CHAPTER 11

MAINTENANCE

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CHAPTER 11 MAINTENANCE

11.1 Improvement of Maintenance Level

11.1.1 Significance of Improvement of Maintenance Level

The maintenance level shall be determined taking into consideration the maintenance service for subscribers and economy of PERUMTEL.

(1) Subscriber Side

There are lots of troubles in telephone system in Jakarta today. According to the data of troubles in telephone exchange offices, a trouble occurs once in around four months for each subscriber there while Japan's 1974 Statistics shows that it occurs only once in about 6 years per subscriber in Japan. Accordingly, complaints on this matter are mounting from among the subscribers in Jakarta. It takes regularly several days but sometimes more than one week for the telephone exchange office to repair a trouble. Therefore, some subscribers are making a complaint about too much delay of the repairing service and in addition some are grumbling over disconnection, misconnection, serious cross talk, etc. in the telephone service. Under these circumstances, the subscribers are always expecting to receive better maintenance services.

(2) PERUMTEL Side

Low maintenance level means that the constructed facilities are not efficiently used. As a result, there may be a decrease of income or investment in those facilities may become useless in the worst case. High maintenance level will promise fruitful benefit for PERUMTEL. However, it will require enormous amount of cost and labor to meet high level requirements of the subscribers. PERUMTEL, in due consideration of the current maintenance level, should determine the reasonable level of the maintenance service. Generally with the diffusion of telephone subscribers, the maintenance level has been improved in every country.

Fig. 11.1.(1) shows the relations between the maintenance level and the diffusion rate of the telephone subscribers.

11.1.2 Improvement of Maintenance Level

The following three methods are applied to improve the maintenance level.

1. Reduction in the number of troubles
2. Shortening of repair time
3. Introduction of statistical control method

(1) Reduction in the number of troubles

Introduction of highly advanced facilities with less trouble, trouble control and facilities control are required to reduce the number of troubles. In this regard, it is necessary to grasp conditions of troubles and facilities maintenance, and to introduce the statistical control method in the future.

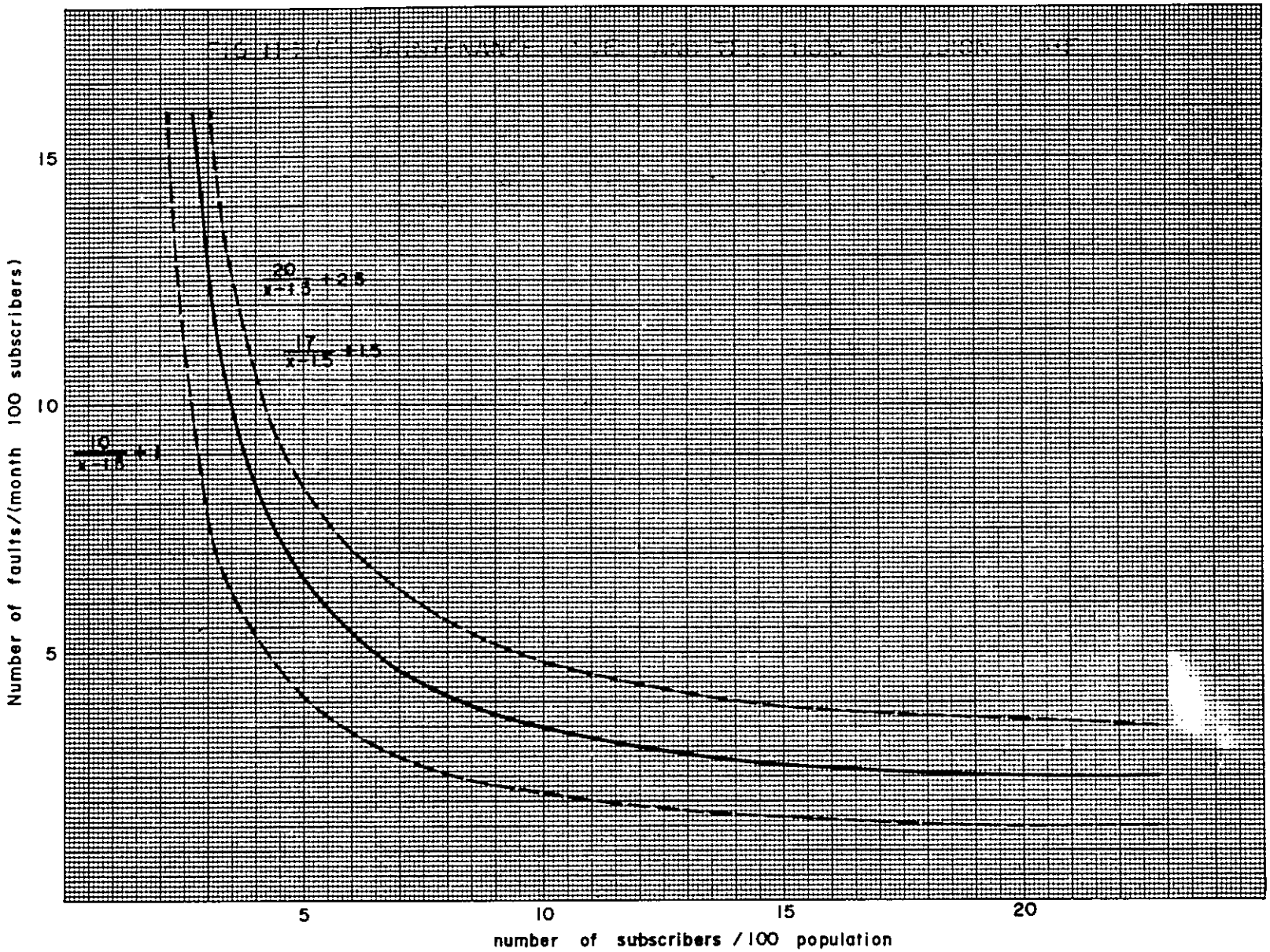


FIG. II-1-(1) MAINTENANCE LEVEL AND TELEPHONE DIFFUSION RATE

1) Introduction of facilities with less trouble

There are a number of old, directly buried primary cables of minor pairs in Jakarta, including considerable amount of the cables out of use, because of their characteristics of inferior insulation or disconnection. In 1974, the telephone exchange offices in Jakarta had totally 105,000 cases of trouble. The troubles in the outside plant, subscriber premise facilities and inside plant made up 60%, 27% and 13% respectively. The outside plant includes primary cable, secondary cable and distribution box. The directly buried paper insulated cables and plastic cables are used for the secondary cable. On rainy days, the old, paper-insulated, directly buried cables of minor pairs frequently have troubles due to their weakened insulation. The large pair cables for conduit system have been recently brought into practical use for the subscribers and junction cable in the telephone exchange offices of Gambir, Kota, Kebayaran and Jatinegara. It is necessary to use such large pair cables for conduit system in order to reduce the number of torubles and rehabilitate the current undesirable situation.

(2) Shortening of repair time

1) Suitable arrangement of maintenance men

The telephone office is collecting data of the distribution of the number of troubles per day and will collect the similar data by a day of the week in the future. At the same time, average trouble repair time is necessary. Taking the above into consideration, appropriate number of maintenance men shall be selected. Thus, it is possible to shorten the trouble repair time and reduce the number of troubles unsettled within the day.

2) Effective application of test desk

The complaints on troubles are received at the test desk and transferred to the proper repair men. Therefore, the test desk can make arrangements for the another trouble taking into consideration the locations of the complaints and the necessary contents of repair works. The test desk shall control the progress of repair work and help repair men to communicate each other.

3) Arrangements for transportation means and spare parts for repair

Bicycles and motorcycles are used as a transportation means for repair men in the general subscriber telephone troubles. In this case, the repair men may carry with them only simple tools for repair because of a lack of spare parts for repairing. Therefore, the repair man has to take back the troubled telephone set to the telephone exchange office, even when the trouble can be settled on the spot merely by replacing the troubled parts, if he carries the spare parts with him.

Although some may have an opinion that the troubled telephone set should be replaced by a new one instead of replacing the troubled parts only, it is con-

sidered for the present to be most desirable that the repair man should carry the spare parts with him.

The past trouble analysis tells us what kind of troubles occurred frequently and what kind of spare parts may be required. Accordingly it is desirable to provide light vans for repair men to be able to always carry with them the necessary spare parts for those troubles which may occur frequently.

4) Countermeasures for the time being

Those described above 1), 2) & 3) are regarded mainly as the countermeasures in the future. Let's discuss here countermeasures for the time being. It takes at least several days or sometimes more than a week until the trouble is perfectly recovered. The major reasons why quick repair is impossible are as follows.

(A) In addition to shortage of repair men, the repair men are poor in techniques and take much time to shoot and repair the troubled parts.

(B) It is difficult to shoot the troubled parts quickly because of shortage of measuring instruments. This is particularly ture in the case of trouble in cables.

(C) Because of shortage of the spare cables and spare parts for repairing, it is difficult to repair the troubled part immediately after it is shot.

In consideration of the present condition described above, the following countermeasures shall be taken to shorten the trouble repair time.

(A) It is necessary to provide regular training of the repair men to improve repairing techniques.

(B) The measuring instruments shall be provided and the repair men shall undergo a special training in using them properly to be able to shoot the location of the faulty parts of the cable.

(C) Major telephone exchange offices shall prepare the lists of spare cables and parts until a construction work office is established so that the repair men can use the cables and spare parts for repair work temporarily from other exchange offices. Those materials and parts often required shall be purchased within the limit of budgetary appropriation.

(3) Introduction of Statistical Control Method

The statistical control method is one of very useful methods for trouble control and facilities control on condition that the trouble is stable. This method has been used in most of the advanced countries. However, it is impossible to apply this method immediately to the telephone exchange offices in Jakarta where current conditions of the telephone facilities are not satisfactory and stable.

Present application of this method shall be explained as follows.

1. The manager in charge of repairing shall understand the concepts of this method and put it into practical application for the daily work.
2. By using objective figures instead of remembering only past experience, it will become possible to recognize the troubled parts or the cables where troubles frequently occur.

Because of budgetary limitations, it is impossible to replace every inferior facilities all at once. Therefore, it is important to select the worst conditioned facilities from among them and to replace them effectively within the limit of budgetary appropriation.

1) Collection and analysis of trouble data

It is necessary to record correctly the trouble data and to make statistical analysis from the standpoint of facilities control and trouble control. The statistical analysis of the trouble will form the basis to determine the maintenance level. For collection/analysis of trouble data, it is necessary to classify the trouble by facility group, i.e. by cable structure, type and usage. It is also necessary to establish the basic classification system including classification by location, cause, and phenomena of trouble. Besides, trouble classification at the point of demarcation shall be defined.

Table 11.1.(2) shows and the basic trouble classification system for local cable in Japan.

2) Plant maintenance condition

The maintenance condition of a plant shall be duly evaluated by comparing the statistical value of actual troubles with the predetermined standard value of plant trouble which is specified as the standard statistical value of trouble. In the case of cables, the above value is expressed in the unit of "number of troubles (100 pairs x Km x months)."

3) Plant control

The purpose of plant control is to provide rational maintenance services to keep the quality of telecommunication facilities in good condition. In order to extract those plant group which may produce troubles frequently (distribution block, span, manhole, etc.), facility control value for each plant shall be determined. When the total number of troubles during a specified control period reaches the value of facility control, the plant shall be regarded to reach the control limit. The value of facility control shall be determined according to the past trouble records of the corresponding plant. The value of facility control is an index to be referred to in judging the condition of a plant (group). That is, the plant where the number of troubles exceeds the value of facility control is judged abnomal

and improvement is made based on the judgement. The office in charge of plant maintenance is responsible for analysis of the causes of such troubles, and improvement is made by putting preference to such plant.

Assuming that a lead-sheathed aerial cable had troubles twice in the same distribution block and another new trouble is recorded within the same fiscal year, the total number of troubles becomes 3 and it is regarded to have reached the value of facility control limit as shown in the Table 11.1.(3).

Table 11.1.(3) shows the facility control limit value for local cable in Japan.

4) Recognition of the service target value

Control of the maintenance service aims to provide better services through analysis of subscriber's complaints which are considered to represent the degree of the maintenance service in the most typical expression, from the standpoint of the subscribers. The target value for the maintenance service indicates not only the service level for the subscribers but also the limit of the service control.

Every telephone exchange office of PERUMTEL submits a statistical report of troubles to the Regional Telecommunication Bureau, but the Bureau has made no comment on this report after receiving the report, since they never make their efforts to study whether the current level of maintenance services is satisfactory one. The reasons for the above may be based on the fact that only a few of them know the setting of target value for the maintenance service and the meaning of setting such value. The telephone exchange office, as well as the Telecommunication Bureau must recognize the target value and the meaning of it. It is desirable to determine an attainable target value for the maintenance service taking the present maintenance level into consideration. Table 11.1.(4) shows the general subscriber telephone trouble rate in Jakarta (number of troubles/(month x 100 subscribers)). The average troubles rates as of January 1974 and December 1974 of all telephone exchange offices in Jakarta were 25.9 and 18.9 respectively. The annual average trouble rate in 1974 was 22.8. According to the result in 1974, the target value for the maintenance service in 1975 can be determined to be 20 so that every telephone exchange office may make efforts to attain the goal, which may contribute to improvement of the maintenance level as a whole. Some may worry that there may appear some incorrect reports. However, this problem can be solved when the staff members of the telephone exchange offices understand the meaning of setting such a target and they are properly trained. Both the target value and attained value of the trouble rate of the general subscribers in Japan are shown for reference in the Table 11.1.(5).

TABLE II-I-(2) BASIC TROUBLE CLASSIFICATION SYSTEM FOR LOCAL CABLE

Division	Basic classification			
	Classification by plant	Classification by Place	Classification by Cause	Classification by Detection
Subscriber	Overhead — Lead sheathed (nongas-filled) cable; Plastic cable	Space; Vicinity of pole; Span; Boxes	1, NTT construction 2, Outsider construction 3, Vehicles 4, Man caused disaster 5, Other articles 6, Natural disaster 7, contact with electric power line lightning 8, Electrical or chemical corrosion 9, Poor construction 10, Poor maintenance 11, Deterioration of facilities 12, Other cause	Complaint While working Alarm Test (disaster)
	Underground — Lead sheathed gas filled cable; Lead sheathed (nongas-filled) cable; Plastic cable	Space; Inside of manhole; Inside of conduit; Pulling out portion		
	Underground distribution — Lead sheathed (nongas-filled) cable; Plastic cable	Space; Inside of handhole; Inside of conduit; Lead-up portion		
Junction	Overhead — Lead sheathed (non gas-filled) cable; Plastic cable	Space; Vicinity of pole; Span; Boxes		
	Underground — Lead sheathed (nongas-filled) cable; Plastic cable	Space; Inside of manhole; Inside of conduit; Lead-up portion		
General	Open wire	Space; Cable pairs; Associated accessories		
	SD (RD) wire Cable conductor	Space; Cable conductor; Accessories		

TABLE 11-1-(3)

FACILITY CONTROL LIMIT VALUE (LOCAL CABLE)

Facilities		Control Unit	Control Period (Year)	Facility Control limit Value	Remarks
Subscriber overhead cable		One distribution block	( )	3 (Times)	(Lead)
			1	2 "	(Plastic)
Subscriber underground lead-in cable		One lead-in cable	1	4 "	
Subscriber underground distribution cable		One distribution block	1	4 "	(Lead)
				2 "	(Plastic)
Junction underground or overhead cable		One cable, one span	1	5 "	1
Cable in a manhole		One manhole	1	2 "	2
Open wire		Open wire at one distribution block	1	4 "	
SD (RD) wire		SD (RD) wire at one distribution block	1	5 "	
Cable conductor	Paper insulated	One distribution block	-	3 (Circuits)	
	Plastic insulated	"	-	10 "	

·1 Generally one trunk span, but in case of gas-filled cable, the span is, if necessarry, a maintenance section partitioned by the maintenance boundary.

·2 Subscriber, junction, toll-cable in a complicated manhole.

TABLE II-I-(4)

MONTHLY GENERAL SUBSCRIBER TROUBLE RATE OF EXCHANGE OFFICES IN JAKARTA

Trouble rate : Troubles per (month · 100 Subscriber lines) In 1974.

Exchange Office / Month	KOTA	TANJUNG PRIOK	GAMBIR	SLIPI	JATINEGARA	SEMANGGI	KEBAYORAN	GANDARIA	Average
1	16.5	17.4	38.3	18.6	29.6	15.1	13.7	24.5	25.9
2	21.0	21.2	37.5	23.6	35.3	17.6	21.2	44.7	28.8
3	17.7	18.8	38.8	25.6	30.2	20.3	18.0	12.8	27.6
4	13.3	18.8	32.4	24.8	33.4	31.0	19.0	34.0	25.0
5	18.9	22.5	36.0	25.3	33.8	21.9	18.9	37.2	27.6
6	11.4	19.3	30.5	26.4	29.7	23.9	19.6	138.3	22.2
7	11.0	19.1	22.2	22.2	28.5	17.7	20.9	33.0	19.6
8	11.4	19.5	18.1	22.7	27.2	17.1	22.8	26.6	18.1
9	12.5	17.8	20.0	21.5	26.8	14.5	23.4	28.7	19.0
10	9.2	16.9	20.9	20.7	24.8	14.0	22.9	25.5	17.8
11	12.6	21.4	17.2	22.0	33.6	17.6	22.8	26.6	18.9
12	16.0	22.6	20.8	—	37.5	19.4	28.0	—	—
Average	14.3	19.6	27.7	23.0	30.7	19.2	20.9	39.4	22.8

Table 11.1.(5) General Subscriber Telephone Trouble Rate in Japan

Year	1958	1959	1960	1961	1962	1963	1964
Target level	5.5	5.5	5.5	5.5	5.0	5.0	5.0
Attained level	5.7	5.7	5.8	5.6	5.3	4.8	4.4
Year	1965	1966	1967	1968	1969	1970	1971
Target level	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Attained level	4.4	3.7	3.0	2.4	2.3	1.8	1.4

Trouble Rate: Number of troubles per (month x 100 subscribers)

11.2 Improvement and Modernization of Outside Plant Field

11.2.1 Characteristics of Outside Plant

(1) The outside plant accounts for large percentage of the total fixed assets, and it means that rational and effective utilization of this outside plant has a great effect on management of an enterprise.

(2) The outside plant is quite different from the inside plant. That is, construction/design/maintenance work for the outside plant is accompanied by various kinds of difficult problems under the severe conditions of social/natural environment.

(3) As for the inside plant, troubled parts can be automatically shot and repaired concentratedly.

On the other hand, trouble in the outside plant may be automatically shot to an extent but there still remain many problems requiring human efforts for the subsequent trouble repair procedure.

The outside plant has such characteristics as described above. The outside plant department, as often called the secondary window, has many chances to directly contact subscribers through construction/maintenance works.

For many and different kind of outside plant, various control business are required. The field of the outside plant, influenced by severe conditions of natural environment, has been delayed in modernization * compared to the other fields. However, the more difficult modernization in the above field may be, the more intensive efforts we should make in order to improve control business and other services in the outside plant field.

* Modernization includes arrangement of work organization and equipment, and improvement of control business.

11.2.2 Improvement and Modernization of Outside Plant Field

The scope of improvement and modernization of outside plant field may be classified into the following two items.

(1) Arrangement of work organization and equipment

(2) Improvement of control business

Each item can be divided into details as follows:

(1) Arrangement of work organization and equipment

1) Desirable construction/maintenance work organization

2) Introduction of vehicles as a means of transportation

3) Employment of measuring instruments and working tools

(2) Improvement of control business

1) Arrangement of plant record (See 11.4, plant record)

2) Improvement of trouble control

3) Improvement of material control

4) Others

(3) Desirable construction/maintenance work organization

1) Present construction/maintenance work organization

In Jakarta, PERUMTEL itself is not directly engaged in a large construction work for the present. The MDF section of the telephone exchange office has carried on a minor scale construction and maintenance work such as test board work, jumpering work, general subscriber trouble repair and service order work.

The outside Plant Department is engaged in cable installation/removing work and cable trouble repair which cannot be carried out by the MDF section. Table 11.2.(1) shows the present maintenance organization of the telephone exchange office in Jakarta.

Table 11.2.(1) Present Maintenance Organization in Telephone Exchange Office

Item / Classification		Breakdown	Telephone Exchange Office
Attended office	a	Chief of an office Bussiness section, Switch section, MDF section, Outside section	Gambir, Kota, Kebayoran, Jatinegara, Semanggi
	b	Head of an office Switch section, MDF section	Slipi, Tanjung priok
	c	Switch maintenance men	Gandaria
Non attended office	d	Switch only	Cipete

The Outside Plant Department is established in the telephone exchange offices with the chief, such as Gambir, Kebayoran, Kota, Jatinegara and Semanggi.

No Outside Plant Department is existing in the telephone exchange offices with the head instead of the chief, such as Tanjung, Priok or Slipi.

However, the MDF section instead of the Outside Plant Department carries on general subscriber telephone trouble repair and service order work. In the telephone exchange offices of Gandaria and Cipete, parent offices take care of the maintenance work of outside plant.

Fig. 11.2.(2) shows present maintenance areas of outside plant of telephone exchange offices in Jakarta.

* Service order work includes new subscriber installation and subscriber removal.

2) Construction/maintenance work organization after 1977

According to the plan of PERUMTEL, the numbers of telephone exchange offices and the switch terminals will increase to 27 and 253,300 respectively in the end of 1977, which shows a remarkable expansion as compared with the end of 1974 (9 telephone offices and 45,300 terminals).

With this expansion, the number of the Outside Plant will also increase to a great extent. We suggest that the construction/maintenance work for the outside plant should be conducted as follows.

Because of the limited number of the working staff and mobile power, it is difficult for the Outside Plant Department of the telephone exchange office to carry out the large/midium scale construction/maintenance works.

Therefore, the whole area of Jakarta is divided into several blocks as shown in Fig. 11.2.(3), with several telephone exchange offices being organized into one block. In each block, an outside plant construction work office with necessary vehicles, materials and tools for work shall be provided for the special purpose of large/midium scale construction and maintenance works. Upon the request of the telephone exchange office in each block, the large/medium scale construction/maintenance works shall be carried out by the construction work office.

The minor scale construction and maintenance works are described in the following.

