BASIC DESIGN STUDY REPORT

ON

THE PROJECT FOR TELEPHONE NETWORK DEVELOPMENT IN EIGHT TOWNSHIPS

IN

THE SOCIALIST REPUBLIC OF THE UNION OF BURMA

JULY 1987

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

In response to the request of the Government of the Socialist Republic of the Union of Burma, the Government of Japan has decided to conduct a basic design study on the Project for Telephone Network Development in Eight Townships and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to Burma a study team headed by Mr. Kazuhisa NIWA, Deputy Director of the Land Communications Division, Radio Department, Telecommunications Bureau, Ministry of Posts and Telecommunications, from February 15 to March 21, 1987.

The team had discussions on the Project with the officials concerned of the Government of Burma and conducted a field survey in Eight Townships and other areas. After the team returned to Japan, further studies were made, a draft report was prepared and, for the explanation and discussion of it, a mission headed by Mr. Hisakuni NOGAMI, Deputy Director of the Trunk Communications Division, Radio Department, Telecommunications Bureau, Ministry of Posts and Telecommunications, was sent to Burma from June 21 to June 30, 1987. As a result, the present report has been prepared.

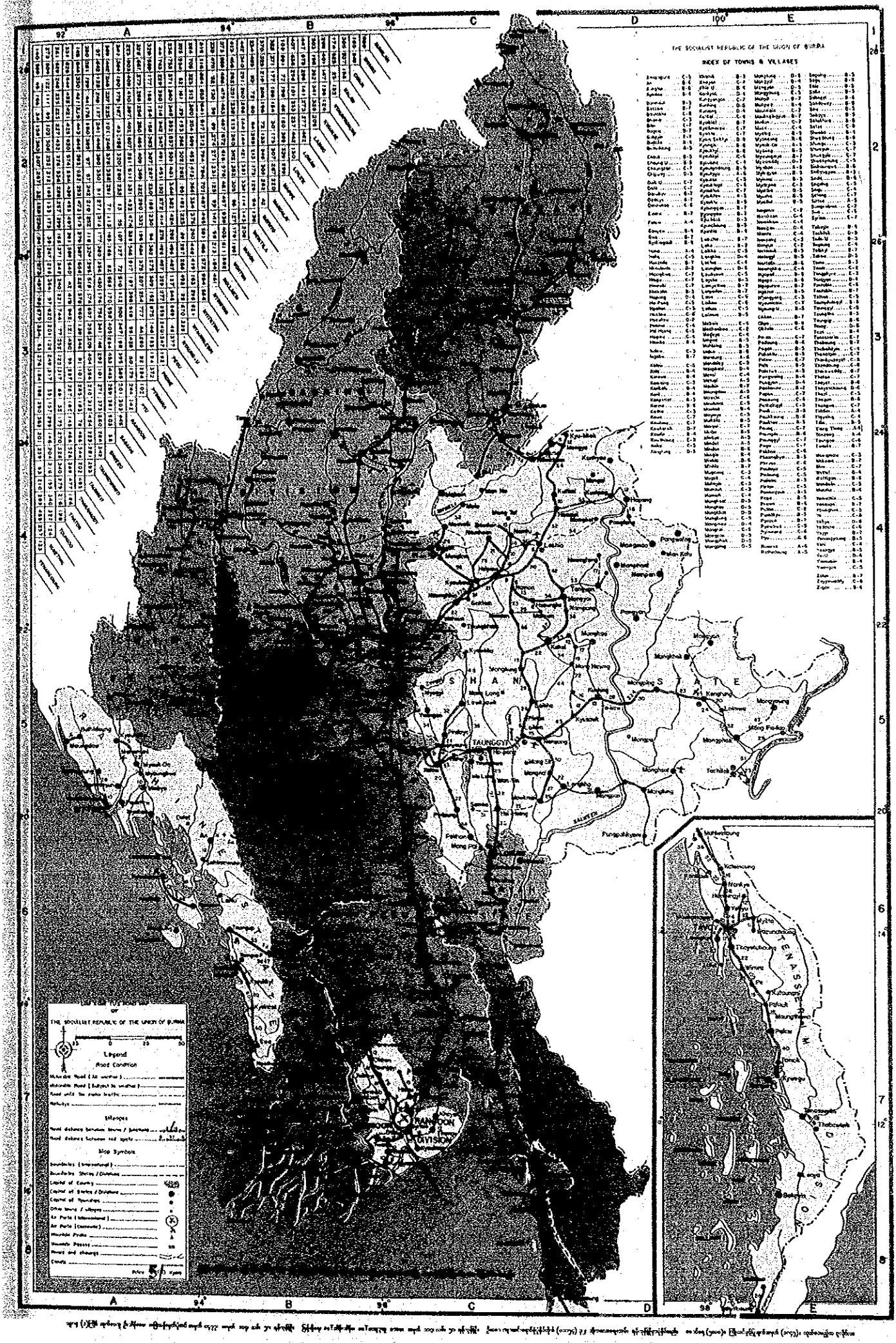
I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

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

July, 1987

Keisuke Arita

Keisuke Arita
President
Japan International Cooperation Agency



THE SOCIALIST REPUBLIC OF THE UNION OF BURMA

SUMMARY

Forty years after independence, the Socialist Republic of the Union of Burma (hereinafter referred to as 'Burma') is promoting the building of the nation on the basis of the New 20-Year Plan (1974-1993) established in 1974.

The telecommunications networks in Burma were considerably improved by the First Telecommunications Development Plan (1975-1980) and the Second Telecommunications Development Plan (1980-1986). However, overall telecommunications are still at a considerably insufficient level, with delays in services especially in rural areas.

Under these circumstances, the Government of Burma selected 10 townships that meet the following conditions: expecting more telephone demand in the future, located along the existing microwave transmission links, able to ensure adequate electric power service, and located in the provincial center. The Government requested grant aid from the Japanese Government to cover implementation of the Project for Telephone Network Development in Ten Townships. The gist of the request is as follows:

Introduction of the following equipment and materials for the development of the telephone networks in the ten townships of Myaungmya, Sandoway, Minbu, Thayetmyo, Yenangyaung, Tharrawaddy, Maubin, Thaton, Myede, and Kyaukpyu

. Exchange facilities	Container type digital exchange	6,000 terminals for 10 townships
	Manual board	for 10 townships
. Outside plant	Underground cable	6.1 km
	Overhead cable	298.8 km

. Toll transmission facilities	UHF/VHF radio system	for 4 townships
	Tie cable	for 7 townships
	Toll cable	for 3 townships
. Power equipment	Emergency engine generator	for 5 townships
. Premises equipment	Telephone sets	6,600 sets
. Others	Airconditioning equipment	
	Spare parts	
	Measuring instruments	
	Tools	

In response to this request, the Japanese Government decided to conduct a basic design study of the Project for Telephone Network Development in Ten Townships in Burma, and the Japan International Cooperation Agency carried out the study. As a result, the following points have been appeared: The improvement is needed for the telecommunications services in the provincial areas of Burma. In the 10 surveyed townships, manual switch- boards that are 25 to 30 years old are used for accommodation of current subscribers. There is large number of subscriber applicants still waiting to be accommodated because of the shortages in terminals, however it is financially difficult for Burma to cope with further demands for telephone service in the future. Furthermore, most of the existing manual exchanges are of the conventional magneto type exchanges housed in old wooden office buildings. Under such circumstances, the scale of the telecommunications service provided is minimal. Moreover, most of the local outside plants use open wiring which results in many failures during the rainy season due to inferior insulation. The open wire lines require prompt replacement.

Development of telephone networks for the townships under the Project will contribute greatly to solving these problems. At the same time, the Project will be effective and significant in stimulating the economy of the country.

Furthermore, the ten townships with which the field survey was made this time, have the strongest needs for telephone network development among the townships having manual exchanges because of their good potential for future development, it is expected that the effect of grant aid would be great.

The contents and scale of the Project are as below.
With regard to the townships selected for development, the necessity of telephone networks for them is fully understood. However, 24-hour commercial power supply is a precondition. Therefore the two townships of Sandoway and Kyaukpyu have been omitted because of the lack of 24-hour power supply and the lack of any guarantee regarding the fulfillment of the said condition in the future.
This has reduced the number of development target townships to eight for which the following equipment and materials are to be introduced as "the Project for Telephone Network Development in Eight Townships in Burma":

(Target townships)	Myaungmya, Minbu, Thayetmyo, Yenangyaung, Tharrawaddy, Maubin, Thaton, Myede,	
. Exchange facilities	Container type digital exchange	4,400 terminals for 8 townships
	Manual board	for 8 townships
. Outside Plant	Underground cable (Including toll cable and underwater cable)	41.2 km
	Overhead cable (Including toll cable)	178.8 km

. Toll transmission facilities	UHF radio system	for 2 townships
	Tie cable	for 2 townships
	Toll cable	for 6 townships
. Power equipment	Emergency engine generator	for 8 townships
. Others	Airconditioning equipment	
	Spare parts	
	Measuring instruments	
	Tools	

Considering the self-help efforts on the part of Burma, the office buildings, foundation work, construction materials, and telephone sets are to be provided by Burma. Japan will provide the equipment and Burma will carry out construction under the guidance and direction of engineers dispatched from Japan. The Project cost to be borne by Burma is estimated at approximately 5.05 million kyats.

The Project will be executed in the following three phases:

Phase I:	Construction of exchange, power and toll transmission facilities for 4 townships
Phase II:	Construction of outside plant for the above 4 townships. Construction of exchange, power and toll transmission facilities for the remaining 4 townships.
Phase III:	Construction of outside plant for the second 4 townships.

Upon commencement of the execution of the Project, Burmese engineers need to be trained for the techniques to be newly introduced to the country. These engineers are expected to supervise construction work efficiently and correctly. It is desirable to train 3 engineers one for each speciality of exchange, outside plant and transmission field for three months in Japan on the basis of the government to government technical cooperation scheme.

With the execution of the Project, telecommunications services in the eight townships will be remarkably improved and this will contribute greatly to solving the standstill problem of the existing telecommunications system. The Project will also enable smooth local and toll calls with automatic dialing connection. Service quality will be greatly improved.

Thus subscribers will benefit from highly reliable telecommunications services with high quality. The Project will greatly contribute to the vitalization of provincial socioeconomic activities, improvement of social welfare services and higher efficiency in materials transportation. In addition to the above, it is expected that the Project will further increase demand for telephone service, improve the collection ratio of telephone charges, the technical level and equipment maintenance.

Judging from the fact that the equipment to be introduced are most urgently needed by Burma, and that past grant aid from Japan has been very effectively used for the development of the country, it is expected that the equipment to be provided under the Project will be effectively utilized, positively contributing to upgrading the infrastructure of the country.

CONTENTS

ABBREVIATION

ITU	International Telecommunication Union
APT	Asia-Pacific Telecommunity
PTC	Posts and Telecommunications Corporation, Burma
CCITT	Comité Consultatif International Télégraphique et Téléphonique
CCIR	Comité Consultatif International des Radiocommunications
IDA	International Development Association
ADB	Asian Development Bank
AVR	Automatic Voltage Regulator

CHAPTER 1 INTRODUCTION

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The Socialist Republic of the Union of Burma (hereinafter referred to as Burma) is promoting the building of the nation on the basis of the New 20-Year Plan (1974-1993) established in 1974. Burma's main industries are agriculture (mainly rice) and forestry (mainly teakwood). Due to the drops in export prices for its primary commodities since 1982, the nation's economic growth rate has been slowing down. However, Burma is rich in natural resources such as oil, natural gas, and nonferrous metals, and on the basis of these resources, the Government of Burma is promoting socioeconomic development with the goal of becoming an agriculture-based industrial country. Accordingly, the government is exerting great efforts to construct a telecommunications network which is a prerequisite for achieving the above objective.

The telecommunications network in Burma was considerably improved by the First Telecommunications Development Plan (1975-1980) and the Second Telecommunications Development Plan (1980-1986). However, more than half the nation's telecommunications equipment is concentrated in Rangoon, its capital, depriving the provinces of a telecommunications network. Overall telecommunications development is still at a considerably insufficient level, and there are many provinces where no telephone service is available.

Under such circumstances, Burma requested the Japanese Government for grant aid in connection with the implementation of the Project for Telephone Network Development in Ten Townships including centers of industries with high priority for development.

Upon receiving the request, the Japanese Government decided to carry out a basic design study of the Project for Telephone Network Development in Ten Townships in Burma. It dispatched, to Burma through JICA, a basic design study team headed by Mr. Kazuhisa NIWA (Deputy Director of the Land Communications Division, Radio Department, Telecommunications Bureau, Ministry of Posts and Telecommunications), from February 15 to March 21, 1987. The study team carried out field surveys in the ten selected townships, Rangoon and Mandalay.

