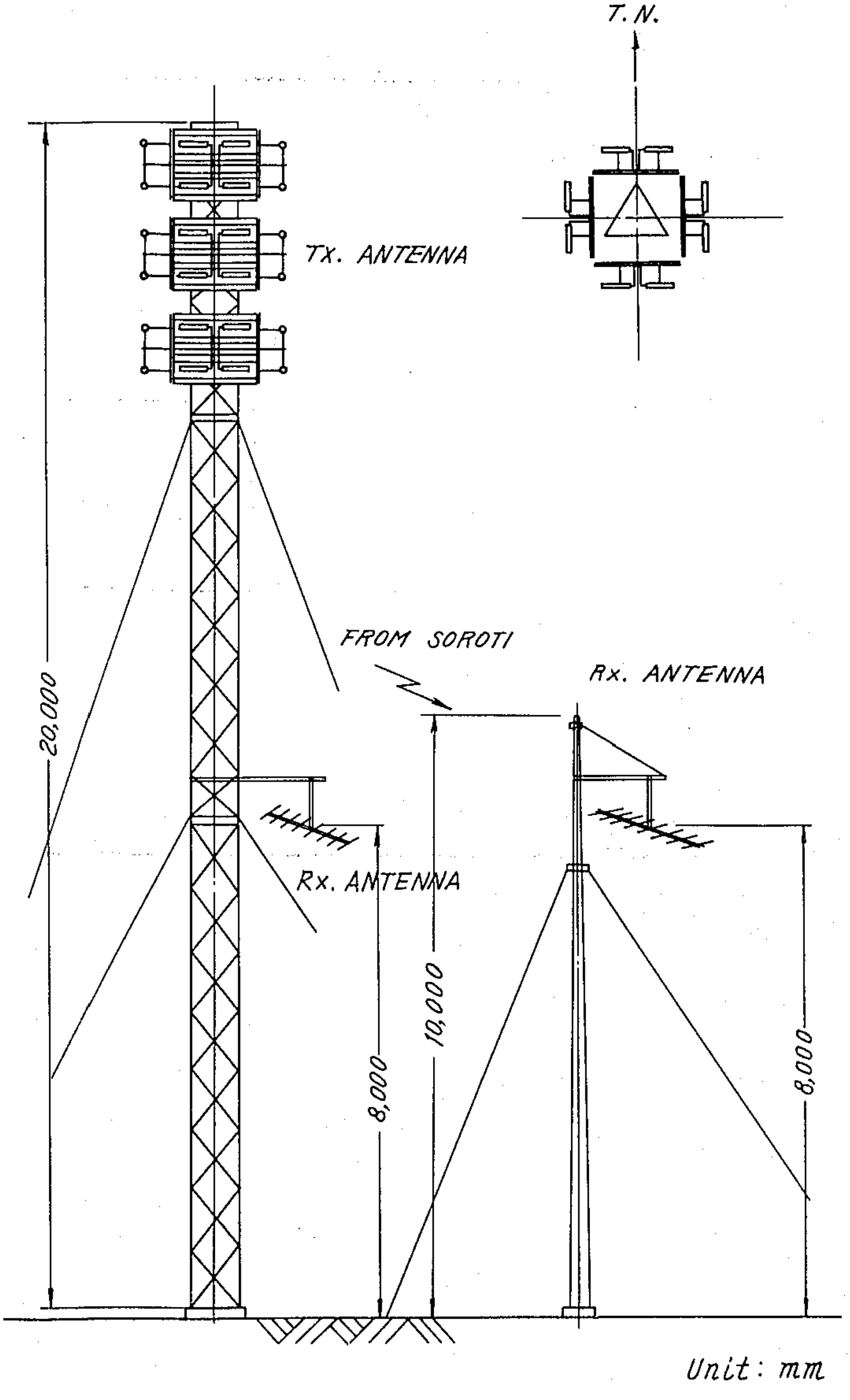


Fig. 6-97 TORORO STATION

Moroto Station

Table 6-45 List of Facilities

Item	Description	Q'ty	Remarks
1.	Building	1 set	
2.	Power Line	1 set	
1.	TV Antenna	1 set	
2.	3W (V-V) Translator	1 set	including spare parts
3.	Receiving Antenna	1 set	
4.	Tower	1 set	
5.	Power Supply Equipment	1 set	
6.	Accessories	1 set	

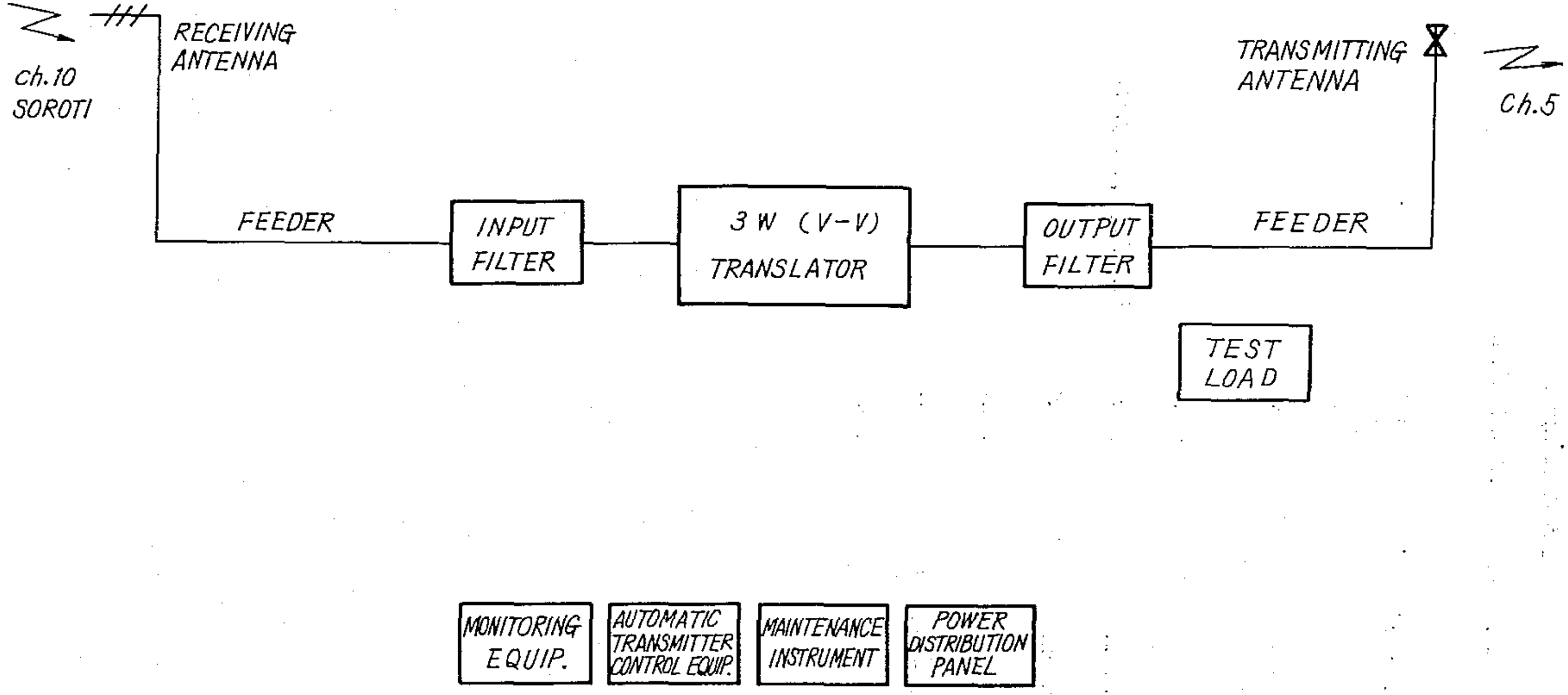
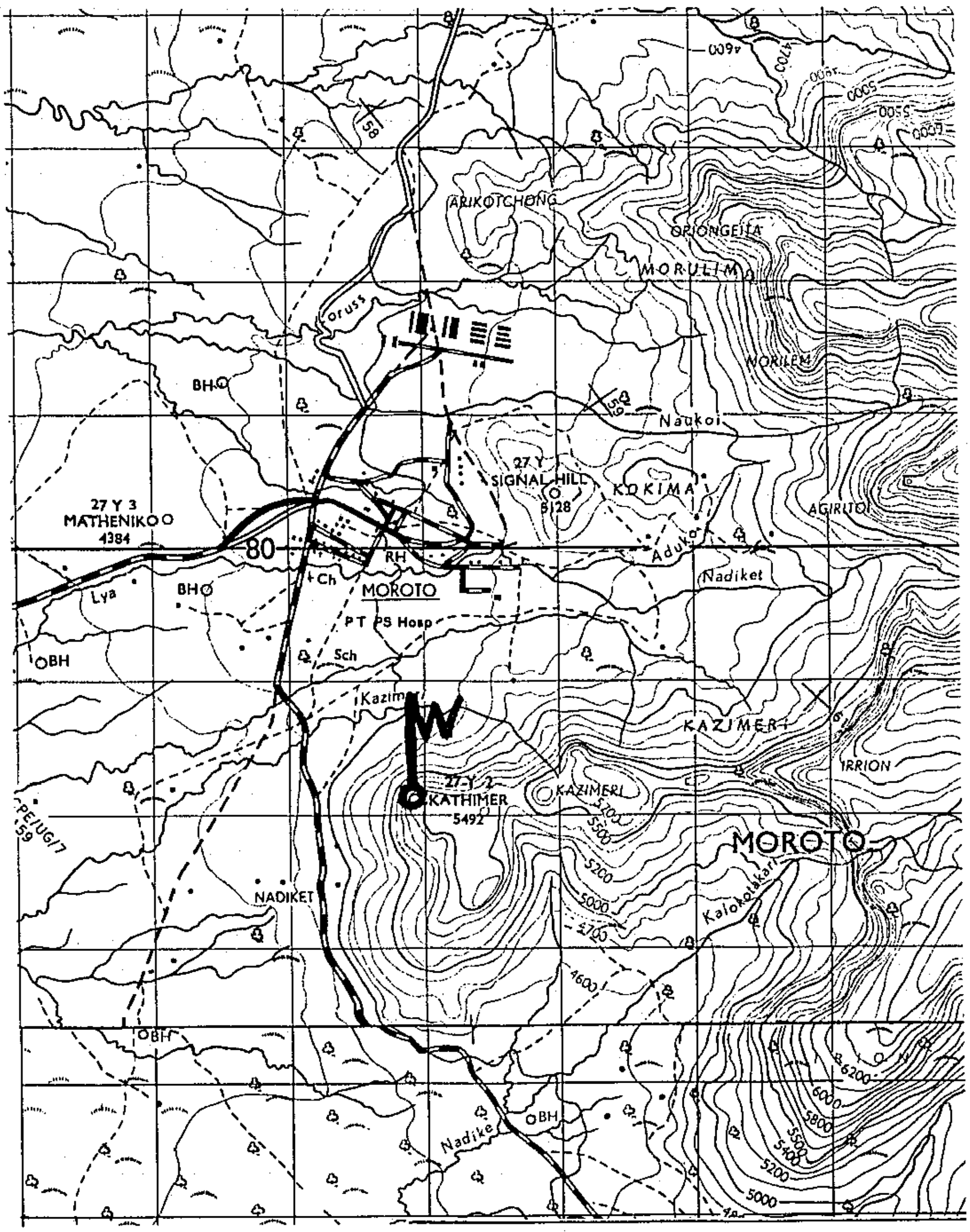


Fig.6-98 SCHEMATIC DIAGRAM OF MOROTO STATION

Table 6-46 Main Specifications for Moroto Station

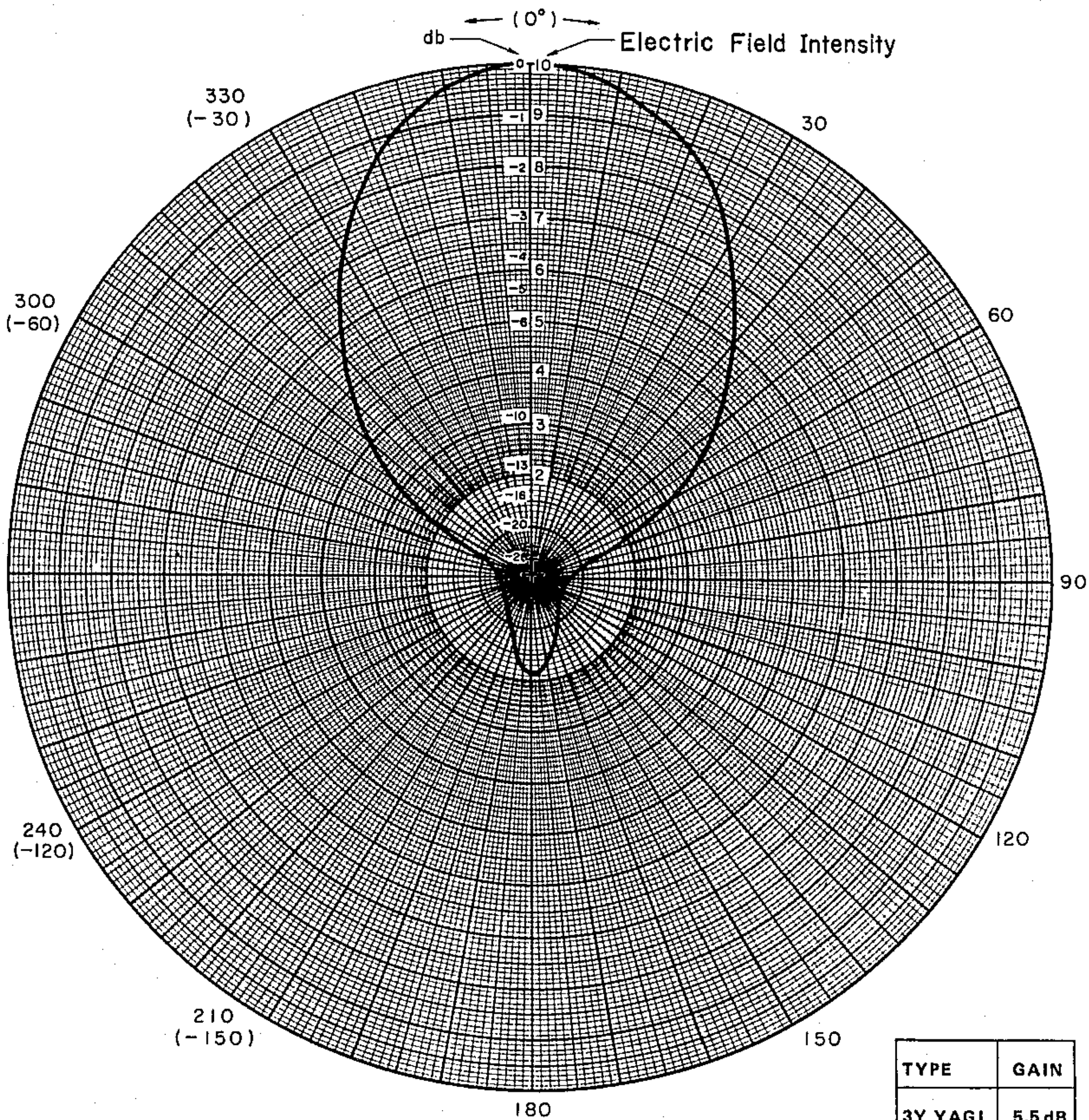
Name of Station		Moroto
Type of Station		Broadcasting (Translator)
Site of Station		Refer to Fig. 6-99
Transmitting Frequency		BAND III CH. 5
Transmitter Output Power		3 W (Video Peak)
Transmitting Antenna	Type	3Y·1
	Height of Tower Top	10 m
Mother Station	Name of Station	Soroti
	Frequency	BAND III CH. 10
Receiving Antenna	Type	12Y·2
	Height of Mast Top	(6) m and 10 m
Power Supply	Type of Power Supply	Lines
	Capacity	2 KVA
Supervisory Equipment	Frequency	
	Output Power	
	Transmitting Antenna	
	Receiving Antenna	
Note		

Note: Height described in brackets ( ) represents the receiving antenna height to be mounted on the transmitting antenna tower.