It is considered that, by the time installation of 250,000 terminals has been completed, the primary large pair cables for conduit system will have been applied to the outside plant and the old primary cables which have frequently troubles shall have been removed. It is estimated that the general subscriber telephone trouble rate can be decreased from 23 (number of troubles/(month x 100 subscribers)) as of 1974 to approximately 10 as of 1977. Assuming that a repair man can deal with 4 troubles per day (see Fig. 11.2.2.(4)), 5 line men will be necessary for repairing general subscriber troubles in a telephone exchange office with 5,000 terminals. (Refer to (4) trouble control)

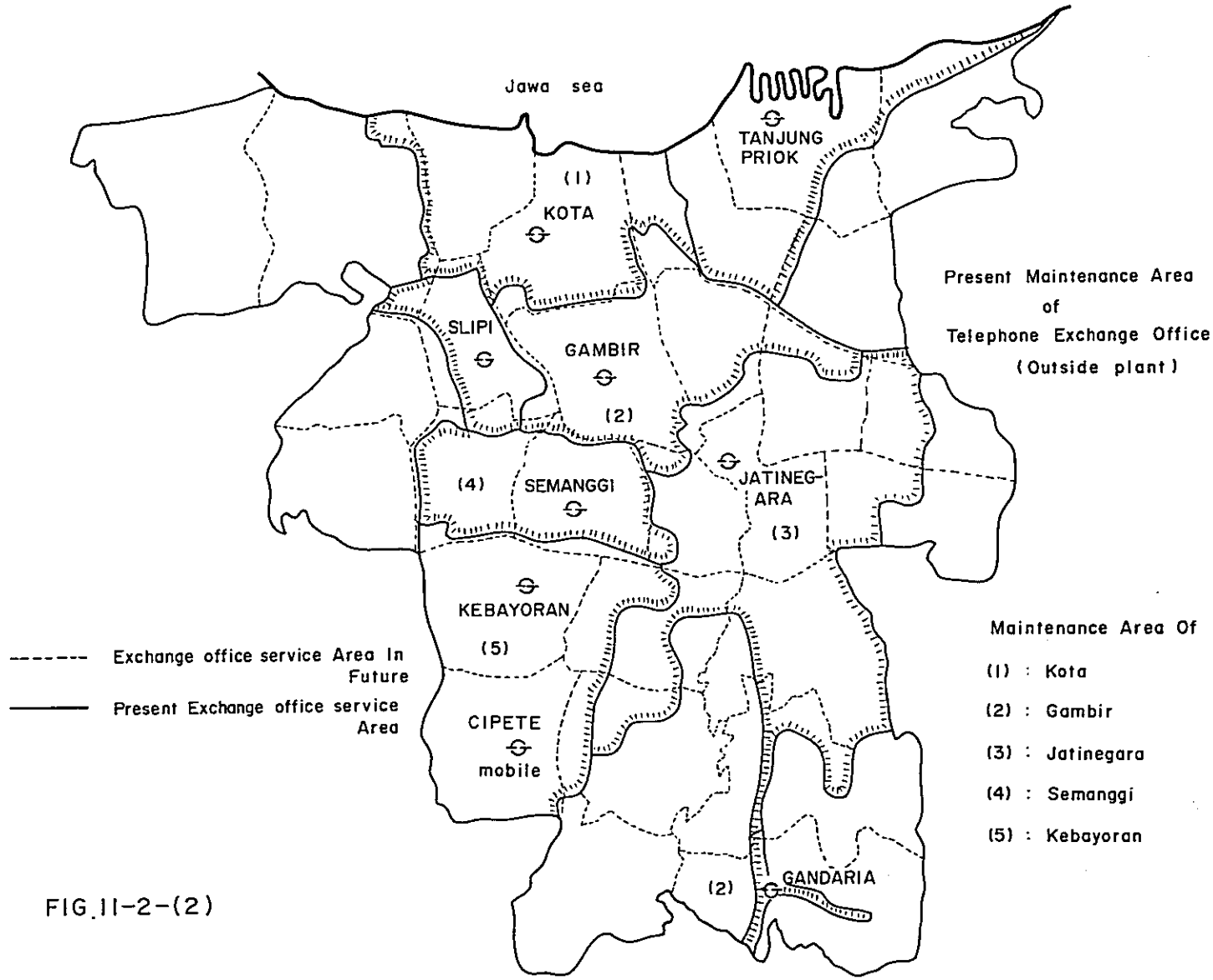

Jawa sea
TANJUNG PRIOK
(1)
KOTA
SLIPI
GAMBIR
(2)
(4)
SEMANGGI
JATINEGARA
(3)
KEBAYORAN
(5)
CIPETE
mobile
(2)
GANDARIA
Present Maintenance Area of Telephone Exchange Office (Outside plant)
Exchange office service Area In Future
Present Exchange office service Area
Maintenance Area Of
(1) : Kota
(2) : Gambir
(3) : Jatinegara
(4) : Semanggi
(5) : Kebayoran

FIG.II-2-(2)

Assuming also that 5 line men are required for the service order work, the telephone exchange office with 5,000 terminals will require totally 10 line men for the minor scale construction and maintenance works.

Fig. 11.2.(3) shows the number of line men required for the minor scale construction and maintenance works in the telephone exchange offices in 1977. These necessary line men shall belong to the MDF section of the telephone exchange office.

The MDF section, however, shall not be established when the estimated number of staff required for the MDF section including necessary line men is not more than 5. The reason is that too much burden may be concentrated on only a few staff members to offer continuous services to the subscribers in case some of them should get absent from office. The outside plant work of these telephone exchange offices shall be taken over by the neighboring parent offices.

As for maintenance of the switching equipment, with EMD switch, the routine work such as mechanical adjustment work may require more manpower than the trouble repair work. However, the new type switching equipment of the common control system requires no adjustment work and has very few troubles. Accordingly the maintenance staff shall be positioned only in the telephone exchange offices with more than 5,000 terminals. Table 11.2.(4) shows the maintenance organization of the telephone exchange offices in 1977.

Table 11.2.(4) Maintenance Organization after 1977 in Telephone Exchange Office

Item / Classification		Breakdown	Telephone Exchange Office
Attended office	a	Chief of an office Bussiness section, Switch section, MDF section	
	b	Head of an office Switch section, MDF section	
	c	Head of an office MDF section	
Non attended office	d	Switch only	

The procedure from the time of receiving compliants of the subscribers to trouble repair includes three steps; i.e. receipt of compliants (compliant desk), test (test desk), and trouble repair. The combination of 3 steps can be classified into centralized system, semi-centralized system and separated system as shown in Table 11.2.(5). In the centralized system, the compliant desk, test desk and maintenance men are centralized in one or several

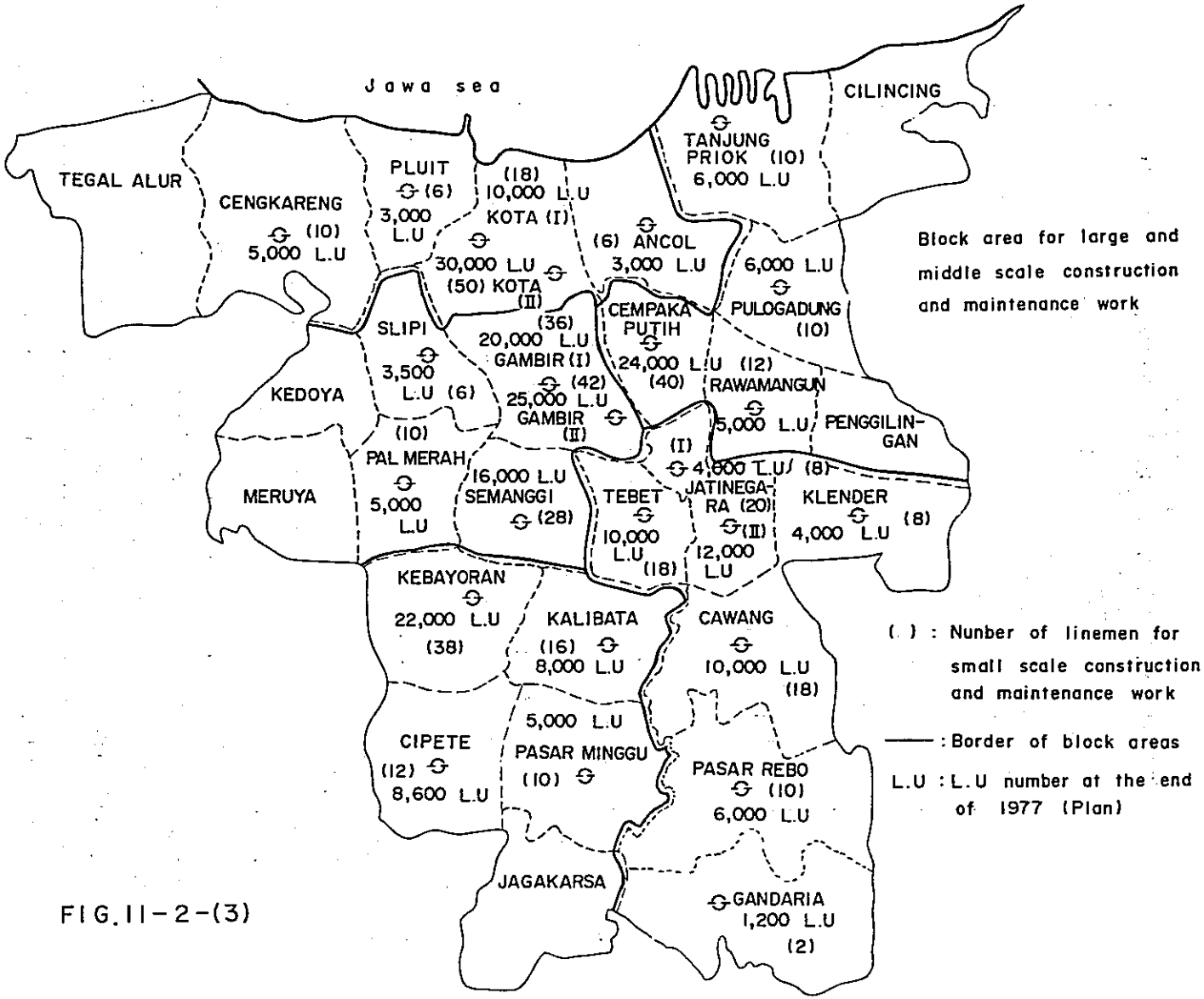

Jawa sea
TEGAL ALUR
CENGKARENG
(10)
5,000 L.U
PLUIT
(6)
3,000
L.U
(18)
10,000 L.U
KOTA (I)
30,000 L.U
(50) KOTA
(II)
TANJUNG
PRIOK (10)
6,000 L.U
CILINCING
(6) ANCOL
3,000 L.U
6,000 L.U
PULOGADUNG
(10)
CEMPAKA
PUTIH
24,000 L.U
(40)
(12)
RAWAMANGUN
5,000 L.U
PENGGILIN-
GAN
(8)
SLIPI
3,500
L.U
(6)
(36)
20,000 L.U
GAMBIR (I)
(42)
25,000 L.U
GAMBIR
(II)
KEDOYA
(10)
PAL MERAH
5,000
L.U
16,000 L.U
SEMANGGI
(28)
MERUYA
(I)
4,000 L.U
JATINEGA-
RA (20)
(II)
10,000
L.U
(18)
12,000
L.U
TEBET
KLENDER
4,000 L.U
(8)
KEBAYORAN
22,000 L.U
(38)
KALIBATA
(16)
8,000 L.U
CAWANG
10,000 L.U
(18)
5,000 L.U
CIPETE
(12)
8,600 L.U
PASAR MINGGU
(10)
PASAR REBO
(10)
6,000 L.U
JAGAKARSA
GANDARIA
1,200 L.U
(2)
Block area for large and middle scale construction and maintenance work
( ) : Nunber of linemen for small scale construction and maintenance work
——— : Border of block areas
L.U : L.U number at the end of 1977 (Plan)

FIG.II-2-(3)

fixed places. In the separated system, the compliant desk, test desk and maintenance men are located in each telephone exchange office. Semi-centralized system employs a combination of the centralized system and the separated system.

Table 11.2.(5)
Installation Classification for Complaint Desk, Test Desk and Maintenance Men

Classification \ Item			Complaint desk	Test desk	Maintenance men
(1)	Centralized form	Fixed place	O	O	O
		Exchange office	–	–	–
(2)	Semi-centralized form	Fixed place	O	O	O
		Exchange office	–	–	–
(3)		Fixed place	O	–	–
		Exchange office	–	O	O
(4)	Separated form	Fixed place	–	–	–
		Exchange office	O	O	O

Except for some particularly small exchange offices, the separated system should be adopted as the maintenance organization after 1977. Some may have an opinion that the compliant desk should be concentratedly located in fixed centers (for example, Tandem office). However in Jakarta where troubles may frequently occur, it seems difficult to expect immediate profit from centralized system. There may be some fears that the reported number of troubles is incorrect, but such a problem will be gradually solved through intensive training of the staff members concerned. Table 11.2.(6) shows the construction/maintenance work classified by scale.

(4) Introduction of cars

The expansion of outside plant must be planned with diffusion of the telephone. Since the working field of outside plant are scattered, the outdoor work requires mobile power and is comparatively heavy work. Cars are essential in the work efficiency and safety for the construction and maintenance works of outside plant. In Jakarta, bicycles and motorcycles are used for general subscriber trouble repair. In addition, jeeps and small trucks are used for outside plant work, mainly for the construction and maintenance works of cables. However, the number of cars is few, for example, even in the largest telephone exchange office of Jakarta, Gambir which accommodates more than 15,000 subscribers, the number of cars is 3. These cars exceed their life and the maintenance is not thoroughly performed. It is needless to say that cars are required for the work of outside plant.

When cars are introduced in Jakarta, the following points are to be considered:

TABLE II-2-(6)

CLASSIFICATION OF LARGE SCALE AND SMALL SCALE WORK

Classification \ Item		Contents
Large Scale Work	Construction	• Cable installation and removal work, telecommunication pole erectiong work in new telephone exchange office construction or subscriber cable expansion construction • Many simultaneous subscriber installations
	Maintenance	• Cable installation and removal work, telecommunication pole erectiong work in removing construction • junction cable maintenance work in many sections • Cable trouble repair work
Small Scale work	Construction	• Subscriber installation
	Maintenance	• General subscriber trouble repair • Small removing work

1) Increase in the number of cars

In the present situation where the absolute number of cars is deficient and cars exceeding their life are used, it is most important to plan the increase of new cars.

2) Introduction of light cars

For general subscriber trouble repair, it is desirable to introduce light cars which can load spare parts from the viewpoint of shortening repair time and safety in the current situation of increasing traffic.

3) Study on introduction of cars with special devices

Since the outdoor work includes a variety of ground work, pole work and underground manhole work, it is desirable to study the introduction of cars having special devices. A ground-drill/pole-erecting car, oil pressure crane truck, draining/generator car, extension ladder car and cable feed car are referred to as cars with special devices. It is difficult to purchase and use special cars immediately for various reasons. However, it is necessary to study the introduction of those cars as a future policy.

(5) Introduction of measuring instruments and working tools

What is most urgently needed for telephone exchange offices in Jakarta is the introduction of measuring instruments. At present, only one pulse measuring instrument for trouble shooting is provided in Gambir among the nine telephone exchange offices. This instrument is of a very old type and the instruction manual is not provided. When this pulse measuring instrument is required for other telephone exchange offices, not only the measuring instrument but also a handling man is leased from Gambir exchange office.

Generally, circuit measurement may be classified into two; one is for the construction work and the other for trouble shooting. A large amount of facilities will be constructed during the next five years by the contracted works. After that, it is estimated that the construction work under direct control of PERUMTEL will increase. After a large amount of facilities have been completed, trouble shooting measuring instruments are required to maintain these facilities. In addition, measuring instruments for construction work must also be provided with the increase of construction works by PERUMTEL. For reference, trouble measuring instruments which are used in Japan at present are shown in Table 11.2.(7) and Table 11.2.(8). The measuring instruments of Table 11.2.(7) are used to shoot a trouble and determine a trouble location. Table 11.2.(8) shows measuring instruments used to find the accurate position of trouble location.

In addition to measuring instruments, various types of working tools must also be introduced in order to improve the work efficiency and work safety and reduce working hours.

TABLE 11-2-(7) MEASURING LNSTRUMENT

Kind of Cable	Trouble	Measuring Equipment	Measuring Method	Remarks
Paper Insulated Cable	Low insulation, shorted pairs Grounded pairs,	No. 3 Portable test instrument The measuring circuit employs resisters and batteries and galvanometer. It is called a "wheatstone bridge"	Murray loop method Varley loop method	These are used when one or more good Pairs, which are the same Kind of pairs as a troubled pair, are available in the troubled section.
			Fisher loop method	This is used when all pairs are in trouble and a good pair is not avialable. However, one insulated line pair is required. (For example, a drop wire pair etc.)
			Simple method	This is used when a troubled point can be located in a short section (within about one section of underground cable, and within about three spans of aerial cable). However, an insulated line pair is required. (For example, a pair of drop wire etc.)
	Disconnected Pairs	No. 1-C Capacity bridge or No. 3 Portable test instrument	Electrostatic Capacitance unbalance test	This is used when a good pair, which is the same Kind of pair as the troubled pair, is available in the troubled section.
Plastic Insulated Cable	Low insulation, Pairs crossed, Grounded pairs, Disconnected Pairs,	Pulse tester	Impedance in quality test	

TABLE 11-2-(8) MEASURING LNSTRUMENT

Kind of Line	Measuring Instrument	Remarks
Cable	(1) Cable trouble searching coil (2) No.20-E Tone oscillator (3) No. 2 searching tone amplifier (1), (2), and (3), are used in combination with each other	
	Simple bridge searching method	
S D wire (Self supported rural distributing wire)	(1) S D wire trouble searching antenna (2) No.20-E Tone oscillator (3) No. 2 searching tone amplifier (1), (2), and (3) are used in combination with each other	This is used only for searching for an S D wire disconnection trouble.

(4) Improvement of trouble control

Since the trouble control items are few in Jakarta, it is hard to say that the whole aspect of troubles is grasped. In this respect, it is suggested that the control items should be increased.

The items include the following:

The outside trouble dispatch slip used in telephone exchange offices is the basis of various trouble controls. However, the contents of the present outside trouble dispatch slip must be changed because the contents are not appropriate.

For subscriber troubles, the monthly trouble rate statistics (the number of troubles per 100 subscribers/month) are being taken now. The control based on the average value of these statistics is important for the time being.

However, in the future, in addition to the control based on the average value, the controls by carried forward troubles (known as troubles for which repair are not completed on the day) and repeated troubles will be required to improve maintenance service.

The number of public telephones in Jakarta is approximately 200 as of end-1974. The diffusion rate of public telephones is 0.04 set per 100 persons (6 sets per 100 persons in Japan) and this shows a very low diffusion level in view of the population of 5 million. For this reason, expansion of public telephones will be materialized in future and consequently, the number of public telephones will increase. The public telephone set differs from the general subscriber telephone set in structure. Accordingly, it should be controlled separately from the general subscriber telephone.

When the number of telephone lines increases and telephones become essential for social and individual lives in the future, it will be important to take countermeasures against occurrence of extraordinary failure which will greatly affect the society.

The following covers each item.

1) Outside trouble dispatch slip

The outside trouble dispatch slip which is used in Jakarta at present is shown in Table 11.2.(9). The described items are rough facility classification, a type of trouble and a trouble point of a faulty telephone, but basic classifications such as classification of facilities in accordance with their kinds, a trouble location, cause and phenomena are not provided. Since the present outside trouble dispatch slip is not suitable for the statistical control of troubles, the items to be described must be changed as early as possible. For reference, the outside trouble dispatch slip in Japan is shown in Table 11.2.(10). The above is the explanation for general subscriber troubles. In Jakarta, the outside trouble dispatch slip for general sub-

scriber trouble is also used for cable faults. However, the use of this slip for cable faults is not suitable. For this reason, detailed trouble control must be performed by newly preparing the trouble repair request slip for cable faults.

Table 11.2.(11) shows the trouble repair request slip for the subscriber/junction cables in Japan.

2) Control of trouble left unrepaired within the day

Any trouble left unrepaired within the day becomes a carried forward trouble. Numerous carried forward troubles are found in Jakarta and it occasionally takes more than one week till the completion of trouble repair. If the carried forward trouble occurs frequently, it is required to investigate its cause. For example, if the number of repair men is not sufficient, it can be investigated whether or not the present number of repair men is sufficient by taking into consideration the number of daily troubles (the number of trouble occurrences has the Poisson's distribution of the mean value M), average repair hour and waiting time.

3) . Repeated trouble control

The monthly maintenance level can be grasped, for example, at a rate of (the number of troubles)/(100 subscribers a month) for a trouble rate of general subscribers. When the maintenance level is improved in the future and the trouble rate becomes approx. 5 troubles/(100 subscribers a month) for example, it may be considered that a telephone exchange office maintains excellent maintenance level as a whole. However, it is occasionally found out through careful analysis that more than three troubles occur in some particular subscribers during one-year period. In this case, these subscribers must be individually controlled as repeated trouble subscribers and the causes of frequent troubles must be located thoroughly.

It is also necessary to make efforts to prevent trouble occurrence by individually controlling cables where troubles occur frequently.

4) Public telephone trouble control

The public telephone (coin telephone) is intricate in structure since dialing is ready after a dial tone has been received by throwing in a coin. Accrodingly, it has a high trouble occurrence rate. It is generally said that the number of troubles of the public telephone is proportionate to the number of uses. Therefore, the public telephone meter must be checked in exchange office taking into consideration the number of uses of the public telephone and its installation site. The first step of trouble control is to classify troubles in accordance with their causes and phenomena by classifying troubles into a trouble of the mechanism

(large and small divisions of trouble), a trouble of the circuit (large and small divisions of trouble) and a man-caused trouble. For reference, the public telephone trouble control chart is shown in Table 11.2.(12) and the public telephone trouble analysis table in Table 11.2.(13).

5) Extraordinary failure control

A facility trouble or abnormal trouble which extremely lowers telecommunication service is known as an extraordinary failure. For example, there is a possibility that service between two telephone exchange offices may halt due to the breakage of multi-pair junction cables by the third party causing an extraordinary failure.

When an extraordinary failure occurs, it is dealt with in the following order:

(A) Each facility maintenance division must immediately carry out the repair work and remove the cause of a trouble. In this case, it is necessary to secure the maximum flow of the network by changing a transmission line to another and using the alternative trunking function of an exchange. In repairing circuits, remember to dissolve interruption of telecommunications and secure major circuits.

(B) In the application reception counter, the staff must respond to complaint application from customers and furnish information through talky service, etc.

Concerning troubles which may cause disasters or which may be of social concern, the necessary information shall be provided to mass media, etc.

(C) After that, prepare detailed report and feed it back to each division of the PERUMTEL to prevent trouble reoccurrence and improve facilities reliability for facilities control.

If the countermeasures are to be studied and taken each time the extraordinary failure happens, it will be long before the communication is recovered, and therefore, it is difficult to minimize the confusion in communication and spread of abnormal conditions. It is necessary to establish standard remedy procedures through standardizing or stereotyping the foreseeable abnormal conditions, so that necessary counter-measures can be taken whenever an abnormal condition takes place.

(5) Improvement of material control

The problems on materials in Jakarta are as follows:

1) Construction and maintenance materials are not sufficiently secured due to

TABLE 11-2-(9) 1/2 NOTES OF SUBSCRIBERS TROUBLE
(FRONT PAGE) (1)

Number :

Testboard man								Cable data
Phone number	Name	Address	Complaint	Code number	Transferred to			P
					Date	Time	Sign	
								RK

Trouble shooter						Telephone repair section				S
Trouble	Code number	Parts to be changed	Repaired			Fault Point	Received			
			Date	Time	Sign		Date	Time	Sign	
										Ge lang

Outside Plant									Notes	Lu rus
Received			Solved			Returned				
Date	Time	Sign	Date	Time	Sign	Date	Time	Sign		Dp

TABLE 11-2-(9) 2/2 NOTES OF SUBSCRIBERS TROUBLE (BACK PAGE) (2)

Note :

Kgg: Head of Trouble Section

SPI: Head of Slipi Exchange

TRO: Head of PABX

Gda: Head of Gandaria Exchange

•) Kind of trouble _____

Date : _____

By : _____

L_1/E = ____ M Ohm	L_1 = _____ M Ohm
L_2/E = _____ "	L_2 = _____ "
L_1/L_2 = _____ "	R = _____ Ohm

Jakarta, _____

Chief of *Internal* Technique (_____)

Kgg/SPI/TRO/Gda (_____)

••) Details of repairing _____

Date : _____

By : _____

L_1/E = ____ M Ohm	L_1 _____ M Ohm
L_2/E = _____ "	L_2 _____ "
L_1/L_2 = _____ "	R _____ Ohm

Jakarta, _____

Chief of *Outside* Plant (_____)

Chief of *Section* _____ (_____)

TABLE 11-2-(10)1/2 OUTSIDE TROUBLE DISPATCH SLIP (FRONT PAGE) (1)

File No.