Then, on the basis of analysis and examination of the result of the field survey, and from its appropriateness as a case for grant aid, eight townships were selected as the target townships of the Project and the draft final report of basic design study consisting of basic design, construction work plan, project evaluation, recommendations, and so forth was prepared. The draft final report explanation team headed by Mr. Hisakuni NOGAMI (Deputy Director of the Trunk Communications Division, Radio Department, Telecommunications Bureau, Ministry of Posts and Telecommunications) was dispatched to discuss on the draft final report with the officials concerned of the Government of Burma from June 21 to 30, 1987. As a result, the project was decided for implementation as "the Project for Telephone Network Development in Eight Townships in Burma".

The results of the discussions held between the Burmese Government and the team were summarized in the Minutes of Discussions and signed and exchanged by the Managing Director of the Posts and Telecommunications Corporation and the leader of the study team.

Copies of the Minutes of Discussions, the member list of the team, survey schedule, and a list of persons interviewed are appended to the report.

CHAPTER 2 BACKGROUND OF THE PROJECT

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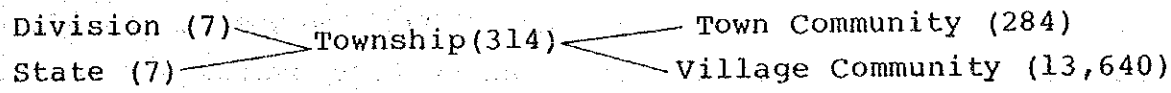
2.1 Outline of Burma

Burma is located to the east of the Indian Subcontinent, in the westernmost part of Southeast Asia. It borders China and India on the north, Bangladesh on the west, Thailand and Laos on the east, and faces the Andaman Sea and Indian Ocean on the south. It has an area of approximately 680,000 square kilometers, or roughly 1.8 times the area of Japan. It is the second largest country in Southeast Asia, next to Indonesia.

The climate differs slightly among the provinces in the northern, central, and southern parts of the country. It is generally divided into three seasons: a hot season from the end of February to the end of May, a rainy season from the end of May to the middle of October, and a cool season from the middle of October to the end of February.

The administrative structure of Burma is divided into seven divisions and seven states under which there are 314 townships. Under the townships, there are town communities and village communities; forming the following administrative structure:



According to a report of the People's Council, the population of Burma in 1986 was 37.115 million. The latest population growth rate (fiscal 1985-1986) stands at 1.99% per year. The estimated population in metropolitan Rangoon is approximately 2.5 million and that of the second largest city, Mandalay, is approximately 400 thousand.

Approximately 85% of the population is Buddhist.
The official language is Burmese.

The educational system is divided into 5 years of primary school, 4 years of junior high school, 2 years of senior high school, 2 years of regional college (liberal arts), 2 years of university (major course), and 2 years of a master's course (no doctorial course) at graduate school.

Agriculture and forestry are the two major industries in Burma. Agriculture accounts for 38.9% of the Burmese gross domestic product. It absorbs 63.3% of the labor force and is the country's most important industry. The export of farm produce is 43% of total exports.

Burma has 390 thousand square kilometers of forests that occupy 57% of the land. Hardwood, mostly teakwood, is produced in Burma where 75% of the world's teakwood is grown. The percentage of forest products in Burma's gross domestic product was only 2.1% for fiscal 1985. However, the export share of forest products was 33.4%, second to agricultural produce.

Burma is rich in mineral resources such as crude oil, natural gas, and nonferrous metals such as tin, lead, zinc, copper, tungsten, nickel, and so forth. The growth rate in mining for fiscal 1985 was 21.9%.

With respect to Burma's industries, the economy was in a state of depression during the 1960s and 1970s. However, the effects of introducing a self-supporting accounting system and various measures taken for streamlining business activities have begun to show recently, and industrial production is showing a steady growth. The country's industries marked a growth rate of 9.5% for fiscal 1985. Burmese industries consist mainly of light industries with 77% of industrial production shared by the food processing and textile industries. As for heavy industries, production of agricultural machinery, electrical appliances, and heavy and light vehicles is under way with economic assistance from Japan.

As thus far outlined, Burma is self-supporting in oil and food supplies, and it has a higher level of education and health services compared to other developing nations of identical income levels. In addition to agriculture, it is rich in forest and mineral resources, and from a long- range outlook, the country has great potential for future economic growth.

Recent progress not withstanding, Burma's gross domestic product (GDP) amounts to 6,915 million US dollars or a GDP per capita of as low as 186 US dollars.

Under such social and economic circumstances, the Government of Burma has been promoting several 4-year plans on the basis of the New 20-Year Plan (1974-1993) as Table 2.1 shows. At present, the government is implementing the Fifth 4-Year Plan (1986-1989). In the present plan, the average annual economic growth is set at 4.5%. Above all, approximately 7.3 billion Kyats are estimated for public investment that accounts for most of the nation's investment (75%). Table 2.2 outlines the planned GDP growth rate and investment ratio for individual fields. According to the plan, an annual growth rate averaging 13% is expected for the telecommunications field, the highest among the various fields. This proves that the development of a telecommunications network is the most urgent area of the nation's national development plan.

Table 2. 1 The New 20-Year Plan

(Based on 1969/1970 prices)

① GDP Per Capita and Consumption Per Capita (Unit :Kyats)

Particulars	1973/74	1993/94	Average Annual Growth Rate (%)
	Amount (Kyats)	Amount (Kyats)	
G D P	376	752	3.5
Consumption	341	558	2.5

② GDP by Industry (Unit : Million Kyats)

Particulars	1973/74		1993/94		Average Annual Growth Rate (%)
	Amount	Share	Amount	Share	
Agriculture	2,925	25.7	7,493	20.9	4.8
Livestock and fisheries	888	7.8	2,259	6.3	4.8
Forestry	296	2.6	753	2.1	4.8
Mining	137	1.2	466	1.3	6.3
Processing and manufacturing	1,309	11.5	7,923	22.1	9.4
Power	80	0.7	502	1.4	9.6
Construction	216	1.9	860	2.4	7.2
Transportation	660	5.8	2,796	7.8	7.5
Communications	84	0.3	148	0.4	7.4
Financial institutions	187	1.2	859	1.0	5.0
Social and administrative services	1,047	9.2	2,760	7.7	5.0
Rentals and other services	808	7.1	2,115	5.9	4.9
Trade	2,846	25.0	7,421	20.7	4.9
T o t a l G D P	11,383	100.0	35,850	100.0	5.9

③ GDP by Ownership (Unit : Million Kyats)

Sectors	1973/74		1993/94		Average Annual Growth Rate (%)
	Amount	Share	Amount	Share	
State Sector	8,961	34.8	17,208	48.0	7.6
Co-operative Sector	979	8.6	9,321	26.0	11.9
Private Sector	6,443	56.6	9,321	26.0	1.9
T o t a l G D P	11,383	100.0	35,850	100.0	5.9

Table 2. 2 The Fifth 4-Year Plan

① GDP Growth Rate by Industry

Particulars	Average Annual Growth Rate of GDP (%)
Agriculture	3.9
Livestock and fisheries	6.1
Forestry	3.8
Mining	9.9
Manufacturing and industry	5.1
Power	9.3
Construction	2.4
Transportation	5.8
Telecommunications	13.4
Social administrative services	4.2
Trade	4.0
T o t a l	4.5

① Public Investment by Industry

Particulars	Percentage (%)
Agriculture	13.6
Livestock and fisheries	2.6
Forestry	3.4
Mining	6.9
Manufacturing and industry	29.1
Power	9.6
Construction	3.9
Transportation & Telecommunications	14.0
Trade	3.6
Social services	6.7
Finance	0.5
Administrative services	5.0
Regional autonomy	1.1
T o t a l	100.0

2.2 Present State of Telecommunications in Burma

2.2.1 Supervising Ministry and Administrative Structure of Telecommunications

The Ministry of Transport and Communications supervises telecommunications in Burma. The Posts and Telecommunications Corporation (PTC) manages domestic and international telecommunications as the administrative structure of public telecommunications such as telegraph and telephone services.

Figure 2.1 shows the organization of the Ministry of Transport and Communications, and Figure 2.2 shows the organization and number of employees of the PTC. Appendix VII outlines the financial standing of the PTC.

The head office of the PTC consists of Personnel Department, Planning and Training Department, Operation and Inspection Department, Stores Department, Accounts Department, and Divisions under the direct control of the head office. The nation is divided into 14 divisions. Each division has a Divisional Manager's office that reports to the head office.

The total number of PTC employees is 13,824, of which 6,478 work for the telecommunications field and the rest for the postal service. The 6,478 employees consist of 157 engineers, 3,244 technicians, and 3,077 workers in clerical and various other job categories.

For maintenance of telecommunications equipment, engineers and technicians for switching systems and outside plant are posted at every telephone office in the country. For maintenance of transmission facilities, technicians are posted at every radio station and engineers are centrally posted at the major radio stations in Rangoon and Mandalay.

The PTC has a Telecommunications and Postal Training Center (TPTC) in Rangoon where training ranging from 2-week to 12-week courses are provided on regular subjects in basic telecommunications, radio, television, transmission, telex, outside plant, exchange, post, and other subjects. With regard to training facilities, in addition to the microwave transmission facilities and crossbar exchange, the latest technological developments such as digital exchange and JF cables are introduced and the content of the training has been improving gradually. Most of the textbooks were prepared by PTC instructors on the basis of various manuals. Textbooks are mostly written in English and classes are held in Burmese. (See Appendix VIII.)

Besides the training at the TPTC, people are sent to the manufacturer's factory for training in the introduction of telecommunications equipment under foreign assistance. The PTC employees can carry out the maintenance and operation of telecommunications facilities without problems.

According to the latest survey, PTC's maintenance, operation, and control levels are quite high judging from the quality of the maintenance and preparation of equipment provided by PTC employees and their well-disciplined work attitude.