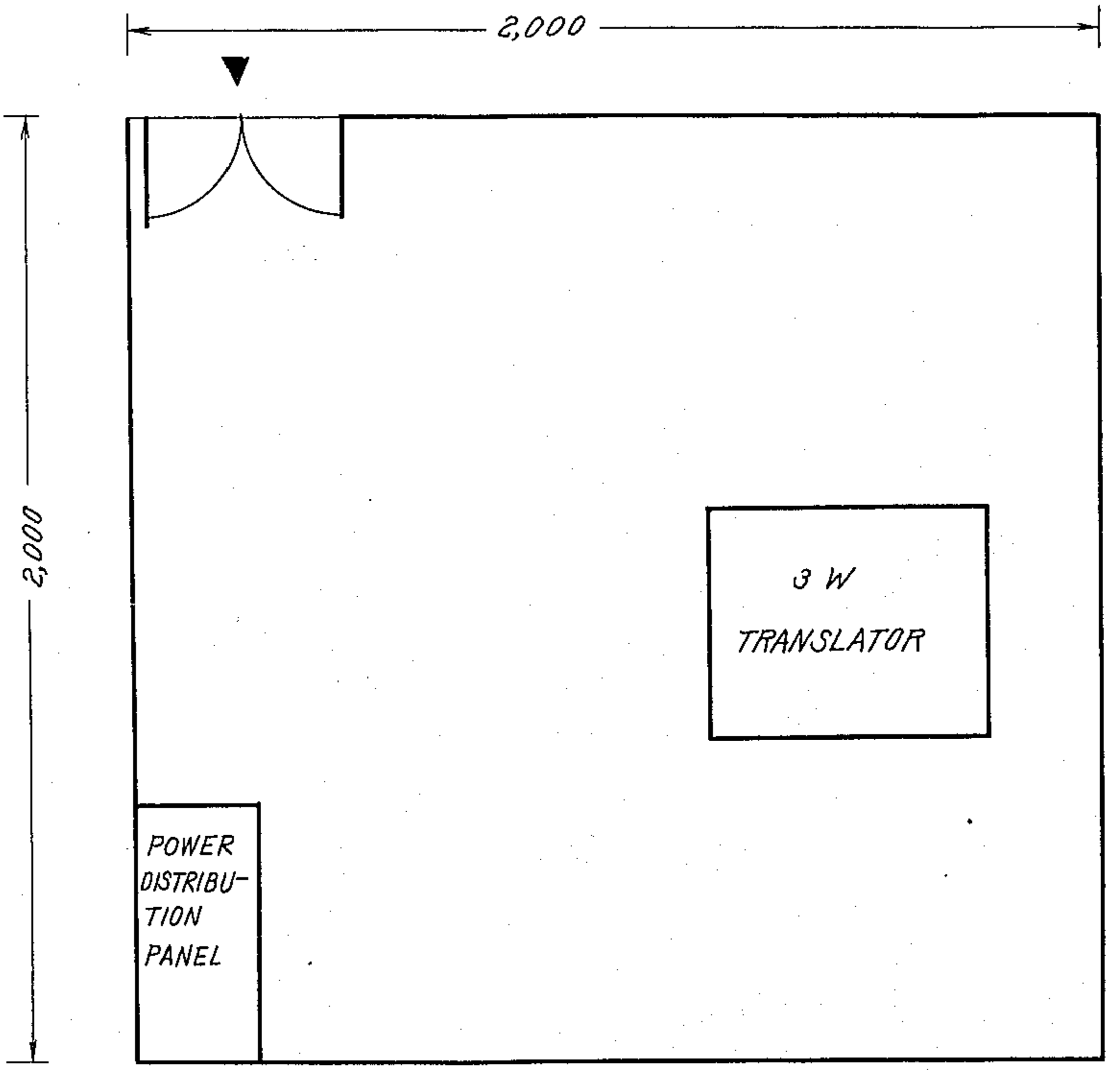
N E	02°30'50" 34°39'52"
Altitude	1,670 m
Map No.	27-3 36-1

Fig. 6-99 Location of Moroto Station



TYPE	GAIN
3Y YAGI	5.5 dB

Fig. 6-100 HORIZONTAL PATTERN OF MOROTO STATION



Unit : mm

Fig. 6-101 TYPICAL FLOOR LAYOUT FOR MOROTO STATION

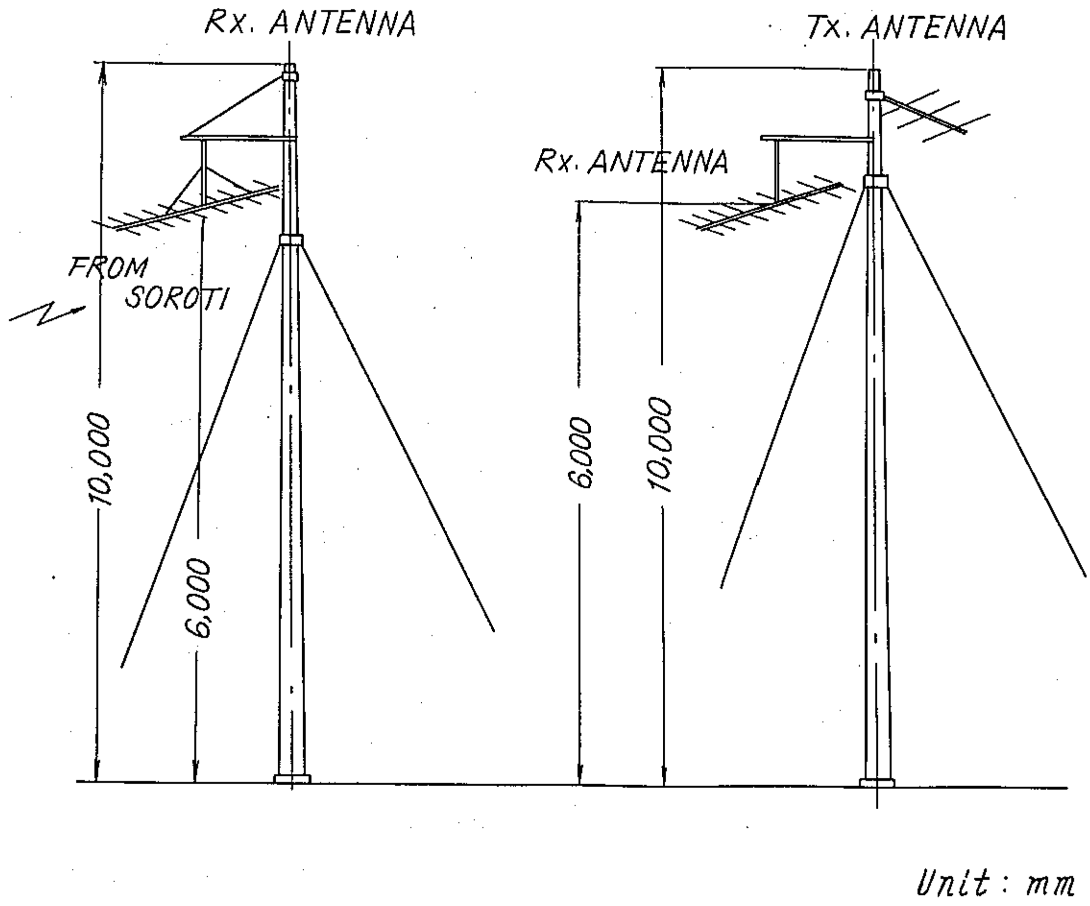


Fig. 6-102 MOROTO STATION

6-24 Common References

Table 6-47 Summary of Specifications for 5 KW TV TRANSMITTER

Vision section

1.	Frequency	An assigned VHF TV channel
2.	Output Power	5 KW (at sync. peak value)
3.	Output Impedance	50 ohms
4.	Input Impedance	75 ohms or high impedance
5.	Input level	0.4 – 1.0 V (p-p)
6.	AM Noise level	-40 dB max. at 100% modulation

Sound section

1.	Frequency	An assigned VHF TV channel
2.	Output Power	1 KW
3.	Output Impedance	50 ohms
4.	Input Impedance	600 ohms
5.	Input level	4 ~ 10 dBm at 100% modulation
6.	Frequency deviation	±50 KHz at 100% modulation
7.	AM Noise level	-60dB max. at 1000 Hz, 100% modulation
8.	Pre-emphasis	50μ sec.
9.	Power Supply (Vision & Sound)	AC 415 V. 3ϕ, 4-w, 50 Hz

Table 6-48 Summary of Specifications for TRANSLATOR

1. Frequency	
Receiver	An assigned $\binom{\text{VHF}}{\text{UHF}}$ TV channel
Transmitter	An assigned $\binom{\text{VHF}}{\text{UHF}}$ TV channel
2. Input Level	60 dBμ. 50 ohms
3. Output Power	
Vision	Assigned power (at sync. peak value) (3W, 100W, or 500W)
Sound	1/5 of video power at continuous wave. (0.6W, 20W, 100W)
4. Input & Output Impedance	50 ohms
5. Signal to Noise Ratio	50 dB min. (hum component) at rated output power, 1000 Hz, and 50% modulation.
6. Noise Figure	
VHF reception	8 dB max.
UHF reception	11 dB max.
7. AGC Characteristics (output regulation)	Output level is regulated within $^{+0.5}_{-1.0}$ dB against input level variation of $^{+10}_{-20}$ dB.
8. Power Supply	AC 240 V, 1ϕ, 50 Hz.

Table 6-49 Summary of Specifications for REBROADCASTING RECEIVER

1.	Frequency	An assigned $\binom{\text{UHF}}{\text{VHF}}$ TV channel
2.	Input Impedance	50 ohms
3.	Input Level	60 dBμ, 50 ohms
4.	Output Impedance	
	Vision	75 ohms (unbalanced)
	Sound	600 ohms (balanced)
5.	Output Level	
	Vision	1.0 V (p-p)
	Sound	+10 dBm (at 400 Hz, 100% mod.)
6.	Noise Figure	
	VHF Reception	8 dB
	UHF Reception	11 dB
7.	Output Regulation	Output level is regulated within $^{+0.5}_{-1.0}$ dB against $^{+10}_{-20}$ dB input level variation
8.	Noise	
	Vision	10mV (p-p) max. at no input signal
	Sound	S/N = 55 dB min.
9.	Power Supply	AC 240V, 1ϕ, 50 Hz.

Table 6-50 Summary of Specifications for VHF RADIO EQUIPMENT (Used for relaying of supervisory signals)

1.	Frequency	150 MHz band
2.	Transmitter Output Power	5, 10, or 50W.
3.	RF Impedance	50 ohms
4.	Receiving Sensitivity	Better than 6 dBμV for 20 dB quieting.

Table 6-51 List of Studio Equipment

Item No.	Description	Q'ty
1.	VTR Car (Outside Broadcasting Van)	1 set
2.	SVTR (Stationary Video Tape Recorder)	1 set

Table 6-52 List of Accessories

Item	Description	Q'ty
1.	TV Monitor	1 ea
2.	VTVM	1 ea
3.	Tools & others.	1 set

Note: The TV Monitor and VTVM will not be prepared for existing 6 stations.

Table 6-53 List of Measuring Instruments

Kampala Station (One each)

1. Audio Test Set
2. VHF Sweep Generator
3. UHF Sweep Generator
4. FM Sideband Analyzer
5. VHF Signal Generator
6. UHF Signal Generator
7. Oscilloscope
8. Frequency Counter
9. Field Strength Meter
10. Impedance Bridge
11. Square Sine Wave Generator
12. Square Wave Generator
13. Waveform Generator
14. Variable Attenuator
15. Kilovolt Meter
16. Video Demodulator
17. Calibration Dummy Load
18. Sound Monitor

Soroti and Mbarara Stations (One each for a station)

1. Audio Test Set
2. VHF Sweep Generator
3. UHF Sweep Generator
4. FM Sideband Analyzer
5. VHF Signal Generator
6. UHF Signal Generator
7. Oscilloscope
8. Frequency Counter

9. Waveform Generator

10. Variable Attenuator

11. Kilovolt Meter

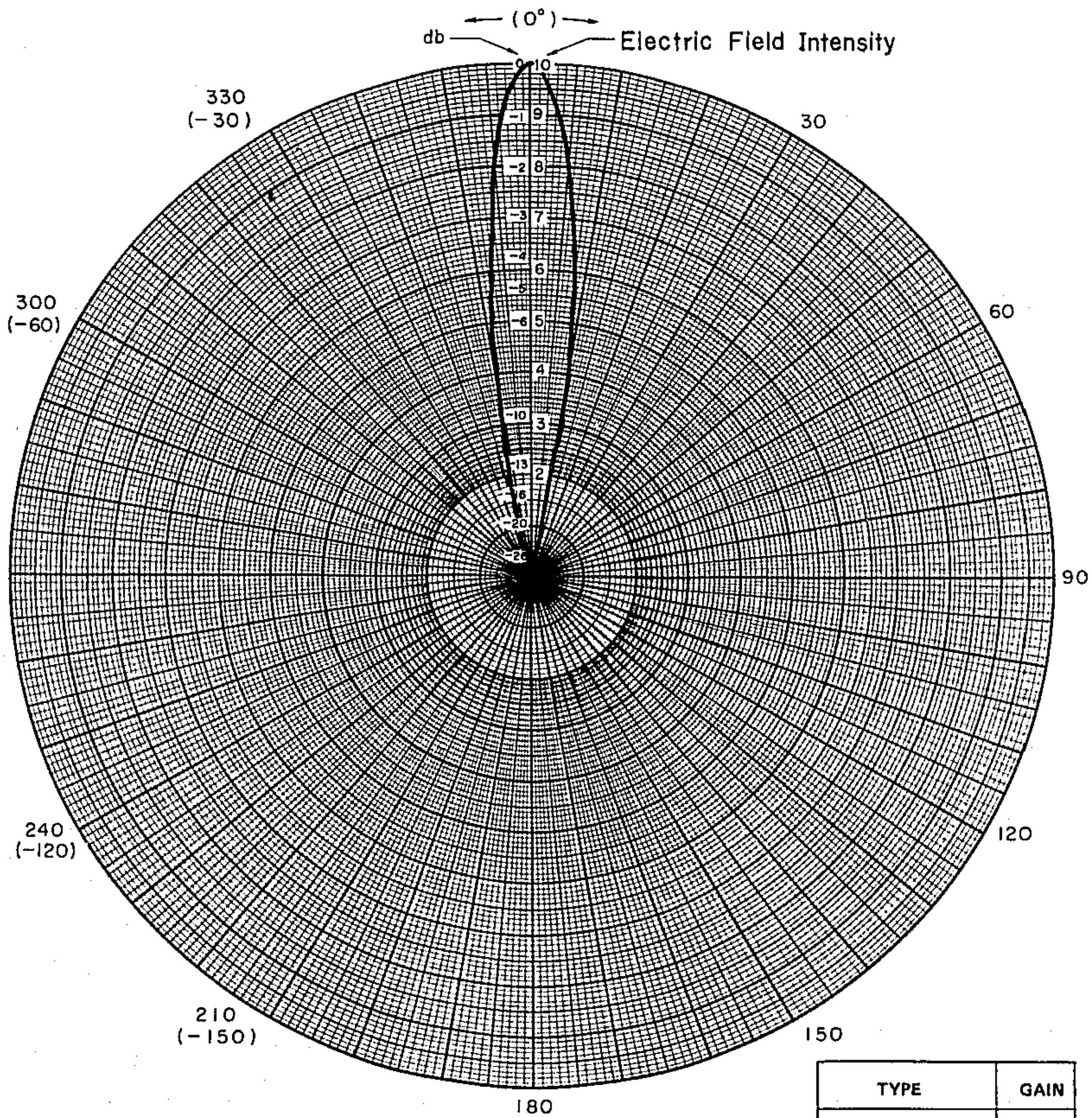
12. Sound Monitor

Gulu Station (One each)

1. Audio Test Set
2. AM Sideband Analyzer
3. FM Sideband Analyzer
4. VHF Signal Generator
5. Oscilloscope
6. Envelope Oscilloscope
7. Waveform Generator
8. Tester
9. Kilovolt Meter
10. Video Demodulator
11. FM Detector
12. Master Monitor
13. Monitor Amplifier
14. Monitor Speaker