Entry items of test Department	Office name		Classification by detection	Complaint, work alarm, disaster	Installed Location		Occupation		
	Telephone No,		Subscriber *name*		Distribution pole				
	Kind of Telephone Set		Line No., etc.		Lead in pole				
	Acceptance	Month, date & time	Kind of trouble		Name of first testman		Test	Month, Date. Time	
Entry items of line department	1, *Time of repair* completion	*Month, date* & time	2, Repairman		3, *Name of* Testman			Dispatch	
	4, Trouble point	Main Branch Sub-branch	from No.....to No.....		7, Classification Items by causes	Remarks		Month, Date, Time	
	5, *Classification* by facilities	6, Classification by Location			1, *NTT construction*			Total trouble Time	
	1 Open wire	1 Splice	Open wire (both sides), open wire with others		2, Outsider construction			Hour, Minutes	
		2 wire	wire position on arm arm No. ( ) Step No. ( )		3, Vehicles				
		3 Accessories	Arm, insulater, connecting, wire, binding wire, local choke coil, shield wire against induction, tool of separation test, protecter on pole, prefixed arrester, false connection of terminals, screw loose, fuse in distribution box, arrester		4, Man caused *disaster*			9, Items to request permanent repair	
	2 SD wire (Self supported rural distributihg wire)	1 Jointing part	SD (both sides), SD wire with others		5, Other articles				
		2 Conducter	changed pair No From ( ) to ( )		6, Natural disaster				
		3 Accessories	SD terminal box, terminal box for separation, protecter on pole, prefixed arrester, *false connection of terminals*, screw loose, fuse in distribution box, arrester,		7, Contact with electric power line or lightning				
	3 Conducter of cable	Subscriber	Name of changed route from ( ) to ( ) Changed pair No. from ( ) to ( )		8, Electrical or *chemical* corrosion				
					9, Poor construction				
					10, Poor maintenance			Outside plant natural restoration	
					11, Deterioration of facilities				
					12, Other cause				
8, Code No.									

Column with mark (•) is filled by person in charge

TABLE 11-2-(10)2/2 OUTSIDE TROUBLE DISPATCH SLIP (BACK PAGE) (2)

Kind of Telephone (1)		
Individual		01
Party line		02
P.B.X		11
Building Telephone		12
R.C.G.Tel		13
		21
		31
		41
Public Telephone Box	Coinuse SLDD	51
	Coinuse Local	52
	Others	53
Public Telephone Desk	Coinuse SLDD	61
	Coinuse Local	62
	Others	63
		71

Large Division of Facilities (2)		
House Installation	Telephone set	01
	Drop wire	02
	Arrester equipment	03
	Inside wire	04
	Battery	05
	Other part	09
Public Telephone	Mechanical	11
	Electrical	12
	Man caused disaster	13
	Tested O.K	18
Not troubled		99

Kind of Telephone Set (7)			
Automatic			
Common Battery			
Magnetic			
Key Telephone			
Pink Telephone			
Public Telephone			

Repair Method (6)

- Replace
- Contact
- Adjust
- Clean

Permanent Repair

Remarks

Small Division of Facilities (3)		
Other equipment — Telephone set (circuit)	Dial	21
	TR set	22
	Cord	23
	Circuit network	24
	Terminal metal	25
	Case	26
	Other parst	29
Other equipment — Arrester Equipment	Fuse	31
	Arrester	32
	Other part	39
Other equipment — key Telephone	Main eq	41
	Tel set	42
	Lamp	43
	Distri wire	44
	Connecter	45
	Others	49
Other equipment — Secretary Telephone	Main eq	51
	Tel set	52
	Distri wire	53
	Others	59

Mechanical part		
Coin slot		71
Rails — Coin selecting rail		72
Rails — Other rail		73
Coin collecting and refunding mechanism		74
Relay, Magnet		75
Coin contact mechanism		76
KS contact mechanism		77
Dial mechanism		78
coin refunding gate		79
H.S slow timer mechanism		80
Emergency call unit		81
Other part		89

Phenomena (4)	
Break	01
Cut	02
Lack of parts	03
Contact	04
Bad insulation	05
Ground	06
Noise	07
Bad He,or Re	08
Misconnect	09
Coin stopped	11
Other trouble	19

Causes (5)	
NTT Construction	21
Outsider Const	22
Vehicle	23
Poor construct	24
Bad article	25
Lightning	26
Disaster	27
Insect	28
Deterioration	29
Corrosion	31
Poor adjustment	32
Dirty	33
Screw lost	34
Pin t.M off	35
Badly shaped coin	36
Stolen	37
Incorrect use	38
Mischief	39
Coin box filled	41
Other cause	89
Unclear	99

Main Material	Name	Unit	Number

Code Number	Kind	Large division	Small division	Phenomena	Cause

TABLE 11-2-(11) 1/3 TROUBLE REPAIR REQUEST SLIP (1)

(SUBSCRIBER CABLE AND JUNCTION CABLE)

File No.

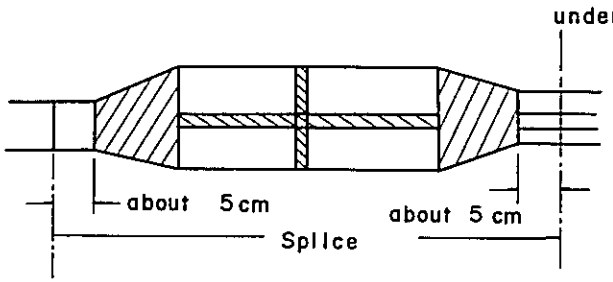
1, Classification by Detection	Complaint, Work, Alarm, Disaster,	10, Time		12, Work Expense	14, Approval
2, Name & No. of Trouble Lines		a) Occurrence (Date, Time, Month,)		Grand Total (Yen)	Section Chief
3, No. of Troubled Circuit	General (cct) Public (") Private (") Other (") Total (")	b) Acceptance (")	Break down	Wage (")	Unit Chief / Work Chief
		c) Arrangement (")		Traveling Expenses (")	Person in Charge
		d) Departure (")		Material Expenses (")	15, Disposal Copy
4, Kind of Trouble		e) Arrival (")		Contracted Expenses (")	Tabulation
5, Reporter (Test Department)		f) Discovery (")			Control Chart.
6, Measurement	Measuring Apparatus. Line No. Loop Resistance. Location of Measurement.	g) Restoration (")		13, Person Responsible for Repair	Control Table
		h) Completion of Repair			
		11, Inspector for Confirmation			
7, Instruction Item & Note 8, Kind of Cable 9, Troubled point		16, Main steps operation	To change cable	meters	17, Total working time ( ) Man ( ) Hour ( ) Man x day
			To add other cable	meters	
			To add other conducter	pairs	
			To desiccate cable for repair	points	

TABLE 11-2-(11) 2/3 TROUBLE REPAIR REQUEST SLIP (2)

18, Entry column of troubled point

(A) Splice details (lead sheathed)

(Troubled point is indicated with x)



(B) Troubled point

(indicated with x)

(C) name of box

TABLE 11-2-(11) 3/3 TROUBLE REPAIR REQUEST SLIP (3)

Classification and division of troubles	19, Classification by Facilities		20, Classification by location			21, Classification by Causes	23, Classification by Repair
			Overhead	Underground	Underground distribution	1, NTT construction 2, Outsider construction 3, Vehicles 4, Man caused disaster 5, Other articles 6, Natural disaster 7, Contact with electric power line or lightning 8, Elctricalor chemical corrosion 9, Poor construction 10, Poor meintenance 11, Deterioration of facilities 12, Other cause	Permanent repair Temporary repair Direct managed work Contracted work 24, Name of contracted company
	1 Overhead	1 Gas cable lead sheathed	1 Splice	1 Splice	1 Splice		
	2 Underground	2 Cable lead sheathed (non gas)	2 Cable near pole	2 Within manhole	2 Within handhole		
	3 Underground distribution	3 Plastic Cable	3 Span	3 Within conduit	3 Within conduit		
			4 Boxes	4 Tapping	4 Tapping		
Number of code 22,							

TABLE 11-2-(12) PUBLIC TELEPHONE TROUBLE CONTROL CHART

Kind of Telephone. :

Number of Troubles (T + F) ↑													Trouble Ratio (T + F) ↑ Per Month X 100 Telephone sets			
Month			4	5	6	7	8	9	10	11	12	1	2	3	First half	Last half	Year
Number of Troubles	Complaints (T)																
	Find (F)																
	Total																
Trouble Ratio (T + F)																	
Details In Location	Mechanical	T															
		F															
	Electrical	T															
		F															
	Man caused Disaster	T															
		F															
	Tested O. K.	T															
		F															
Number of Telephone Sets																	
Not Troubled (Number)																	

TABLE 11-2-(13) PUBLIC TELEPHONE TROUBLE ANALYSIS TABLE

Year: Month:

Classification / Location			Phenomena												Causes																		
			Break	Cut	Lack in parts	Contact	Bad insul	Ground	Noise	Bad He, Re	Misconnect	Coin stopped	Other fault	Total	Poor construction	Bad telephone set	Deterioration	Corrosion	Poor adjustment	Dirty	Screw lost	Pin T.M. off	Badly shaped coin	Other cause	Not clear	Total	Artificial Disaster: Stolen	Incorrect use	Mischief	Coin box filled	Total	Total
Mechanical part	Coin slot																																
	Rails	Coin selecting rail																															
		Other rail																															
	Coinselecting and refunding mechanism																																
	Relay and magnet																																
	Coin contact mechanism																																
	KS contact mechanism																																
	Dial mechanism																																
	Coin refunding gate																																
	H.S slow timer mechanism																																
	Emergency call unit																																
	Other part																																
	Total																																
Circuit part	T R set																																
	Cord																																
	Dial																																
	Circuit network																																
	Terminal metal																																
	Case																																
	Other part																																
	Total																																
Tested O.K																																	
Total																																	

the shortage of the budget.

2) In Indonesia, cables, telephones and PVC pipes are partly manufactured domestically, but a considerable amount of materials relies upon importing. For this reason, repair parts which are in urgent need are not available on some occasions.

As stated above, the material control business is under difficult conditions. Improvement of the material control business, taking into account actual conditions, is considered as follows:

1) The material purchase plan must be prepared in accordance with frequency in use of materials based on the results of trouble analysis.

2) Since telephone sets are assembled in Indonesia, it is comparatively easy to secure repair parts. Spare telephone sets and repair parts shall be prepared for repairing telephones.

3) Since cable trouble has a great influence, cables often used shall be stored in the telephone exchange office within the budget appropriation, until the construction work office is established.

4) The delivery of materials is currently made on a nonscheduled basis. Rationalization and simplification of business shall be performed through scheduled delivery of, for example, once a week.

(6) Others

Various types of statistics and reports are stored in telephone exchange offices and Regional Telecommunication Bureaus. Although the contents of these data are not always excellent, the data shall be combined with the action plan by rechecking and utilizing them for various studies.

11.3 Training

11.3.1 Significance of Training

The telegraph and telephone enterprise is the facilities industry which possesses a variety of huge facilities. To control and manage these facilities smoothly, personnel with sufficient technological knowledge and techniques are required. Great expansion of facilities will be performed in future for the dissolution of waiting telephone applicants and service improvement. In addition to the plan, design and construction, reasonable and efficient maintenance are essential for the expansion and maintenance of these facilities. The technological knowledge and technique which are required for business accomplishment are mainly acquired through training. It is important to train personnel who cannot accomplish their routine works completely, so that they can fulfil them. It is also necessary for personnel of ability to master a higher level of technique through training to be assigned to the

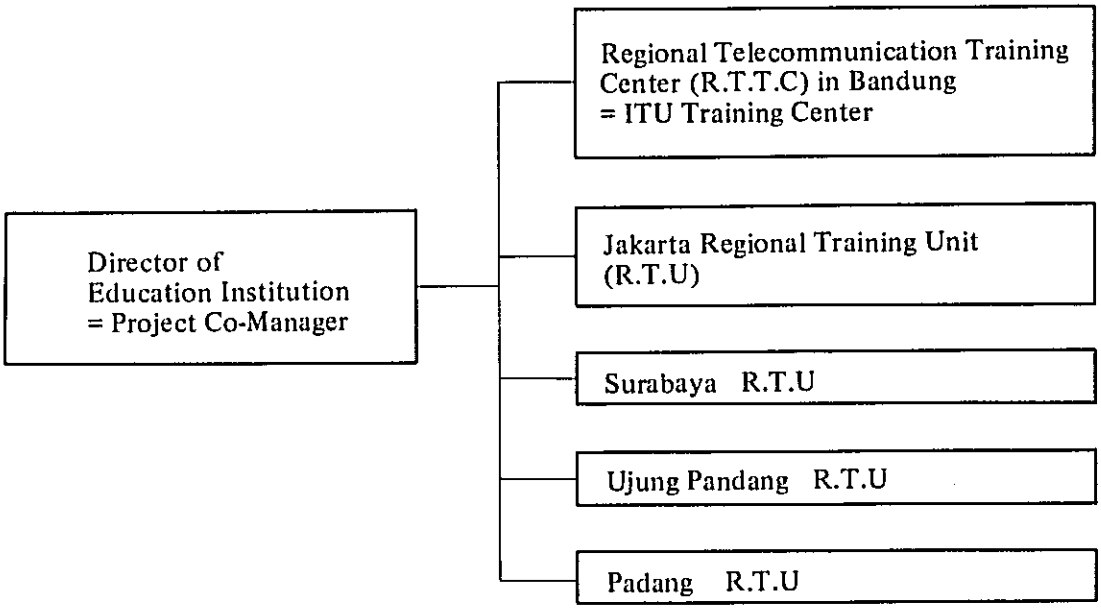
posts suitable for the acquainted technique. Everyone recognizes the importance of training, and numerous companies and enterprises endeavor to upgrade personnel through training. PERUMTEL has the Director of Education Institution in its organization to conduct training systematically. In Bandung, the ITU Training Center is serving as the traininig center of PERUMTEL. This training center is systematically established and plays a vital role in PERUMTEL.

11.3.2 Present Conditions of Training in PERUMTEL

(1) Training organization

PERUMTEL conducts training systematically and its organization is as follows:

Fig. 11.3.(1)



As shown in Figure 11.3.(1), Regional Telecommunication Training Center (R.T.T.C.) in Bandung and Regional Training Units in four regions of Jakarta, Surabaya, Ujung Pandung and Padung are established under the control of the Director of Education Institution. The Regional Telecommunication Training Center (R.T.T.C.) in Bandung is a training center based on the technical cooperation with the ITU. Project Manager is assigned in this Training Center from the ITU. In PERUMTEL, Director of Education Institution serves concurrently as project co-manager of the Training Center for efficient and effective management. PERUMTEL dispatches a senior instructor for each special course in addition to ITU expert so that PERUMTEL can systematically train the trainees. In this sense, Bandung Training Center based on the technical co-

operation with the ITU is a only training center of PERUMTEL which provides an independent building and senior instructors.

Fig. 11.3.(2) shows the relationship between the ITU technical cooperation plan and Regional Telecommunication Training Center (R.T.T.C.) and the organization of Regional Telecommunication Units (R.T.U.).

(2) Classification of training

The training comes in two types; one is "regular training" for new employees and the other "upgrading training" for existing employees.

1) Training for new employees

All new employees who take the technical course are trained. The training periods and locations vary according to schools where new employees graduated and the classes which they will enter in future. The Indonesian education system is shown in Fig. 11.3.(3) for reference. The engineer class of PERUMTEL includes three classes; junior, senior and academy (B.C.T.T.). Graduating schools for obtaining these qualification and training periods after employment by PERUMTEL are shown in Table 11.3.(4).

Table 11.3.(4) Classification of Engineers

Items / Class	Graduating school	Training period (year)	Training Center
Junior	Junior Technical School Junior High School	1	ITU Training Center and Each R.T.U
Senior	Senior Technical School Senior High School	2	ITU Training Center
Academy (B.C.T.T)	Bachelor (University) (College)	2	ITU Training Center

2) Training for existing employees

This training is to improve ability of existing employees by providing special knowledge to them. Selection of employees is made by a chief in a field. Training is given mainly in each regional training unit. When there is no suitable instructor or training facilities, training is given in the ITU Training Center in Bandung. A

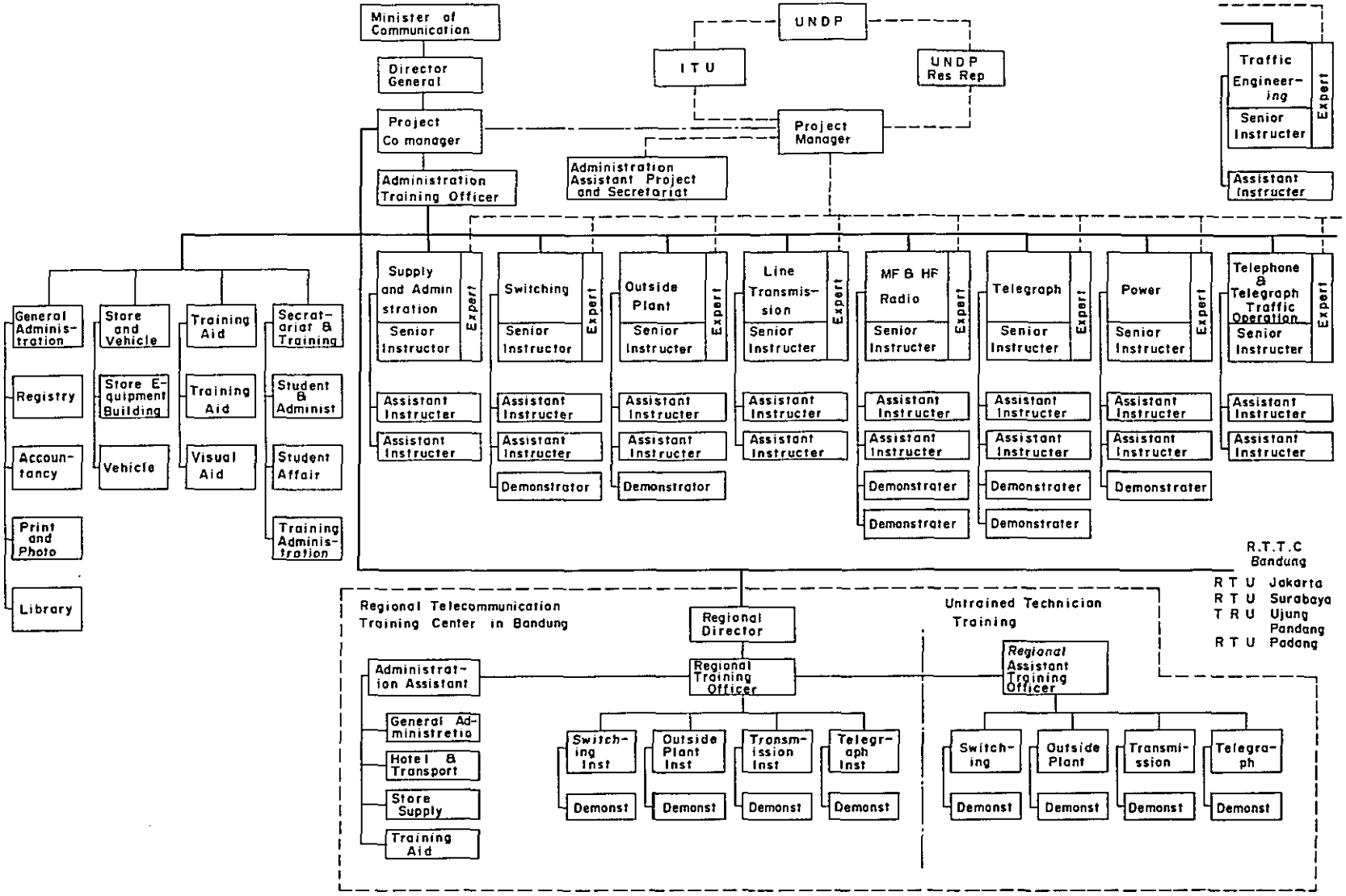


FIG. II-3-(2) PERUMTEL TRAINING ORGANIZATION AND ITU TRAINING CENTER

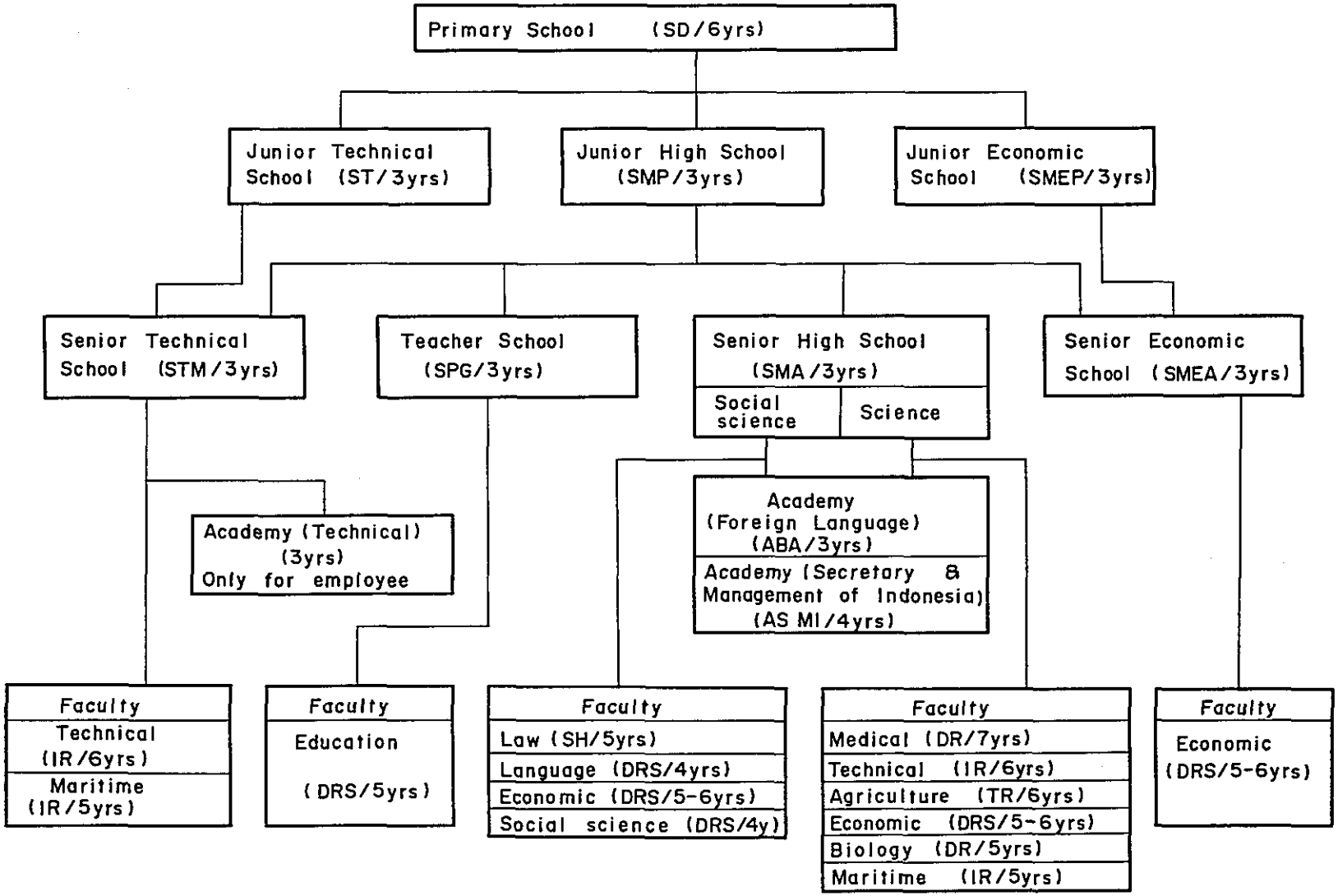


FIG. II-3-(3) EDUCATION SYSTEM IN INDONESIA

training period is approx. 6 months.

3) Others

For reference, training results of each special course which was conducted in the Training Center in Bandung based on the technical co-operation with the ITU are shown in Table 11.3.(5) to Table 11.3.(14).