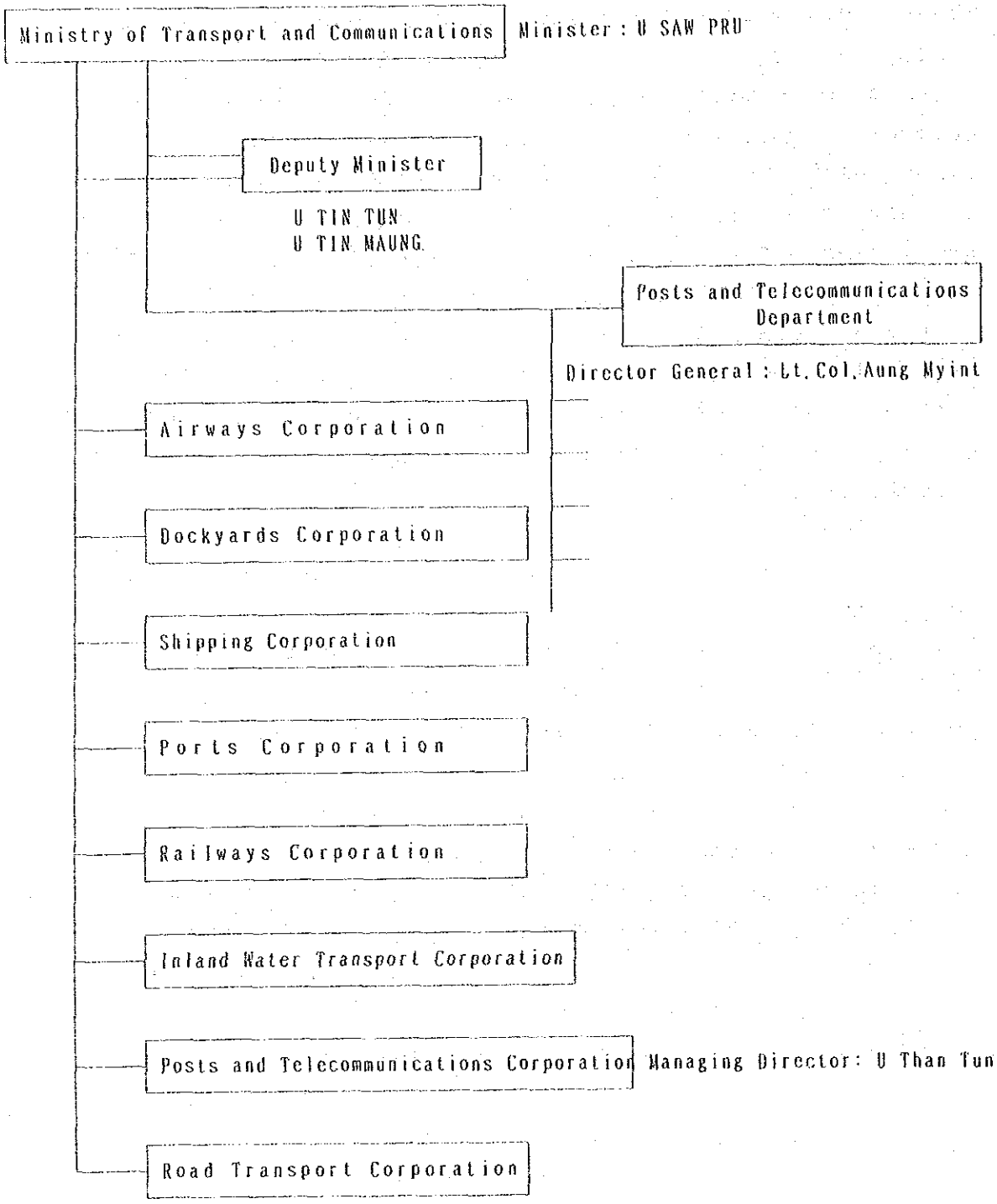
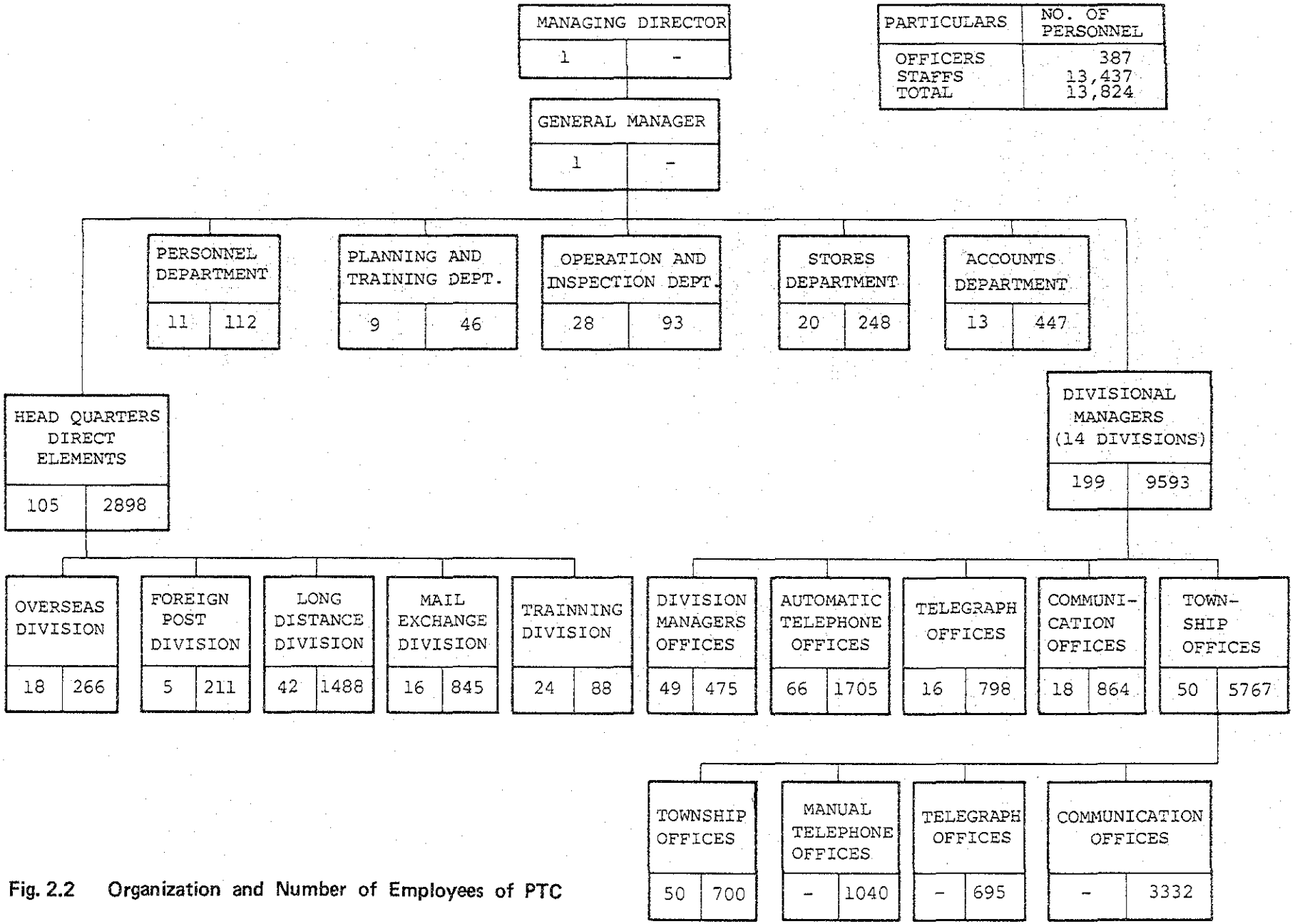


Fig. 2. 1 Organization of Ministry of Transport and Communications



PARTICULARS	NO. OF PERSONNEL
OFFICERS	387
STAFFS	13,437
TOTAL	13,824

Fig. 2.2 Organization and Number of Employees of PTC

2.2.2 Present State of Telecommunications

Table 2.3 outlines the state of telecommunications in Burma for the last 7 years. As of March 1987, the total number of subscribers is 55,991 with 65,405 telephone sets. With the start of digital exchange service as the result of the Second Telecommunications Development Plan (1980-1986), the number of subscribers and telephone sets showed a remarkable growth of 27% and 23% respectively for fiscal 1986. The nation's telephone rate remains at 0.176 unit per 100 persons, which is low among developing nations.

Table 2.3 lists the number of local telephone switching systems in Burma. As of March 1987, there were 229 exchange offices with 69,607 terminals. Of these, 30 exchange offices have automatic exchanges with 57,800 terminals and the other 199 exchange offices with 11,807 terminals have manual exchanges. Of the manual offices, one is undergoing construction for automatization. With regard to automatic exchanges, digital exchanges were introduced after the Second Telecommunications Development Plan and at present 10 digitalized exchange offices are in service with another 3 offices (with 6,600 terminals) under construction.

However, development of telecommunications is promoted centering around major cities like Rangoon and Mandalay. The metropolitan Rangoon area has a concentration of 39,200 circuits or 51% of the total number of terminals. Consequently, telephone service in provincial areas is far behind. Of the 314 townships across the country, 83 are without telephone service. And even for townships with telephone service, the service areas are limited to the central towns and their adjacent areas, and peripheral towns and villages remain without service.

Telephone service in the central towns of townships occupies the lowest level of service with manual exchanges and open wire lines. Development of a telephone network for the townships poses an urgent task for the country at present.

Telephone exchange types currently in use in Burma include magneto exchanges, common battery exchanges (manual), and crossbar and digital exchanges (automatic). Table 2.4 lists their breakdowns. Figure 2.3 shows the locations of exchange offices across the country.

With regard to outside plant, cables are partly used in major city areas. However, mostly open wires are used in other areas and they are becoming obsolete. Cables in use are mostly aerial type and self-supporting small-pair CCP cable is much in use. For drop wire, outside wire without supporting wire is widely used. For telephone poles, wooden and steel poles are used. Wooden poles are not treated with creosote and steel poles are mostly spliced with incomplete anticorrosion treatment. The condition of outside plant is generally not good and, during the rainy season, troubles attributable to defective outside plant occur in many places across the country.

For toll call service, crossbar type toll exchanges are installed in Rangoon and Mandalay, and major towns are connected by microwave and UHF radio transmission links. At present, seven 6 GHz 960 channel microwave transmission links operate in Burma as trunk transmission lines. (See Table 2.5) As branches of these trunk lines UHF radio transmission links of 900 MHz band 120 channel and 400 MHz band 24 channel are operating in 13 sections. (See Table 2.5.) Between provincial towns, carrier systems using open wires are in use with 3-, 4-, and 12-channel transmission capacities. Figure 2.4 shows a national toll transmission line diagram.

For international telecommunications, an electronic type international switching system is installed in Rangoon. In addition to this, a satellite telecommunications earth station is located in the suburbs of Rangoon for telephone, telegraph, and telex services through direct circuits to Japan, Hong Kong, Singapore, Thailand, India, and Great Britain.

Table 2.6 outlines the charge systems for telecommunication services in Burma.

Table 2. 3 State of Telecommunications Service in Burma

		1980	1981	1982	1983	1984	1985	1986
Capacity of Local Exchanges	Automatic	36,000	36,000	36,400	36,400	47,400	52,400	57,800
	Manual	10,550	9,825	10,465	11,410	11,865	13,078	11,807
	Total	46,550	45,825	46,865	47,810	59,265	65,478	69,607
Number of Telephone Subscribers	Automatic	24,498	28,399	30,612	33,170	34,237	35,033	47,402
	Manual	7,678	6,878	7,250	7,630	8,626	9,140	8,589
	Total	32,176	35,277	37,862	40,800	42,863	44,173	55,991
Number of Telephone Sets	Automatic	32,112	35,688	38,411	40,941	42,259	43,573	56,407
	Manual	8,060	7,188	7,685	8,116	9,044	9,568	8,998
	Total	40,172	42,876	46,096	49,057	51,303	53,141	65,405

Table 2. 4 Telephone Exchange in Burma

(March 1987)

Type of Exchange	Number of Units	Capacity (lines)	Remarks
NC-460	9	8,800	XB Local Switch, Made in Japan
NC-400	6	23,200	XB Local Switch, Made in Japan
C11	1	400	XB Local Switch, Made in Japan
ARF 101	4	17,000	XB Local Switch, Made in Sweden
ARF 102	1	1,600	XB Tandem Switch, Made in Sweden
NEAX-61	1	3,000	Digital Local Switch, Made in Japan
	(2)	(6,000)	Digital Local Switch, Made in Japan
TMX-10	9	5,400	Digital Local Switch, Made in Israel
	(1)	(600)	Digital Local Switch, Made in Israel
NC-820	2	3,200	XB Toll Switch, Made in Japan
NXE-20	1	20	International Switch, Made in Japan
NEDIX 510A	1	400	Telex Exchange, Made in Japan
Magnet	198	11,527	Made in Japan, England and Korea
Common Battery	1	280	Made in Japan

Note : (1) A word in parretheses expresses that the exchange is under construction.
(2) XB ; Crossbar Exchange
DX ; Digital Excange
ESS ; Electronic Switching System