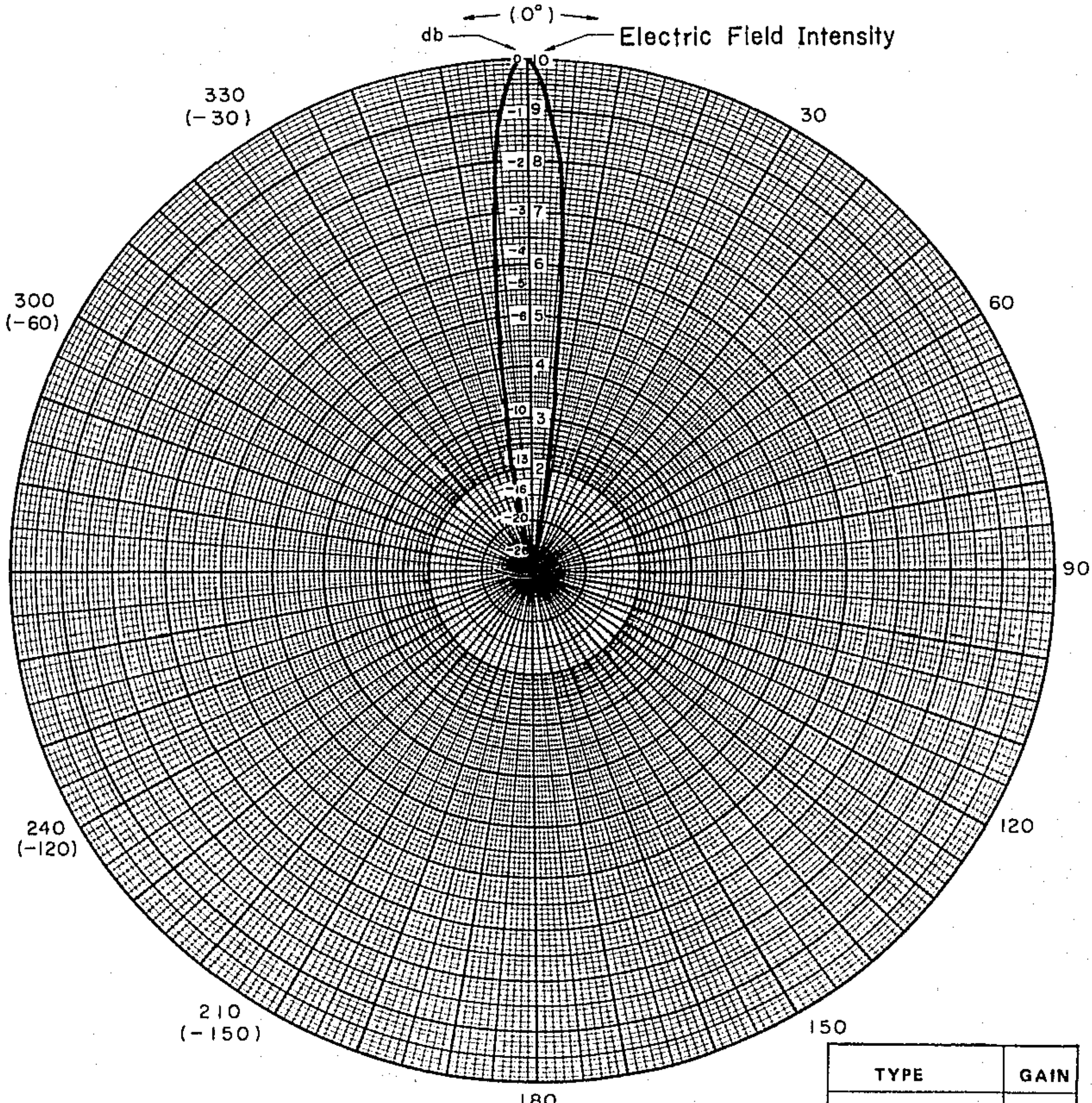
Hoime Station (One each)

1. VHF Sweep Generator
2. UHF Sweep Generator
3. VHF Signal Generator
4. UHF Signal Generator
5. Oscilloscope
6. Frequency Counter
7. Variable Attenuator
8. Tester
9. Kilovolt Meter
10. Sound Monitor (for spare)



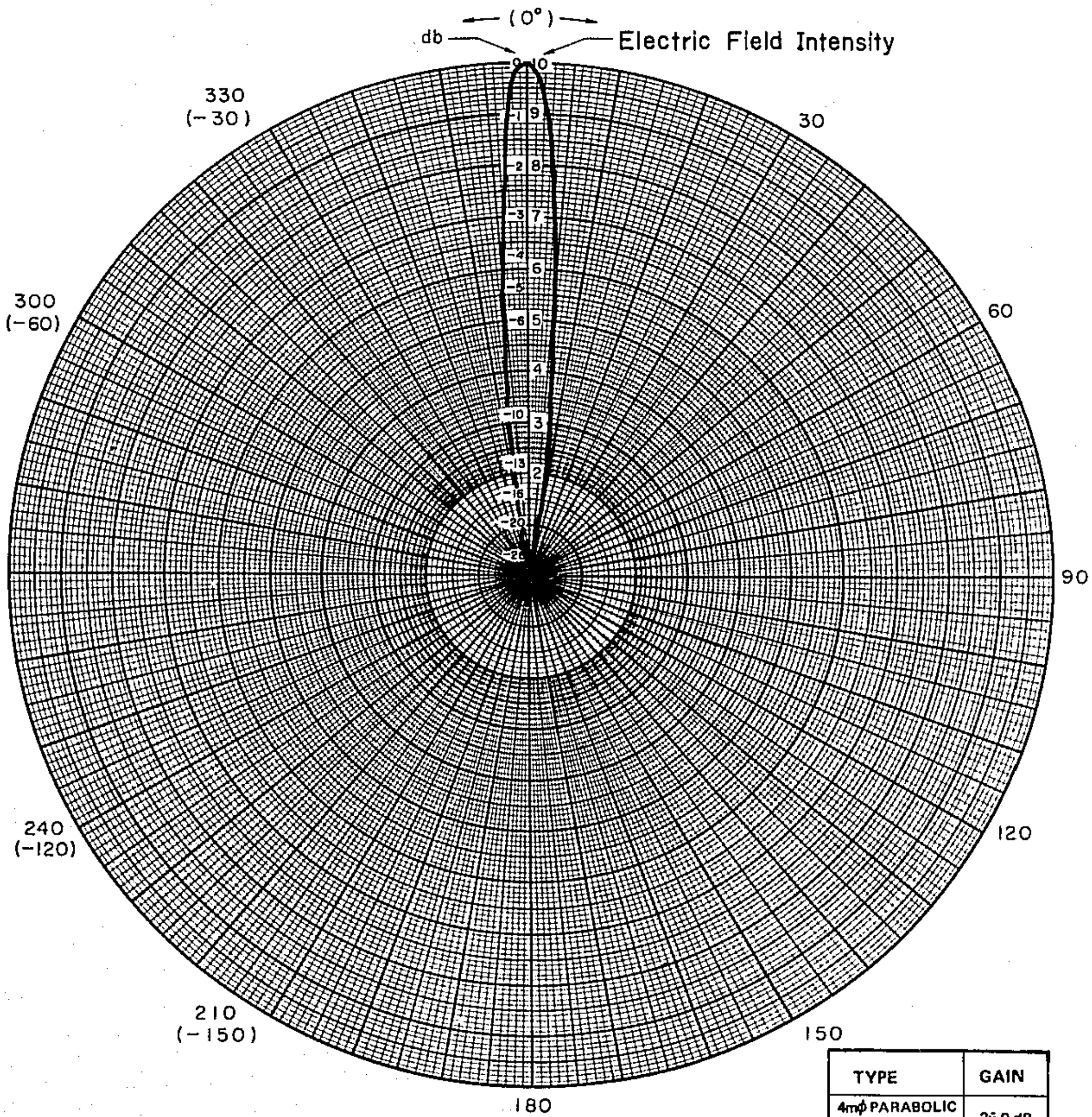
TYPE	GAIN
2.4mϕ PARABOLIC ANTENNA	20.0 dB