11.3.3 Training in the Future

The following covers efficient training for the training classification and method to re-recognize the importance of training, while pointing out problems to be improved in the present training, taking into consideration actual conditions in Indonesia.

(1) Classification of training

The training is classified into two types; training for new employees and for existing employees, both of which are enforced in Indonesia.

1) Training for new employees

New Personnel are employed every year in order to develop the telegraph and telephone enterprise. New employees may be classified into high class engineers, middle calss engineers and field technicians. In this sense, it is an excellent way for PERUMTEL to classify engineers into three categories; academy, senior and junior in accordance with their graduating schools and to determine a training period in accordance with each class. Generally, a high level of training is provided to the academy class, while the outline of the telegraph and telephone enterprise, general knowledge of telegraph and telephone facilities and special knowledge required for filed job to be engaged are instructed to the senior and junior classes. In Indonesia, new employees are trained for a proper period of time in the ITU Training Center (R.T.T.C.) in Bandung and four Regional Training Units (R.T.U.) in accordance with the types of class which they enter after employment. They have a field trip before training finishes, but they have no opportunity to work in fields such as a telephone exchange office or a radio and carrier repeater station for a certain period of time. The training in the Training Center includes practice, but generally it tends to be theoretical. Consequently, even if new employees trained for a certain period is immediately dispatched to the field, excellent results can not always be expected.

Therefore, the following improvement is desirable in order to increase training efficiency.

The improvement plan is to divide the training in the training center into the former and latter periods. After the former-period training is done, newly employed personnel are assigned to fields. The latter-period training is given in the

TABLE II-3-(5) TOTAL COURSISTS OF EACH SPECIALIZATION

(ITU TRAINING CENTER)

Items \ Year		1969 ~ 1970	1971	1972	1973	1974	
Switching	Senior	23	14	16	49	28	
	Special	63	87	49	9	43	
	Total	86	101	65	58	71	
Outside Plant	Sn	62	10	21	9	—	
	Sp	32	73	37	93	142	
	Total	94	83	58	102	142	
Radio	Sn	42	55	15	24	14	
	Sp	44	81	40	17	25	
	Total	86	81	55	41	25	
Telegraph	Sn	35	67	23	38	22	
	Sp	51	—	14	25	—	
	Total	86	67	37	63	22	
Transmission	Sh	37	6	15	—	26	
	Sp	46	40	29	31	11	
	Total	83	46	44	31	37	
Power Plant	Sn	12	29	—	15	14	
	Sp	—	24	51	20	29	
	Total	12	53	51	35	43	
Traffic Engineering	Sn	—	—	—	—	37	
	Sp	—	—	—	12	—	
	Total	—	—	—	12	37	
Telephone and Telegraph Oparation	Sn	—	—	—	83	112	
	Sp	—	—	—	—	—	
	Total	—	—	—	83	112	
Teaching Method	Sn	—	—	—	—	—	
	Sp	27	—	—	—	—	
	Total	27	—	—	—	—	
Administration and Finance	Sn	—	—	—	—	30	
	Sp	—	—	—	—	—	
	Total	—	—	—	—	30	
Grand Total	Sn	211	173	90	218	282	
	Sp	263	258	220	207	236	
	Total	474	433	310	425	519	

TABLE II-3-(6) SWITCHING (ITU TRAINING CENTER)

		Course	Level		Duration (week)	Number of Coursists
			Senior	Special		
1969 ~ 1970	1	Senior common course	1	—	25	23
	2	Test desk	—	1	4	12
	3	Test desk operation	—	1	2	8
	4	Repair Tlp equipment	—	1	5	12
	5	Mantenance of F6 a	—	1	5	8
	6	Test desk	—	1	5	5
	7	Repair Tlp equipment	—	1	5	5
	8	Mantenance F 6 a	—	1	4	7
	9	Repair Tlp equipment	—	1	4	6
		Total				86
1971	1	Common course	1	—	18	14
	2	Repair tlp equipment	—	1	4	8
	3	Mantenance "	—	1	2	8
	4	" "	—	1	2	11
	5	Test desk operation	—	1	5	7
	6	F 6 a	—	1	5	9
	7	Test desk operation	—	1	5	8
	8	Repair tlp equipment	—	1	5	8
	9	HKS 442	—	1	5	8
	10	Repair tlp equipment	—	1	5	9
	11	Test desk operation	—	1	5	11
		Total				101
1972	1	Maintenance of F6 a	1	—	14	16
	2	Test desk	—	1	5	8
	3	CB ADK = 513	—	1	4	11
	4	CB ADK = 513	—	1	7	12
	5	Test desk operation	—	1	4	12
	6	Maintenance trunk exch F36	—	1	5	6
		Total				65
1973	1	Maintenance/operat F6 a	1	—	12	6
	2	SLDD/CIT Fitters	1	—	9	12
	3	HKS = 442	—	1	12	10
	4	SLDD/CIT fitters	1	—	5	13
	5	SLDD/CIT testers	1	—	21	17
		Total				58
1974	1	ART = 102	1	—	13	14
	2	Test desk	—	1	14	13
	3	ARF = 102	1	—	15	14
	4	Test = desk	—	1	14	15
	5	F6 a	—	1	22	15
		Total				71

TABLE 11-3-(7)

OUTSIDE PLANT (ITU TRAINING CENTER)

No.		Course	Outside		Duration (week)	Number of coursists
			Senior	Special		
1969 ~ 1970	1	Common course	1	—	16	24
	2	Aerial construction	—	1	4	16
	3	Common course	1	—	18	17
	4	Cable Jointing	—	1	6	16
	5	Common course	1	—	18	21
		Total				94
1971	1	Cable Jointing	—	1	5	20
	2	Duct system	—	1	5	18
	3	Common course	1	—	20	10
	4	Cable jointing	—	1	5	16
	5	Cable jointing	—	1	6	19
		Total				83
1972	1	Senior regular	1	—	24	21
	2	Aerial construction	—	1	6	15
	3	Cable jointing	—	1	6	12
	4	〃	—	1	6	10
		Total				58
1973	1	Senior regular	1	—	22	9
	2	Cable jointing	—	1	12	47
	3	Open wire lines	—	1	12	46
		Total				102
1974	1	Open wire lines	—	1	12	48
	2	Cable jointing	—	1	13	48
	3	〃	—	1	14	46
		Total				142

TABLE II-3-(8) RADIO (ITU TRAINING CENTER)

No		Course	Level		Duration (week)	Number of Coursists
			Senior	Special		
1969 ~ 1970	1	Common course	1	—	16	24
	2	Vodas vogad	—	1	4	11
	3	Common course	1	—	18	18
	4	Vodas vogad	—	1	6	12
	5	Troposcater relay equip	—	1	10	21
		Total				86
1971	1	Senior specialist course	1	—	4	23
	2	Project Aid Filips	—	1	12	15
	3	Microwave	1	—	20	16
	4	Microwave/troposcater	1	—	20	16
	5	Radio relay equip	—	1	12	11
		Total				81
1972	1	Microwave relay equip	—	1	12	16
	2	Jawa-Bali Mw madem	—	1	12	13
	3	" " "	—	1	12	11
	4	Linc. Compr/Exponder	1	—	8	15
		Total				55
1973	1	Microwave Tx/Rx	—	1	14	17
	2	TSMS Convention	1	—	9	24
		Total				41
1974	1	Microwave Tx/Rx	—	1	13	11
	2	Lincompex	1	—	10	14
		Total				25

TABLE 11-3-(9)

TELEGRAPH (ITU TRAINING CENTER)

No		Courses	Level		Duration (week)	Number of Coursists
			Senior	Special		
1969 ⟩ 1970	1	Common course	1	–	16	19
	2	Common course	–	1	4	12
	3	" "	1	–	18	16
	4	Siemens T-100	–	1	6	12
	5	Fm/Vft	–	1	6	11
	6	Fm/Vft	–	1	7	16
		Total				86
1971	1	Common course	1	–	22	22
	2	Telex	1	–	10	12
	3	Tgp distortion measurement	1	–	7	25
	4	Arg Parametron	1	–	6	10
		Total				69
1972	1	Supervisor in Tgphy	1	–	22	12
	2	Siemens T-100	–	1	7	14
	3	Tg-Sw Tlx Tw 39	1	–	10	11
		Total				37
1973	1	Tgp equip. T=100	–	1	6	12
	2	Fm UFT (NEC)	1	–	7	9
	3	Term Equipt LU-133	–	1	7	13
	4	Sw-Tgp Twic-9	1	–	6	12
	5	LO - 133	1	–	3	17
		Total				63
1974	1	Supervisor for telegraph station	1	–	13	12
	2	VFT/CIT/Alcatel	1	–	6	10
		Total				22

TABLE 11-3-(10)

TRANSMMISION (ITU TRAINING CENTER)

No		Course	Level		Duration (week)	Number of Coursists
			Senior	Special		
1969 ∫ 1970	1	Common course	1	—	16	21
	2	Basic of line Xm system	—	1	4	25
	3	Common course	1	—	16	16
	4	Basic of line Xm system	—	1	5	10
	5	Line Xm carrier measurement	—	1	4	11
		Total				83
1971	1	Common course	1	—	12	6
	2	12-ch Car. Tlp equip	—	1	5	15
	3	Line Xm Car. measurement	—	1	5	13
	4	12-ch Carr Tlp equip	—	1	5	12
		Total				46
1972	1	Common course	1	—	16	15
	2	Multi channel carr tlp (NEC)	—	1	12	10
	3	〃	—	1	8	9
	4	〃	—	1	9	10
		Total				44
1973	1	Open wire system carrier telephone	—	1	7	11
	2	〃	—	1	8	8
	3	〃	—	1	8	12
		Total				31
1974	1	Broad band Mltpx (NEC)	—	1	9	11
	2	(NEC) (CIT)	1	—	3	14
	3	Open wire lines T-12F	1	—	10	12
		Total				37

TABLE 11-3-(11)

POWER PLANT (ITU TRAINING CENTER)

No		Course	Level		Duration (week)	Number of Coursists
			Senior	Special		
1969 ~ 1970	1	Common course	1	—	16	12
		Total				12
1971	1	Common course	1	—	18	8
	2	Power plant for microwave	—	1	8	8
	3	Diesel generation set	—	1	5	12
	4	Rectifier / Batteries	—	1	8	12
	5	Power for microwave	1	—	12	13
		Total				53
1972	1	Microwave Power	—	1	8	10
	2	Diesel Generator set	—	1	6	16
	3	DC Power for Exchange	—	1	8	11
	4	Air conditioning	—	1	6	14
		Total				51
1973	1	Power for micro wave	—	1	8	9
	2	DC power for exchange	—	1	8	11
	3	Microwave power	1	—	13	15
		Total				35
1974	1	Power for Microwave	1	—	13	14
	2	DC power for exchange	—	1	10	17
	3	Power for exchange	—	1	14	12
		Total				43

TABLE II-3-(12)

TRAFFIC ENGINEERING (ITU TRAINING CENTER)

No		Course	Level		Duration (week)	Number of Coursists
			Senior	Special		
1969 ∿ 1970		—	—	—	—	—
1971		—	—	—	—	—
1972		—	—	—	—	—
1973	1	Traffic operation	—	1	3	12
		Total				12
1974	1	Traffic staff course	1	—	27	26
	2	Basic traffic for staff	1	—	6	11
		Total				37

TABLE II-3-(13) TELEPHONE AND TELEGRAPH OPERATION
(ITU TRAINING CENTER)

No.	Course		Level		Duration (week)	Number of Coursists
			Senior	Special		
1969 ∫ 1970	—		—	—	—	—
1971	—		—	—	—	—
1972	—		—	—	—	—
1973	1	Senior officer	1	—	2	16
	2	Tlp chief supervisor course	1	—	4	17
	3	〃	1	—	6	18
	4	〃	1	—	5	15
	5	〃	1		6	17
	Total					83
1974	1	Tlp chief supervisor	1	—	6	19
	2	Tgp 〃 〃	1	—	6	12
	3	Tgp 〃 〃	1	—	4	14
	4	Tgp 〃 〃	1	—	6	14
	5	Tgp 〃 〃	1	—	6	18
	6	Operator Internationsl tlp	1	—	24	35
	Total					112

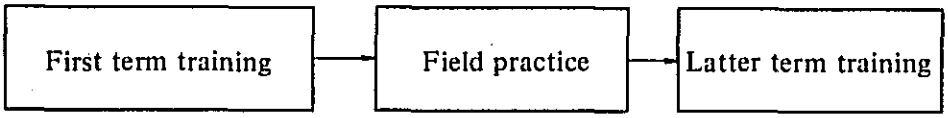
TABLE 11-3-(14)

ADMINISTRATION (ITU TRAINING CENTER)

No		Course	Level		Duration (week)	Number of Coursists
			Senior	Special		
1969 ~ 1970	1	Teaching method	–	1	2	13
	2	" "	–	1	3	14
		Total				27
1971		–	–	–	–	–
1972		–	–	–	–	–
1973		–	–	–	–	–
1974	1	Administration & Finance	1	–	12	30
		Total				30

Training Center after the new employees master field works to a certain extent.

The following flow chart shows the above-mentioned order.



This applies in principle to each of the academy, senior and junior classes.

2) Training for existing employees

As the training for existing employees in Indonesia, a special training course known as "upgrading training" is provided.

(a) Specialized training

The purpose of this training is to improve efficiency in the fields by having the employees acquire a high level of knowledge as to new technologies. Positive introduction of new technologies must be considered for the implementation of the facilities expansion plan. The present training is mainly for existing facilities. PERUMTEL positively introduces new technologies, but it is necessary to adopt new technologies immediately as a training curriculum in order to support excellent maintenance.

The specialized training includes a variety of courses and special curricula as shown in Table 11.3.(15).

Table 11.3.(15) Courses and Subjects of Specialized Training

Class	Contents	
Technical	1	Planning, designing, construction maintenance, traffic
	2	Telegraph, data, switching, power, outside plant, radio, carrier
Others	Operation, business, tariff supply material, public welfare, general affairs etc.	

A training period of one to three months is considered to be appropriate. The specialized training period in Indonesia is six months, but it seems a little too long. The training contents are to teach theories and practices. For instructors, specialists are desirable. Specialists mean those who teach special curricula belonging to the Training Center and who teach their special curricula even if they are ordinarily working outside the Training Center.

(2) Training method

1) Field training

The field training is the most popular training method and has a desirable training base since trainees can engage in operation and maintenance of circuits and facilities which are used in practice. Each field chief is liable to train his followers through the routine works. When staff to be trained exceed the fixed number for training course, representative staff are selected from each field for training. After they return to their fields, they in turn teach to other staff. Even if the staff are trained in the Training Center, field training is useful for applying the taught theories in the Center and for supplementing the uncovered items in the course of the studying.

2) Training in Training Center

Though training in the Training Center has a disadvantage that it tends to be theoretical, it is the most desirable one. Especially, in the case of new employees, training in the Training Center is ideal since it is impossible to give them on-the-job training immediately.

For new employees, the training period is divided into 3 periods in order to enhance the training effect. That is, the following training order is desirable.

(a) New employees learn the outline of telegraph and telephone enterprise and each facility in the former period (former-period training).

(b) After mastering the outline in the Training Center, the employees are dispatched to the field in order to obtain training in a telephone exchange office, radio or carrier repeater station (field practice).

(c) After new employees master basic knowledge in the field to a certain extent, they are trained again in special curricula in the Training Center (latter-period training).

11.3.4 Training Center

The Training Center is established and managed in Bandung based on the ITU technical co-operation. At present, there is only one Training Center. Even if four Regional Training Units (R.T.U.) in Jakarta, Surabaya, Ujung Pandung and Padang are not upgraded to the

Jakarta, Surabaya, Ujung Pandung and Padang are not upgraded to the level of the Training Center in Bandung, it is desirable to develop them to Training Centers with training facilities independent of telephone exchange office, without utilizing the facilities in the telephone exchange office. When PERUMTEL establishes a new Training Center from Regional Training Unit, it is not to say that the Training Center in Bandung will be very useful.

The following describes basic items for establishing Training Center.

(1) Training course

It is recommended to start training from two courses; one is "regular training" for the next new employees, which is essential for planning, design, construction, maintenance and operation of telegraph and telephone facilities and the other is "specialized training" which is specialized for maintenance and operation. And it is recommendable to increase other training courses gradually.

1) Regular training (new employee training)

This regular training course is for new employees of graduates. A high-level training is given to those who graduated from a university or college. The outline of the telegraph and telephone enterprise, general knowledge of telegraph and telephone facilities and special knowledge, required in the field job to be assigned, are taught to those who graduated from senior and junior high schools. The training period for those staff is approx. six months.

2) Specialized training

(a) *Maintenance training*

This is a training for knowledge required in the maintenance field and small construction work technology. It is considered suitable that the training period of this course is one to three months. The basic maintenance training course is shown in Table 11.3.(16).

(b) Operation training

This is a training for manual-exchange operators and telegraph operators in the field. It is considered suitable that the training period is approx. two months for telephone operators and approx. six months for telegraph operators.

(2) Training instructors

A specialized instructor is required for each special curriculum in the Training Center. It is of importance to select superior instructors. Excellent engineers must be selected from any staff as candidates for instructors.

(3) Curricula

As curricula at the beginning special curricula for switching, telegraph, power, outside plant, radio and carrier, and curricula for operation, traffic and material supply are required. After that, it is recommended to furnish curricula of systematical item such as maintenance service controls.

Table 11.3.(16) Basic Maintenance Training Course

Training Course	Training Course Contents
Telephone	Automatic, manual switching, P.B.X, P.A.B.X etc.
Telegraph	Teletype, terminal equipment etc.
Outside Plant Maintenance	Laying cable, Splicing, Mounting on a pole, Civil engineering, Erecting a pole, Removal, Plumbing, Telephone repair etc.
Power Plant	Power source, Air conditioner, Stand-by engine etc.
Radio & Transmission Maintenance	Transmitter, Receiver, Antenna, Carrier equipment etc.

(4) Training facilities

The most effective training method for maintenance and operation of telegraph and telephone facilities is to master technical knowledge and to become familiar with facilities and instruments by operating them in practice. For that purpose, it is required to provide various model sets and measuring instruments for each speciality.

The following training facilities will be essential.

1) Telephone practice
   (a) Automatic and manual switching equipment, PABX and PBX switching equipment
   (b) Test board, MDF, jumper wires, inside cables
   (c) Signalling equipment, telephone sets
   (d) Various test equipment, tools for relay adjustment, adjusting boards and measuring instruments

2) Telegraph practice
   (a) Telex switching equipment, subscriber station equipment
   (b) Tele-printer and other telegraph facilities
   (c) Telegraph relay equipment
   (d) Voice-frequency telegraph equipment
   (e) Various test equipment, adjusting tools, adjusting boards, measuring equipment, etc.

3) Outside plant practice
   (a) Outside plant test equipment
   (b) Trouble shooting equipment
   (c) Gas testing equipment
   (d) Splicing and plumbing equipment
   (e) Open wires, aerial cables, underground cables
   (f) Manholes, hand holes, conduit lines
   (g) Outside plant construction machinery
4) Power practice
   (a) Transformers, emergency power equipment
   (b) Rectifiers, batteries
   (c) Control panels, power distribution panels
   (d) Automatic voltage regulators, etc.
5) Radio and carrier practice
   (a) High-frequency transmitters and receivers
   (b) Carrier terminal equipment
   (c) Antennas
   (d) Various test equipment, measuring equipment, etc.
6) Telephone operation practice
   (a) Various types of manual switchboards
   (b) Service observation desk
7) Telegraph operation practice
   (a) Key-perforators
   (b) Phonogram accepting equipment
   (c) Morse code transmitters and receivers

11.4 Plant Record

11.4.1 Present Plant Record

Concerning the plant record of the outside plant of telephone offices in Jakarta, its kinds are few and it would be rather unfair to say that management is thoroughly performed.

The symbol marks and terms are being standardized by PERUMTEL, in the process of and preparation of the standard practices is in the process.

Samples of the plant record which are used at each telephone office are shown below.

(1) Underground cable map ..... .Fig. 11.4.(1)

(2) Aerial cable map ..... .Fig. 11.4.(2)

(3) Primary cable-secondary cable contrast chart

1) For the cabinet area .....Table 11.4.(3)

2) For direct distribution area .....Table 11.4.(4)

11.4.2 Management Method of Plant Record

Management of the plant record is extremely important for maintenance and expansion of facilities. If the plant record is completely provided, it is possible to immediately respond to applications of new telephone installation and transfer of subscribers, and the installation work can easily be carried out.

The construction work may be carried out by a telephone exchange office itself concerned in some cases and by higher rank office in other cases. Furthermore several contractors may carry out the work during the same period of time in the same telephone exchange office area in some cases. Therefore, the following points must thoroughly be considered for preparation and management of the plant record.

(1) To unify the symbols and form of the plant record

(2) To manage the plant record through a special section (plant record section)

(3) To assign a duty to the construction sections and contractors to send the required number of plant records to the plant record section after completion of construction work.

11.4.3 *Desirable Plant Record*

11.4.3.1 Primary Cable and Gas Pressurization System Map

An example is shown in Fig. 11.4.(5). In this case, the primary cable and gas pressurization system maps are plotted in one sheet of drawing. For a large telephone exchange area, however, it is better to separate these two maps.

11.4.3.2 S.R.E. and DC Resistance Map

An example is shown in Fig. 11.4.(6). The S.R.E. and DC resistance values of the primary and secondary cables are indicated every primary cable route.

11.4.3.3 Secondary Cable Map

The secondary cable routes, poles and drop wires are plotted on the topographical map (scale; 1/1,000 to 1/5,000) so that the secondary cable routes besides the positions of poles and subscribers can easily be found. An example is shown in Fig. 11.4.(7).

11.4.3.4 Junction Cable Diagram

On this drawing, type of loading coil, coil spacing and test connection positions are put in for every junction cable. An example is shown in Fig. 11.4.(8).

11.4.3.5 Conduit Route Map

(1) Conduit Route Map (1)

Conduit route names, the numbers of conduits, manhole spans and types of laid cables are written in this map. An example is shown in Fig. 11.4.(9).

(2) Conduit Route Map (2)

In this map, conduit layouts of conduit routes, names of cables filled with, conduit and manhole positions and road names are written. An example is shown in Fig. 11.4.(10).

11.4.6 Cable Map in Cable Vault

The cable laying condition from the cable lead-in section of an exchange office to the M.D.F. is written in this map. In addition, the connecting condition between cables and the M.D.F. is also written therein.

An example is shown in Fig. 11.4.(11).

11.4.7 M.D.F. Map

The connecting condition between cables and M.D.F. terminals is written in this map. The wiring section numbers of cables are written for each M.D.F. frame. An example is shown in Fig. 11.4.(12).

11.4.8 Primary Cable-Secondary Cable Contrast Chart

The connecting condition between conductors of the primary and secondary cables in each cross-connection cabinet is written in this chart.

An example is shown in Table 11.4.(13).

11.4.9 Secondary Cable Distribution Chart

The connecting condition for conductors of the secondary cable in each terminal box is written in this chart. In addition, the connection between the secondary and primary cables in a cross-connection cabinet is also shown there.

11.4.9.1 Aerial Cable

See Table 11.4.(14).

11.4.9.2 Underground Cable

See Table 11.4.(15).

11.4.10 Pole Detail List

Types of poles, pole lengths and construction dates are laid in this list. An example is shown in Table 11.4.(16).