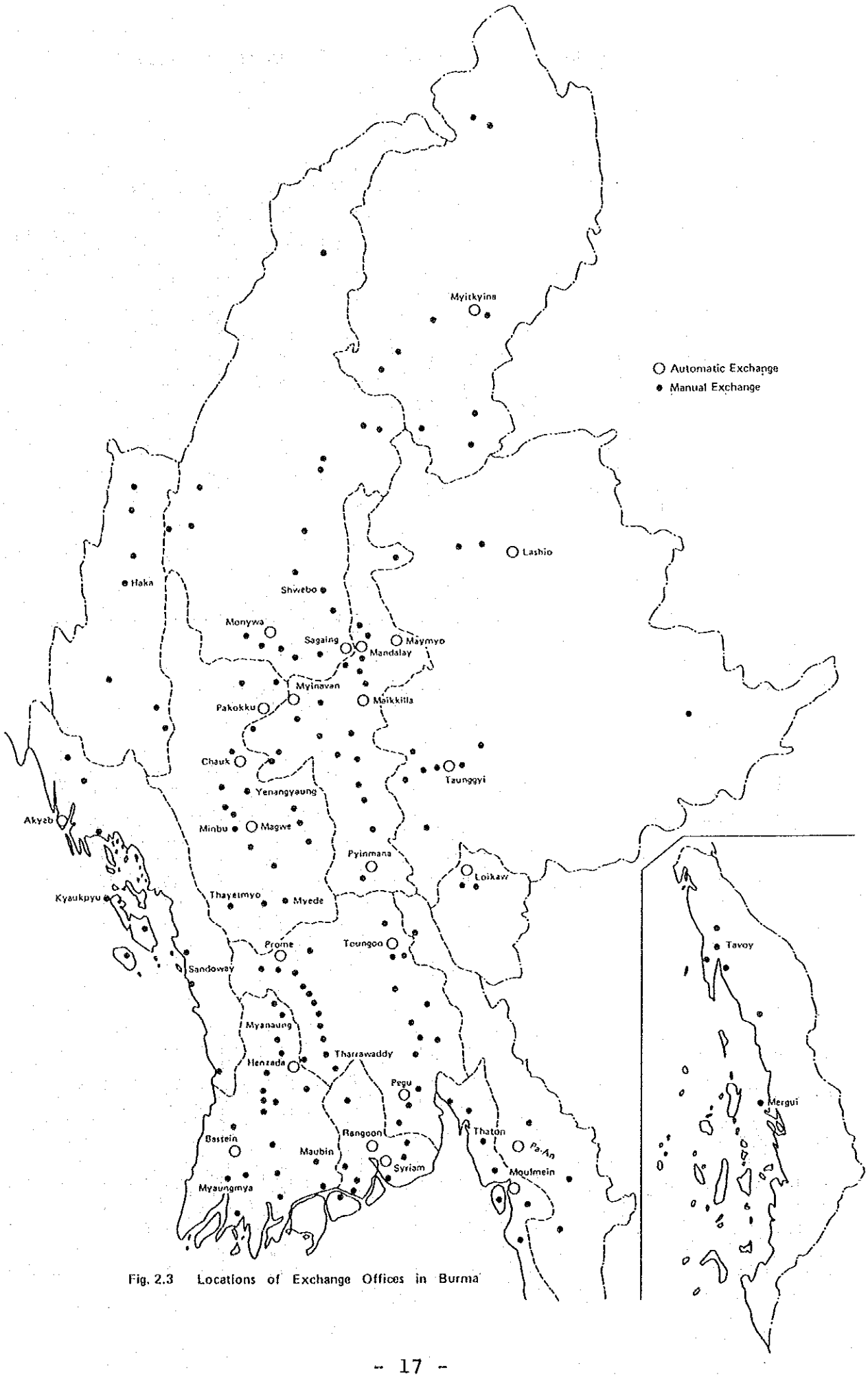


Fig. 2.3 Locations of Exchange Offices in Burma

Table 2. 5 List of Microwave and UHF Transmission System

(1) Microwave Transmission System

Name of Route	Name of Link	Type of System	No. of Links	Length(km)	Remarks
A	Rangoon-Mandalay	6GHz/960 CH	18	723.2	1st Plan
B	Rangoon-Moulmein	6GHz/960 CH	7	273.3	1st Plan
C	Rangoon-Bassein	6GHz/960 CH	5	163.5	1st Plan
D	Prome-Akyab	6GHz/960 CH	7	392.4	1st Plan
E	Moulmein-Tavoy	6GHz/960 CH	5	269.9	1st Plan
F	Pegu-Meiktila	6GHz/960 CH	9	412.7	2nd Plan
G	Meiktila-Taunggyi	6GHz/960 CH	3	131.8	2nd Plan

(2) UHF Transmission System

Name of Route	Type of System	No. of Links	Length(km)	Remarks
Sandoway (PTO) Sandoway (Santaung)	400MHz/24CH (not in use)	1	4.2	1st Plan
Kyaukpyu (PTO) Kyaukpyu radio Station	400MHz/24CH	1	6.6	1st Plan
Ye-Mahlwetaung	400MHz/24CH	1	19.9	1st Plan
Mandalay-Monywa	900MHz/120CH	4	248.3	2nd Plan
Popa-Pakokku	900MHz/120CH	1	48.7	2nd Plan
Popa-Myingyan	900MHz/120CH	1	63.1	2nd Plan
Popa-Chauk	900MHz/120CH	1	44.1	2nd Plan
Bassein-Henzada	900MHz/120CH	3	125.1	2nd Plan
Rangoon-Syriam	900MHz/120CH	1	10.4	2nd Plan
Magwe-Minbu	400MHz/24CH	1	4.5	2nd Plan
Myede-Thayet	400MHz/24CH	1	6.7	2nd Plan
Moulmein-Chaungzon	400MHz/24CH	1	14.9	2nd Plan
Bassein-Labutta	400MHz/24CH	2	71.4	2nd Plan
Rangoon-Daila	400MHz/24CH	1	1.9	2nd Plan

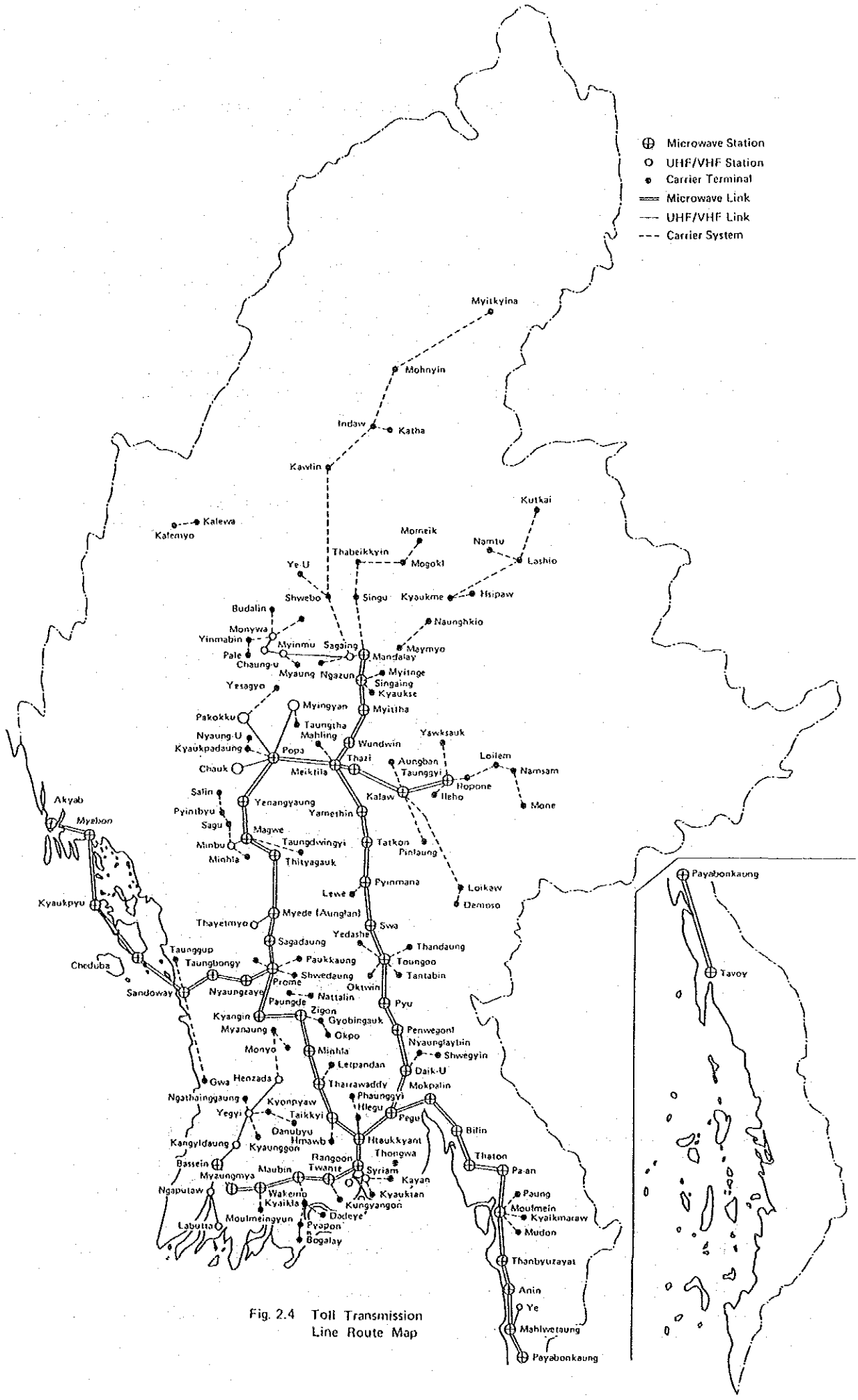


Fig. 2.4 Toll Transmission Line Route Map

Table 2. 6 (1/2) Telephone and Telegraph Service Rate

(1) Installation Fee (Unit : Kyats)

Particulars	Rate	Note
Direct Telephone	240	for one telephone set
Extension Telephone (i) Internal Extension (ii) External Extension	 120 240	 for one extension telephone set for one extension telephone set
P. B. X	240	for one junction line
Telephone connected to a P.B.X (i) Internal Extension (ii) External Extension	 120 240	 for one extension telephone set for one extension telephone set
Re-connections charge	240	
Extra bell	100	
Plug and socket	100	for one set
Deposite (i) Direct Telephone (ii) P. B. X	 500 500	 for one telephone set for one junction line

(2) Subscription Fee (Direct Telephone) (Unit : Kyats)

Particulars	Annual Rate	
	Auto.	Manual
Direct Line connection within 3 miles radius from exchange with trunk facility	540	660
Direct Line connection within 3 miles radius with no trunk facility	----	540
For every additional 1/2 mile outside 3 miles limit up to 5 miles	100	100
Internal Extension from direct connection	240	240
External Extension from direct connection within 1/4 mile actual distance from direct connection	300	300
Every additional 1/4 mile outside the 1/4 mile limit	100	100

Table 2. 6 (2/2) Telephone and Telegraph Service Rate

(3) Local Call Charges (Unit : Kyats)

Type of subscriber	Rate (per call)
Automatic service	0.3
Manual service	No Charge
Coin telephone	0.5

(Note : Local calls are charged in a call without the limitation of time.)

(4) Long Distance Call Charges (Unit : Kyats)

Distance (in miles)	For first 3 minutes	For each additional minute
~50	2.10	0.70
51~100	3.00	1.00
101~200	5.40	1.80
201~300	6.60	2.20
301 and above	8.10	2.70

(5) Telegraph Service Rate (Unit : 1Pya=1/100Kyat)

Kind of Language	Basic Rate	Additional Rate
Burmese	Minimum (16) Words--2 Kyats	15 Pyas. per word
English	Minimum (8) Words--2 Kyats	30 Pyas. per word

2.3 Outline of Telecommunications Development Plans

Full-scale expansion programs in the Burmese telecommunications field began with the First Telecommunications Development Plan (1975-1980) and the Second Telecommunications Development Plan (1980-1986) that followed it. The Second Development Plan has just been completed and the country is preparing to enter the Third Development Plan in the future. An outline of each telecommunications development plan is as follows:

(1) First Telecommunications Development Plan (1975-1980)

Under this plan, crossbar exchanges with 17,000 terminals were installed in 15 offices and 6 GHz 960 channel microwave transmission systems were installed in 5 sections. International telecommunication service was enhanced by the installation of a satellite communicaton earth station (Standard B). With grant aid from Japan, two crossbar exchanges (container type) for two exchange offices with 2,400 terminals were installed. Table 2.7 outlines the processes of the plan. The plan was financed with IDA and OPEC loans and grant aid from Japan.

(2) Second Telecommunications Development Plan (1980-1986)

Under this plan, crossbar exchanges with 15,000 terminals were additionally installed with the new introduction of digital exchanges in 13 offices with 15,000 terminals. Two new sections of microwave transmission links were installed with an increase of circuits in the existing sections. As for UHF transmission links, 11 new sections were installed. In addition, open wire carrier systems were applied to the toll junction lines and PCM transmission systems to the local junction lines. Table 2.8 outlines the processes of the plan which was financed with IDA and Japanese loans.

(3) Third Telecommunications Development Plan (1986-1993)

This plan was established in 1986 to match the Fifth 4-Year Plan (1986-1989). Except for some portions, financing for this plan has not been secured at present and its implementation may be delayed. The plan is divided into Phase I (1986-1990) and Phase II (1991-1993).

(i) Phase I (1986-1990)

New and additional installations of crossbar and digital exchanges are planned for the metropolitan Rangoon area with 56,000 terminals and for provincial towns with 9,600 terminals. Additional links in the existing sections and installation of four new sections are planned for microwave transmission links. Expansion of international telecommunications services is planned by use of a satellite communications earth station (Standard A) and a digital international switching system. In addition, introduction of inexpensive, small-capacity manual exchanges are planned for 90 locations to help those areas without telephone service. Table 2.9 outlines the processes of Phase I of the plan.

With regard to the expansion program of international telecommunications, advance implementation has been under way since 1986 with Japanese loans. Awarding of loans to finance Phase I of the plan is under examination by ADB, IDA, Denmark, and Finland.

(ii) Phase II (1991-1993)

Additional and new installation of digital exchanges are planned for the metropolitan Rangoon area with 26,000 terminals and for provincial towns with 16,600 terminals. Facsimile and optical fiber cable transmission systems are also planned under this phase of the plan.

Table 2.10 outlines the processes under Phase II of the plan.

The Project for Telephone Network Development in Ten Townships was originally scheduled in Phase II, and the Government of Burma requested grant aid from the Japanese Government to finance advance implementation of development for the 10 townships.

In addition to the grant aid from Japan, the possibility of ADB, IDA, Danish, and Finnish loans are being examined for Phase II, the same as for Phase I.