Fig. 6-103 HORIZONTAL PATTERN



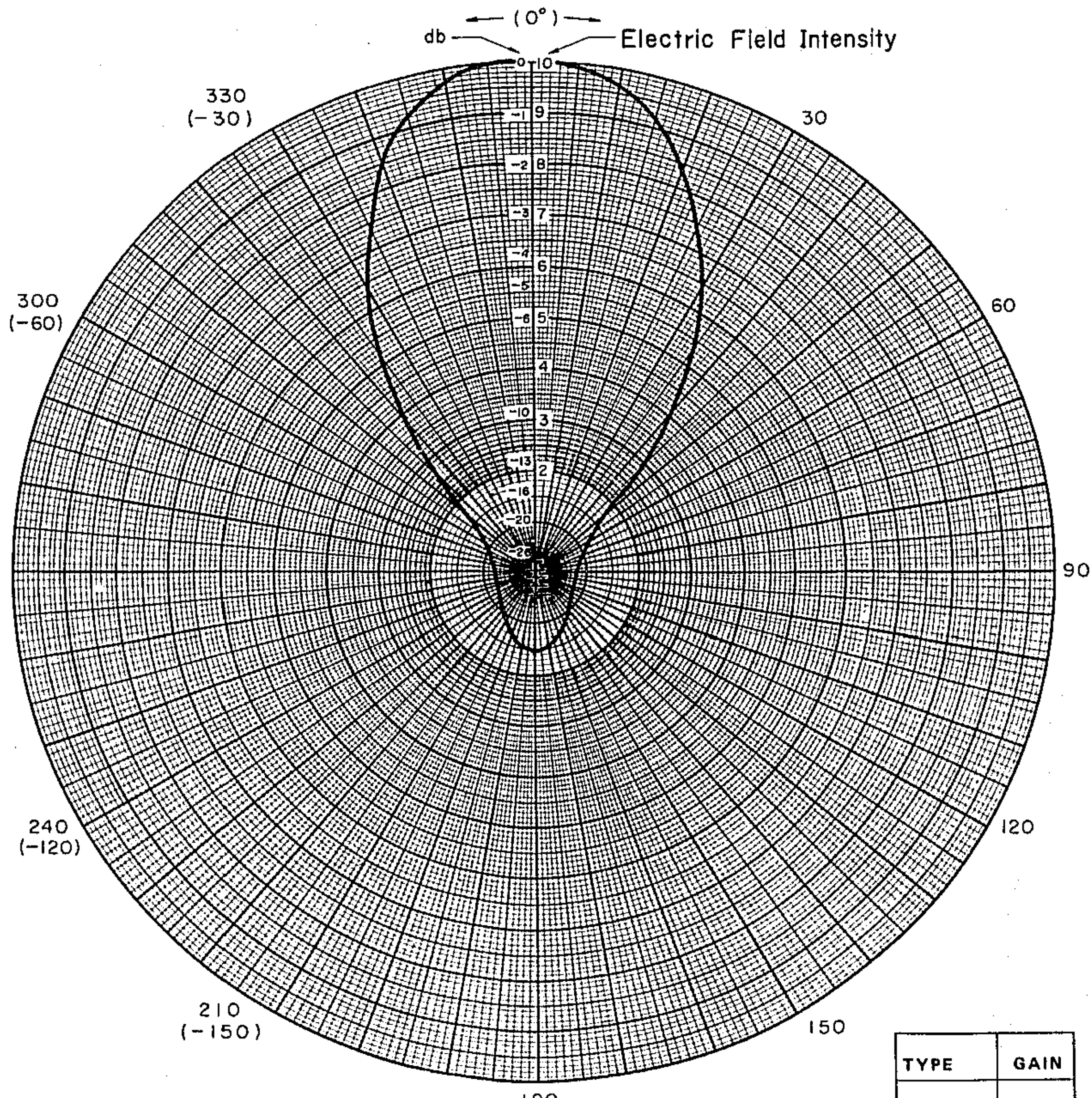
TYPE	GAIN
3mϕ PARABOLIC ANTENNA	22.0 dB

Fig. 6-104 HORIZONTAL PATTERN



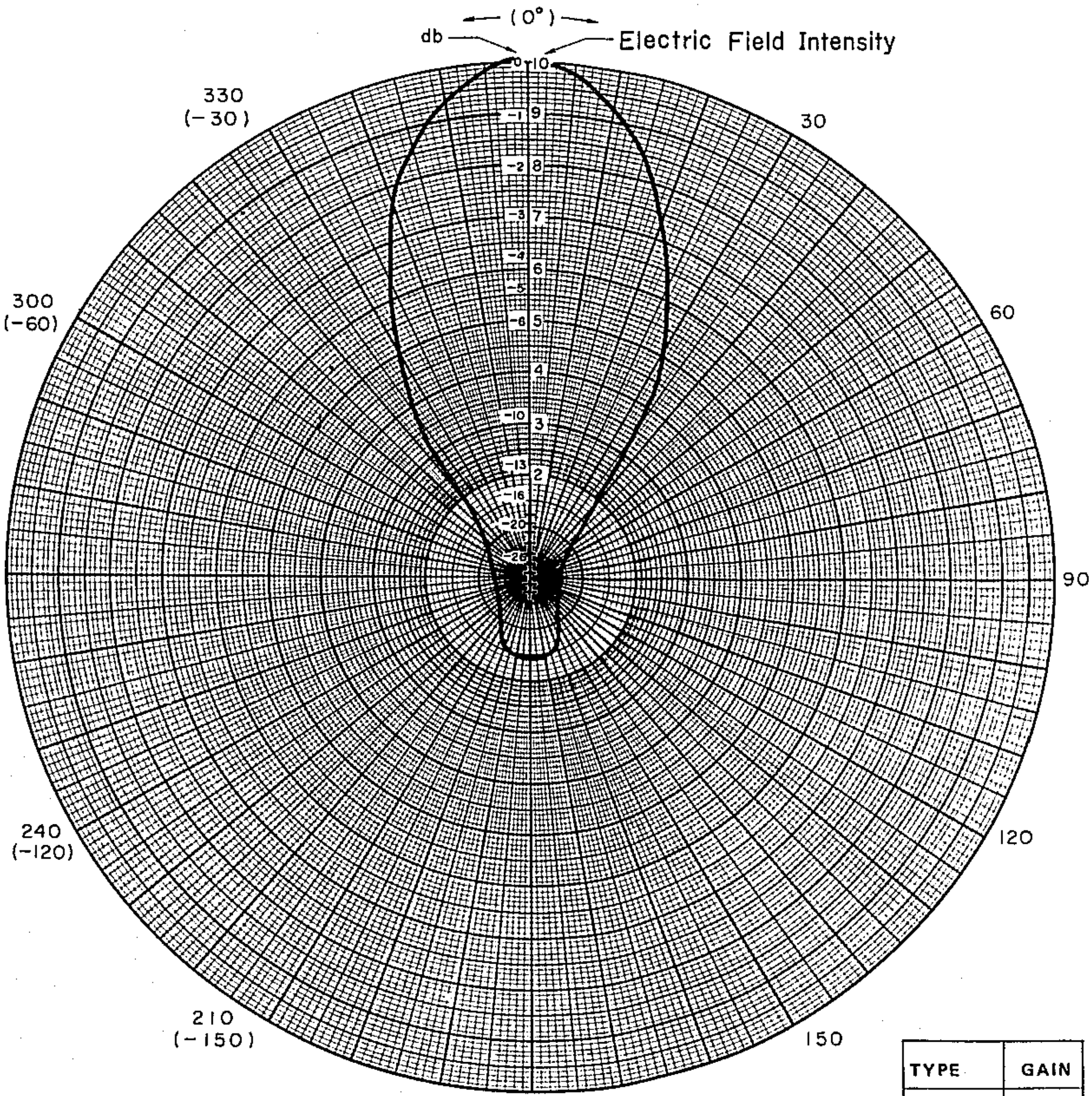
TYPE	GAIN
4mφ PARABOLIC ANTENNA	25.0 dB

Fig. 6-105 HORIZONTAL PATTERN



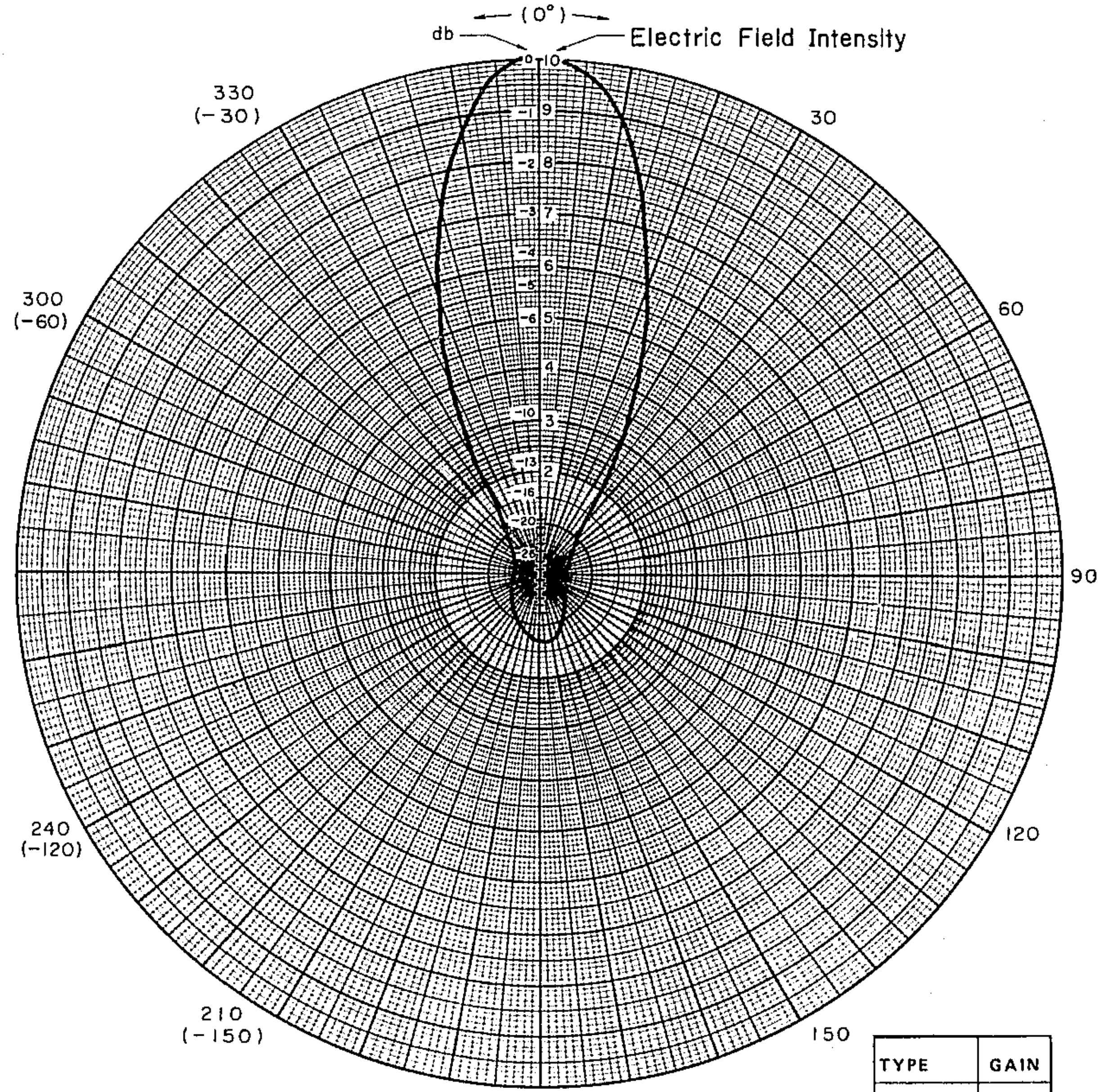
TYPE	GAIN
5Y YAGI	9.0dB

Fig. 6-106 HORIZONTAL PATTERN



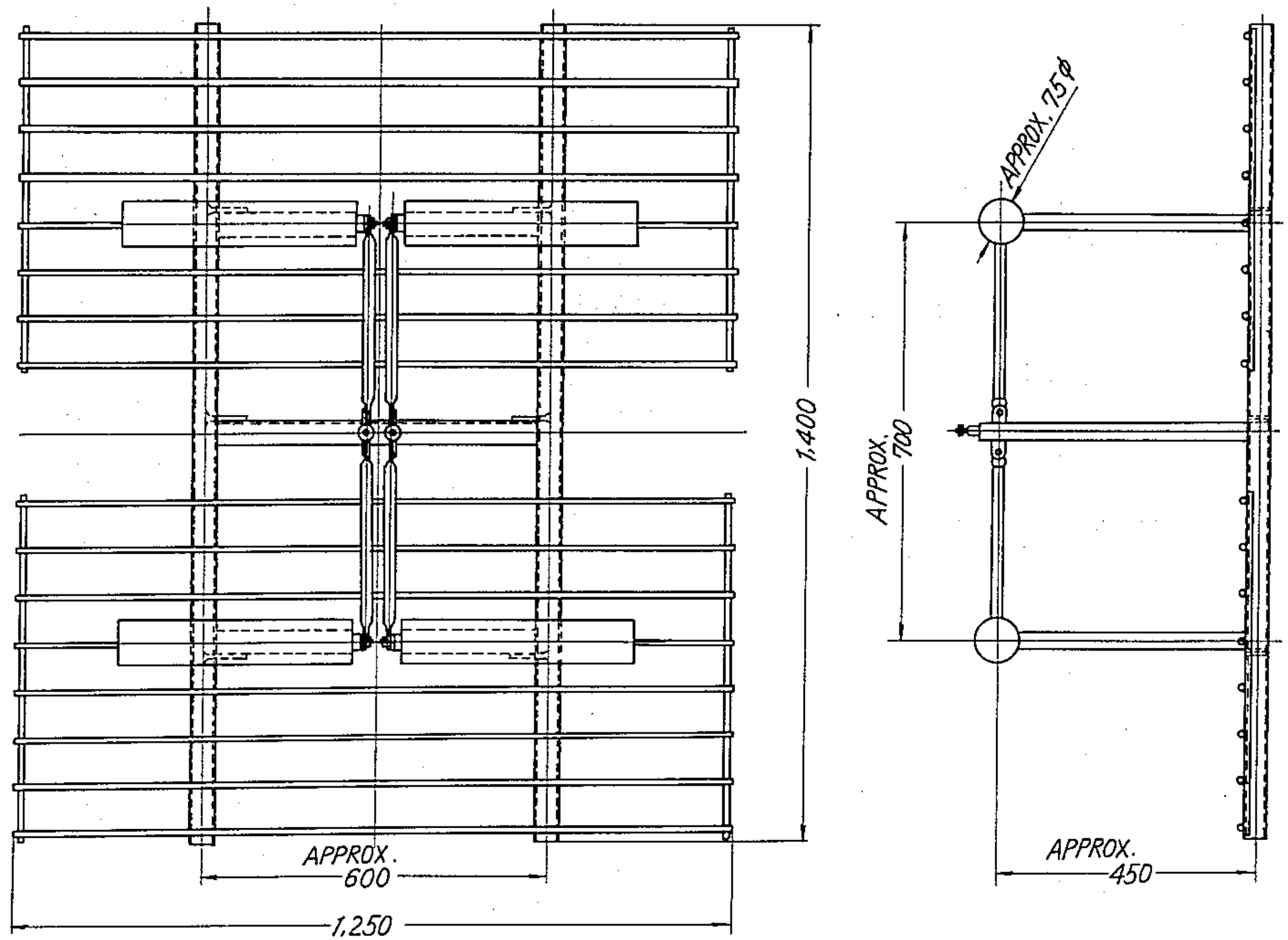
TYPE	GAIN
8Y YAGI	10.5dB

Fig. 6-107 HORIZONTAL PATTERN



TYPE	GAIN
12Y YAGI	12.5dB

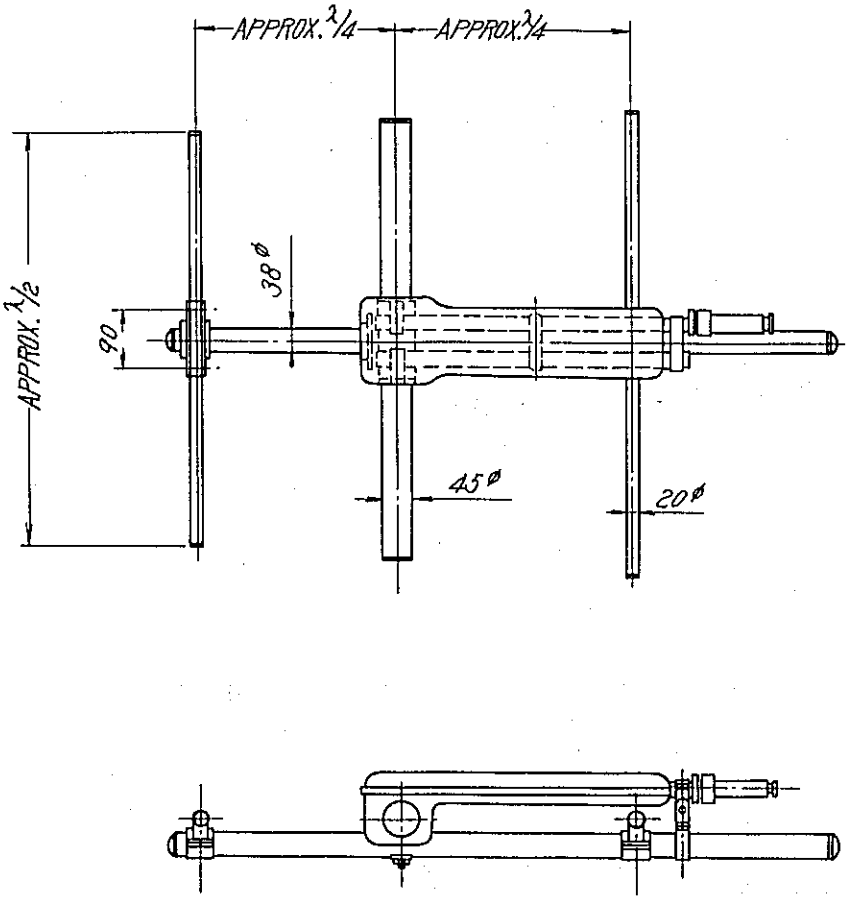
Fig. 6-108 HORIZONTAL PATTERN



STEEL : HOT-DIPPED ZINC COATING