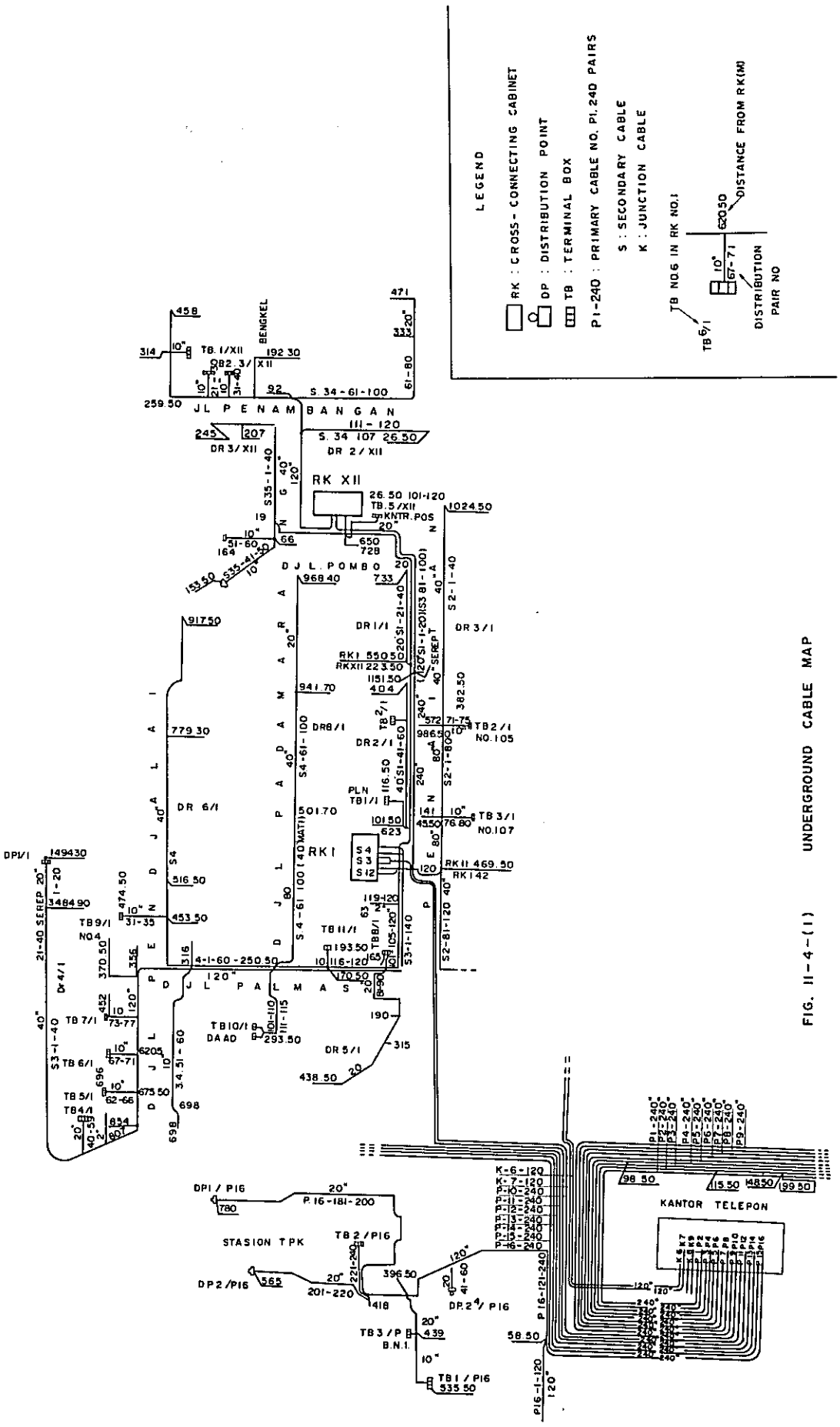


FIG. II-4-(1) UNDERGROUND CABLE MAP

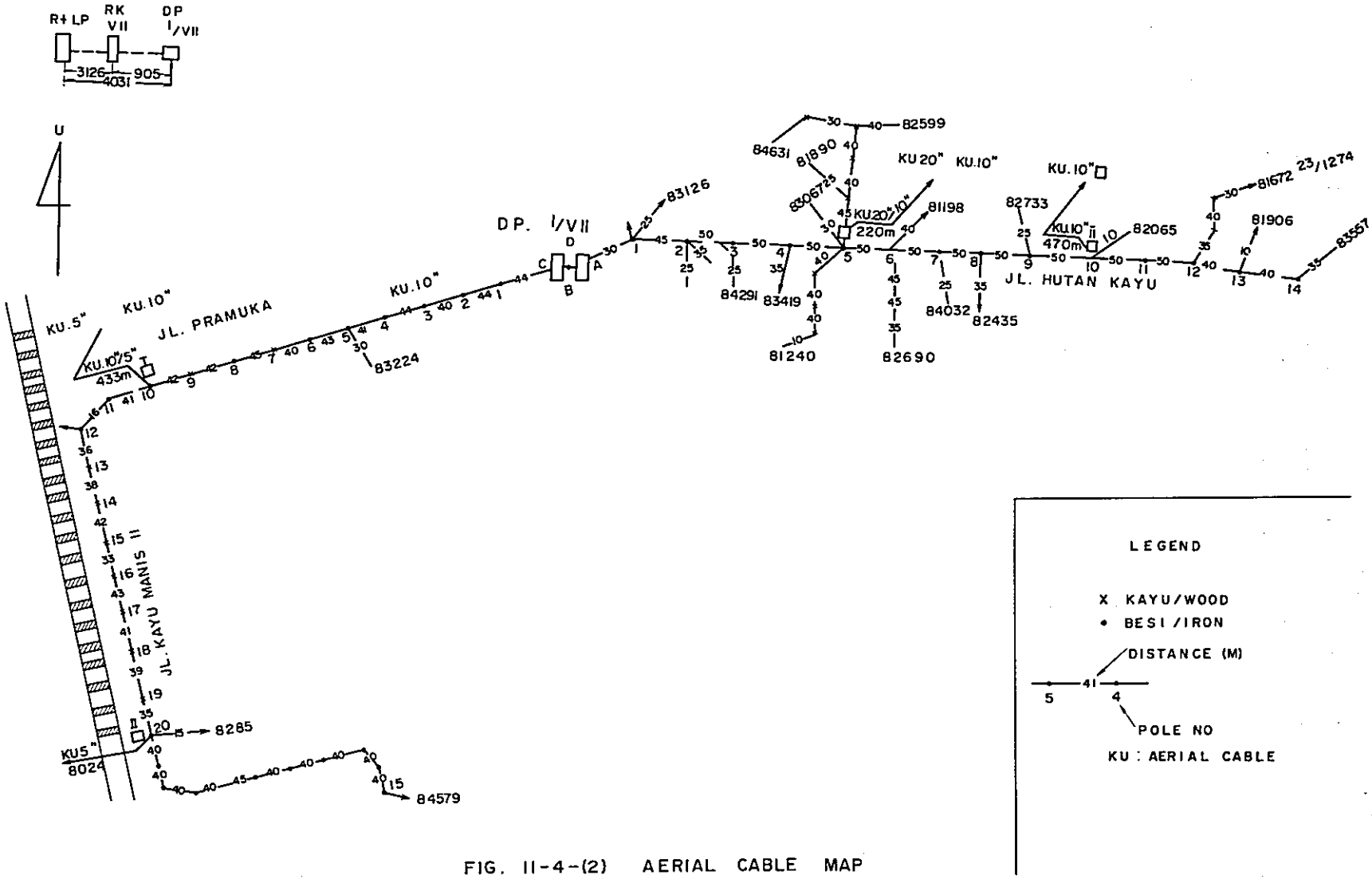


FIG. II-4-(2) AERIAL CABLE MAP

TABLE II-4-(3)

PRIMARY CABLE-SECONDARY CABLE CONTRAST CHART

(FOR CROSS-CONNECTION CABINET AREA)

JAKARTA SERVICE AREA CROSS CONNECTION CABINET NUMBER .....

CONNECTED BY		TELP NO.	CABLE		TEL NO.	CONNECTED BY	
CABLE	WIRE NO.					CABLE	WIRE NO.
			0-0 1	31 0-0			
			0-0 2	32 0-0			
			0-0 3	33 0-0			
			0-0 4	34 0-0			
			0-0 5	35 0-0			
			0-0 6	36 0-0			
			0-0 7	37 0-0			
			0-0 8	38 0-0			
			0-0 9	39 0-0			
			0-0 10	40 0-0			
			0-0 11	41 0-0			
			0-0 12	42 0-0			
			0-0 13	43 0-0			
			0-0 14	44 0-0			
			0-0 15	45 0-0			
			0-0 16	46 0-0			
			0-0 17	47 0-0			
			0-0 18	48 0-0			
			0-0 19	49 0-0			
			0-0 20	50 0-0			
			0-0 21	51 0-0			
			0-0 22	52 0-0			
			0-0 23	53 0-0			
			0-0 24	54 0-0			
			0-0 25	55 0-0			
			0-0 26	56 0-0			
			0-0 27	57 0-0			
			0-0 28	58 0-0			
			0-0 29	59 0-0			
			0-0 30	60 0-0			

TABLE II-4-(4)

PRIMARY CABLE-SECONDARY CABLE CONTRAST CHART

(FOR DIRECT DISTRIBUTION AREA)