Table 2. 7 Outline of First Telecommunications Development Plan

Particulars		Contents	Remarks
LOCAL	Exchange	17,000 L : 15 offices	Crossbar
	Subscriber's Line	17,000 L : 15 offices	
	Telephone Set	22,750 Sets	
TOLL	Exchange	1,400 L : 2 offices	Crossbar
	Microwave Transmission System	836 channels : 5 sections	6 GHz/960ch
INT	Earth Station for Satellite	Standard B Earth Station : 1 station	
	Exchange	20 L : 1 office	Electronic SW
	Telex Exchange	200 L : 1 office	

Table 2. 8 Outline of Second Telecommunications Development Plan

Particulars		Contents	Remarks
LOCAL	Exchange	New installation of 15,000L (13 offices) Extension of 15,000L (15 offices)	Digital Exchange Crossbar Exchange
	Subscriber's Line	30,000 L	
	Telephone Set	36,000 sets	
TOLL	Exchange	Extension of 1,800L (2 offices)	Crossbar Exchange
	Microwave Transmission System	Extension of 836 channels (5 sections) New installation of 420 channels (2 sections)	
	UHF/VHF Transmission System	New installation of 720 channels (6 sections) New installation of 120 channels (5 sections)	900MHz/120ch 400MHz/24ch
	Open Wire Carrier System	New installation of 13 sections New installation of 13 sections	3ch-carrier sys. 12ch-carrier sys.
INT.	Telex Exchange	Extension of 200L	

Table 2. 9 (1/2) Outline of Third Telecommunications Development Plan (Phase I)

Particulars		Contents	
LOCAL EXCHANGE	Rangoon Metropolitan Area Extension	Rangoon East	8,000 lines
		Rangoon West	8,000 lines
		Mayangon	7,000 lines
		Insein	3,000 lines
		Mingaladon	1,000 lines
		(Total)	(27,000 lines)
	New Installation	Maungtaulay I	13,000 lines
		Hanthawaddy	8,000 lines
		Tamwe	6,000 lines
		Thingangyan	2,000 lines
		(Total)	(29,000 lines)
	Provincial Area Extension	Mandalay	3,000 lines
		Moulmein	1,000 lines
		Taunggyi	1,000 lines
		Pegu	1,000 lines
		(Total)	(6,000 lines)
	New Installation	Maymyo	600 lines
		Myanaung	600 lines
		Mergui	600 lines
		Tavoy	600 lines
		Shwebo	600 lines
		Haka	600 lines
		(Total)	(3,600 lines)
LINE WORK	(i) Installation of PCM Network		15,700 L
	(ii) Extension of Telephone Network in Rangoon		9,600 L
	(iii) Installation of Distribution Network in Provincial Towns		
	(iv) Upgrading of Local Network		
	(v) Installation of P.A.B.X. System		120 sys.
	(vi) Telephone Set		47,000 sets

Table 2. 9 (2/2) Outline of Third Telecommunications Development Plan (Phase I)

Particulars		Contents
T O L L	Exchange	(i) Rangoon TS 1,200 lines (ii) Mandalay TS 900 lines
	Microwave Transmission System	(i) Rangoon-Popa Extension (+1) (ii) Popa-Mandalay New(2+1) (iii) Mandalay-Lashio New(1+1) (iv) Mandalay-Haka New(1+1) (v) Taunggyi-Loikaw New(1+1) (vi) Extension of carrier terminals for existing routes Rangoon-Mandalay 360 channels Rangoon-Moulmein 240 channels Rangoon-Bassein 180 channels Meiktila-Taunggyi 120 channels
	UHF Transmission System	New Installation 7 links Extension
R U R A L	(i) New Installation of Manual Exchange (ii) Installation of Distribution Network (iii) Telephone Sets (iv) Construction of Trunk Lines and HF/VHF Radio System	4,500 L (90 offices) 4,500 L (90 offices) 4,500 sets 90 L
I N T	(i) Standard "A" Earth Station (ii) New International Automatic Digital Telephone Exchange	75 L 200 L
O T H E R S	(i) P.A.B.X (ii) Maritime Radio Service (iii) Charge Calculation System, Number information System, and Subscriber's information System (iv) Building	120 sys. 1 sys.

Table 2. 10 (1/2) Outline of Third Telecommunications Development Plan (Phase II)

Particulars		Contents	
LOCAL EXCHANGE	Rangoon Metropolitan Area Extension	Maugtaulay I	7,000 lines
		Hanthawaddy	2,000 lines
		Tamwe	4,000 lines
		Insein	3,000 lines
		Mingaladon	2,000 lines
		Mayangon	3,000 lines
		North Okkalapa	3,000 lines
		Thaketa	2,000 lines
		(Total)	(26,000 lines)
	Provincial Area Extension	Bassein	800 lines
		Akyab	400 lines
		Prome	800 lines
		Toungoo	600 lines
		Tavoy	600 lines
		Henzada	600 lines
		Pa-an	400 lines
		Syriam	600 lines
		Magwe	400 lines
		Meiktila	400 lines
		Lashio	400 lines
		Myitkyina	400 lines
		Monywa	1,000 lines
		Myingyan	600 lines
		Sagaing	600 lines
		Chauk	600 lines
		Loikaw	400 lines
		Pinmana	600 lines
		Pakkoka	600 lines
		(Total)	(10,600 lines)
	New Installation	Tharrawaddy	600 lines
		Maubin	600 lines
		Minbu	600 lines
		Thayetmyo	600 lines
		Myede	600 lines
		Yenangyaung	600 lines
		Kyaukpyu	600 lines
		Sandoway	600 lines
		Thaton	600 lines
		Myaungmya	600 lines
		(Total)	(6,000 lines)
		(10 offices mentioned above are requested this time by the Government of Burma.)	

Table 2. 10 (2/2) Outline of Third Telecommunications Development Plan (Phase II)

	Particulars	Contents
LINE	(i) Installation of PCM system	
	(ii) Extension of Telephone Network in Rangoon	26,000 L
	(iii) Installation of Distribution Network in Provincial Towns	16,600 L
	(iv) Upgrading of Local Network	
	(v) Installation of P.A.B.X System	100 sys.
	(vi) Telephone Set	
TOLL	Exchange	New Installation of 3 offices (3,000 lines)
	Microwave Transmission System	Extension
	UHF/VHF Transmission System	Extension
	HF Transmission System	Extension
INT.	Extension of Telex Exchange	
OTHERS	(i) Mobile Radio Service	
	(ii) Facsimile Equipment	140 sets
	(iii) Introduction of Optical Fiber Network in Rangoon	
	(iv) Building	

2.4 Details of Burmese Government Request

The Government of Burma is carrying out economic development according to its New 20-Year Plan (1974-1993) for improving national living standards. A target is set in the middle of the Fifth 4-Year Plan (1986-1989) that sets a target of attaining an average annual GDP growth rate of 4.5% and achieving growth of 13.4% in the telecommunications sector.

In promoting economic development, Burma has corrected its development policy that previously placed emphasis on urban areas. It is beginning to make efforts for correcting provincial disparities through provincial development, which inevitably requires prompt development of a telecommunications network in politically and economically important provincial towns.

The administrative entity of telecommunications in Burma is the Posts and Telecommunications Corporation (PTC). PTC is presently promoting the Third Telecommunications Development Plan after the First and Second Telecommunications Development Plans that aimed at general expansion in the telecommunications field. The nation's telecommunications development remains at an insufficient level and is especially so in provincial areas.

Under these circumstances, the Government of Burma selected the 10 townships that meet the following conditions: expecting more future telephone demand; located along the existing microwave transmission links ; able to ensure adequate electric power service ; and located in the provincial center. The Government requested the Japanese Government for grant aid to cover implementation of the Project for Telephone Network Development in Ten Townships.

The contents of the request of the Government of Burma concerning the subject are as follows:

Supply of the following equipment and material for the development of telephone networks in the ten townships.

Myaungmya, Sandoway, Minbu, Thayetmyo, Yenangyaung, Tharrawaddy, Maubin, Thaton, Myede, and Kyaukpyu

. Exchange facilities	Container type digital exchange	6,000 terminals for 10 townships
	Manual board	for 10 townships
. Outside Plant	Underground cable	6.1 km
	Overhead cable	298.8 km
. Toll transmission facilities	UHF/VHF radio system	for 4 townships
	Tie cable	for 7 townships
	Toll cable	for 3 townships
. Power equipment	Emergency engine generator	for 5 townships
. Premises equipment	Telephone sets	6,600 sets
. Others	Airconditioning equipment	
	Spare parts	
	Measuring instruments	
	Tools	

CHAPTER 3 CONTENTS OF THE PROJECT

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3.1 Configuration of Telecommunications System in Townships

In the present telecommunications systems in the townships of Burma, each telephone set is connected to an intra-office manual exchange by an open wire as shown in Figure 3.1. When a toll call is originated, the manual exchange operator connects it to the destination office over a circuit via the related microwave stations according to the subscriber's request. Each exchange office is connected to its microwave station by a tie cable, a toll cable, or a UHF radio transmission link. For a UHF system, a UHF stastion is located near the exchange office. The microwave station multiplexes the telephone signals from adjacent exchange offices with terminal equipment, then transmits them to the destination microwave station over a microwave link. The destination microwave station demultiplexes the multiple telephone signals received with terminal equipment. Each telephone signal is then transmitted to the exchange office nearest the destination subscriber, where it is connected to the called subscriber by the manual exchange operator, over a transmission line or radio transmission link.

Improvement of facilities and installation of new equipment for the telephone networks to cover 10 townships are planned as part of the Project for Telephone Network Development in Ten Townships. Figures 3.2 to 3.5 show the configuration of the telecommunications system necessary for the Project.

General System Configuration	Fig. 3.2
Local Outside Plant	Fig. 3.3
Local Exchange Facilities and Power Equipment	Fig. 3.4
Toll Transmission Facilities	Fig. 3.5

The present telecommunications systems in the townships require manual exchange by telephone operators. The primary purpose of the Project is to introduce automatic exchanges and improve the local outside plant from open wires to cables. The Project is also expected to realize dialing connection of local calls by automatic exchanges and automatic dialing connection of toll calls via toll exchanges in Rangoon or Mandalay by capacity increase of the toll transmission facilities between microwave stations and exchange offices.

Figure 3.2 shows the scope to be covered by the Project. The facilities included in the Project are roughly as follows:

(1) Exchange facilities

Exchange facilities refer to facilities necessary for mutual connection of telephone sets and call connection. They include automatic exchanges to connect calls according to dial signals from subscribers, manual boards for directory information, delayed call reservation, delayed call connection, and so forth; main distribution frames (MDF) to accommodate subscriber and intra-office cables; and so forth.

(2) Power equipment

Power equipment refers to equipment necessary for power supply to the exchange facilities. It includes power receiving equipment to receive commercial power supply, container type emergency engine generators to supply power in case of commercial power failure, rectifiers to convert commercial power into DC power, batteries to supply DC power until the engine generators are started and stabilized in case of commercial power failure, and so forth.

(3) Outside plant

Outside plant refers to facilities to connect telephone sets to exchanges. They include cables to constitute subscriber circuits, poles to support them, and so forth.

(4) Toll transmission facilities

Toll transmission facilities refer to facilities to connect exchange offices to microwave stations. They denote wire transmission lines of tie cables or toll cables or UHF radio transmission links. For toll transmission facilities for a UHF system, radio equipment, carrier terminal equipment, power equipment, and so forth are required in addition to the above-mentioned transmission lines.

In the Project, the facilities mentioned above will be designed to provide the telecommunications system suitable for each township.