Unit : mm

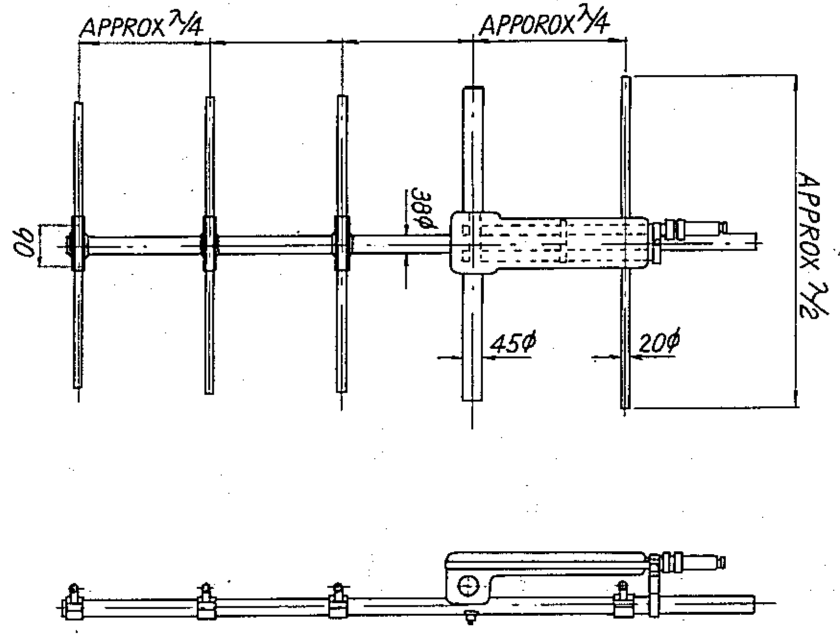
Fig. 6-109 2 DIPOLE PANEL ANTENNA



λ : WAVE LENGTH

Unit : mm

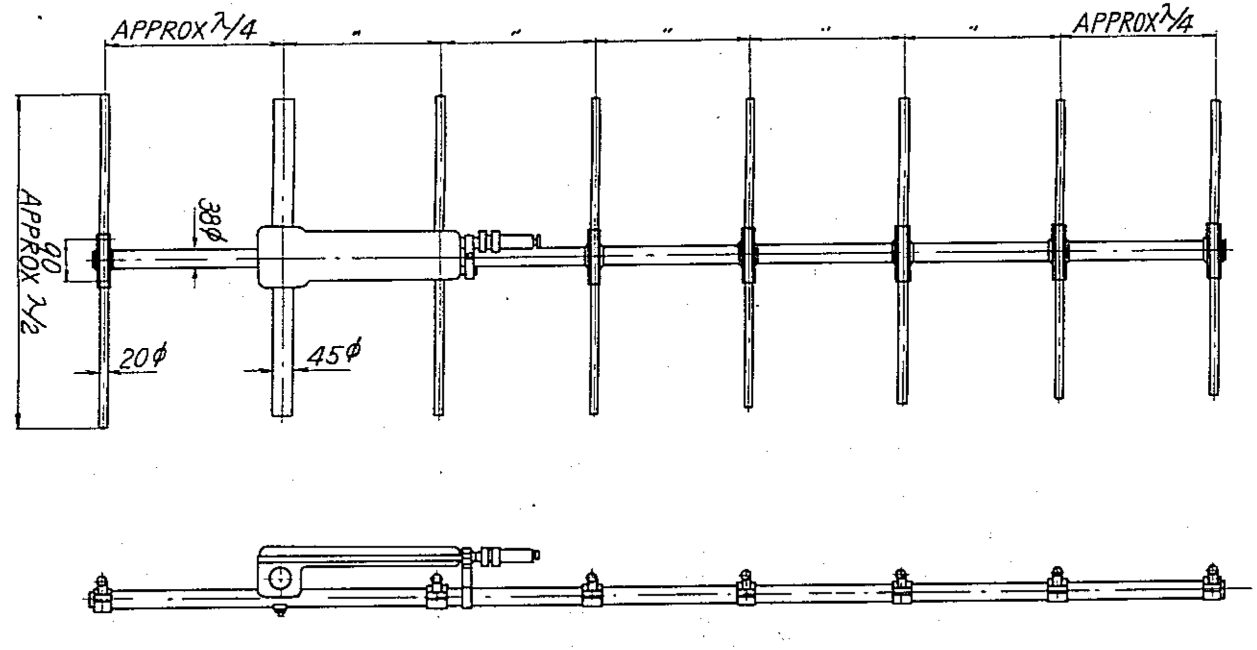
Fig. 6-110 3-ELEMENT YAGI ANTENNA



λ : WAVE LENGTH

Unit : mm

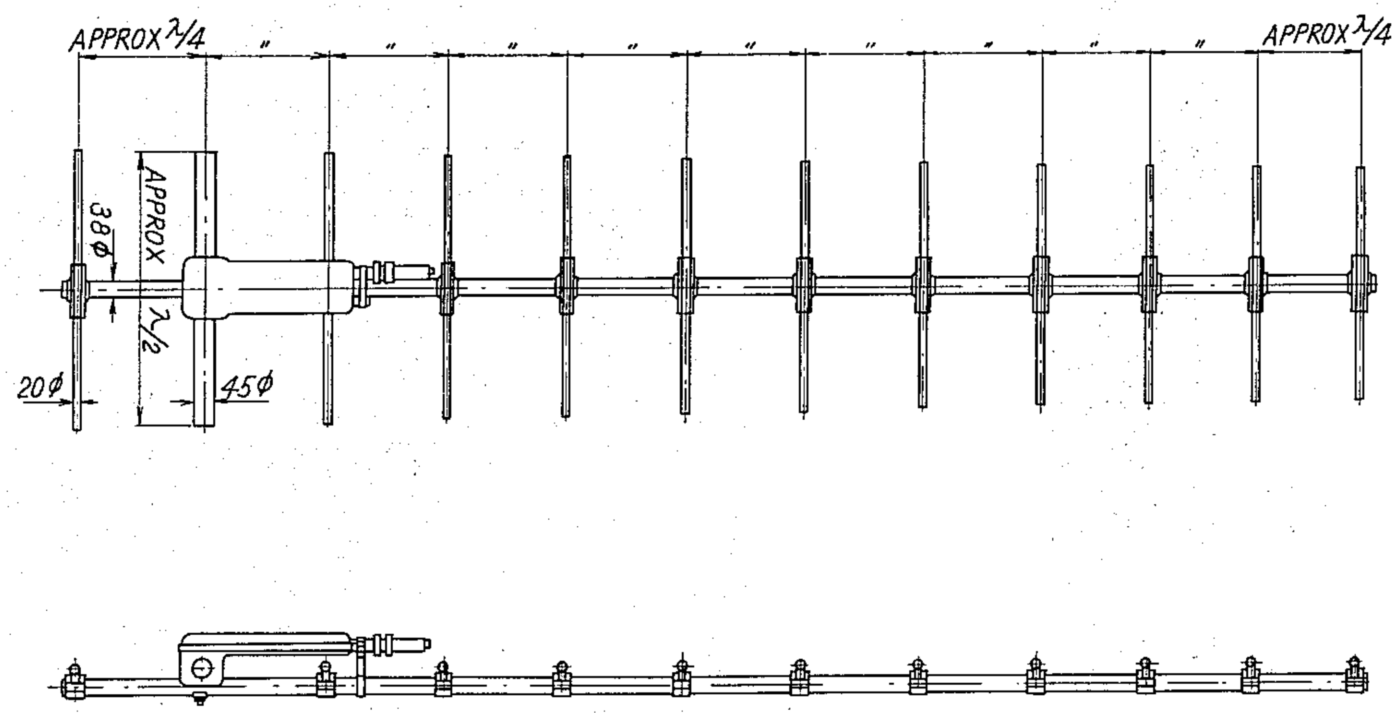
Fig. 6-111 5-ELEMENT YAGI ANTENNA



λ : WAVE LENGTH

Unit : mm

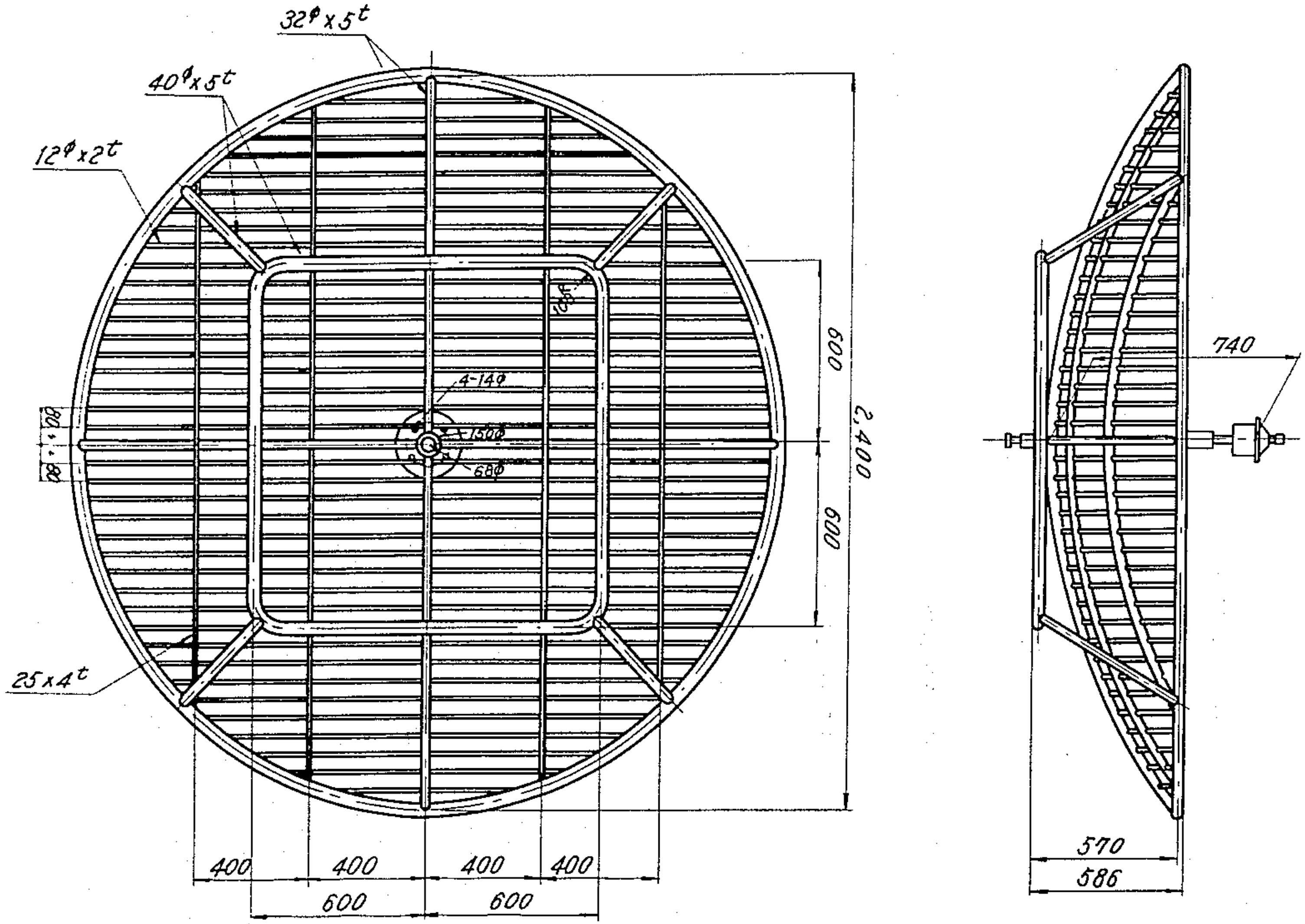
Fig. 6-112 8-ELEMENT YAGI ANTENNA



λ : WAVE LENGTH

Unit : mm

Fig. 6-113 12-ELEMENT YAGI ANTENNA



Unit: mm

Fig. 6-114   2.4 mφ PARABOLIC ANTENNA

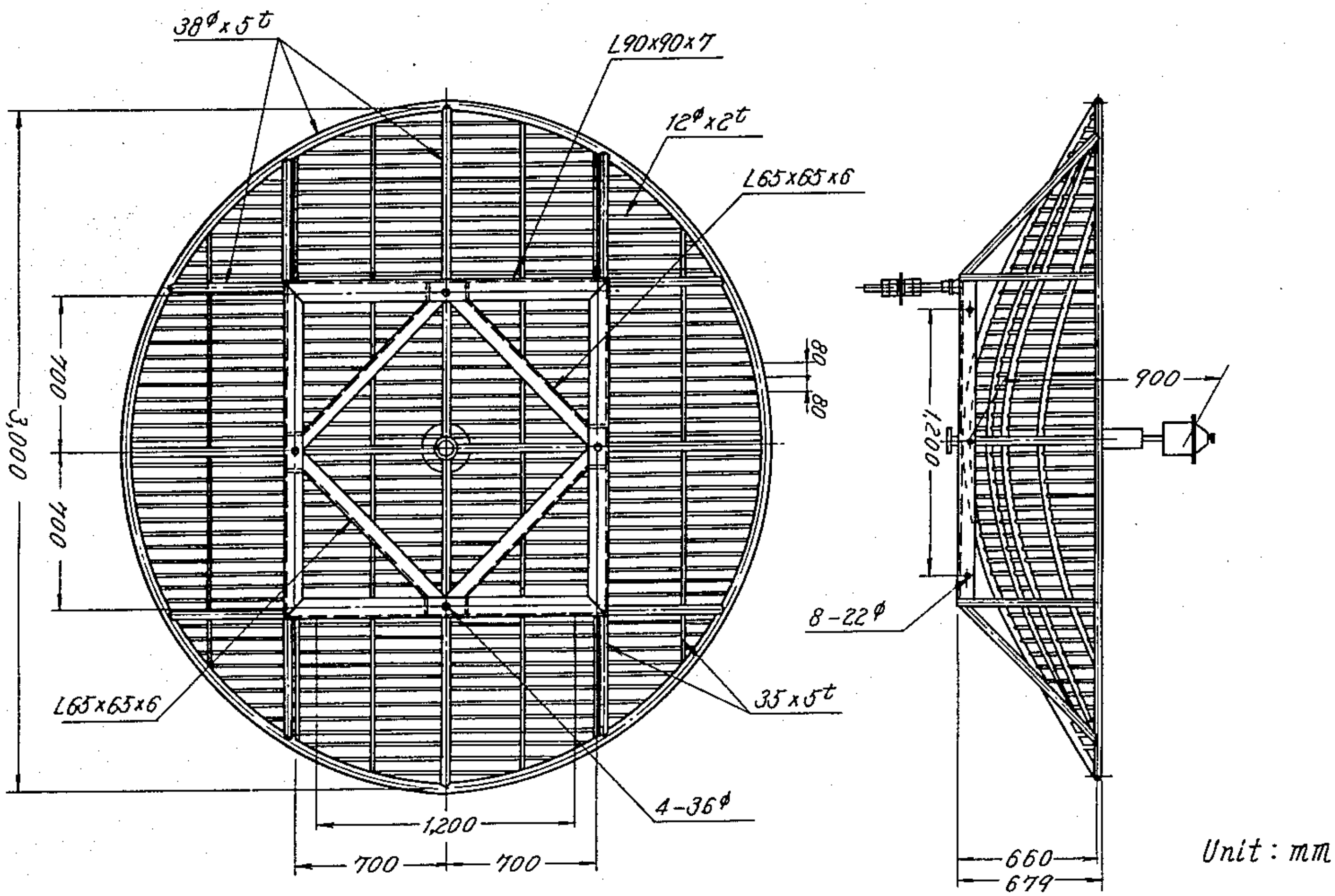
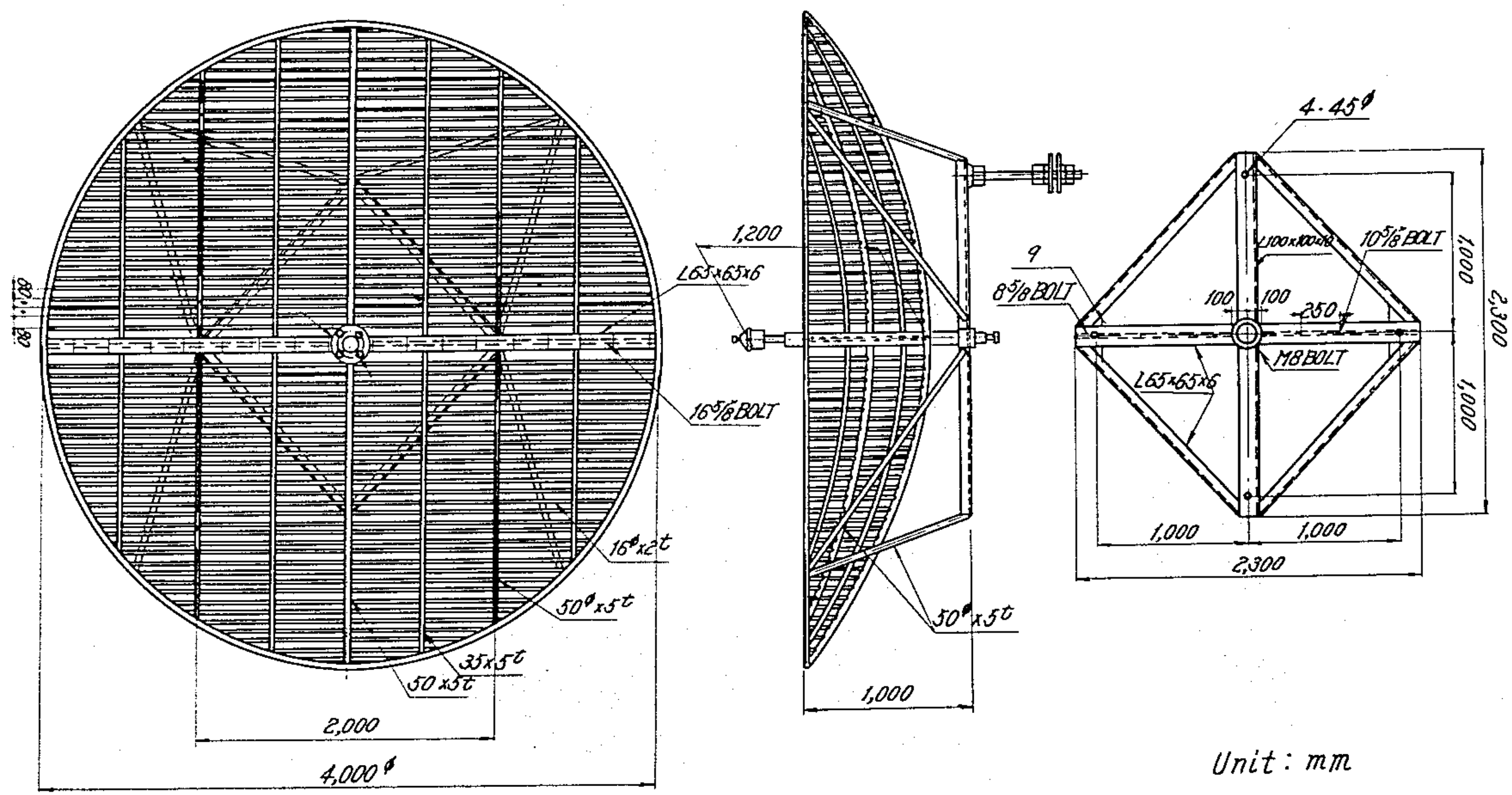