TERMINAL BOX NO PLACE

PAIR NO.OF TERMINAL	TEL NO.	ADRESS	CABLE PAIR NO.	DIRECTION
				ROUTE
				ROUTE
				ROUTE

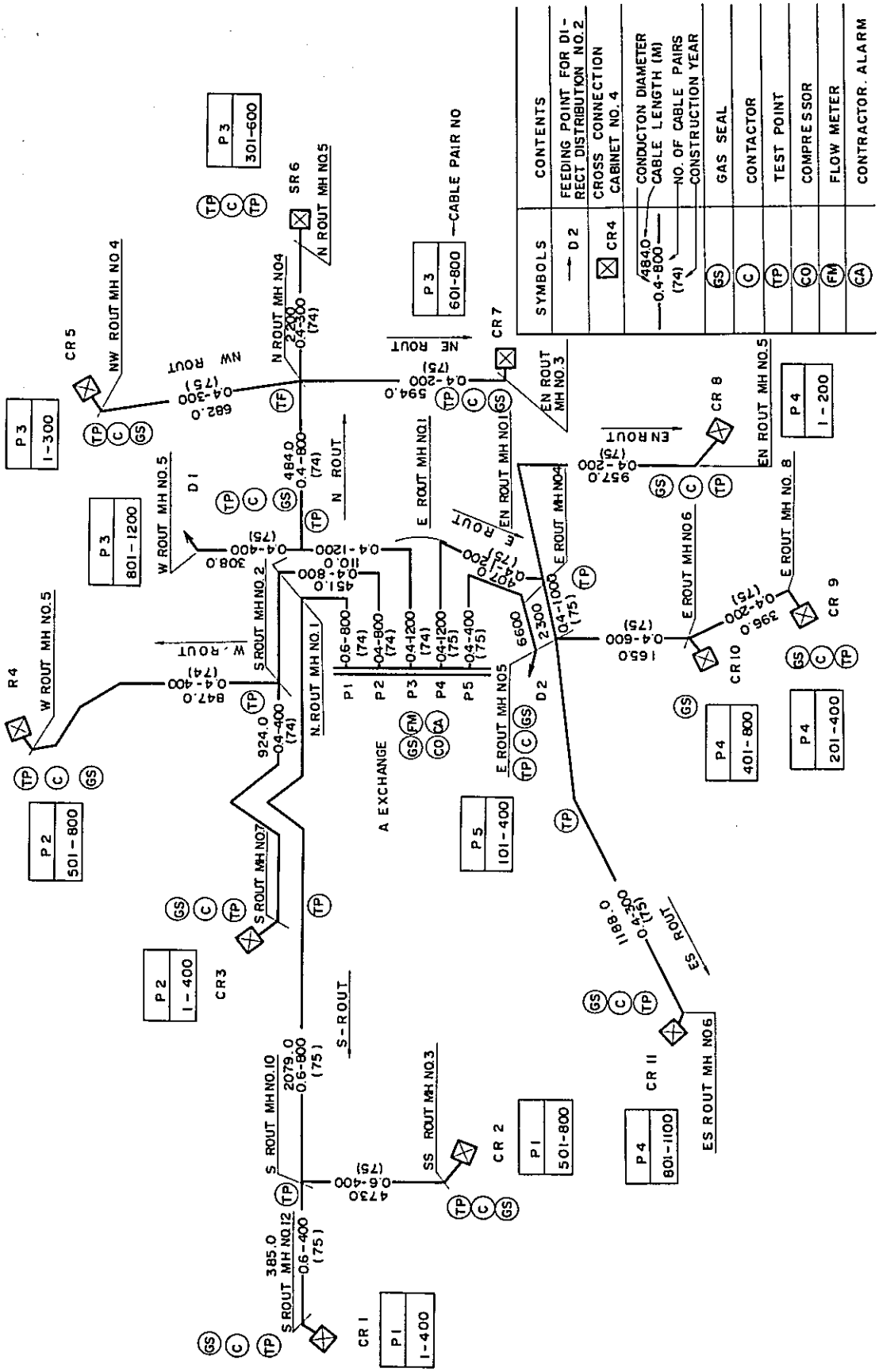


FIG. II-4-(5) PRIMARY CABLE & GAS PRESSURIZATION SYSTEM MAP

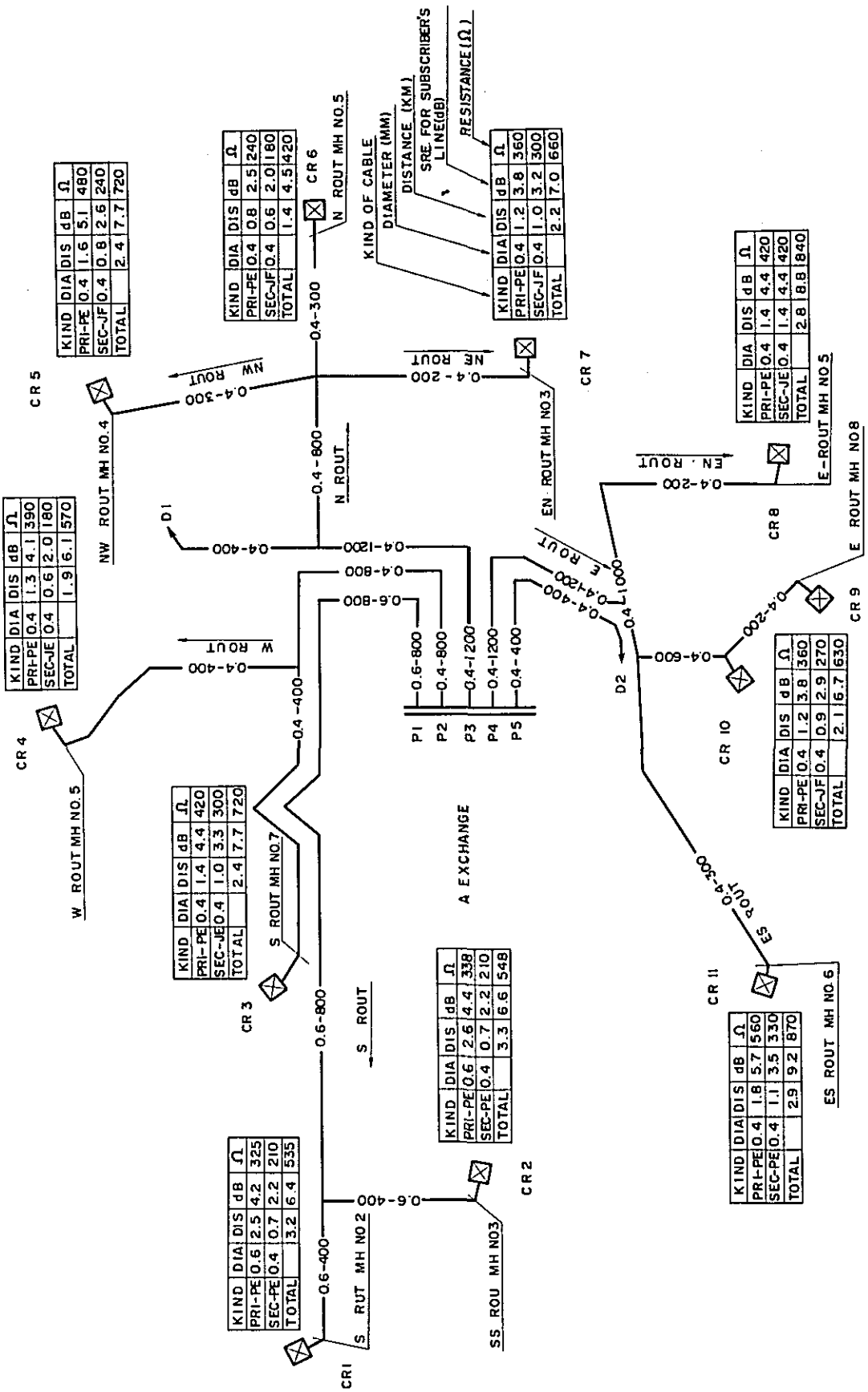


FIG. 11-4-(6) S.R.E. & DC RESISTANCE MAP

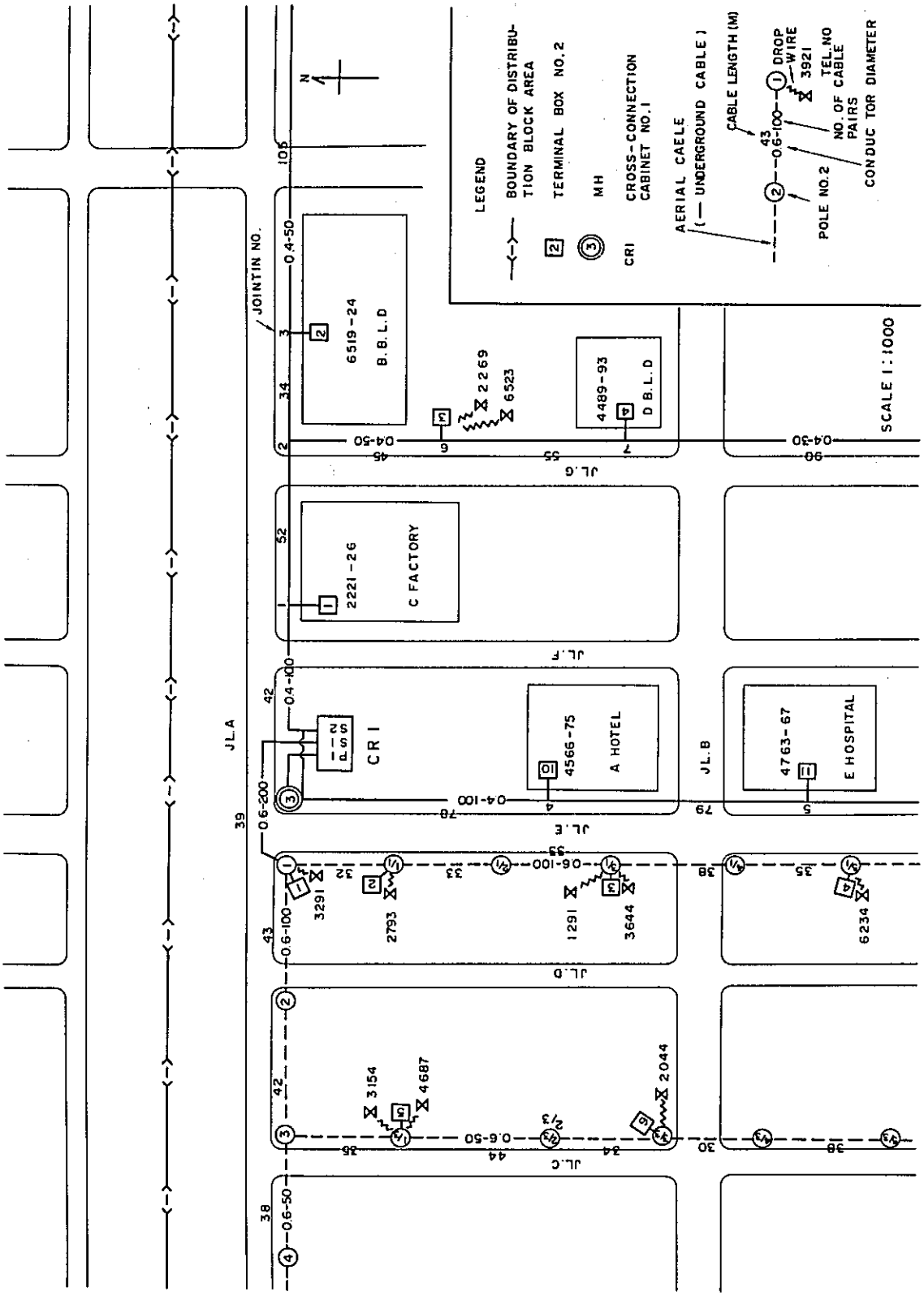


FIG. II-4-(7) SECONDARY CABLE MAP

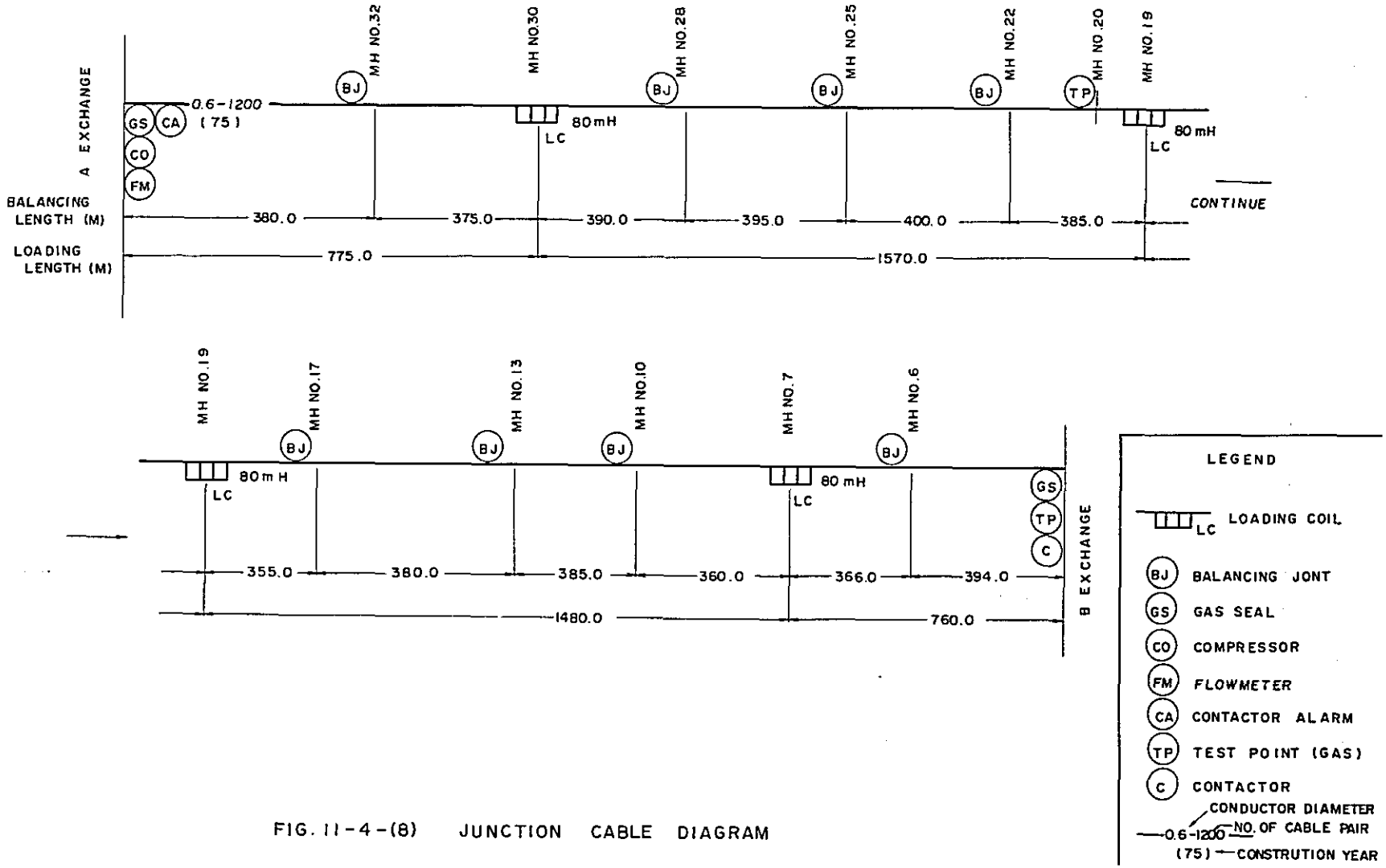


FIG. II-4-(8) JUNCTION CABLE DIAGRAM

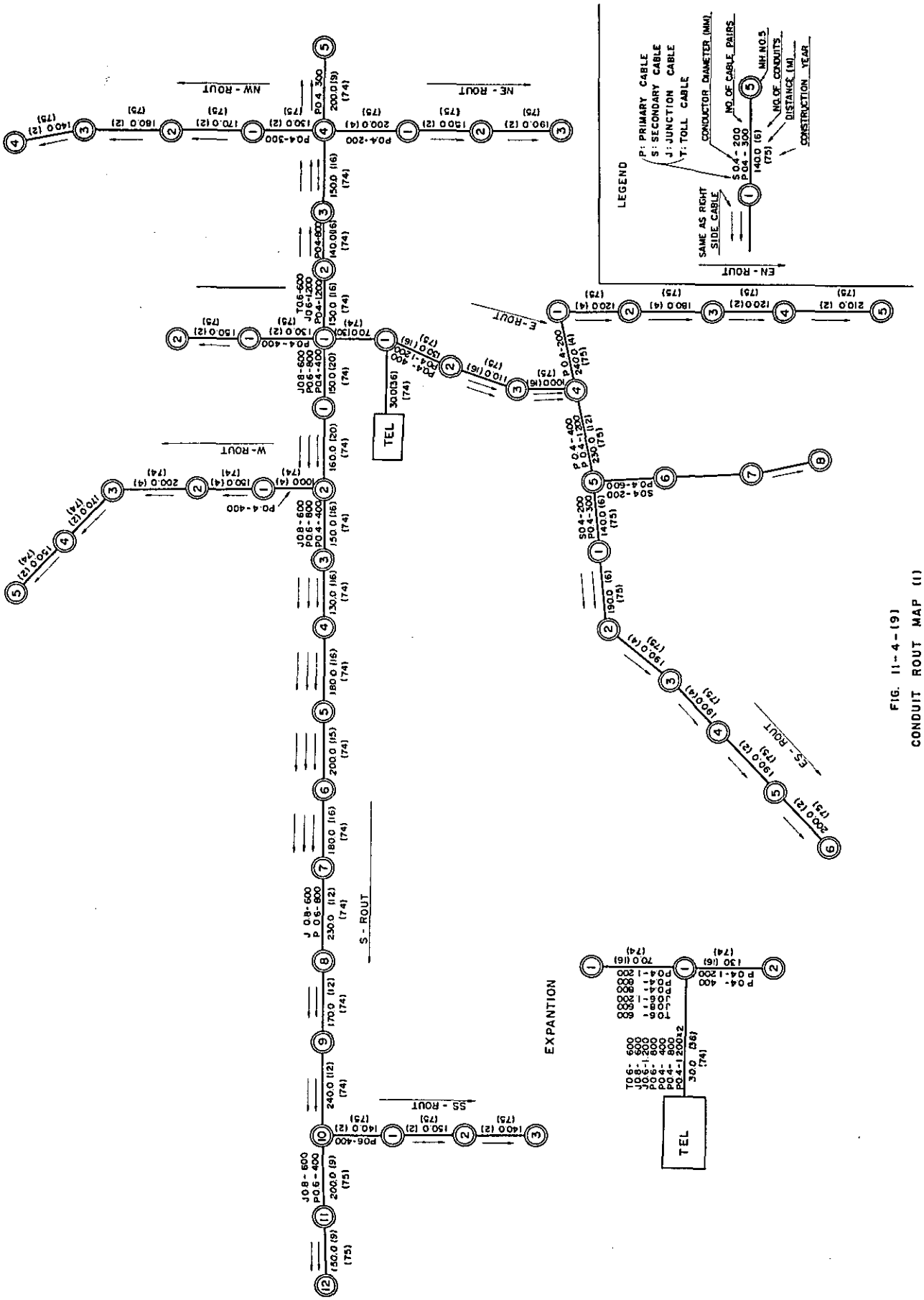


FIG. II-4-(9)
CONDUIT ROUT MAP (I)

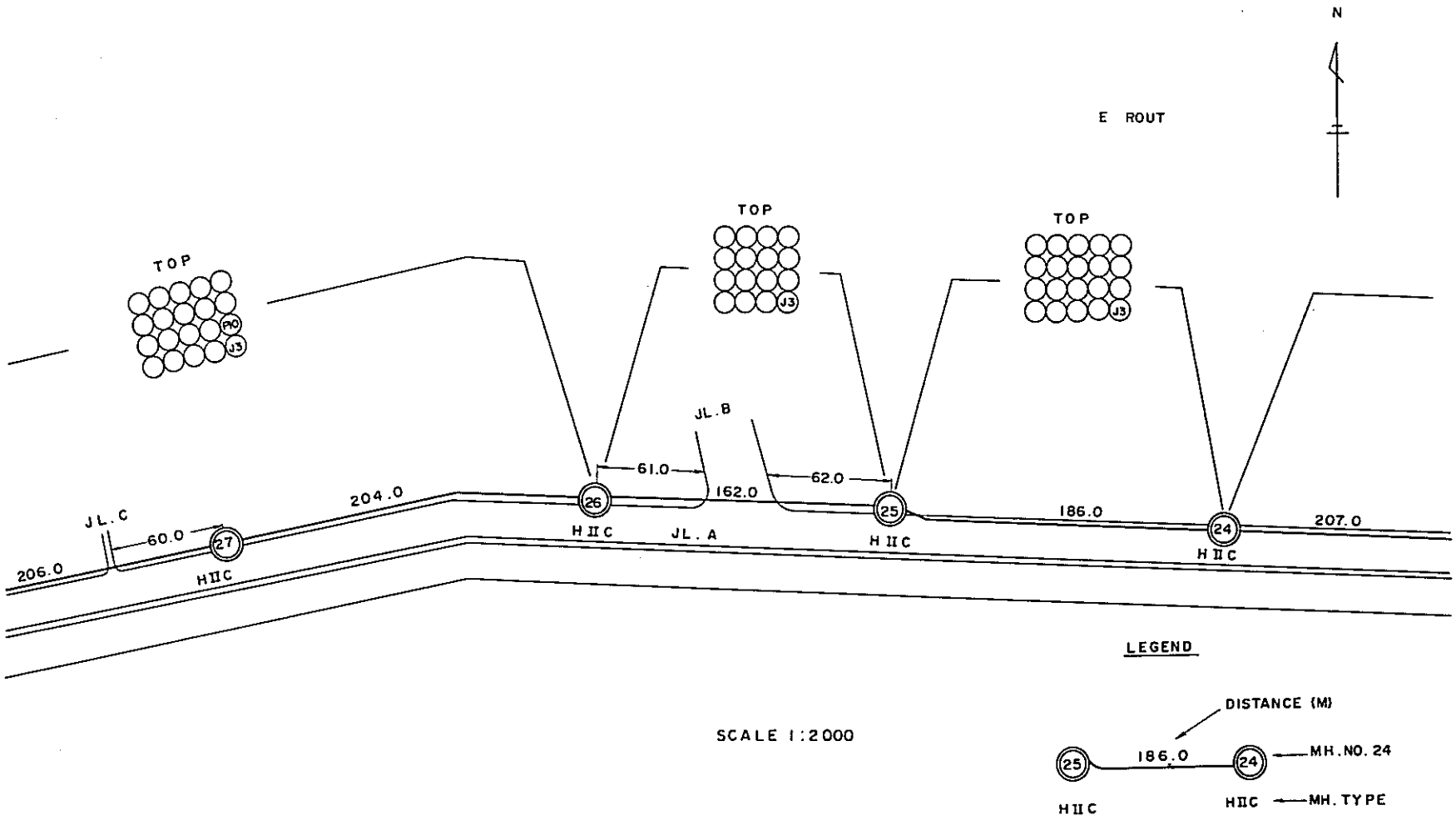


FIG. II-4-(10) CONDUIT ROUT MAP (2)

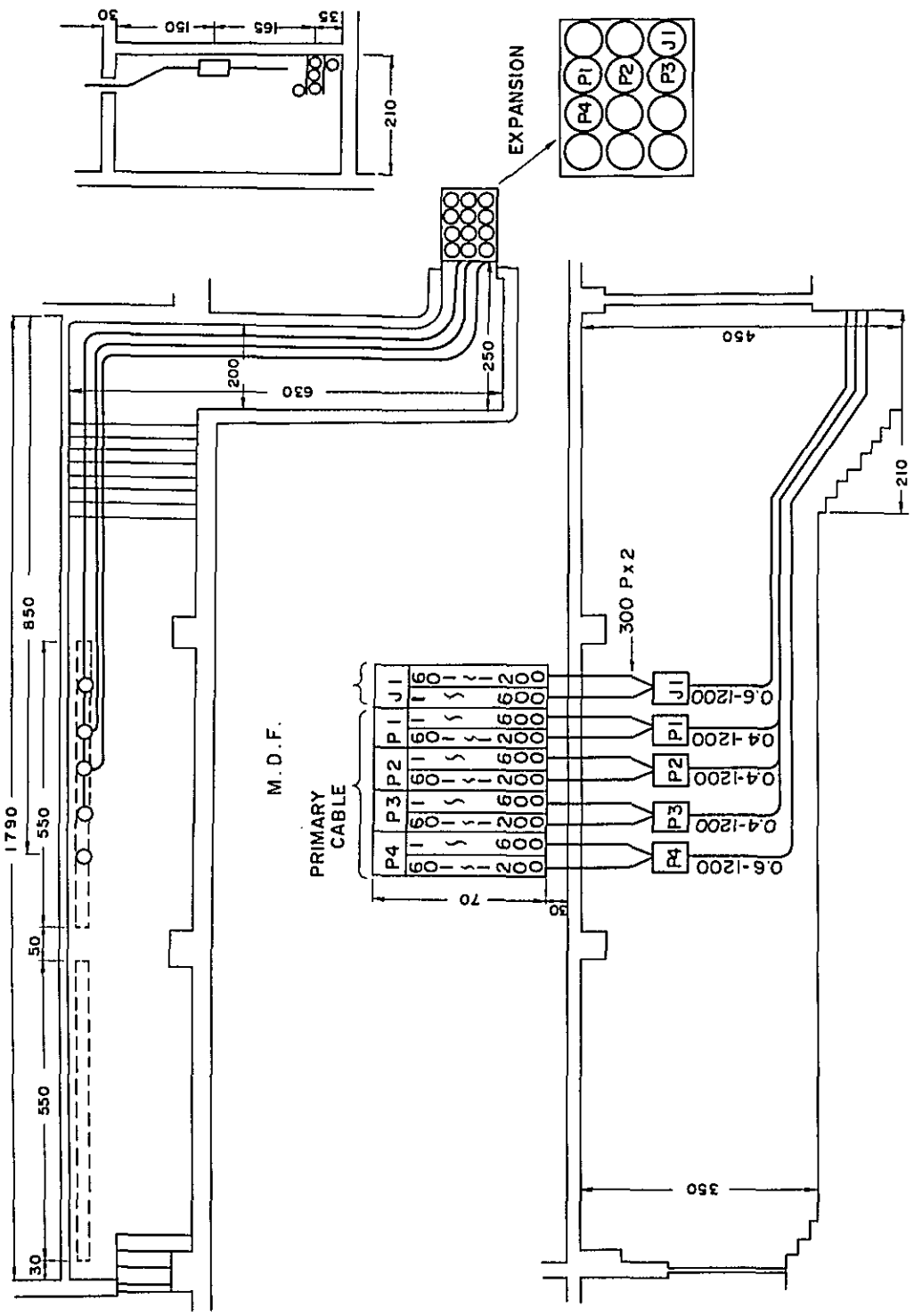
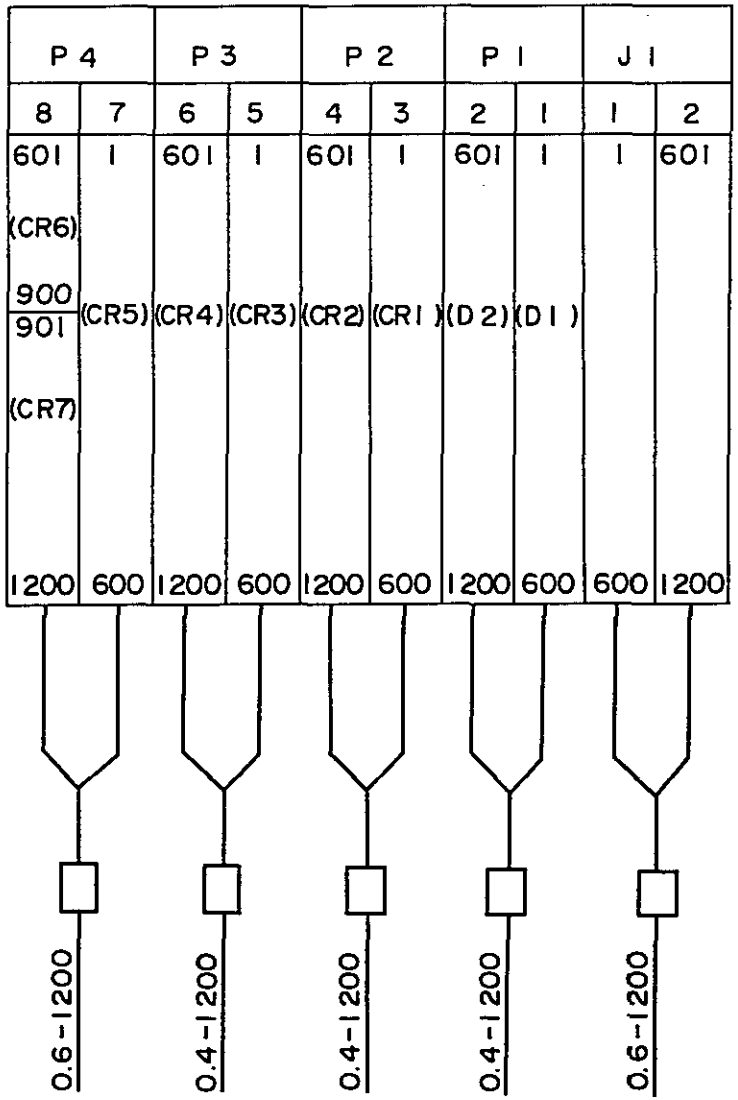


FIG. II-4-(II) CABLE MAP IN CABLE VAULT



P2 ----- PRIMARY CABLE NO.

J 1 ----- JUNCTION CABLE NO.

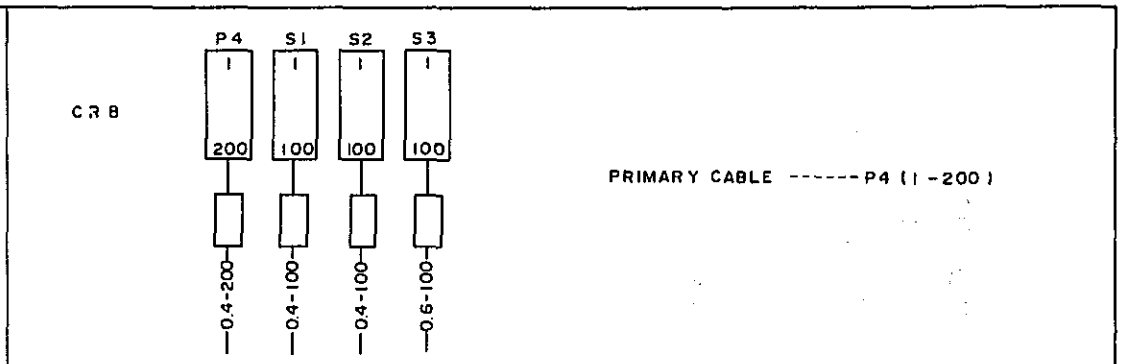
D2 ----- DIRECT DISTRIBUTION AREA NO.

CR4 ---- CROSS - CONNECTION CABINET AREA NO.

FIG. 11-4-(12) MDF MAP

TABLE II-4-(13)

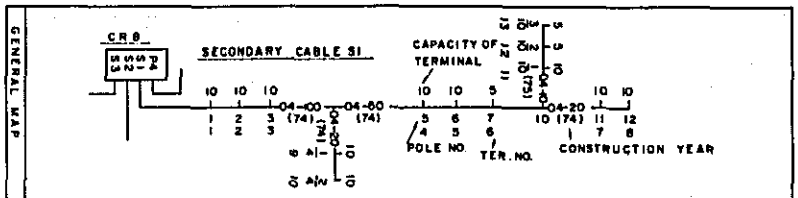
GENERAL MAP



PRIMARY CABLE PAIR NO.	SECONDARY CABLE PAIR NO.		TEL NO.	NOTE	PRIMARY CABLE PAIR NO.	SECONDARY CABLE PAIR NO.		TEL NO.	NOTE	PRIMARY CABLE PAIR NO.	SECONDARY CABLE PAIR NO.		TEL NO.	NOTE	PRIMARY CABLE PAIR NO.	SECONDARY CABLE PAIR NO.		TEL NO.	NOTE
1					51					101	S2	31	4045		151				
2					2					2					2				
3	S1	3	3154		3					3	S2	33	1029		3				
4					4					4	S2	34	4040		4				
5					5					5					5				
6					6					6					6				
7					7	S1	77	4493		7					7				
8					8					8					8				
9					9					9					9				
10					60					110					160				
1					1					1					1				
2					2					2					2				
3					3					3					3				
4	S1	14	4566		4	S1	84	2465		4					4				
5					5	S1	93	1871		5					5				
6					6					6					6				
7					7					7					7				
8					8					8					8				
9					9					9					9				
20					70					120					170				
1	S1	21	1161		1	S2	1	2689		1					1				
2					2					2					2				
3	S1	23	4113		3					3					3				
4					4					4					4				
5					5					5					5				
6					6					6					6				
7	S1	27	1723		7					7					7				
8					8					8					8				
9					9					9					9				
30					80					130					180				
1					1	S2	11	2991		1					1				
2	S1	32	3456		2	S2	12	3024		2					2				
3					3	S2	13	5678		3					3				
4					4					4					4				
5					5					5					5				
6					6					6					6				
7					7					7					7				
8					8					8					8				
9					9					9					9				
40	S1	40	1924		90					140					190				
1					1					1					1				
2					2					2					2				
3					3					3					3				
4					4					4					4				
5					5					5					5				
6	S1	46	4622		6					6					6				
7	S1	53	2466		7					7					7				
8					8					8					8				
9					9					9					9				
50	S1	60	1643		100					150					200				

TABLE II-4-(14)

SECONDARY CABLE DISTRIBUTION CHART OF AERIAL CABLE



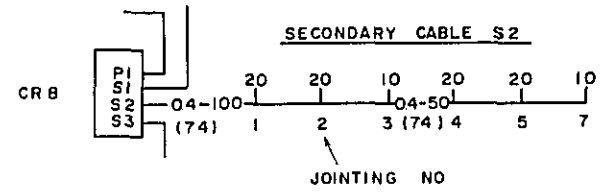
POLE NO. / TER. NO. / CAP. OF TER. / SECONDARY CABLE PAIR NO.				1	2	3		1/4	2/4	3/4	5	6	7	1/10	2/10	3/10	11	12	PRYMARY CABLE PAIR NO	TEL NO	ADDRESS
				1	2	3		9	10		4	5	6	11	12	13	7	8			
				10	10	10		10	10		10	10	5	10	5	5	10	10			
RED	R1	1																			
	R2	2																			
	W1	3																	P4 3	3154	JL A 1/I
	W2	4																			
	G1	5																			
	G2	6																			
	Y1	7																			
	Y2	8																			
	B1	9																			
	B2	10																			
WHITE	R1	11																			
	R2	12																			
	W1	13																			
	W2	14																	P4 14	4566	JL A 6/I
	G1	15																			
	G2	16																			
	Y1	17																			
	Y2	18																			
	B1	19																			
	B2	20																			
YELLOW	R1	21																	P4 21	1161	JL A1/III
	R2	22																			
	W1	23																	P4 23	4113	JL A2/III
	W2	24																			
	G1	25																			
	G2	26																			
	Y1	27																	P4 27	1723	JL A3/III
	Y2	28																			
	B1	29																			
	B2	30																			
WHITE	R1	31																			
	R2	32																	P4 32	3456	JL A1/IV
	W1	33																			
	W2	34																			
	G1	35																			
	G2	36																			
	Y1	37																			
	Y2	38																			
	B1	39																			
	B2	40																	P4 40	1924	JL A2/IV
YELLOW	R1	41																			
	R2	42																			
	W1	43																			
	W2	44																			
	G1	45																			
	G1	46																	P 46	4622	JL A1/V
	Y1	47																			
	Y2	48																			
	B1	49																			
	B2	50																			
WHITE	R1	51																			
	R2	52																			
	W1	53																	P4 47	2466	JL B1/I
	W2	54																			
	G1	55																			
	G2	56																			
	Y1	57																			
	Y2	58																			
	B1	59																			
	B2	60																	P4 60	1843	JL B3/I
YELLOW	R1	61																			
	R2	62																			
	W1	63																			
	W2	64																			
	G1	65																			
	G2	66																			
	Y1	67																			
	Y2	68																			
	B1	69																			
	B2	70																			
WHITE	R1	71																			
	R2	72																			
	W1	73																			
	W2	74																			
	G1	75																			
	G2	76																			
	Y1	77																	P4 57	4493	JL B1/II
	Y2	78																			
	B1	79																			
	B2	80																			
YELLOW	R1	81																			
	R2	82																			
	W1	83																			
	W2	84																	P4 64	2455	JL B2/II
	G1	85																			
	G2	86																			
	Y1	87																			
	Y2	88																			
	B1	89																			
	B2	90																			
BLUE	R1	91																			
	R2	92																			
	W1	93																	P4 65	1871	JL B3/II
	W2	94																			
	G1	95																			
	G2	96																			
	Y1	97																			
	Y2	98																			
	R1	99																			
	R2	100																			

CONTINUE TO NEXT PAGE

TABLE II-4-(15)

SECONDARY CABLE DISTRIBUTION CHART OF UNDERGROUND CABLE

GENERAL MAP



		JOINTING NO / CAPACITY OF TERMINAL / SECONDARY CABLE PAIR NO.		1	2	3	4	5	7	PRIMARY CABLE PAIR NO.		TEL. NO.	ADRESS
				20	20	10	20	20	10				
RED	R 1	1							1				
	R 2	2											
	W 1	3											
	W 2	4											
	G 1	5											
	G 2	6											
	Y 1	7											
	Y 2	8											
	B 1	9											
	B 2	10											
WHITE	R 1	11						1	1	P4	82	2991	JLB1/11
	R 2	12						2	2 → TERMINALL NO.	P4	82	3024	JLB2/11
	W 1	13						3	3	P4	83	5678	JLB3/11
	W 2	14											
	G 1	15											
	G 2	16											
	Y 1	17											
	Y 2	18											
	B 1	19											
	B 2	20											
YELLOW	R 1	21											
	R 2	22											
	W 1	23											
	W 2	24											
	G 1	25											
	G 2	26											
	Y 1	27											
	Y 2	28											
	B 1	29											
	B 2	30											
WHITE	R 1	31						1		P4	101	4045	JL C2/11
	R 2	32											
	W 1	33						3		P4	103	1029	JL C3/11
	W 2	34						4		P4	104	4040	JL C4/11
	G 1	35											
	G 2	36											
	Y 1	37											
	Y 2	38											
	B 1	39											
	B 2	40											
YELLOW	R 1	41											
	R 4	42											
	W 1	43											
	W 2	44											
	G 1	45											
	G 4	46											
	Y 1	47											
	Y 2	48											
	B 1	49											
	B 2	50											
	B 1	99											
	B 2	100											

TABLE II-4-(16) POLE DETAIL LIST

NAME OF POLE ROUTE A

POLE NO	DISTANCE	LENGTH OF POLE (M)	CONSTRUCTION YEAR	TYPE OF POLE	NOTE
1		7	75	←STAY	POLE
2	30	7	75	←	GUY WIRE
3	33	8	75	←	IRON POLE
4	34	8	75	(W) ←	WOODEN POLE
5	40				

CHAPTER 12

OTHER RECOMMENDATION

CHAPTER XI

OTHER RECOMMENDATIONS

CHAPTER 12 OTHER RECOMMENDATIONS

12.1 Improvement of Call Completion Rate

12.1.1 Introduction

It has already been described in Section 1.3 that one of the duties of a telephone enterprise is to provide the telephone service which can establish quick call connection at a low charge, that is, to satisfy the telephone users by improving the call completion rate. The call completion rate is determined by the statistical data collected through call observation. The statistical data produced through call observation are the most impartial and accurate data for both subscribers and the telephone enterprise. In order to improve the call completion rate, therefore, it is necessary to introduce the call observation system and to produce the necessary statistical data. Then based on the data, appropriate measures should be taken for improvement of the call completion rate.