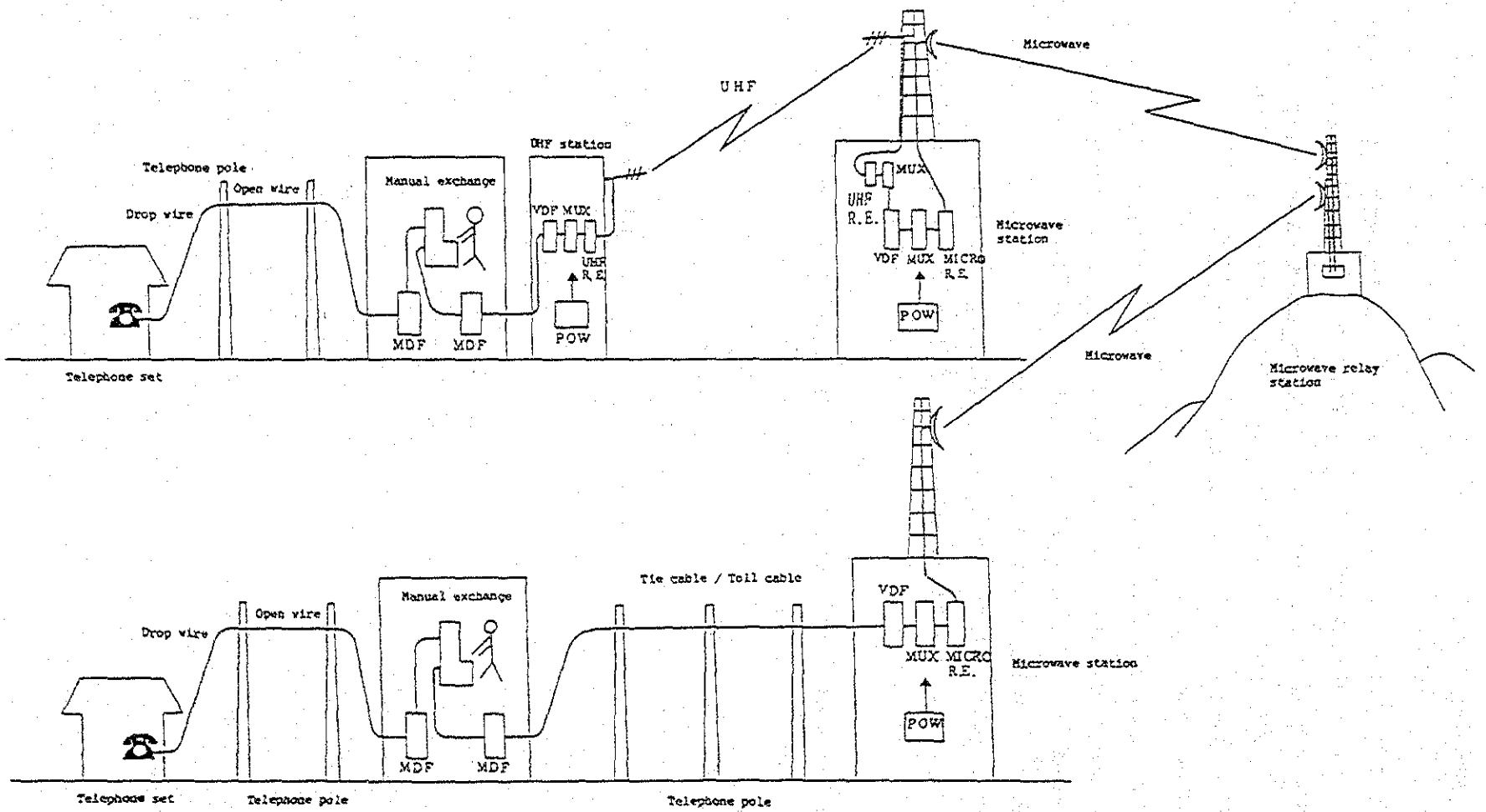

Fig. 3.1 Outline of Existing Telecommunications System in Townships

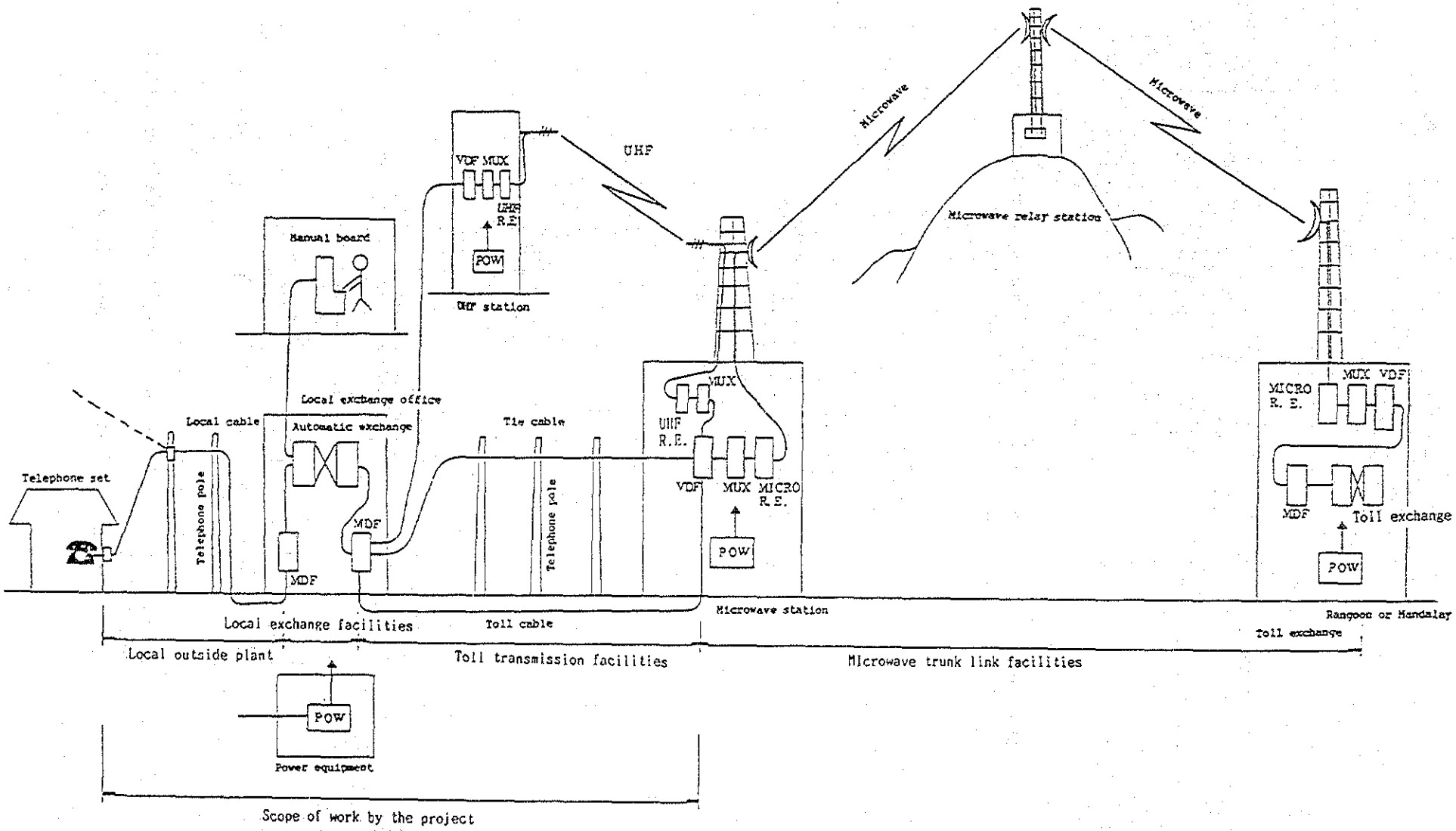

Fig. 3.2 Telecommunications System of Telephone Network Development Project in Townships - System Configuration -

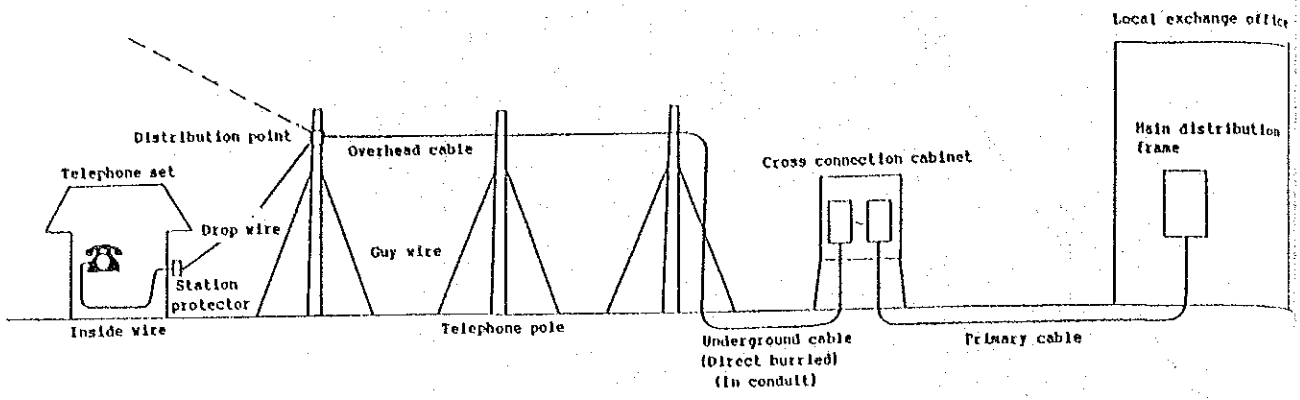

Fig. 3.3 Telecommunications System of Telephone Network Development Project in Townships - Local Outside Plant -

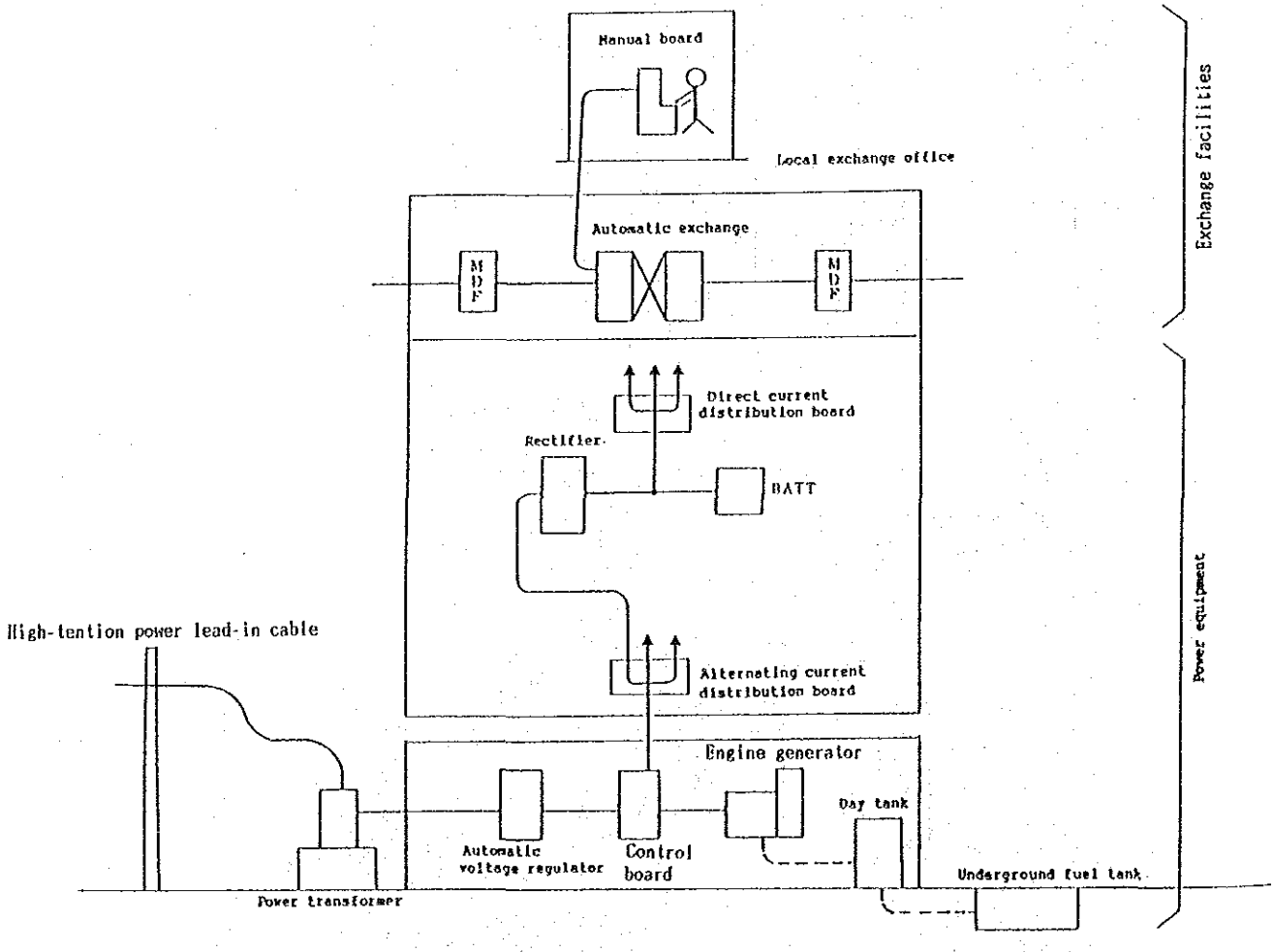

Fig. 3.4 Telecommunications System of Telephone Network Development Project in Townships
- Local Exchange Facilities and Power Equipment -