Fig. 6-115 3.0 mφ PARABOLIC ANTENNA



Unit: mm

Fig. 6-116 4.0 mφ PARABOLIC ANTENNA

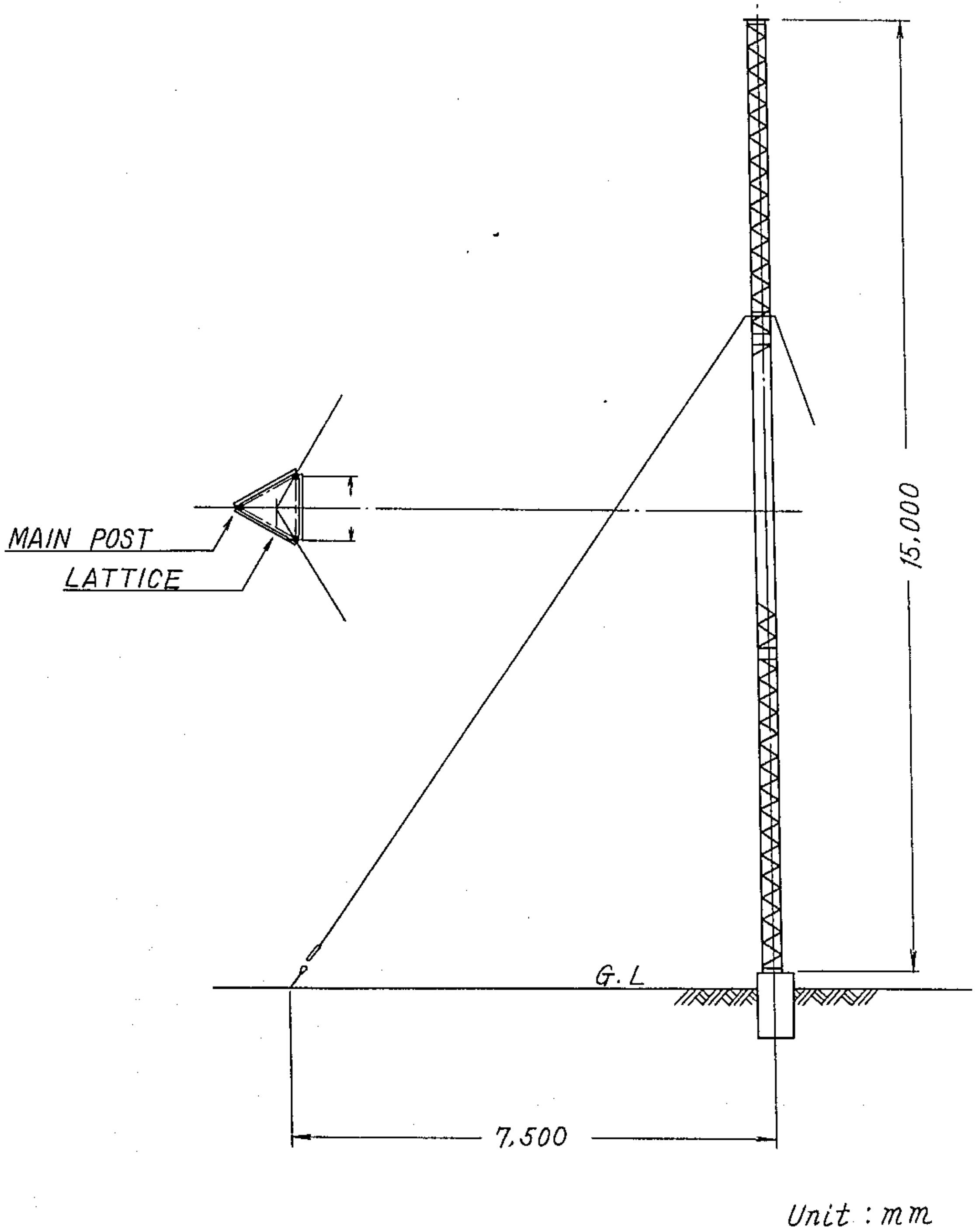


Fig.6-117 15M HEIGHT GUIED MAST

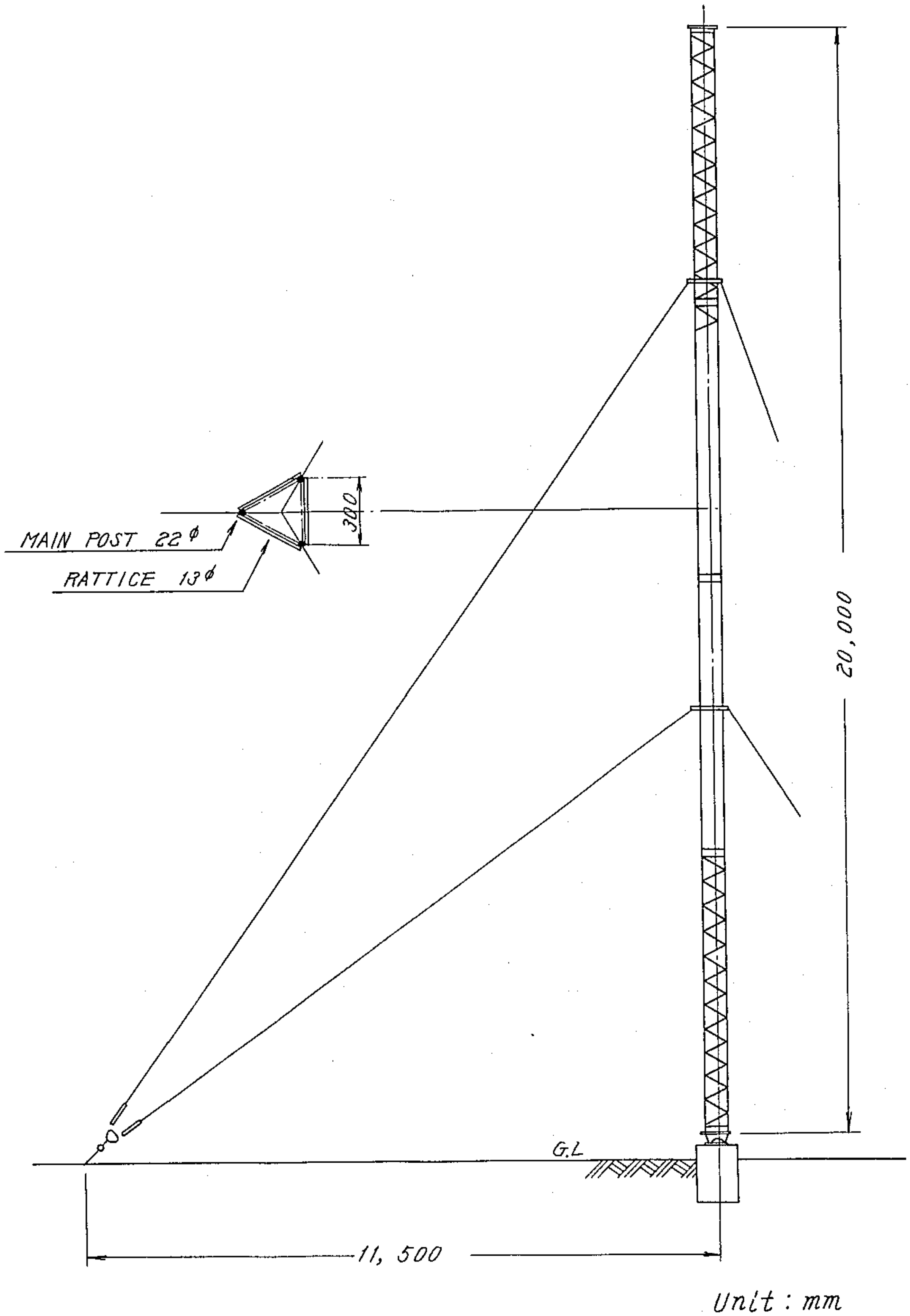


Fig. 6-118 20M HEIGHT GUIED MAST

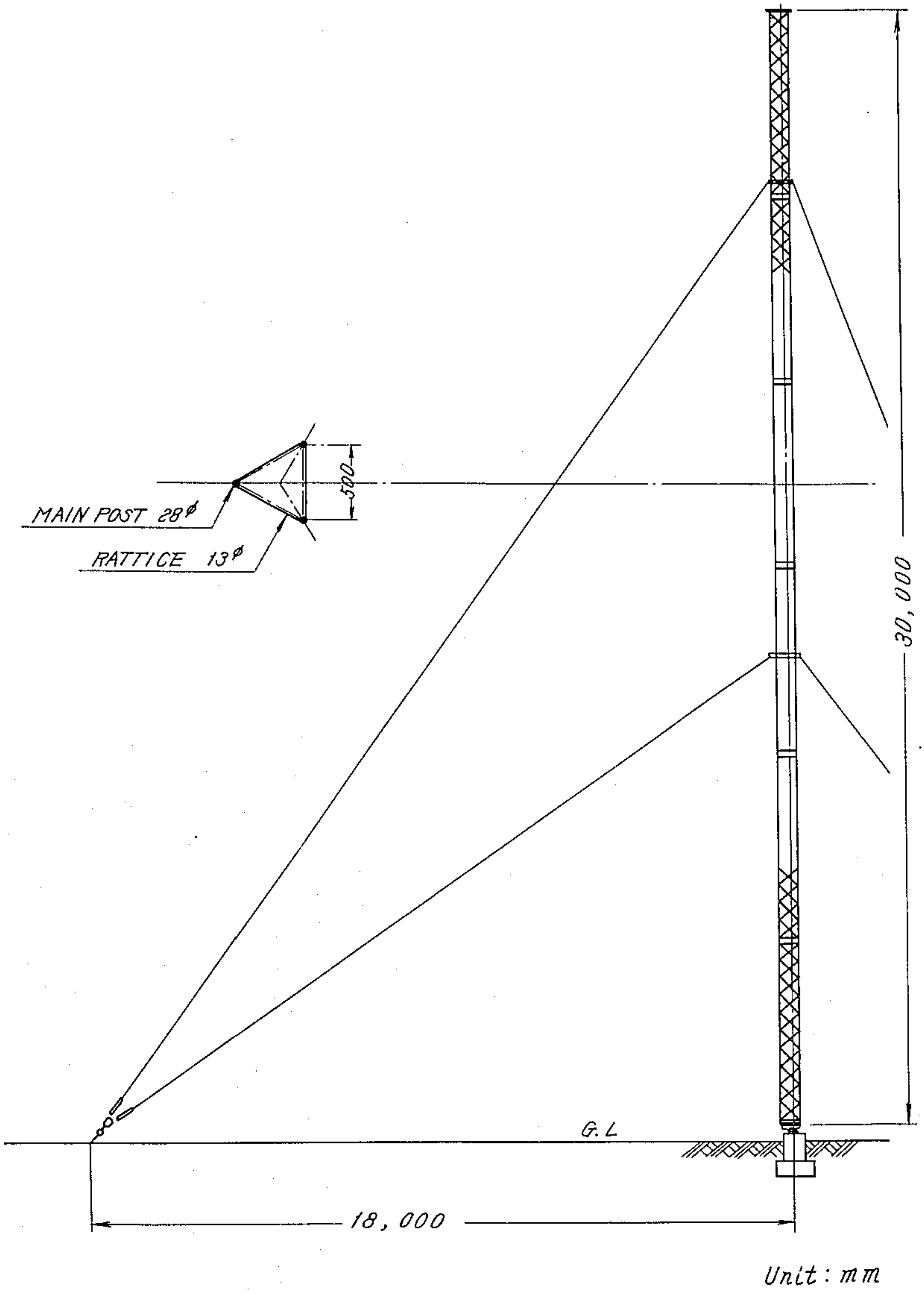


Fig. 6-119 30M HEIGHT GUIED MAST

CHAPTER 7 TIME SCHEDULE AND FUTURE PLAN

Chapter 7 Time Schedule and Future Plan

7.1 Time Schedule for Network Construction

Time schedule for implementation of the nation-wide TV network project, of which scope is described in the preceding Chapter, will be described.

7.1.1 General

Implementation of this project will require three years and six months which is divided into the following periods.

(1) Preparation Period 6 months

(From July 1969 to Dec. 1969)

(2) Construction Period 3 years

(From January 1970 to Dec. 1972)

First phase 18 months

Second phase 18 months

Details of works to be carried out in each phase, and scope of each construction work will be described in the following subsections. Also, time schedule of the works is tabulated in Table 7-1.

7.1.2 Works to be Conducted During the Preparation Period

All preparatory works necessary to implement the construction project must be completed in this period by the Government of Uganda. In order to complete the entire first phase construction works by the end of the 2nd 5-year plan for Economic Development, the preparatory works must be completed by the end of 1969.

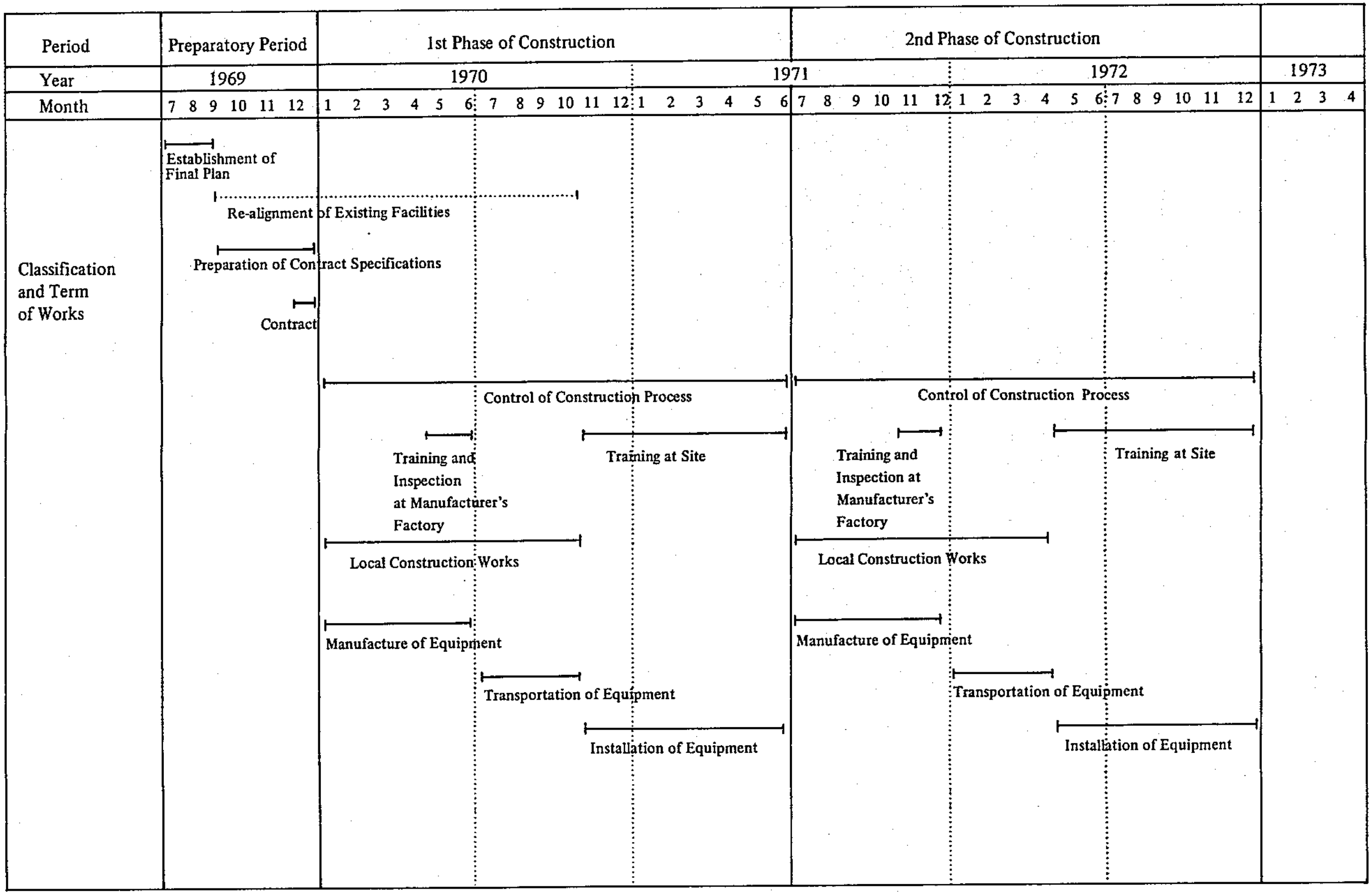
(1) Establishment of Plans

Scope and term of works, cost, and personnel responsible for the implementation of individual works must be finally and rigidly determined. The final plan must be examined by competent authorities and organizations for their acceptance and agreement.

(2) Re-alignment of Existing Facilities

Investigations into the existing transmitters, antennas, and other associated equipment in the six stations indicated that all of them fail to function satisfactorily with some deteriorated performance characteristics and unstable operation involved. As already pointed out in section 4.2, it is required to replace improper components and parts with new ones and to carefully readjust all equipment for acceptable operation prior to carrying out the construction project. Otherwise, these existing facilities will impede satisfactory performance of new relay stations, and will adversely affect the quality of programmes transmitted from new broadcasting stations.

Table 7-1 Time Schedule



The re-alignment of facilities must be completed before the construction work starts on the station sites.

As a result of meetings frequently held between the Government of Uganda and the technical survey party, the re-alignment of existing facilities was set to be carried out by ordinary budjet of Uganda; thus, the re-alignment was not included in the specifications nor in the cost estimate described in the following Chapter. Because of its importance, however, its time schedule is shown, by dotted lines, in Table 7-1.

(3) Preparation of Specifications

Detailed specifications for equipment, construction works, and other documents necessary for contract must be prepared in this period.

(4) Contract

The contractors for equipment supply and construction works must be appropriately determined, and necessary documents must be prepared and exchanged.

7.1.3 Works to be Completed in the 1st Phase

Works to be completed in the 1st phase includes improvement on the existing broadcasting network and the first extension of TV broadcasting network.

(1) Improvement on the Existing TV Relay Network

Improvement of the network to be conducted in the 1st phase includes construction of five U.H.F. relay stations in Jinja, Kagulu, Ongora, Nkirakira, and Nakisaja, which will obviously improve picture quality transmitted from the existing stations.

(2) Improvement on Existing Broadcasting Facilities

A stand-by transmitter will be installed in Kampala station. The stand-by transmitter will remarkably ease off the maintenance and servicing and also minimize the accidental break of broadcasting.

(3) Expansion of TV Broadcasting Network in the 1st Phase

The expansion of TV network in the 1st phase includes construction of three broadcasting stations in Jinja, Gulu, and Kabale.

(4) Installation of Supervisory Network

The supervisory network which supervises operation of major existing and new stations will be constructed to assure prompt maintenance services when required. The supervisory links and terminal equipment for the aforesaid stations will be constructed in this phase.

7.1.4 Works to be Completed in the 2nd Phase

The following works will be conducted in the 2nd phase to complete the nation-wide TV network.

(1) Improvement on Existing Transmitting Facilities

A stand-by transmitter will be installed at Soroti station.

(2) Completion of the Nation-wide TV Network

In conjunction with seven broadcasting stations which will be constructed in Hoima, Mashindi, Arua, Fort Portal, Kasese, Tororo, and Moroto, three U.H.F. relaying stations will be constructed in Biko, Erusi East, and Kabuga.

(3) Expansion of Supervisory Network

To cope with the increase of new TV stations, the supervisory network will have to be extended to link these stations.

(4) Improvement on Studio Facilities

To improve programme quality, an outside broadcasting van and a consol VTR will be provided for Kampala studio.

7.1.5 Works to be Conducted During the Construction Period

(1) Process Control

The progress of individual works must be strictly supervised in accordance with the final plan, and if an unexpected matter should necessitate a change in the schedule, prompt countermeasures must be taken in due consideration of its influence on the entire schedule. The control of construction process is essential throughout the construction period.

(2) Training at Factory and Inspection of Equipment

When the equipment are close to completion, engineers must be dispatched by the Government of Uganda for training so that they may become accustomed with the operation of the equipment and examine if the equipment comply with the requirements in the specifications. The training and inspection team should be composed of two or three engineers who have the ability to maintain the equipments of TV station (TV engineers or equivalents).

(3) Training at Site

When the manufacturers of equipment start installation at site, maintenance engineers and their assistants should be dispatched to the site where they will be trained to handle the equipment and take adequate measures against trouble.

(4) Local Construction Works

The local construction works which include construction of road, leveling of site, construction of building, power supply, and erection of tower must be completed before the installation of equipment starts.

(5) Manufacture of Equipment

Manufacture of transmitters, antennas, and VTR (for the 2nd phase only) at factory.

(6) Transportation of Equipment

Transportation of equipment from factory to the installation site.

(7) Installation of Equipment

Installation, adjustment, and final operation test at site. According to convenience and considering efficiency, these works may be conducted simultaneously or sequentially.

7.2 Community Viewing TV Receivers

7.2.1 Importance and Necessity of Community Viewing

Improved picture quality and extended service area display true effects of the nation-wide TV network only when all the nation view the programme. Chapter 12 of this report will describe details of the dissemination plan of TV receivers, therefore, this section gives brief description on the desirability of community viewing which will attain the intended purpose of TV broadcasting with the minimum time and effort. It is recommendable to distribute TV receivers to schools and community centres. For areas where power line is not available, portable engine generators must be distributed.

7.2.2 Schedule of Distribution

It is most desirable that the community viewing receivers will increase keeping pace with the development of the nation-wide TV network.

Preferable and practical quantity of receivers to be distributed will be 1,000 units by the end of 1st phase construction and 2,000 units more during the 2nd phase construction.

After the nation-wide TV network plan is completed, the number of the community viewing TV receivers will have to be increased, in due consideration of their social utility and the extent of popularization of home receivers.

7.3 Future Plan

The nation-wide TV network plan described in this report is neither complete nor comprehensive enough to satisfy anticipated future requirements. Further expansion and development will be required to comply with these future requirements. Hence, a new project will have to be drawn up to attain a more complete servicing.

Foreseeable major items which merit serious consideration are briefly described below.

7.3.1 Enrichment of Programme Production

One of the most important requirement will be the construction of a new studio centre accompanied with updating of studio facilities.

At the same time, facilities to relay outside events will be required.

7.3.2 Consolidation of Network

(1) Updating of Existing Facilities

Most of the existing facilities will be considerably superannuated at the time of completion of the present plan. Excessively deteriorated facilities will require updating.

(2) Installation of Stand-by Transmitters

To ease off the maintenance and servicing and to minimize the break of service, a stand-by transmitter will have to be installed in each station other than Kampala and Soroti.

(3) Installation of Emergency Power Supply Facilities

To provide against power failure and sustain broadcasting of stations of which power is supplied from line emergency engine generators will have to be installed.