12.1.2 Measures to be taken for Improvement of Call Completion Rate

In order to improve the call completion rate, it is necessary to minimize the number of failure calls.

Failure calls can be classified into the following three kinds according to the cause.

A) Cause on the part of calling (originating) subscriber.

B) Cause on the part of called (terminating) subscriber.

C) Cause on the part of telephone service enterprise.

12.1.2.1 Measures against Failure Calls Caused by Calling Subscriber

Causes in this case include:

(1) Poor dialling.

(2) Giving up during dialling because of insufficient data (for example, not knowing the correct telephone number, etc.) or misconnection.

(3) Poor handling of the telephone due to lack of knowledge on the telephone (for example, not knowing audible signal tone, post-dialling delay, etc.).

As the measures against the above, the telephone enterprise should propagate the proper way to use the telephone as follows, so that it can be clearly known among the subscribers:

a. In regard to item (1),
   To dial correctly.

b. In regard to item (2),
   To refer always to the written number in dialling and not to dial the number in memory.

c. In regard to item (3),
   To make known the correct knowledge on various kinds of audible signal tones

and the post-dialling delay due to the introduction of a new system. (Subscribers who are acquainted with the step-by-step system but are not acquainted with the post-dialling delay due to the introduction of the new system frequently give up after completing dialling even though the connection is under progress.) To dial only the pilot number when the called party is a PBX subscriber.

Further, the telephone enterprise should give suitable information and guidance, through talkie information devices, to a subscriber who has dialled such telephone number or code as described below.

- the unused office code.
- the dead level.
- the dead number.
- the former number (when the number of the called subscriber has been changed).

12.1.2.2 Measures against Failure Calls Caused by Called Subscriber

(1) Among the causes in this case, failure due to the called subscriber busy accounts for a large percentage. Generally speaking, a subscriber who makes many calls receives many calls. Therefore, the rate of the called subscriber busy is high with such subscriber (hereinafter called "congested subscriber"). In order to reduce the rate of the called subscriber busy in the case of the congested subscriber, the following measures should be taken:

1) Establishment of Criteria of Congested Subscriber

When the total telephone traffic of a certain subscriber at a certain place exceeds the value given in Table 12.1.2.2.(1), such subscriber is judged to be a congested subscriber.

2) Application of Criteria of Congested Subscriber

Congested subscribers are picked up based on such data as the telephone enterprise's investigation on subscribers, complaints from subscribers concerning the called subscriber busy, and the questionnaire survey results (responders are general subscribers and telephone operators).

3) Measures to be Taken for Congested Subscribers

i) To recommend to a congested subscriber the installation of an additional telephone line, in accordance with Table 12.2.2.(2).

ii) To propose to a subscriber who owns two or more independent telephones to utilize the pilot number service;

iii) To recommend to a congested subscriber with especially heavy traffic the installation of a telephone line to be used only for call reception.

In order to reduce the rate of called subscriber busy of not only the congested sub-

Table 12.1.2.2.(1) Traffic Standard for the Congestion Subscriber (in Erl)

No. of Line	Traffic		No. of Line	Traffic	
	A	B		A	B
1	0.30	0.27	21	16.90	15.21
2	1.00	0.90	22	17.71	15.94
3	1.80	1.62	23	18.51	16.66
4	2.64	2.38	24	19.31	17.38
5	3.51	3.16	25	20.12	18.11
6	4.40	3.96	26	20.93	18.83
7	5.30	4.77	27	21.73	19.56
8	6.20	5.58	28	22.53	20.28
9	7.12	6.41	29	23.34	21.01
10	8.05	7.24	30	24.14	21.73
11	8.85	7.97	31	24.95	22.45
12	9.66	8.69	32	25.75	23.17
13	10.46	9.41	33	26.56	23.91
14	11.27	10.14	34	27.36	24.63
15	12.07	10.86	35	28.16	25.35
16	12.87	11.59	36	28.97	26.07
17	13.68	12.31	37	29.78	26.80
18	14.48	13.03	38	30.58	27.52
19	15.29	13.76	39	31.38	28.24
20	16.09	14.48	40	32.18	28.97

A : Office whose successful call rate of local call is 65% or more.
B : Office whose successful call rate of local call is less than 65%.

scribers but also the general subscribers, it is desirable to introduce the camp-on service and the call waiting service (refer to Section 12.2).

Table 12.1.2.2.(2)
Recommended Number of Subscriber's Circuits

No. of Lines	Traffic	No. of Lines	Traffic
1	0.11	21	13.65
2	0.53	22	14.30
3	1.10	23	14.95
4	1.75	24	15.60
5	2.43	25	16.25
6	3.15	26	16.90
7	3.90	27	17.55
8	4.66	28	18.20
9	5.43	29	18.85
10	6.22	30	19.50
11	6.88	31	20.15
12	7.56	32	20.86
13	8.26	33	21.45
14	8.96	34	22.10
15	9.68	35	22.75
16	10.40	36	23.40
17	11.05	37	24.05
18	11.70	38	24.70
19	12.35	39	25.35
20	13.00	40	26.00

(2) Another cause of failure is the no answer by the called subscriber. Conceivable countermeasures are:

1) Installation of automatic answering telephone which can answer calls when the called subscriber is absent from home.
2) Provision of a reception telephone in the PBX for use during the night and on holidays.
3) Installation of telephone sets equipped with high power bell for subscribers in outdoors or for telephones at noisy places.

(3) Besides the foregoing, the leaving off of the handset also causes the called subscriber busy. In most cases, this is caused by carelessness of the calling or called subscriber after the call. Once it takes place, it tends to continue for a long time and causes a lot of troubles. In order not to produce such condition, the inspection of switches must be made many times each day and an automatic detection device be provided, so that the subscribers who leave off the handset can be automatically detected.

12.1.2.3 Measures against Failure Calls Caused by Telephone Enterprise

Causes in this case are found in insufficient switching equipment and junction cables, as well as poor equipment and devices.

For the honor of the telephone enterprise, such types of failures must be kept at the minimum. It is necessary to install switching equipment and junction cables that can meet the telephone traffic and the connection standard, and to establish the satisfactory maintenance system.

12.1.3 Target Value of Call Completion Rate

Most complaints from subscribers concerning the failure calls are those concerning B) and C) described in the foregoing. For failure calls due to C), a remedial plan can be easily prepared by the telephone enterprise. However, A) and B) requires much efforts, and yet it is difficult to obtain the good results.

The amount of capital expenditure for improving the call completion rate generally should be kept within the limit of the benefit obtained when failure calls are turned into success calls.

Even if the capital expenditures are kept on increase for improvement of the call completion rate, the improvement of the call completion rate abruptly becomes dull when the rate exceeds 80%, though there may be a difference according to the size of the cities.

Therefore, it would be advisable to set the target of the call completion rate at 70% to 75%.

An example of the target value of call completion rate in the future is shown in Table 12.1.3.(1).

12.1.4 Observation Device

12.1.4.1 Purpose of Observation

It would be necessary for the telephone enterprise to grasp from the concrete data the actual condition of its own telephone service. In expressing the actual condition of the telephone service concretely, two ways are available, i.e., quantitative way and qualitative

TABLE 12-1-3-(1) TARGET OF OBSERVATION RESULT.

			PRESENT SITUATION	FUTURE TARGET	
				EXCLUDING FAILURE CALL CAUSED BY(I)	INCLUDING FAILURE CALL CAUSED BY(I)
SUCCESS CALL			34.2	83.7	72.8
FAILURE CALL	(I) DUE TO CALLING SUBSCRIBER	DIALLING ABANDONMENT			7.2
		DIALLING FAILURE			0.7
		DL. DN. CONNECTION			1.1
		HANG UP (DISCONNECTION) BEFORE RINGING			1.3
		HANG UP (DISCONNECTION) BEFORE ANSWER			2.7
		SUB - TOTAL			13.0
	(II) DUE TO CALLED SUBSCRIBER	SUBSCRIBER ENGAGED	10.8	11.0	9.6
		NO ANSWER	5.1	4.3	3.7
		SUB - TOTAL	15.9	15.3	13.3
	(III) DUE TO ENTERPRISE	JUNCTION ENGAGED	27.6	0.9	0.8
		OFFICE SWITCH ENGAGED	13.7	-	-
		NO RINGING	6.4	0.1	0.1
		SUB - TOTAL	47.7	1.0	0.9
	(IV)	OTHERS	2.2	—	—
		TOTAL	65.8	16.3	27.2

way. The former is to grasp the trend in telephone traffic quantitatively and is expressed by the traffic data. The latter is to grasp the condition of the subscribers' calls qualitatively and is expressed by the statistical data of the observations, i.e., the data concerning in what condition a call is ended after a subscriber lifts the handset for the call. These data are used in preparing various plans for maintenance, improvement and expansion of facilities, as well as countermeasures for telephone service improvement.

12.1.4.2 Example of Observation Statistics

Statistical data of observations in large cities are shown in Table 12.1.4.2.(1).

Table 12.1.4.2.(1) Example of Observation Result % (in 1971)

Item \ City			T	O	N	Y
Success call			72.8 %	72.5 %	74.3 %	68.9 %
Failure call			27.2	27.5	25.7	31.1
Classification of failure call	Due to OS	Dialling abandonment	7.2	7.6	6.6	7.0
		Dialling failure	0.7	0.8	0.7	0.9
		DL. DN. Connection	1.1	1.5	1.2	1.9
		Line cut off before ringing	1.3	0.9	0.9	0.9
		Line cut off before answer	2.7	3.2	2.8	4.4
		TOTAL	13.0	14.0	12.2	15.1
	Due to TS	Subscriber engaged	9.6	9.1	8.3	10.1
		No answer	3.7	3.8	4.7	5.1
		TOTAL	13.3	12.9	13.0	15.2
	Due to enterprise	Junction busy	0.8	0.6	0.4	0.7
		No ringing	0.1	0.0	0.1	0.1
		TOTAL	0.9	0.6	0.5	0.8

OS : Originating Subscriber
TS : Terminating Subscriber

12.1.4.3 Items to be Investigated through Observations

a. Connection Process Investigation

Causes of failure call during the connection process are shown in Table 12.1.4.3.(1).

Table 12.1.4.3.(1)

Condition		Cause	
Success		----	
Failure	Busy	Called subscriber busy. Junction line busy. Switching equipment busy.	
	Subscriber Fault	Giving up during dialling. Poor dialling. Giving up before ringing tone is transmitted. Giving up before the called subscriber answers. No answer by the called subscriber. Giving up without dialling.	
	No Tone	No calling tone, other faults of equipment.	
	Dead Level Connection	Talkie information device is provided.	Talkie information.
		No talkie information device.	Busy tone.
	Dead & former Number Connection	Talkie information device is provided.	Talkie information.
		No talkie information device.	Ringing tone is transmitted but no answer.

b. Measurement of Holding Time

Success call – Circuit holding time
– Conversation time
– Time from sending of ringing tone up to answer by operator (In case of a terminating call to manual switchboard.)
– Others

Failure call – Circuit holding time

c. Observation of Charging Pulse

12.1.4.4 Connection of Observation Device

The observation devices installed at the local exchange offices accommodate 20 or 50 circuits of the subscribers picked up at random for call observation. The originated calls on each circuit are connected to the device in the main exchange office in the order of origination, and the information on the originating condition is thus sent to the main exchange office. Usually, 8 local exchange offices are accommodated in the main exchange office. The information transmitted from local exchange offices are observed and judged at the main exchange office, and the data obtained are compiled and analyzed to produce the statistical data.

12.1.4.5 Observation System

There are two types of observation devices: manual system and automatic system. As compared with the manual system, the automatic system is quick and efficient in preparation of statistical data, but the price is high. A typical example of the connection is shown in Fig. 12.1.4.5.(1).

12.1.4.6 Comparison between Manual Observation System and Automatic Observation System

Table 12.1.4.6.(1) shows the comparison between the manual observation system and the automatic observation system.

Table 12.1.4.6.(1)

Comparison items	Observation systems	
	Manual	Automatic
Operation expenses	Large	Small
Installation cost	Small	Large
Continuous observation	Difficult	Easy
Number of calls handled	Small	Large
Difference according to individual handlers	Yes	No
Data processing work	Slow	Fast
Privacy of calls	Depending on moral of the individual	Completely protected
Observation time zone	Limited	Unlimited
Observation of misconnection	Possible	Impossible
Identification of talkie information	Possible	Impossible
Observations which require human judgement	Possible	Impossible
Judgement of transmission faults	Possible	Impossible

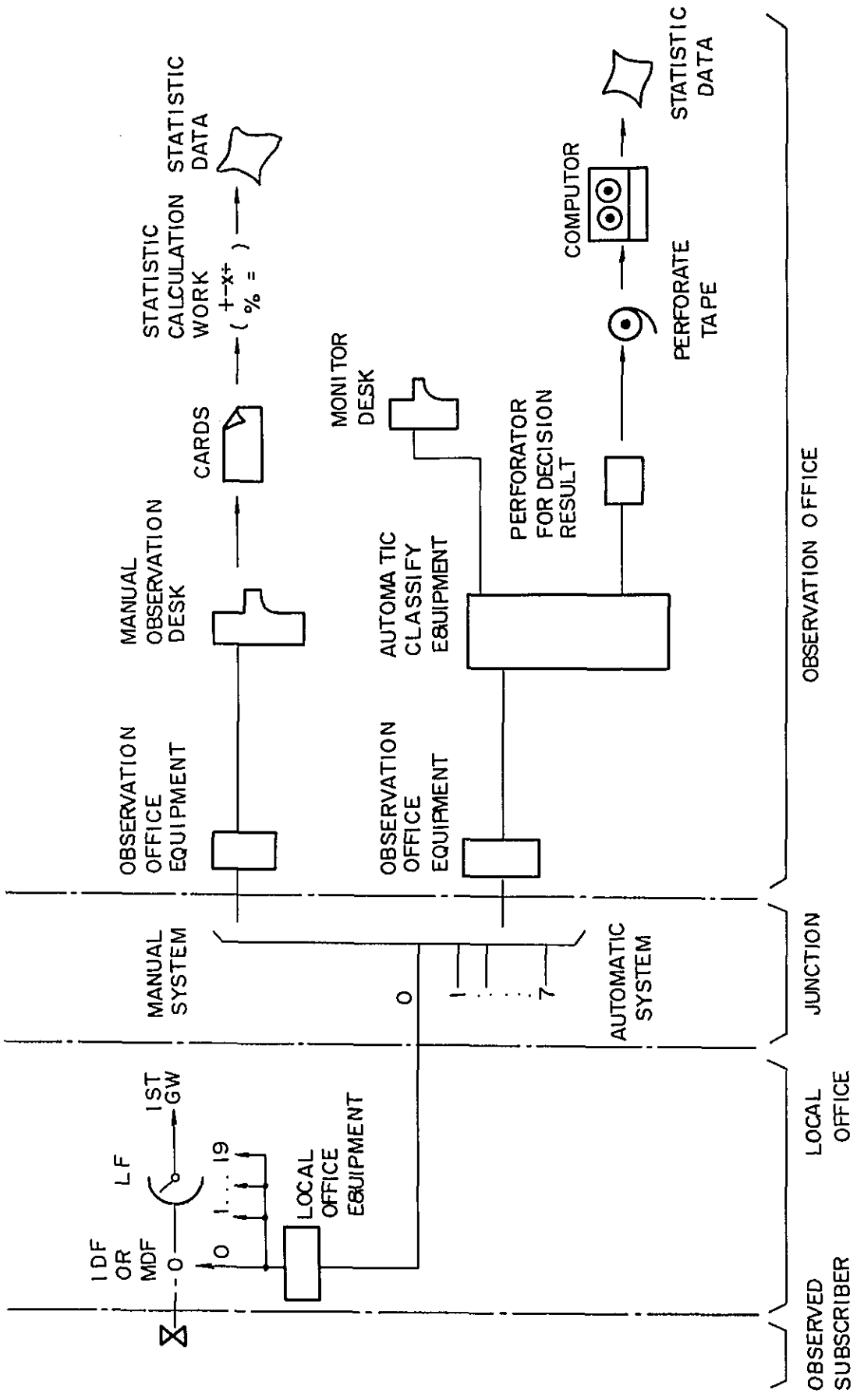


FIG. 12-1-4-5-(1) CONNECTION DIAGRAM OF OBSERVATION SYSTEM

As seen in the above comparison table, both systems have their respective merits. Therefore, it is proposed that the manual observation system be introduced for the present. The reason is that its installation cost is more moderate as compared with the automatic system. It is desirable to introduce the automatic observation system later and step by step.

The employees of the telephone enterprise engaged in the observation work must be well versed with the operation rules and the telephone regulations, and must strictly keep the secrets of calls learned through the call observation work.

12.2 New Services

12.2.1 Introduction

The purpose of the telephone is to call up the other party by telephone whenever communication is necessary. However, with the diffusion of telephone and the upgrading of the living level of the people, requests will be made for further convenience in the use of the telephone.

Furthermore, besides the telephone, various kinds of telecommunications (The purpose of telecommunications is to convey the intention or information at any time and from anywhere to anybody, simple, accurate, speedily and inexpensively) will become necessary.

Several of these new services have already been applied by PERUMTEL (directly provided) or subscribers (privately provided). However, the new services described in paragraph 12.2.2.2 are only those directly provided by PERUMTEL and not those provided by subscribers.

12.2.2 Kinds of New Services

Although there are many new services to be developed in the telecommunications field in the future, it would be convenient to classify the new services as in the following.

12.2.2.1 New Services Provided by Switching Equipment

These kinds of services are provided mainly through stored program control type switching equipment (or partly wired logic common control type switching equipment). These new services must be provided by PERUMTEL.

According to PERUMTEL's plan, it is expected that more than 70% of the automatic switching equipment in Jakarta will comprise of the stored program control type switching equipment (P.R.X) by 1977. Consequently, the provision of these new services in nearly all the areas of Jakarta City will be possible. Of course, some of these services are provided by subscriber premise equipment as described in paragraph 12.2.2 and shown in Table 12.2.(2) but even if the service quality were the same, they would be more expensive than those provided by switching equipment.

Table 12.2.1

New Service in Telecommunication Field	Telephone Service Field	Service Provided by Switching Equipment
		Service Provided by Subscriber's Premise Equipment
		Mobile Communication Service
	Other Field	Picture Communication Service
		Data Communication Service

(1) Push-Button Telephone

This telephone set has push buttons instead of the rotary type dial. Furthermore, a great number of new services would be possible through the use of this telephone set.

(2) Abbreviated Dial

Connection will be made by dialling only 2 or 3 figures instead of all the figures in the telephone number.

(3) Camp-On

While conversing with the called person, when the caller dials a special number, he will be connected after completing the call with the called person.

(4) Automatic Reservation Call

By having the memory device of the exchange memorize beforehand the desired time and telephone number of the other party, both calling and called parties can be automatically called and connected at the designated time.

(5) Automatic Answering

When the subscriber is absent from home/office and dial a special number, incoming calls will be automatically answered and the prior recorded messages will be sent out during his absence.

(6) Direct Transfer of Incoming Call

When the subscriber will be absent from home/office, the incoming calls thereafter will be, by dialling a special number, transferred automatically to the designated telephone number.

(7) Automatic Transfer to New Telephone Number

In case an incoming call is made to a vacant number due to change in number, after making talkie service, the call will automatically be transferred to the new number.

(8) Automatic Transfer to Another Telephone Number

Even when call signals are made several times to the telephone number initially connected and there is no answer, it will automatically be transferred to a separate designated number.

(9) Pick-Up

In case there are two or more sets of telephones, the incoming call to one set can be answered from a separate nearby set by dialling a special number.

(10) Conference Call

The calling party can communicate simultaneously with several desired subscribers.

(11) Add-On

During the telephone conversation, one party can call a third party to participate in the conversation.

(12) Holding

During the telephone conversation, the subscriber can have the other party wait while conversing with a third party. Moreover, while conversing with the third party, the conversation cannot be heard by the other party.

(13) Call Waiting

During the telephone conversation, if there is an indication of an incoming call from another party, the subscriber receiving the indication can answer such call by hooking. Thereafter, he can change the other conversing party by hooking.

(14) Wake-Up Service

By having the switching equipment memorize the desired time for calling, a call will be made from the exchange at such time.

(15) Charge Information

The telephone charge will be announced during or after the conversation.

(16) Detail Charge Information

The breakdown (originating number, date and time, conversation time, etc.)of the telephone charge, etc. will be notified to the subscriber each month on detailed printed out form.

(17) Toll Reverse Charge

When the calling party of the toll call desires to have the telephone charge paid by the called party and if the called party acknowledges, the telephone charge can be paid by the called party.

(18) International Subscriber Dialling

Connection can be made solely by subscriber dialling to any country in the world.

(19) Automatic Reporting

When something occurs at the subscriber, by dialling a special number corresponding to the phenomena to a subscriber decided before hand, the occurrence of the phenomena will be reported.

12.2.2.2 New Services provided by Subscriber Premise Equipment

This kind of service is for convenience in telecommunication by installing special subscriber's premise equipment and will raise the added ornamental value such as design, colour, size, etc.

Subscriber's premise equipment with an anticipated large demand and subscriber's premise equipment which contribute to the social welfare but with small demand should be directly provided by PERUMTEL. Regarding privately provided equipment, PERUMTEL should standardize them or set up a dealer authorization system, if necessary. The same can be said for "picture communication service" and "data communication service."

(1) Auto Dial

The auto dial is an accessory apparatus attached to the telephone set, and frequently called telephone numbers are set in this apparatus. For example, when the key corresponding to a certain telephone number is depressed, dial pulses for all the figures of that number will be sent out. This service is also possible for the service (abbreviated dial) provided by the switching equipment.

(2) Automatic Answering Telephone

By directly connecting the telephone set and the tape recorder, messages can be conveyed to incoming calls or the subject matter recorded when absent from home or office. This service (automatic answering service) is also possible through switching equipment.

(3) Privacy Set

When this apparatus is attached to both the calling and called subscribers. telephone sets, the conversation cannot be wiretapped by others.

(4) Loud-speaker Telephone

This is to amplify by speaker the sound of the received call.

(5) Telephone for Blind Persons

This telephone set has guide marks installed on the dial plate.