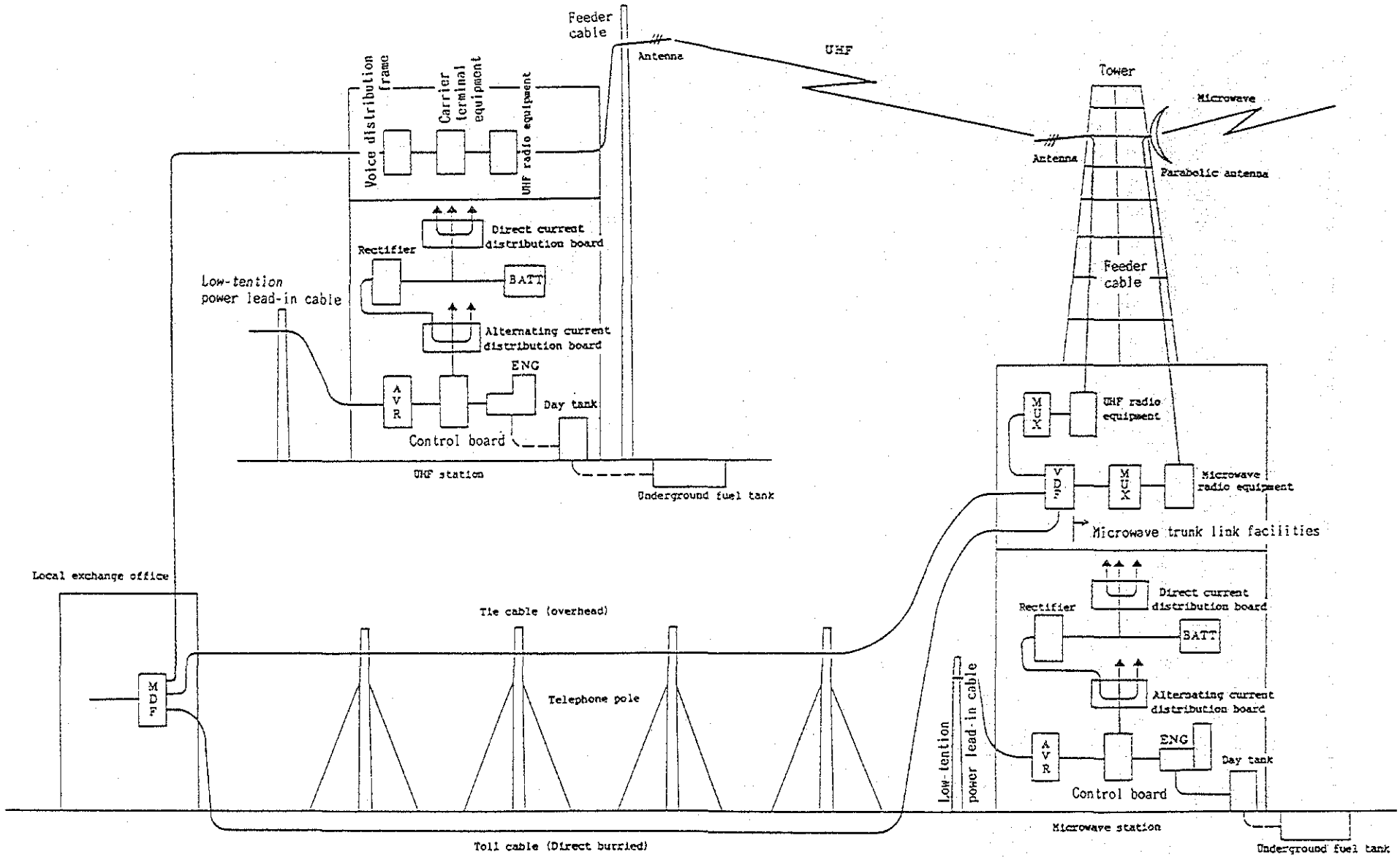

Fig. 3.5 Telecommunications System of Telephone Network Development Project in Townships - Toll Transmission Facilities -

3.2 Present Situation of Telecommunications System in 10 Townships

The telephone service in the 10 townships surveyed this time is provided by manual exchanges and there are presently 69 to 290 subscribers in each township. There are 68 to 480 potential subscribers in each township who have applied for subscription, but are still waiting, and the existing systems cannot cope with the increasing demand for telephone service in the future.

Most of the manual exchanges currently in use are 25 to 30-year-old magneto switchboards and most office buildings housing them are old wooden buildings.

Most local lines are open wires; and they often have insulation troubles, especially in the rainy season. On average, 70 to 250 troubles per 100 subscribers are reported per month.

Table 3.1 lists the present telecommunication facilities in the 10 townships surveyed.

Table 3. 1 (1/3) Existing Telecommunications Equipment in 10 Townships

Item / Townships	Local Exchange Equipment			Existing Exchange Office	Outside Plant			
	Type of Exchange	Capacity (lines)	Number of Subscribers		Underground Cable	Overhead Cable	Open Wire	Trouble Rate (100 subscribers . month)
① Myaungmya	CB OKI (1978)	300	290	2 F wooden building	1.5 Km	8.7 Km	276 Km	86
② Minbu	Magnet Local (1978)	100	76	1 F wooden building	1.0 Km	1.7 Km	72 Km	164
(Magwe)	—	—	—	—	—	—	—	—
③ Thayetmyo	Magnet Anritsu (1976)	100	69	1 F brick building	0 Km	1.9 Km	65 Km	254
④ Yenangyaung	Magnet Local (1977) Korea (1986)	200	102	1 F brick building	2.0 Km	1.5 Km	97 Km	74
⑤ Tharrawaddy	Magnet OKI (1978)	100	87	2 F wooden building	0 Km	5.6 Km	83 Km	144
⑥ Maubin	Magnet OKI (1958)	190	165	2 F wooden building	1.0 Km	2.4 Km	157 Km	76
⑦ Thaton	Magnet GEC Korea (1985)	150	115	2 F wooden building	1.3 Km	4.2 Km	109 Km	87
⑧ Myede	Magnet Korea (1986)	100	75	1 F wooden building	0 Km	1.7 Km	71 Km	67
⑨ Sandoway Upper column :PTO Lower column :Micro	Magnet OKI (1964)	100	86	1 F wooden building	0.8 Km	2.0 Km	82 Km	73
⑩ Kyaukpyu Upper column :PTO Lower column :Micro	Magnet GEC Korea (1984)	210	115	1 F wooden building	0 Km	4.5 Km	109 Km	76

Table 3. 1 (2/3) Existing Telecommunications Equipment in 10 Townships

Item / Townships	Number of Telephone	Toll Transmission Facilities				
		Toll Cable	Tie Cable	Distance of UHF Link	UHF Radio Equipment	UHF Carrier Terminal Equipment
① Myaungmya	307 sets	—	10 m	—	—	—
② Minbu	87 sets	—	20 m	4.5 Km	400MHz Analog UHF (24CH) 1+1 SYS	Analog 14CH
(Magwe)	—	—	—		400MHz Analog UHF (24CH) 1+1 SYS	Analog 14CH
③ Thayetmyo	76 sets	500 m	—	6.7 Km	400MHz Analog UHF (24CH) 1+1 SYS	Analog 14CH
④ Yenangyaung	110 sets	2.0 Km	—	—	—	—
⑤ Tharrawaddy	93 sets	—	200 m	—	—	—
⑥ Maubin	186 sets	—	20 m	—	—	—
⑦ Thaton	139 sets	3.5 Km	—	—	—	—
⑧ Myede	78 sets	1.2 Km	—	(6.7) Km	400MHz Analog UHF (24CH) 1+1 SYS	Analog 14CH
⑨ Sandoway Upper column :PTO Lower column :Micro	86 sets	6.5 Km	—	4.2 Km (presently not in use)	400MHz Analog UHF (presently not in use)	Analog (presently not in use)
					400MHz Analog UHF (presently not in use)	Analog (presently not in use)
⑩ Kyaukpyu Upper column :PTO Lower column :Micro	120 sets	—	20 m	6.6 Km	400MHz Analog UHF (24CH) 1+1 SYS	Analog 10CH
					400MHz Analog UHF (24CH) 1+1 SYS	Analog 10CH

Table 3. 1 (3/3) Existing Telecommunications Equipment in 10 Townships

Item / Townships	Microwave Radio Station or UHF Station Equipment							
	Radio Station Building	Steel Tower	UHF Antenna Height	UHF Feeder	ENG	AVR	RECT	BATT
① Myaungmya	2F wooden building (the same as exchange office)	m 47	—	—	7.5KVA ×2 (1978)	3 KVA (1965)	24V 30A (1979)	50AH ×2 (1979)
② Minbu	1F concrete building	m 20	18m grid antenna	m 28	5 KVA ×1 (1984)	3 KVA (1986)	24V 20A (1984)	60AH ×2 (1989)
(Magwe)	1F concrete building	m 50	33m grid antenna	m 52	—	12.5KVA (1986)	24V 50A (1978) 24V 20A (1984)	150AH×2 (1978) 60AH×2 (1984)
③ Thayetmyo	1F concrete building	m 20	18m grid antenna	m 28	5 KVA ×1 (1984)	3 KVA (1986)	24V 20A (1984)	60AH ×2 (1984)
④ Yenangyaung	1F concrete building	m 50	—	—	7.5KVA ×2 (1978)	5 KVA (1983)	24V 30A (1978)	80AH ×2 (1978)
⑤ Tharrawaddy	1F concrete building	m 70	—	—	7.5KVA ×2 (1978)	5 KVA (1978)	24V 30A (1978)	80AH ×2 (1978)
⑥ Maubin	2F wooden building (the same as exchange office)	m 76	—	—	7.5KVA ×1 (1978)	7.5KVA (1978)	24V 50A (1979)	150AH ×2 (1979)
⑦ Thaton	Radio Station 1F concrete building Power Supply Station 1F concrete building	m 30	—	—	7.5KVA ×2 (1979)	3 KVA (1965)	24V 30A (1979)	200AH ×2 (1979)
⑧ Myede	1F concrete building	m 115	25m grid antenna	m 42	7.5KVA ×2 (1978)	—	24V 30A (1978) 24V 20A (1984)	80AH×2 (1978) 60AH×2 (1984)
⑨ Sandoway (Upper column :PTO Lower column :Micro)	1F wooden building	m 20	20m Yagi antenna	m 32	7.5KVA ×1 (1979)	5 KVA (1978)	24V 30A (1979)	60AH ×2 (1979)
	1F concrete building	m 42	20m Yagi antenna	m 40	7.5KVA ×2 (1979)	7.5KVA (1979)	24V 50A (1979)	120AH ×2 (1979)
⑩ Kyaukpyu (Upper column :PTO Lower column :Micro)	1F wooden building	m 20	20m Yagi antenna	m 32	7.5KVA ×1 (1979)	5 KVA (1983)	24V 30A (1979)	60AH ×2 (1979)
	1F concrete building	m 107	20m Yagi antenna	m 40	7.5KVA ×2 (1979)	—	24V 30A (1979)	200AH ×2 (1979)

3.3 Study of Request Contents

The outline of the contents of the request from Burma is as follows:

(1) The following 10 townships will be covered by the requested Telephone Network Development Project for the following reasons:

Myaungmya, Sandoway, Minbu, Thayetmyo, Yenangyaung, Tharrawaddy, Maubin, Thaton, Myede, Kyaukpyu

(a) Expecting more telephone demand in the future.
(b) Located along the existing microwave transmission link.
(c) Able to ensure good electric power service.
(d) Located in the center of the provincial area.

(2) The telephone services in the above 10 townships will be improved by the introduction of digital exchanges.

(3) The service areas of the telephone network developed by the project will cover all the townships, and the network will be designed to meet the demand for at least 4 to 5 years after the commencement of service.

(4) The following equipment and facilities necessary for the telephone network developement under the Project will be supplied by Japan:

- Exchange facilities
- Outside plant
- Toll transmission facilities
- Power equipment
- Telephone sets

The following sections summarize the results of the field survey made for the Project:

3.3.1 Selection of Objective Townships

Table 3.2 lists the automatic exchange offices in Burma, including some presently under construction. At present the telephone services in 198 townships of Burma are still provided by manual exchanges. Of those townships, Table 3.3 lists the 40 tonships whose exchange capacity exceeds 100 terminals and which have excessive demand for subscriptions with many applicants on waiting lists. Introduction of automatic exchanges into 5 of these 40 townsips has already been planned in another project as mentioned in the table. Table 3.3 gives the results of comparative studies on the remaining 35 townships.

The following 10 townships have been found to have the most pressing need for telephone network development as a result of the comparative studies, and Burma's request has been found to be reasonable.

Tharrawaddy, Yenangyaung, Myede, Thayetmyo, Minbu, Thaton, Kyaukpyu, Sandoway, Myaungmya, and Maubin

Table 3.4 details the comparative study on the order of development precedence for these 10 townships. The decided order of precedence is as follows:

1. Myaungmya
2. Minbu
3. Thayetmyo
4. Yenangyaung
5. Tharrawaddy
6. Maubin
7. Thaton
8. Myede
9. Sandoway
10. Kyaukpyu

The Project, however, is planned on the condition that 24-hour commercial power service is available.
At present 24-hour commercial power service is not available in Sandoway and Kyaukpyu, and there is no assurance that such service will be available in the near future.
Therefore, these two townships will be excluded from the Project.