7.3.3 Supplement of Small Power Local Stations

To cover all the hard-to-enjoy spots, a number of small power local stations will be required to improve service of the nation-wide TV network.

7.3.4 Construction of Inter-station Communication Network

To provide communication measures between stations, an intercommunication network will be required.

The supervisory network under planning will be commonly used for upward communication line, therefore, the communication network will be accomplished by constructing only one-way (downward) line.

7.3.5 Increase of Community Viewing Receivers

In order to enhance the effect of the nation-wide TV broadcasting network, much more community viewing receivers will have to be installed in community centres and schools.

CHAPTER 8 COSTS OF CONSTRUCTION AND OPERATION OF NATION-WIDE TV BROADCASTING NETWORK

Chapter 8 Costs of Construction and Operation of Nation-wide TV Broadcasting Network

8.1 Construction Cost

The estimated cost for the construction of the nation-wide TV broadcasting network is shown in Table 8-1.

The local charge described in the table includes the cost for transportation of equipment from Mombasa to sites, installation of equipment and materials, erection of tower, installation of antenna, and other costs which must be paid in Uganda currency.

The estimated cost in the table are for the standard type equipment and facilities delivered at site after fulfilment of the manufacturer's burden including installation, adjustment and inspection on the site. Costs for road construction and leveling of station site are not included in the table. Expenses for station building and lead-in of power line are based on the estimate of the Ministry of Works, Communications and Housing and the Uganda Electricity Board respectively, and are subject to change in actual construction on the sites.

Table 8-1 Summary of Total Cost Estimation for Uganda TV Network

Unit: Shillings

Phase	Facilities	Building	Power line	Local charge	Total
First	7,620,000	190,000	220,000	520,000	8,550,000
Second	7,540,000	200,000	150,000	530,000	8,420,000
Total	15,160,000	390,000	370,000	1,050,000	16,970,000

The construction cost of major equipment (corresponding to the item "Facilities" in Table 8-1) classified by indivisual station is shown in Table 8-2.

Table 8-2 Construction Cost for Each Station

1st Phase		2nd Phase	
Station	Shillings	Station	Shillings
Jinja	560,000	Biko	430,000
Kagulu	590,000	Hoima	830,000
Soroti	490,000	Masindi	620,000
Mbale	140,000	Kabuga	580,000
Ongora	370,000	Fort Portal	620,000
Lira	220,000	Kasese	210,000
Nkirakira	390,000	Erusi East	560,000
Masaka	260,000	Arua	480,000
Nakisaja	530,000	Tororo	330,000
Mbarara	500,000	Moroto	220,000
Kampala	1,380,000	Soroti & others	970,000
Gulu	1,570,000		
Kabale	620,000	Studio equipment	1,690,000
Grand Total	7,620,000	Grand Total	7,540,000

8.2 Operation Cost

The operation cost of broadcasting and relaying stations as estimated on the basis of the following conditions and classified by the construction phase is shown in Table 8-3.

Table 8-3 Operation Cost

Phase	Shillings
First	184,000
Second	129,000
Total	313,000

Conditions: The costs in the table cover power supply, fuel and oil for engine generators, and supply of consumable parts of equipment for one year.

Personnel expenditures, maintenance expenses for the station building, and general management expenses are not included. Also, costs in the table are estimated only for the stations to be newly built, hence operating costs for the existing stations are not included in the cost for each phase.

The daily broadcasting hours is set at 8 hrs. and 35 min. assumed to be achieved at time of completion of the construction project.

CHAPTER 9 BROADCASTING SYSTEM

Chapter 9 Broadcasting System

9.1 Broadcasting Legislation

9.1.1 Necessity for Legislation on Broadcasting Control

Radio waves used in broadcasting as its medium have a nature of propagation and such a nature has a substantial international influence. On the other hand, there is a limit to the frequency available. So, radio waves have been subject to the international regulations since the early days when they were first put into practical use. The International Telecommunication Convention and Radio Regulations annexed thereto, which are the origin of the laws for telecommunication control, have a series of regulations (the regulations, for example, concerning the licence, frequency, harmful interference, etc.) binding on the contracting states. And the governments of the contracting states are obliged to take necessary steps to ensure that their broadcasting stations should follow these regulations. In addition to such requirements from the international society, the broadcasting has a great influence upon the formation of public opinion, plays an important role in national education, and has a close relation with the maintenance of the law and order. Therefore, every country has formulated legislation suitable for its own conditions. And, from the above-mentioned point of view, it is desirable that the Government of Uganda to prepare some legislation needed.

9.1.2 Contents of Legislation

Such legislation may be required to cover the following items.

(a) Object of Legislation

It may be necessary to state it as the object of legislation to make the broadcasting not only useful for the achievement of the national objects but also helpful to the improvement of the national welfare through its dissemination throughout the nation and the exercise of its function in full. It may also be necessary to state that stress would be placed upon the educational functions of broadcasting which should play an important role in elevating the nation's present level of education.

(b) Broadcasting Enterprise

It is desirable to fix by legislation fundamental items concerning an organ in charge of broadcasting, its organization, the scope of its enterprise activity, etc.

(c) Technical Supervision

It is necessary to set up a general tehcnical standard, an inspection system, etc. for the broadcasting station.

(d) Supervision of Programme

It is necessary to expressly stipulate a programme code, the right to and responsibility for the compilation of programme, a standard for advertisement broadcasting, etc.

9.2 Form of Enterprise

9.2.1 Main Constituent of Management

When briefly classifying the main constituents of management for the broadcasting enterprises in the world, they are operated and managed either by the national government, the public corporation, or the private enterprise. In addition, there are some countries where either two of the above management forms are existing together.

Table 9-1 Management and Operation Forms of the Broadcasting Enterprises in the World

Classification	Name of Country
1. Management and Operation by the nation	USSR, East Germany and other East European countries, United Arab Republic, India, etc.
2. Management and operation by the private enterprise	USA, Chile, Mexico, Monaco, etc.
3. Management and operation by the public corporation	United Kingdom, France, West Germany, Italy, Ghana, Ceylon, etc.
4. Co-existence of the management and operation by the nation and the private enterprise	Spain, Portugal, Argentina, Brazil, Saudi Arabia, Philippines, etc.
5. Co-existence of the management and operation by the public corporation and the private enterprise	Canada, Australia, New Zealand, Nigeria, Israel, Japan, etc.

Every country is adopting the most suitable management form, taking into consideration its present condition, historical changes, traditions, custom, object of broadcasting, etc.

It is generally said that a public corporation is most suitable for the main constituent of the management of the broadcasting enterprise, since it can get rid of the defects inherent to the national or private management that are undesirable for the public and influential character of broadcasting. This may be somewhat endorsed by the case of Britain where commercial broadcastings are permitted only under the powerful control and regulation of a public corporation called the ITA (Independent Television Authority).

As to the management form of broadcasting enterprise in Uganda, it appears appropriate to place it under government management for the time being. The reasons are: First, the government, attaching great importance to the educational and information transmitting functions of broadcasting, intends to make the most use of it for the achievement of such national objects as the dissemination of education, unification of public opinion and national language. Secondly, the above-mentioned objects may be most effectively achieved by a single enterprise with a nation-wide network, for Uganda cannot afford economically the establishment of more than two broadcasting enterprises at present. And thirdly, the broadcasting enterprise must turn to the national finance for the greater part of its operating fund and construction investment for the time being, from whatever revenue source they may come. But when the country fully matured in its politics, economy, society and civilization, it is of course desirable to switch over to the management by a public corporation free from the defects of the government-managed enterprise.

Even in the case of government management, the broadcasting enterprise, must clarify its income and expenditure, which will arouse the enterprising spirit among the personnel and help toward the development of progressive enterprise activities. For this purpose, the following two steps seem to be necessary.

(1) Adopt a special accounting system independent of the general account of the government, as a step forward to establish the self-supporting accounting system in future.

(2) To achieve it, in the way of organization, it is necessary to make it an extra-ministerial bureau of the Ministry of Information, Broadcasting and Tourism or a government-managed enterprise – an enterprise that has not substantially but technically independent finance and management systems – under the control and order of the Cabinet or the Ministry of Information, Broadcasting and Tourism.

9.2.2 Integration of Radio and Television

In Uganda today, each of radio and TV broadcasting enterprises forms a division of the Ministry of Information, Broadcasting and Tourism and is connected directly with its permanent secretary, but there is little communication between the two divisions.

There are two opposing opinions as to the management form of radio and TV: To place radio and TV together under the management of a single organ or to separate them into two independent enterprises. The following are the points of argument.

(1) When radio and TV are independently managed:

a) In the case of TV, image comes first and sound next. Therefore, it requires experts of new type.

b) Even when TV has developed into a major broadcasting medium, radio is still worthy of existence for the poor or the residents in remote places. But if it is integrated with TV, there is the risk that the radio's unique roles will be hampered.

c) As a result of integration, talented producers will be engaged in the production of TV programmes only, which may lead to the degradation of radio programmes.

d) From the viewpoint of management, the separate operation of radio and TV does not lead to the saving of personnel.

(2) When radio and TV are integrated into a single enterprise:

a) Radio-experienced personnel are also of worth to TV.

b) If radio and TV have not been integrated when the latter takes the place of the former as the major broadcasting medium, the personnel in radio division will become dull and some means must be sought for inter-divisional personnel exchange.

c) As radio and TV divisions have many factors common to each other, efficient utilization of personnel and facilities will become possible.

d) It may be possible to reduce the management personnel of both divisions.

And in the case of Uganda, it seems to be advantageous for the following reasons to integrate the organizations of radio and TV for unfied management, when account is taken of the time when nation-wide radio and TV networks have been completed and the range of programmes have been enlarged.

That is, as to the indirect department, general and administrative sections (Personnel, Labor, Finance, Training Sections, etc.) can be unified as they have the same functions. And the sections in charge of musical notes, information data, books and other printed data, and other broadcasting data can also be unified as such data can be used in common.

In most countries, TV started its operation availing itself of the personnel and material resources of radio. So, if the two divisions are integrated, the resources radio now possesses will be more efficiently utilized. For example, the shortage of TV studio will temporarily be solved by adding some lights to the radio studio and adopting an outside-broadcast van drive system together. Particularly in the way of personnel resources, the source to supplement the TV personnel is available nowhere but in the radio division, since in this country the fields of movie, theatrical play, and electric industry have not developed yet.

As above-mentioned, not a little effect can be expected of the unification of the radio and TV organizations; for example, simplification in organization such as the unified operation of common elements and the inter-divisional exchange in the broadcasting sections, reduction of operating cost through the efficient utilization of personnel and material resources, and mutual supplement in programmes.

From the legal point of view, on the other hand, the unification of radio and TV offers much convenience to them with respect to their relation with writers, entertainers, publishers, etc., since they can follow the same procedure in the negotiation with them.

From the above-mentioned point of view, it is recommended that radio and TV should be unified and operated as a single organization.

9.2.3 Incorporation of Production Staff of Education TV (ETV) into Uganda TV (UTV)

Uganda's ETV is now organized as a division of the Ministry of Education, independent of the Ministry of Information, Broadcasting and Tourism, and therefore it does not directly come under the order and direction of the latter. ETV has its own programme organizers, producers, and other staffs who are producing school programmes with the facilities and personnel of UTV.

However, to make the more efficient use of the present limited facilities and personnel, it seems to be necessary to incorporate the production staffs of school programmes into the organization of UTV so that all the programmes, including those for ETV, may be produced on a unified basis.

9.3 Revenue Source

The maintenance and operation of a broadcasting enterprise requires a very large amount of funds for construction and operation.

The broadcasting enterprises of the world are now turning to the following sources for their funds.

(1) Government fund

(2) Receiving fee income

(3) Advertisement broadcasting income

In Uganda, its TV broadcasting enterprise has totally been financed by the government fund. But Substantially, it may be classified as follows by its sources.

(1) Receiving Licence Fee

(2) Receiver Dealing Licence Fee

(3) Receiver Repairing Licence Fee

(4) Advertisement Broadcasting Income

(5) Governmental Grant-In-Aid

Table 9-2 Comparison of Enterprise Income & Expenditure
– Radio Uganda – (1967/1968)

Classification	Amount (Uganda Pound)
Income	174,215
Receiving fee	0
Advertisement	150,000
Grant-in-aid	24,215
Expenditure	174,215
Transportation	5,000
Car maintenance	2,000
Technical maintenance	12,000
Programme	26,000
Advertisement	3,000
Circuit rent	6,000
Audience investigation	2,200
Electric power	13,000
Special machinery	1,400
Personnel expenses	103,155

Table 9-3 Comparison of Enterprise Income & Expenditure – Uganda Television – (1967/1968)

Classification	Amount (Uganda Pound)
Income	148,800
Receiving fee, etc.	3,000
Advertisement	30,000
Grand-in-aid	115,800
Expenditure	148,800
Technique	30,000
Programme	33,000
Avertisement	1,300
News	9,000
Electric power	8,500
Traveling expenses	5,500
Transportation	1,500
Personnel expenses	60,000

Remarks: (1) Receiving fee and advertisement income are the estimated amount.

(2) Personnel expenses are estimated from those of the technical division.

9.3.1 Governmental Grant-in-Aid

As above-mentioned, it is considered at present that the greater part of UTV's expenditures are financed by the governmental grant-in-aid.

On the other hand:

(1) The TV broadcasting enterprise, which requires a large amount of expenses, may become a primary factor to oppress the general account of the government if its scale is expanded largely.

(2) In view of the desired elevation of enterprise spirit through financial independence, it is not desirable for the broadcasting enterprise to depend on the grant-in-aid.

(3) So far as the audiences are limited to a specific class of the nation, the expenses of the TV broadcasting enterprise are unfairly charged to those who do not watch TV.

(4) It is not possible to secure ample funds needed for the rapid development in future out of the governmental funds.

Therefore, it is necessary to increase the income through other sources so that it can maintain the projected independent accounting system and to gradually decrease the governmental grant-in-aid to such a level as only to make up the deficit. Eventually when it is ready for the independent accounting system, the governmental grant-in-aid must be minimized to the expenses for such programmes as intended for the government's PR activities produced at its request.

9.3.2 Receiving Fee Income

Receiving fee income is the most effective management revenue source for the broadcasting enterprise. Its total amount counterbalances the operating expenses of the broadcasting enterprise including the programme production cost, financial expenses plus collection charges (In case there is an advertisement broadcasting income, its estimated amount must be deducted.) Thus the amount of receiving fee is calculated by dividing this total amount by the number of audiences. However, at a stage in which the TV receivers are not sufficiently disseminated, the amount will be more than can be borne by a receiver. Therefore, it must be decided with due consideration for the receiver's bearing capacity. So long as it is set, keeping its balance with other public rates, at a sum that does not fall heavily upon the household economy, it will not hamper the dissemination of TV.

Table 9-4 Receiving Fee System in the World

Item	Britain	France	Italy	Australia	Sweden	Czechoslovakia	Japan
Character & Authority	Receiving licence issuance fee (Wireless Law, 1949)	Receiver utilization fee (Order on French Government-managed Broadcasting, 1959)	Receiving fee (Imperial ordinance No. 246, Feb. 21, 1938)	Receiving licence fee (Broadcasting Law, 1942)	Licence fee (Imperial ordinance No. 231 on possession of receivers)	Licence fee	Receiving fee (Broadcasting Law, 1950)
Collector	General Post Office	ORTF	Ministry of Finance (Tax Collection Agency)	Ministry of Postal Services	Telecommunication Administration Bureau	Government (Central Post Office)	N.H.K. (Japan Broadcasting Corporation)
Rate (per year) and Basis	Radio: £1-5-0 (22 shillings) Radio/TV: £5-0-0 (86.5 shillings) Colour TV: £10-0-0 (173 shillings) Above rates are applicable to the receivers in the room of hotels, cars and trains, ships, etc. (Regulation of fees approved for telecommunication and broadcasting, 3rd amendment. (1965))	Radio: Fr. 30 (44 shillings) Radio/TV: Fr. 100 (146 shillings) (Regulation on Radio & TV receivers utilization fee, 1960)	Radio: L3,400 (39 shillings) Radio/TV: L12,000 (139 shillings) For the receivers in the restaurant, hotel, high-class automobile, additional fee will be charged. And for the additional speaker and sub-receiver of the master-and-sub TV receiver, special discount rate will be applied. (Minister's Order, Nov. 30, 1960)	Radio: No. 1 District A$5.50 (44 shillings) No. 2 District A$2.80 (23 shillings) TV: A$12.00 (97 shillings) Remarks: No. 1 District is the area within 400 km of the station designated by ABCB. And No. 2 District is the area other than No. 1 District. (Broadcasting Law, 1942)	Radio: KR35 (49 shillings) TV: KR100 (139 shillings) (Imperial ordinance No. 231 on possession of receivers)	Radio: KR60 (60 shillings) TV: KR180 (180 shillings)	Radio: Free TV ¥3,780 (76 shillings) Colour TV: ¥5,580 (112 shillings) (Art. 32, Broadcasting Law)
Rate Decision Method	Decided by the Postmaster General subject to the approval of the Exchequer.	Decided by the regulation of the House of Councilors, based on the report of the Ministries of Information & Finance.	Decided by the Inter-Ministry Commodity Price Liaison Committee and promulgated by the Minister of Postal Services on the Official Gazette.	Decided by Law. (Art 128, Broadcasting Law.)	Decided by the government ordinance.	Decided by the order of the government.	Decided by approval of NHK's revenue and expenditure budget at the Diet.
Payment Method	Paid at post office on issuance and/or renewal of receiving licence certificate (valid for 12 months). Collective payment.	Paid at post office upon receipt of payment notice. Collective payment.	Paid at post office. In principle, annual collective payment. In case of six or three months installment, additional fee will be charged.	Paid at post office on issuance and/or renewal of receiving licence certificate (valid for 12 months). Collective payment.	Paid at Telecommunication Administration Bureau or post office upon issuance and/or renewal of licence. Radio: Annual payment. TV: Quarterly payment.	Paid at post office upon issuance and/or renewal of licence. TV: Monthly payment	NHK's house-to-house collection.
Purpose of use	BBC's operation cost, Direct cost of General Post Office.		Expenses for nation-wide dissemination of broadcasting & promotion of programmes. Payable collections to the government (9.6% of profit).		Production & operation cost of Sweden Broadcasting Corporation. Operation cost of Telecommunication Administration Bureau.	Expenses for the dissemination of broadcasting.	Expenses necessary for the execution of NHK's activities.
Action against Offender	Monetary penalty, forfeiture of receivers, and corporal punishment against illegal equipment.	Monetary penalty, and sometimes forfeiture of receivers, against without-notice equipment. Extra charges and compulsory execution against delinquent.	Monetary penalty against receivers without contract with RAI. Compulsory execution against delinquent.	Monetary penalty or imprisonment against illegal equipment.	Monetary penalty against non-licenced equipment.	Monetary penalty, sometimes forfeiture of receivers, against illegal equipment.	Obligation to conclude receiving contract.
Other Income than Receiving Fee	Government subsidy for overseas broadcasting (16.4% of total income). Income from publications.	Income from publications. Income from public concert, etc.	Advertisement income (27.8% of total income).	Government grant-in-aid (Receiving fee is taken into the treasure, and out of which operation cost for broadcasting services is disbursed.). Income from publications.	Government grant-in-aid for the deficit.	Government subsidy for the deficit.	Government grant-in-aid for overseas broadcasting (0.2% of total income).

(a) Raise in Receiving Fee

In Uganda, TV receiving licence fee is five shillings a year per set, and it is very cheap as compared with the subscription to the newspaper, about 120 shillings a year, and the power rates, 530 shillings a year per household. Therefore,it is desirable to raise it to about fifty shillings a year per set. This amount hardly seems to produce a serious effect, judging from the income of the families that have the ability to purchase TV receivers. With the dissemination of TV receivers, it will become more and more difficult to raise the receiving licence fee. So it is better to raise it now in the early stage of dissemination.

When receivers have spread to the small income groups in future, it will be necessary to develop ways to some suitable installment system so that payment of receiving licence fee should not rest heavily on them.

(b) Method of Receiving Fee Collection

As to the method of collecting the receiving fee, there seem to be two ways: self-collection and consignment to other agency. At present Uganda is adopting a system to pay at the post office. In the case of NHK in Japan, those who have TV receivers are requested by legislation to make a receiving contract with NHK, and NHK is collecting the receiving fee directly from each of these contractors. This method will make it possible for the broadcasting organization to raise the collection rate by its own exertions. In the case of NHK, it is as high as 99.7%. This self-collecting method is thus advantageous in securing the revenue sources. But, as it requires a network of the collecting staff to cover the whole country, it does not necessarily seem to be suitable for Uganda of today. Therefore, there will be no need of changing the present collecting system for the time being. However, the payment of receiving licence fee being left to the option of the possessor of a receiver, it will be necessary to drive home this system as it gets diffused to the general public. And it will be also necessary to ensure the collection of the receiving licence fee by, for example, assigning the duty to the dealer of TV receivers to report its sales to U.T.V.

9.3.3 Advertisement Broadcasting Income

The most effective revenue source next to the receiving licence fee is the advertisement broadcasting income.

In many countries of the world, the broadcasting enterprises are depending upon the advertisement broadcasting income as one of the revenue sources. In the case of private enterprises, the advertisement broadcasting income constitutes a main revenue source. And there are many countries where even government-managed enterprises or public corporations are turning to it as one of their revenue sources.

In the case of Uganda, too, the greater part of the radio income and a part of the TV income are coming from the advertisement broadcasting. Where a self-supporting accounting system is intended, the income from the advertisement broadcasting can be expected as a big revenue source following the receiving fee income.

With respect to the advertisement media in Uganda, newspapers, magazines and other possible means are still so immature that they have not developed into media superior to radio and TV. Total advertisement investment in the radio wave medium, including radio and TV, is about one hundred and eighty thousand pound (1967/1968), accounting for only 0.07% of the gross national product.

In Japan, the advertisement expenses have increased remarkably during the past several years and the following factors may account for this phenomenon. In the first place comes the rise of production level. With the development of new products, and mass-production systems resulting from successive technological innovations and progress of mass-production technology, enterprises have come to think much of advertisement as a means to exploit new markets and to secure their sales share which are now indispensable. In the second place, the increase is attributable to energetic marketing activities of every enterprise. Advertisement is regarded as one of the most important props of marketing, along with market research, product planning and sales promotion. Accompanied with a rapid development of this new management method, the position of advertisement in the enterprise management has been raised markedly. In the third place, the growth of advertisement medium itself may be counted, now that the radio wave medium, particularly commercial TV broadcasting, has made a rapid stride in addition to the conventional printing medium. The above-mentioned background, responsible for the rapid increase in the amount of advertisement in Japan, may also be applicable in predicting the future trend of advertisement expenses in Uganda which aims at developing secondary industries.

It is considered that today's advertisement amount in Uganda remains at a considerably lower level than the demand of the enterprises in the light of its quick tempo in economic growth. And, as the increase of its rate to the national income seems quite sure, it will take not so much time to reach the level of 0.1%.

The share of each advertisement medium in the total advertisement expenses differs by countries in accordance with the degree of its development. In Uganda, radio and TV would gain a pretty great weight, and TV in particular is expected to secure by far the greatest share by virtue of its powerful advertising effects. And this could be justified by the proposed expansion of broadcasting network, the dissemination of TV receivers, the increase of broadcasting hours and the improvement of programmes.

When the number of audience has increased as a result of the completion of the nationwide network, its advertisement effect will be remarkably increased. And it is desirable to raise the present unit rate for the TV commercial messages as well as to make a difference between the rates for the time range with a large audience and the one with less audience.

Table 9-5 Example of TV Broadcasting Rate at Japanese Local Station

	~12	12–14	14–18	18–19	19–22.30	22.30–23	23~
Weekday	C	Special B	C	Special B	A	Special B	C
Holiday	B	A	Special B	A		Special B	C

(Time) (shilling)

	A	Special B	B	C
30 minutes	4,400	4,000	3,600	2,800
25	4,000	3,600	3,200	2,600
20	3,600	3,200	2,800	2,200
15	3,200	2,800	2,400	2,000
10	2,800	2,400	2,000	1,600
5	2,400	2,000	1,600	1,400

(Spot) (shilling)

	A	Special B	B	C
SB 15 seconds	1,200	900	700	500
10	900	700	500	400
5	600	500	400	300

Frequency Reduction	More than 13 times	More than 26 times	More than 52 times	More than 104 times
Time	5%	10%	15%	20%
Spot		5%	10%	15%

* In the case of the broadcasting over 30 minutes, the rate for 30 minutes shall be applied to any part exceeding 30 minutes.

* Application shall be accepted for the maximum period of six months and for over 13 times in principle.

* For the broadcasting immediately before and after each time division, the higher rate shall be applied.

CHAPTER 10 CONSOLIDATION OF MANAGEMENT ORGANIZATION

Chapter 10 Consolidation of Management Organization

10.1 Management Organization

As stated before, it is desirable to integrate the radio and TV divisions for the rational and effective operation of the broadcasting enterprise. It is considered recommendable to establish the following organization (Fig. 10-1) in which such an integrated government-managed enterprise will be allowed to operate systematically covering the nation-wide network, aided by the effective policy-making system.

(1) Appointment of Director General of Broadcasting

The director general should be appointed as chief of the government-managed broadcasting enterprise. Directors of the radio and TV bureaus as well as of the administration bureau should be appointed under him.

(2) Installation of Decision-Making System

As a decision-making system in the conduct of business, a board of management should be organized, headed by the director general as its chief, and comprising the directors of the radio, TV and administration bureaus, and the heads of the engineering, programme and commercial divisions in the radio and TV bureaus. The board of management will discuss important problems concerning the management of the government-managed broadcasting and make decisions in the conduct of its business in conformity to the government policy.

(3) Establishment of Management Planning Division

As a staff-division to assist the decision-making board of management, a management planning system will be necessary.

Individual divisions in the broadcasting enterprise have a close interrelation each other. For example, increase of programmes will bring about not only an increase of direct programme expenses but also an increase of technical and personnel expenses. And, furthermore, an equipment construction programme will need, in principle, not only construction expenses but also an increase of personnel.

As functions of every division, particularly those of the programme production and technical divisions, are expected to become more highly specialized and subdivided in future, a broad-viewed management will be needed to operate them effectively and efficiently as a single organized body. In addition, in drawing up big projects such as the construction and operation programme for the nation-wide network, establishment of a division specially designed for such projects and its close cooperation with all other divisions are essential. In brief, the function of the management planning division is to make necessary researches and studies, to devise fundamental plans, and to offer accurate data on which the decision-making board may be able to make correct management judgement as well as to formulate far-sighted policies.

Major services of the management planning division will be as follows.

a. Laying out of long-term and annual plans and fundamental policies for construction of facilities and equipment, programmes, technique, dissemination, finance, personnel affairs, organization, training, etc.

b. Inter-divisional adjustment and control on entire services. Control of budget and settlement of income and expenditure.

c. Legal services, liaison services with the governmental bodies and overseas organizations, and business auditing.

d. Examination of programmes and other necessary researches and studies such as an opinion research on programmes.

(4) Business Operation Organization

For the execution of daily works, divisions and sections should be instituted in each bureau of radio, TV and administration.

a. Radio Bureau (Omitted)

b. In the TV bureau, a technical division, a studio programme division, an outside programme division, and a commercial division should be instituted.

The following table shows the details of the business for each division.

Division	Details of Business
Engineering Division	Programme transmission Maintenance of equipment Operation of transmitter
Studio Programme Division	Planning, compilation and production of studio programmes Control of expenses for studio programmes Allotment, operation, management, etc. of studio and machinery Artistic services such as design, etc. Purchase and storing of movies Technical services for studio production

Division	Details of Business
Outside Programme Division	(Film Unit) Production of news films Planning, compilation and production of film programmes Developing, cutting and dubbing of films and maintenance of development machinery, etc. Operation of film library (Outside-Broadcast Unit) Planning, compilation and production of outside-broadcast programmes Operation and maintenance of outside-broadcast van
Commercial and Business Division	Planning and compilation of commercial programmes Acquisition and maintenance of contract with sponsors Development of televiewers Public relations measures for televiewers Services for televiewers TV receiver repairing services

c. In the administration bureau, a personnel affairs section, a training section and a finance section should be instituted. Details of their business are shown in the following table.

Section	Details of Business
Personnel Affairs Section	Personnel, labour, welfare, and other related business General affairs
Training Section	Training and other related business
Finance Section	Receipt, disbursement and management of funds Maintenance and management of fixed assets and other articles Procurement of articles

(5) Introduction of Assistant System

For important posts like the Director of TV bureau, and chief engineer, it is desirable to appoint an assistant to each of them who can assist and execute as proxy their tasks, in order to alleviate overmuch burden on them and to cultivate the Ugandan successors.

(6) Repletion of Main Posts

The above-mentioned management organization improvement programme may gradually be realized with the consolidation of internal structure. For the execution of the nation-wide TV network expansion project, it will be a matter of urgent need to replete project officers for the promotion of this project, training officers for the personnel training, and maintenance engineers for the establishment of maintenance system.

(7) Promotion of Radio and TV Unification

The above-mentioned organization is the one formulated for the individual radio and TV bureaus under a single management. But, when TV has developed fully and taken the place of radio as the central figure of the broadcasting enterprise, it would be desirable for the efficient and smooth broadcasting operation abolish the radio and TV bureaus into a completely integrated system in which a TV producer also produces radio programmes and a TV engineer also undertakes the operation and maintenance of the radio machinery and equipment.

10.2 Long-term Management Plan

A TV broadcasting enterprise, as compared with a radio broadcasting enterprise, needs larger facilities and more equipment and personnel, which means a larger sum of expenses. In addition, it requires a high level of knowledge and technique not only for its management and administration, but also for the operation and maintenance of the facilities and production of programmes. Thus, it is necessary for the sound development of a TV broadcasting enterprise with a nation-wide network to secure sufficient revenue sources, excellent personnel, well-equipped facilities and wide-ranged dissemination of TV receivers. Therefore, taking into consideration various conditions of management, a long-range management programme must be formulated on the basis of the detailed researches and exact future forecasting, consisting of annual plans to be designed and carried out in accordance with the long-range target for the construction of facilities, expansion of programmes, promotion of dissemination and repletion and training of personnel required for it, and securing of revenue sources, etc. This long-range management programme must be revised when a change has taken place in the given conditions. So, it is necessary to review and amend it every year to meet the settlement of uncertain factors or a remarkable change in the objective circumstances.

a. Facilities and Equipment Construction Plan

This plan includes the creation of broadcasting and relay stations, establishment of TV network, construction of stuido, consolidation, replacement and improvement of broadcasting machinery and programme production equipment.

b. Programme Plan

This plan is designed for the increase of broadcasting hours, and the repletion and improvement of not only the content of programmes but also associated broadcasting services.

c. Dissemination Plan

This plan includes the dissemination estimate of TV receivers, promotion measures for dissemination of TV receivers and relative repairing services, and basic plans for advertisement sales promotion.

d. Personnel Plan

This plan relates to the employment and training of personnel required for the achievement of the above-mentioned plans.

e. Financial Plan

This plan includes the prospect for the revenue sources needed for construction, operation and administration and the expenditure programme for the above-mentioned business plans.

All the above long-range management plans should be designed by the management planning division from an all-round viewpoint so that they may be carried out in perfect harmony.

10.3 Establishment of Financial System

10.3.1 Establishment of Budget System

For the efficient operation and sound development of the government-managed broadcasting enterprise, it is necessary, as aforesaid, to introduce a budget system to self-control its income and expenditure. The revenue and expenditure budget consists of the capital revenue and expenditure budget and the enterprise revenue and expenditure budget. And it is desirable to compare the budget made at the beginning of each fiscal year with the accounts settled for that year to maintain rationalized income and expenditure.

As the capital revenue, the governmental grant-in-aid and the depreciation expenses transferred in proportion to the replaced facilities may be counted. In future when the self-supporting accounting system has been actually introduced, money borrowed from the Treasury as well as from banks and other financial agencies and funds raised by the issuance of loan bonds are to be included in this item. As the capital expenditure, the construction expenses for the installation and replacement of facilities and equipment may be counted for the time being. And in future, repayment money for various loans and bonds may be added.

Enterprise revenue and expenditure are the ones used for the business activities of the broadcasting enterprise. As the business revenue, the licence fee income raised through granting the receiving, sales, repairing and other licences, the advertisement broadcasting income, the governmental grant-in-aid income, etc. are counted. And in the business expenditure, the personnel, programme production, technical, sales, televiewer service, investigation and research, management, and depreciation expenses are included. And in future, financial expenses, including the interest for loans, may be included, too.

10.3.2 Reserve Funds for Replacement of Equipment and Facilities

The construction investment in the broadcasting enterprise amounts to a huge sum. Therefore, simultaneous replacement of facilities and equipment at a predetermined replacement time will need as much funds as the original construction cost or more. Such a heavy financial burden cannot actually borne. On the other hand, if facilities and equipment are left unreplaced, it may lead to the degradation of the broadcasting programmes. Therefore, it is desirable to determine the life span of buildings, structures, facilities and equipment by the extent of their deterioration and wear, and to pool the replacement funds each year starting from the fiscal year following the year of their construction or installation at a rate fixed by the life span thusdetermined. For this purpose, it is essential to always keep a clear record of the acquisition date, purchase price, life span, latest price at the time of depreciation for every building, structure such as aerial mast, machine, equipment, furniture, etc. that belongs to the government-managed broadcasting enterprise.

Fig. 10-1 Organization Chart for Uganda Government-Managed Broadcasting