Table 3.2 (1/2) List of Automatic Exchanges in Burma

(Mar. 1987)

State or Division	Exchange Office	Capacity	Exchange Type	Remarks
KACHIN	Myitkyina	600	Crossbar	
KAYAH	Loikaw	600	Digital	
KAREN	Pa-an	600	Digital	
SAGAING	Sagaing	600	Digital	
	Monywa	600	Digital	
PEGU	Prome	1000	Crossbar	
	Pegu	1000	Crossbar	
	Toungoo	800	Crossbar	
MAGWE	Magwe	1000	Crossbar	
	Chauk	600	Digital	
	Pakokku	600	Digital	
MANDALAY	Mandalay	7000	Crossbar	
	Maymyo	400	Crossbar (container)	
	Meiktila	1000	Crossbar	
	Myingyan	600	Digital	
	Pyinmana	600	Digital	
MON	Moulmein	2000	Crossbar	
ARAKAN	Akyab	1000	Crossbar	
RANGOON	Hanthawaddy	4000	Crossbar	
	Insein	1000	Crossbar	
	Tamwe	3000	Crossbar	
	Maungtaulay I	9000	Crossbar	
	Maungtaulay II	9600	Crossbar	
	Thingangyun	3000	Crossbar	
	Migaladon	600	Crossbar	

Table 3.2 (2/2) List of Automatic Exchanges in Burma

(Mar. 1987)

State or Division	Exchange Office	Capacity	Exchange Type	Remarks
RANGOON	Mayangon	3000	Digital (container)	
	Rangoon East	3000	Digital	Under construction
	Rangoon West	3000	Digital	Under construction
	Syriam	600	Digital	Under construction
SHAN	Taunggyi	1200	Crossbar	
	Lashio	600	Crossbar	
IRRAWADDY	Bassein	1600	Crossbar	
	Henzada	600	Digital	

Table 3.3 (1/4) List of Townships in Pressing Need for Telephone Network Development

State or Division	Township (Exchange office)	Capacity of Present Manual Exchange	Possibility of Telephone Demands	Nearness to Existing Microwave Link	Power Supply Condition	Possibility of Future Growth in Township	Remarks	Judgement
KACHIN	Mogaung	100	○	△	△	○		
	Bamoh	100	○	△	△	△		
CHIN	Haka	100	◎	△	△	◎	Scheduled in another automatization project	
SAGAING	Katha	100	○	△	△	○		
	Shwebo	150	◎	△	△	○	Scheduled in another automatization project	
TENASSERIM	Tavoy	200	◎	○	△	◎	Scheduled in another automatization project	
	Mergui	200	◎	△	△	○	Scheduled in another automatization project	

Table 3.3 (2/4) List of Townships in Pressing Need for Telephone Network Development

State or Division	Township (Exchange office)	Capacity in Present Manual Exchange	Possibility of Telephone Demands	Nearness to Existing Microwave Link	Power Supply Condition	Possibility of Future Growth in Township	Remarks	Judgement
PEGU	Tharrawaddy	100	◎	○	○	○		○
	Nyaunglaybin	100	○	△	○	△		
	Zeegon	100	○	○	○	△		
	Paungde	100	○	△	○	△		
	Phyu	100	○	○	○	△		
MAGWE	Yenangyaung	100	◎	○	○	○		○
	Taungdwingyi	100	○	△	○	△		
	Myede	100	◎	○	○	○		○
	Thayetmyo	100	◎	○	○	○		○
	Minbu	100	◎	○	○	○		○
MANDALAY	Amarapura	100	○	△	○	△		
	Kyaukse	100	○	△	○	△		
	Yamethin	100	○	○	○	△		
	Kyaukpadaung	200	○	△	○	○		
MON	Thaton	100	◎	○	○	○		○

Table 3.3 (3/4) List of Townships in Pressing Need for Telephone Network Development

State or Division	Township (Exchange office)	Capacity in Present Manual Exchange	Possibility of Telephone Demands	Nearness to Existing Microwave Link	Power Supply Condition	Possibility of Future Growth in Township	Remarks	Judgement
ARAKAN	Kyaukpyu	100	◎	○	*△	○	*Expected to be improved	○
	Sandoway	110	◎	○	*△	○	*Expected to be improved	○
RANGOON	Hmawbi	100	○	△	○	△		
SHAN	Myaungshwe	100	○	△	△	△		
	Kalaw	100	○	○	△	○		
	Kentung	100	○	△	△	△		
	Kyaukme	100	○	△	△	○		

Table 3.3 (4/4) List of Townships in Pressing Need for Telephone Network Development

State or Division	Township (Exchange office)	Capacity in Present Manual Exchange	Possibility of Telephone Demands	Nearness to Existing Microwave Link	Power Supply Condition	Possibility of Future Growth in Township	Remarks	Judgement
IRRAWADDY	Myanaung	150	◎	△	○	○	Scheduled in another automatization project	
	Kyangin	100	○	△	○	△		
	Myaungmya	280	◎	○	○	◎		○
	Laputta	100	○	○	○	△		
	Wakema	100	○	○	○	△		
	Moulmeingu	100	○	△	○	△		
	Maubin	170	◎	○	○	○		○
	Nyaungdone	100	○	△	○	△		
	Danubyu	100	○	△	○	△		
	Pyapon	180	◎	△	○	○		
	Bogale	100	○	△	○	△		

Table 3.4 (1/2) Criteria of Priority in Ten Townships

Criteria \ Township	Kyaukpyu	Maubin	Minbu	Myaungmya	Myede
① Existence of industries contributing to obtaining foreign exchange and their possibility for future growth	1	—	3	2	—
② Existence of industries contributing to foreign exchange saving and their possibility for future growth	—	—	3	2	—
③ Existence of industries to meet domestic demand and their possibility for future growth	1	3	1	3	3
④ Possibility of future growth as an agricultural production area.	—	2	1	2	2
⑤ Necessity of local calls, toll calls, and international calls (as in famous tourist resorts)	—	—	—	—	—
⑥ The present number of subscribers (surveyed in February to March, 1987)	2 (115)	2 (165)	1 (76)	3 (290)	1 (75)
⑦ Population in each exchange office area (surveyed in February, 1987 : Shown in hundreds)	1 (184)	2 (402)	1 (362)	3 (754)	2 (407)
Total Score	5	9	10	15	8
Order of Priority	10	6	2	1	8

(Note) ・The criteria are arranged in the order of priority. (①, ②, ・・・・⑦).

・The greater score shows the higher priority. The priority of two or more townships having the same total score is decided by comparison of the scores for criteria①, ②, ③, and ④.

Table 3.4 (2/2) Criteria of Priority in Ten Townships

Criteria \ Township	Sandoway	Tharrawaddy	Thaton	Thayetmyo	Yenangyaung
① Existence of industries contributing to obtaining foreign exchange and their possibility for future growth	1	—	—	2	2
② Existence of industries contributing to foreign exchange saving and their possibility for future growth	1	2	1	—	—
③ Existence of industries to meet domestic demand and their possibility for future growth	1	1	2	2	1
④ Possibility of future growth as an agricultural production area.	—	3	1	2	2
⑤ Necessity of local calls, toll calls, and international calls (as in famous tourist resorts)	1	—	—	—	—
⑥ The present number of subscribers (surveyed in February to March, 1987)	1 (86)	1 (87)	2 (115)	1 (69)	2 (102)
⑦ Population in each exchange office area (surveyed in February, 1987 : Shown in hundreds)	1 (120)	2 (510)	3 (633)	3 (550)	3 (753)
Total Score	6	9	9	10	10
Order of Priority	9	5	7	3	4

(Note) ・The criteria are arranged in the order of priority. (①, ②, ・・・・⑦).

・The greater score shows the higher priority. The priority of two or more townships having the same total score is decided by comparison of the scores for criteria①, ②, ③, and ④.

[Outlines of Selected 10 Townships]

Outlines of the 10 townships surveyed at this time are as follows:

- Myaungmya

Myaungmya is a port town in the great delta area of the Irrawaddy River and has a population of about 75,000 (the population of the township is about 300,000). It has the largest jute factory (employing about 2,500 workers) in Burma, and rice cleaning mills, and various other plants are located in this gathering place for rice and charcoal. Additionally, a construction project of the largest rice loading port in Burma is now in progress. Twenty-four hour commercial power service is available.

- Minbu

Minbu is a local town about 500 km up the Irrawaddy River and has a population of about 36,000 (the population of the township is about 150,000). It is in a large oil field which also produces natural gas, and a power plant making use of this natural gas is supplying electric power to various regions nearby. There is a TV transmitting station on a hill, and TV broadcasting service has started since 1986 for areas including Magwe on the other side of the river. Twenty-four hour commercial power service is available.

- Thayetmyo

Thayetmyo is a local town about 400 km up the Irrawaddy River, and has a population of about 55,000 (the population of the township is about 100,000). It has the largest cement factory (employing about 1,500 workers) in Burma, and the factory is supplying cement to various regions in Burma by making use of the Irrawaddy River. There are large-scale mining facilities producing raw lime in the mountain area behind this town. Twenty-four hour commercial power service is available.

- Yenangyaung

Yenangyaung is a local town about 550 km up the Irrawaddy River, and has a population of about 75,000 (the population of the township is about 170,000). It is in the largest oil field in Burma, and a trunk road connecting Mandalay, the second largest city, with Rangoon, the capital of Burma, runs near Yenangyaung. Twenty-four hour commercial power service is available.

- Tharrawaddy

Tharrawaddy is a local town about 100 km north-northwest of Rangoon, the capital of Burma, and has a population of about 51,000 (the population of the township is about 130,000). The trunk road connecting Mandalay with Rangoon runs near Tharrawaddy. This town is a gathering place for agricultural produce, and various kinds of household textile industries including textile manufacture for traditional Burmese costumes are prosperous. Twenty-four hour commercial power service is available.

- Maubin

Maubin is a port town in the great delta area of the Irrawaddy River and has a population of about 40,000 (the population of the township is about 260,000). It is a commercial center of the district, and has various kinds of factories for rice polishing, jute, lumbering, and so forth. There is a project afoot to construct a paper pulp mill, and an agricultural school and a job training school are under construction. Twenty-four hour commercial power sevice is available.

- Thaton

Thaton is a local town about 130 km east of Rangoon and has a population of about 63,000 (the population of the township is about 200,000).

It is an agricultural center in a rubber plantation area, and has the largest tire plant (employing about 1,000 workers) in Burma. This tire plant is scheduled to be expanded in the near future and to employ about 3,000 workers. The town is planning to construct a rice polishing plant and promote a town expansion project. Commercial power is supplied from a power plant in the town. Until recently, commercial power was supplied only at night, but since September 1986, twenty-four hour commercial power service has been available.

- Myede

Myede is a local town about 400 km up the Irrawaddy River and has a population of about 41,000 (the population of the township is about 140,000). It is on the opposite side of Thayetmyo across the river, and the trunk road connecting Mandalay with Rangoon runs near Myede. It is a rice loading port on the Irrawaddy River, and has a large-scale lumber mill (employing about 500 workers). Twenty-four hour commercial power service is available.

- Sandoway

Sandoway has the largest tourist beach in Burma on the Bay of Bengal and has a population of about 12,000 (the population of the township is about 90,000). Although the scale of the town itself is relatively small, about 20,000 sightseers visit this town during the tourist season from March to June.

A plant of the People's Pearl and Fisheries Corporation (P.P.F.C.) in this town directly exports processed marine products from the Port of Sandoway. Commercial power is supplied only at night because of a fuel supply problem to the power plant. Commercial power service is limited to 5 hours from 18:00 to 23:00.

- Kyaukpyu

Kyaukpyu is a port town on Ramree Island in the Bay of Bengal and has a population of about 18,000 (the population of the township is about 130,000). There is another plant of the People's Pearl and Fisheries Corporation (P.P.F.C.) on this island, and processed marine products are directly exported from the Port of Kyaukpyu. Saltworks and a lumber mill are located here. Commercial power is supplied only at night because of a fuel supply problem to the power plant. Commercial power service is limited to 3 hours from 19:00 to 22:00.

As is clear from the above descriptions, these 10 townships are in need of telephone network development in the future. The Project, however, is planned on the condition that 24-hour commercial power service is available.
Therefore, eight townships except Sandoway and Kyaukpyu are the target townships of the Project.

3.3.2 Introduction of Digital Exchanges

Introduction of digital exchanges is considered appropriate for the expansion and improvement of the telephone service networks in the eight townships (excluding Sandoway and Kyaukpyu) for the following reasons:

- Digital exchanges are already the mainstream telecommunications technology of the world, and in Burma too, digital exchanges have been introduced since the Second Telecommunications Development Plan (1980-1986).

- Owing to progress in semiconductor techniques, the price of a digital exchange is now about 60% that of a crossbar exchange, and it requires about one-third the space of a crossbar exchange. In other words, introduction of digital exchanges assures not only lower costs but also drastic miniaturization of the equipment and facilities.