(6) Telephone for Hard-of-Hearing Persons

This telephone set is made to amplify the sound of the received conversation.

(7) Switching Telephone

This is something like a small PBX. Several telephone sets are connected in parallel for two or more circuits of exchange lines, and has further additions in performance. In other words, a vacant exchange line can be selected and conversation over internal line telephones is also possible.

(8) Home Telephone

This telephone is one form of switching telephone with several internal line telephone sets connected to one circuit of the exchange line.

(9) Telephone with Lamp

This telephone has a lighting device attached and the lamp flashes when there is an incoming call, besides ringing of the bell.

(10) Automatic Reporting Telephone

When something happens at the subscriber's premise, by depressing the button corresponding to the phenomena, dial impulses of all the numbers will be sent out and connection will be made with a previously designated subscriber and the recorded voice will be conveyed.

This service is also possible for the service (automatic reporting service) through the switching equipment.

(11) Hand-Free Telephone

This telephone has a microphone and speaker instead of the ordinary handset, and there is no need to hold the handset when talking over the telephone.

(12) Noise Suppression Telephone

This telephone set facilitates listening or speaking clearly to the other party even when installed in places where there are loud noises.

(13) Waterproof Telephone

This telephone set is built so that it can be used in the bathroom or other places of heavy moisture.

(14) Plug-In Telephone

This is a telephone set with a plug attached to the end of the telephone set cord, and coversation is possible when moved to places installed with a jack.

(15) Ornamental Telephone

This telephone set is used by subscribers who are not satisfied with a uniform colour, shape and size, and there are sets in various colours, shapes and sizes.

(16) Secretary Telephone

This telephone has two sets connected to one circuit and each set can function for direct calling, request calling, change in connection of incoming call, mutual conversation, private talk, indication during call, etc.

(17) Anti-Explosion Telephone

This telephone set will not cause an explosion even when used in places with inflamable gas.

12.2.2.3 Mobile Communication Service

Although the ordinary telephone is used for calls between fixed places like between the office and the residence, this mobile communication service is a telephone call service between a telephone set installed in a moving object and the ordinary telephone set or between telephones installed in moving objects.

This kind of service requires radio frequencies as the transmission media. The frequency band usually used is 100 to 1000 MHz. Since there is a limitation in the use of frequencies, the key point of this service is how to use these limited frequencies in an economic way. Moreover, in order to catch the moving objects, a certain number of service area zones (transmitting station and receiving station) will have to be established.

(1) Personal Radio Signalling

By carrying this instrument, contact can be made to a person who is away from his home or office, by sending radio signals.

(2) Cordless Telephone

This telephone set has a built-in transceiver inside the telephone set and has no telephone set cord.

This telephone set can be carried within a limited area. But due to the weak radio waves, the suitable area will be limited.

(3) Portable Radio Telephone

This telephone set has a built-in transceiver inside the telephone set. Radio wave is used as subscriber media instead of subscriber line for this telephone and we can telephone from anyplace within the service area. Radio wave station is needed because service area is large.

(4) Railway Radio Telephone

(5) Maritime Mobile Radio Telephone

(6) Automobile Radio Telephone

(7) Aviation Radio Telephone

The telephones, in (4) to (7) above are installed in railway trains, ships, automobiles and airplanes and telephone calls can be made from the ordinary set to these transport organs, inversely, calls can be made from these organs to the ordinary telephone set. These telephones are usually installed as public telephones.

12.2.2.4 Picture Communication Service

Telecommunication over telephone is made solely by voice. However, information by picture includes much information in comparison with information by voice. On the contrary, picture communication requires many zone widths (See Fig. 12.2(1)) in comparison with the telephone, moreover, the cost usually is high. If the presently used telephone cables were used for this service, the service area will be limited.

(1) Videophone

This is a combination of the telephone and television.

(2) Facsimile Telegraphy

This transmits letters, photographs, pictures, etc.

(3) Telehanding

This transmits to the receiving side the actual motion of the pen from the transmitting side.

(4) Electric Cardiograph Transmission

This transmits the cardiograph of people in remote places to the hospital, etc. in the central areas by using the telephone circuit.

(5) Industrial Television

This service is used in the industrial, educational and other fields. For example, the manufacturing process in a distant factory can be controlled from the head office.

(6) CATV (Community Antena Television)

As a means to alleviate the difficulty in looking and listening in low areas between mountains and in backside of buildings in the cities, joint anntennas are erected from

which coaxial cables are laid to each house so that television broadcasts can be seen. Moreover, besides joint listening to television broadcasts, this coaxial cable can be used also for transmitting of privately sponsored broadcasts.

12.2.2.5 Data Communication Service

In line with the development of economic and social activities, the volume of information handled has increased. With the progress in computer techniques, data communication between the central computer and many data terminal ends has been made possible.

When the data terminal end is connected to the telephone circuit and used, a large volume of data can be transmitted for a long time at the unit charge for one call. Therefore, in case PERUMTEL introduce the data communication service, it would be necessary to change the charging system to a rational one.

(1) Banking

This service promptly handles on the on-line-system of the bank business for deposits, loans, notes, etc.

Data terminal equipment is installed in each branch office which is directly connected to the data transmission circuit of the computer in the central office, and cash withdrawals or deposits can be made by the customer without waiting at any branch office in the country.

(2) Sales and Inventory Management

This service provides at any desired time such information as sales slips, purchase slips, warehouse incoming and outgoing slips, daily reports, monthly reports, etc. through the input into large type computer the various kinds and large volume of data occurring in the daily business activities.

(3) Registration

This service is a mechanization of the registration work for automobiles, residing people, etc. The registration book kept separately at each office is filed at the central office under unified management, and the work of file preparation, renewals, erasures, etc. can be promptly carried out.

(4) Reservation

Data terminal equipment is installed in each branch office of the travel company and by connection with the computer in the central office, the reservations for airplanes, railways, etc. can be possible even at the branch offices. Furthermore, these reservations will be possible by telephone from the subscriber.

(5) Scientific and Engineering Calculation

By installing a data terminal equipment in the subscriber's premise and using the computer in the central office, difficult and high degree scientific and engineering calculations can be made.

(6) Information Guidance

Although various kinds of information guidance services are already carried out by telephone, these services can further be indicated by the data terminal equipment (display, printer, etc.).

(7) Data Collecting

This service carries out the accumulation, classification and custody of a large volume of information (patents, judicial precedents, scientific and engineering docu-documents, etc.) and promptly retrieves the requested information.

(8) Remote Meter Reading

The meter readings for electricity, gas, water, etc. for each house can be made through telephone circuit.

(9) Calculation by Telephone

By use of the push button as a telephone set, calculation by telephone is possible through use of the computer in the central office. In such case, the reply can be listened to by telephone voice.

12.2.3 Implementation of New Services in Foreign Countries

The situation on the implementation of new services in foreign countries is as shown in Table 12.2.(2).

12.2.4 Introduction Policy for New Services

12.2.4.1 Order of Priority in Introduction of New Services

When introducing new services, an overall study of the following items is necessary.

- Service to stimulate the use of telephone without increasing the number of telephone circuits.
- Services which efficiently use the facilities of the exchange office.
- Services which can expect low construction cost, large convenience and big demand.
- Services already being carried out in foreign countries.

12.2.4.2 New Service Introduction Plan

In determining the introduction plan for new services, the following three periods were studied.

(1) lst Period (1975 - 1980)

Since there is a large number of waiting applicants and the new installation of telephones must be given priority in this period, the new services should be those which have large convenience and low construction costs.

(2) 2nd Period (1981 - 1986)

In comparison with the lst period, this period will have a large number of subscribers and a small number of waiting applicants. Therefore, even if somewhat large amount of funds are required, new services which is of great convenience to the subscribers should be introduced.

(3) 3rd Period (1987 - 1993)

In this period, there will be a large number of subscribers and new applications for telephones can be quickly responded.

Therefore, besides stimulating the use of telephones without increasing the telephone circuits, those which contribute to the social welfare should be introduced as new services.

In view of the foregoing studies, the introduced plan for the various new services is as shown in Table 12.2.(2).

Fig. 12.2.(1) Frequency Bend Width of Each Communication Service

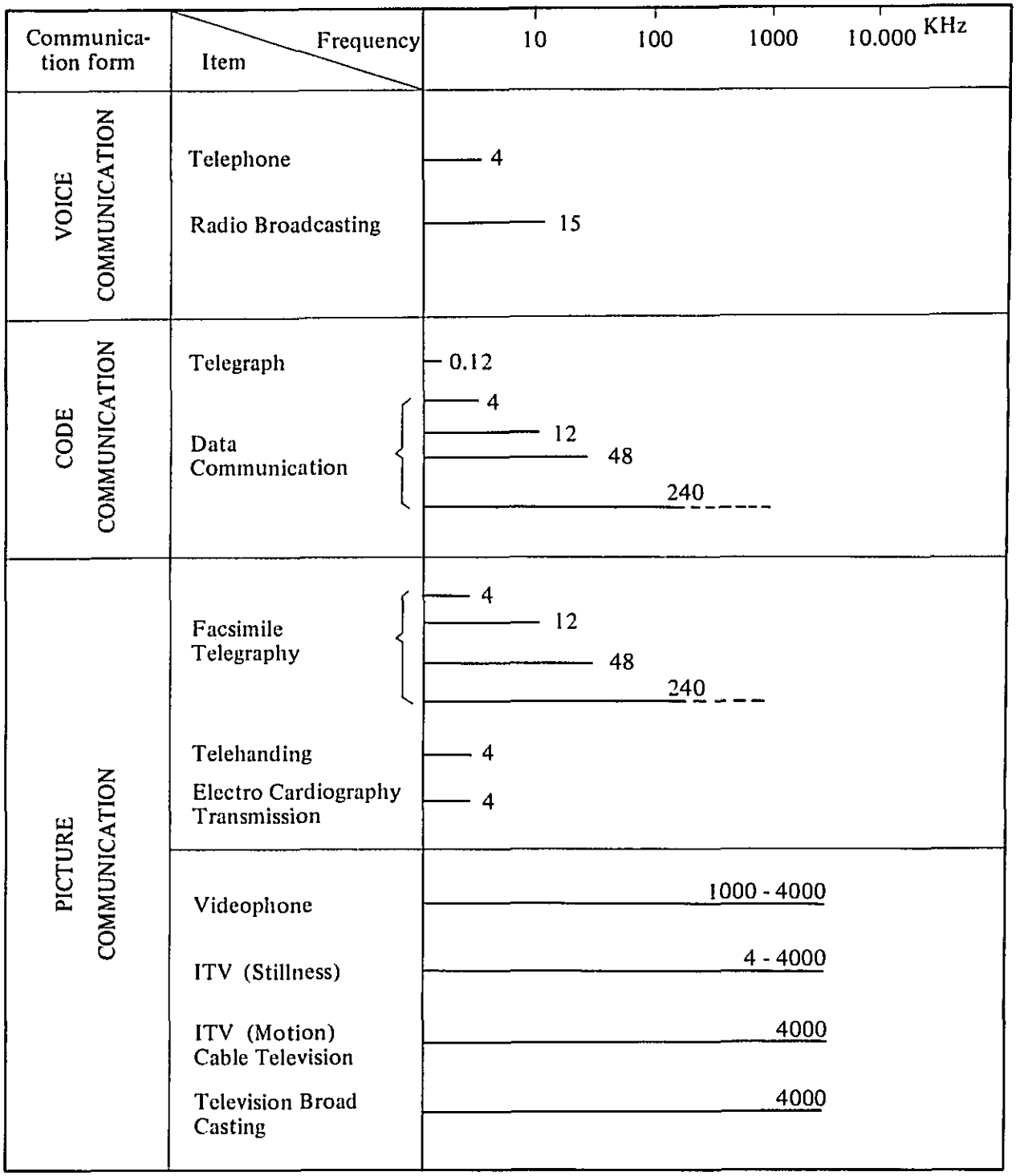


Table 12.2.(1)

(1) New Services Provided by Switching Equipment

Name of service	Condition in foreign countries	Introduction plan		
		1st 1975-1980	2nd 1981-1986	3rd 1987-1993
(1) Push-button telephone	Japan, U.S.A., England, West Germany, France	○		
(2) Abbreviated dial	Japan, U.S.A., England, West Germany, France	○		
(3) Camp-on	Sweden			○
(4) Automatic reservation call				○
(5) Automatic answering			○	
(6) Direct transfer of incoming call	U.S.A., England, W. Germany, France			○
(7) Automatic transfer to new telephone number				○
(8) Automatic transfer to another telephone number				○
(9) Pick-up				○
(10) Conference call	U.S.A., England, W. Germany, France testing			○
(11) Add-on	U. S. A.			○
(12) Holding	Sweden			○
(13) Call waiting	U.S.A., England, W.G., France, Japan		○	
(14) Wake-up service	Sweden			○
(15) Charge information	England, W.G., Franch		○	

Name of service	Condition in foreign countries	Introduction plan		
		1st 1975-1980	2nd 1981-1986	3rd 1987-1993
(16) Detail charge information				○
(17) Toll reverse charge			○	
(18) International subscriber dialling	Japan, U.S.A., Western countries			○
(19) Automatic reporting				○

Note: These service must be provided by PERUMTEL.

(2) New Services Provided by Subscriber Premise Equipment

Name of service	Supplied by		Condition in foreign countries	Introduction plan		
	PERUMTEL	Subscriber		1st 1975-1980	2nd 1981 1986	3rd 1987-1993
(1) Auto dial		○	Japan, U.S.A. England, WG			
(2) Automatic answering telephone		○	Japan, U.S.A. England, WG			
(3) Privacy set		○	Japan, England, WG			
(4) Loud-speaker telephone		○	England, WG			
(5) Telephone for blind persons	○		Japan			○
(6) Telephone for hard-hearing persons	○		Japan			○
(7) Key telephone	○	○	Many countries	○		
(8) Home telephone	○	○	Japan			○
(9) Telephone with lamp		○	England, Japan			
(10) Automatic reporting telephone	○		Japan			○
(11) Hand free telephone		○	England			
(12) Noise suppression telephone	○	○	Japan			○
(13) Waterproof telephone		○	Western countries			
(14) Plug-in telephone	○		Many countries	○		
(15) Ornamental telephone		○	Many countries			
(16) Secretary telephone	○		Japan, U.S.A. WG	○		

Name of service	Supplied by		Condition in foreign countries	Introduction plan		
	PERUMTEL	Subscriber		1st 1975-1980	2nd 1981-1986	3rd 1987-1993
(17) Anti-explosion telephone		○	Japan			

(3) Mobile Communication Services

Name of service	Condition in foreign countries	Introduction plan		
		1st 1975-1980	2nd 1981-1986	3rd 1987-1993
(1) Personal radio signalling	Japan, U.S.A., Netherlands Belgium, Switzerland Austria		○	
(2) Cordless telephone				○
(3) Portable radio telephone				○
(4) Railway radio telephone	Japan, U.S.A.			○
(5) Maritime mobile radio telephone	Many countries			○
(6) Land mobile radio telephone	U.S.A., England, WG France, Sweden Netherlands		○	
(7) Aviation radio telephone	U.S.A.			○

Note: These services must be provided by PERUMTEL.

(4) Picture Communication Services

Name of service	Terminal equipment are supplied by		Condition in foreign countries	Introduction plan		
	PERUMTEL	Subscriber		1st 1975-1980	2nd 1981-1986	3rd 1987-1993
(1) Videophone	○		Japan, U.S.A.			○
(2) Facsimile telegraphy	○	○		○		
(3) Telehanding		○				
(4) Electro Cardiograph transmission		○				
(5) Industrial television		○				
(6) CATV	○		Japan, U.S.A.			○

Note: Transmission lines must be provided by PERUMTEL.

Services (1) - (4) are provided by telephone lines.

Services (5) - (6) are provided by leased circuits.

(5) Data Communication Services

Name of service	Terminal equipment are supplied by		Condition in foreign countries	Introduction plan		
	PERUMTEL	Subscriber		1st 1975-1980	2nd 1981-1986	3rd 1987-1993
(1) Banking	O	O			O	
(2) Sales and inventory management	O					O
(3) Registration	O	O				O
(4) Reservation	O	O			O	
(5) Scientific and engineering calculation	O				O	
(6) Information guidance		O				
(7) Data collecting		O				
(8) Remote meter reading	O	O				O
(9) Calculation by telephone	O				O	

Note: Transmission lines must be provided by PERUMTEL.
Service (2), (5), (6), (7), (8), (9) are provided by telephone lines.
Service (1), (3), (4) are provided by leased circuits.

12.3 Demand Management Control

12.3.1 Present Situation

In the monthly reports, the number of subscriber lines in each telephone exchange in Jakarta is recorded but the number of waiting applicants is not complete. Firm knowledge of this number of waiting applicants is very important in planning the construction work and the demand fulfillment plan or expansion program. Without management control of this waiting list, PERUMTEL will not be able to provide fair and effective telephone services to the customers.

In general, the number on the waiting list is simply personally recorded by the exchange office manager and is not submitted in a satisfactory form in any periodic report. Up to the present, since the number of telephone service installation was small in each fiscal year, management control of the waiting list of applicants was not too big a problem. However, during the 2nd Five-Year Plan, there will be a tremendous increase in the telephone system facilities, and the waiting list must be recorded and managed by dividing the local service areas into small block areas so that economic and effective telephone extension work can be carried out.

Since there is a large time difference between the plan and the time of installation work execution, the social environment conditions will also vary largely and there frequently will be big differences between forecast values and actual values. Therefore, demand management control and forecast revisions must be made for each distribution block area or scheduled exchange office service area.

It is regrettable that we were not able to see the telephone demand management control for each telephone exchange office service area based on the office establishment plan prepared under the 2nd Five-Year Plan. Of course, it may also be because the office service areas are not as yet completely fixed. However, hereafter, at least the future telephone demand in each office service area of the planned exchange offices, including the number of waiting applicants, should be controlled as early as possible. On the basis of demand management control and by revising the demand forecasts, excessive investment in facilities or too little investment can be avoided.

12.3.2 Necessity of Telephone Demand Management Control

First, it must be acknowledged that in forecasting the demand for a certain area, national policies, such as population distribution plan, land use plan, residence construction plan, road plan and economic policy, will have a large effect on the demand forecast.

National policies are frequently revised to correspond with changes in social environment.

Although the planning and designing departments will carry out the design on the basis of the telephone demand forecast, as can be seen from Fig. 12.3.(1), at least a period of from two to three years will be required from the time of demand forecast until the completion of the installation work. Therefore, it is necessary that through demand management control the forecast demand be revised and the information fed back to the designing department. Moreover, even after completion of the installation work, efforts must also be made for unification of demand management control and facility management control, provision of effective and suitable information for the next expansion program, thereby upgrading the telephone service to users, as well as avoiding excessive or too small investments. This demand management control will further lead to the improvement of demand forecast techniques in the future.

Table 12.3.(1)

Item	1				2				3				4			
	1/4	2/4	3/4	4/4	1/4	2/4	3/4	4/4	1/4	2/4	3/4	4/4	1/4	2/4	3/4	4/4
Demand forecast																
Designing and construction (building)																
" (civil)																
" (cable)																
" (switch)																

12.3.3 Urgent Telephone Demand Management Control Items

Telephone demand forecasts are used in all sectors of telecommunications. It would not be saying too much that no plan can be set up without the demand forecasts. Although 25 telephone exchanges offices will be constructed by 1977 according to PERUMTEL's plan, the greater part of this expansion plan was determined by 1974. Therefore, there will be a large difference between the forecast value and the actual value as mentioned previsiouly. For this reason, PERUMTEL should at least plan the promotion of the following items in demand management control.

(1) All Jakarta subscriber area

(2) Service areas of existing exchange offices

(3) Service areas of planned exchange offices

(4) Within distribution block areas.

Regarding demand management control within distribution block areas of item (4), it is believed that immediately carrying this out would be difficult due to the large manpower and new control system required. However, items (1), (2) and (3), must be executed as soon as possible.

Regarding demand management control for all areas of Jakarta in item (1), it would be better for the Telecommunications Bureau to carry this out. The reason is that the demand difference between forecast value and actual value of Jakarta is mainly influenced by the economic policy or road program etc. of the city and must be studied from the viewpoint of macroscopic demand forecast. Demand management control in items (2) and (3) should be executed by each telephone exchange office in view of the service to customers, facility expansion program etc.

Necessary items which should be controlled within the service areas of the planned telephone exchange offices are as follows:

(1) Number of subscriber lines

(2) Number of switchboards according to size

(3) Number of waiting applicants

(4) Miscellaneous circuits (public telephone, telex, special service etc.)

Table 12.3.(2)

	Kind of telephone demand	Objective of use
(1)	Jakarta	Demand fulfilment plan Investment amount
(2)	Exchange service area	Short and long term plan Design (building, inside plant, outside plant) Demand fulfilment plan
(3)	Cross connection box area	Outside palnt design Location of exchange office Exchange service area

12.3.4 Demand Management Control Method

In order to execute demand management control at each exchange office, the responsibility of each department and the mutual relation among the departments must be clarified. In general, the exchange office service areas are determined by the Head Office of PERUMTEL and, therefore, management control by the Telecommunication Bureau which has close relations with the Head Office can be considered. However, exchange offices are most suitable for full comprehension of the information (data concerning number of subscribers and waiting applicants, receiving of applications, work place, time of work, change in area pattern, etc.) required in demand management control and the action based on such information.

For such reasons, it would be desirable for the Head Office or Telecommunication Bureau to notify the telephone exchange offices, in advance, of the service areas of the planned exchange office and have them execute the demand management control for such areas.

The demand forecast department will notify the forecast results to the telephone exchange office and by plotting the actual value on graphs each month, if there is any large difference, the telephone exchange office must analyze the cause as soon as possible and notify the demand forecast department.

Furthermore, it is necessary that the telephone exchange manager or supervisors not only plot the actual value but, from time to time, he must hold periodic discussions with

outside organs such as the city government agency, etc. to obtain advance information on city planning, road program, residence program etc. and collect information in order to revise the forecast demand.

12.3.5 Calculation of Demand Management Control

Demand management control for each distribution block area must be carried out in the future, but the number of these distribution block areas is very large. According to JTP's Master Plan, there are about 1,400 block areas and a large exchange office must complete management control analysis of 100 distribution block areas. Therefore, since a large number of employees will be necessary for this work, it is desirable that an electronic computer be utilized and plans be made for work rationalization, in order to execute demand management control of each of these distribution block areas in the future. However, in Jakarta, it would be better to have the telephone exchange office employees execute this work for the time being.

12.4 Gas Pressurization System

12.4.1 General Description

Cable facilities in outside plants are either aerial cables or underground cables. The natural conditions for the occurrence of faults in these cables vary greatly in comparison with inside plant, i.e., equipment inside the exchange building. That is, the cables extend in all directions as lines and the possibility of fault occurrence covers a wide area. Consequently, in the case of a fault at a far distance from the maintenance office, a long time may be required to reach the site of the fault and there are times when the repair of the fault cannot be commenced immediately due to traffic conditions.

Since the cable conductors are protected by the cable sheath, cable faults can be divided into conductor fault and sheath fault. Cable faults shift from faulty sheath to conductor fault so if the fault can be repaired in the sheath stage, conductor faults can be prevented. The injection of gas into the cable which was created from this idea is the so-called gas pressurization system. This system has an alarm device in the exchange office and when the gas pressure in the cable drops below a preset value due to leakage of gas, the alarm device will operate, the leakage point detected and repairs completed before the occuring of circuit faults? this is the aim of the system. Recently, we are frequently confronted with the need to repair cable faults on roads with congested traffic. In such cases, if the gas pressurized cables had been instituted, the repair starting time can be postponed.

There is heavy rainfall in Jakarta, and the water level in the whole area is high. Consequently, the chances are many for the occurrence of cable faults due to water.

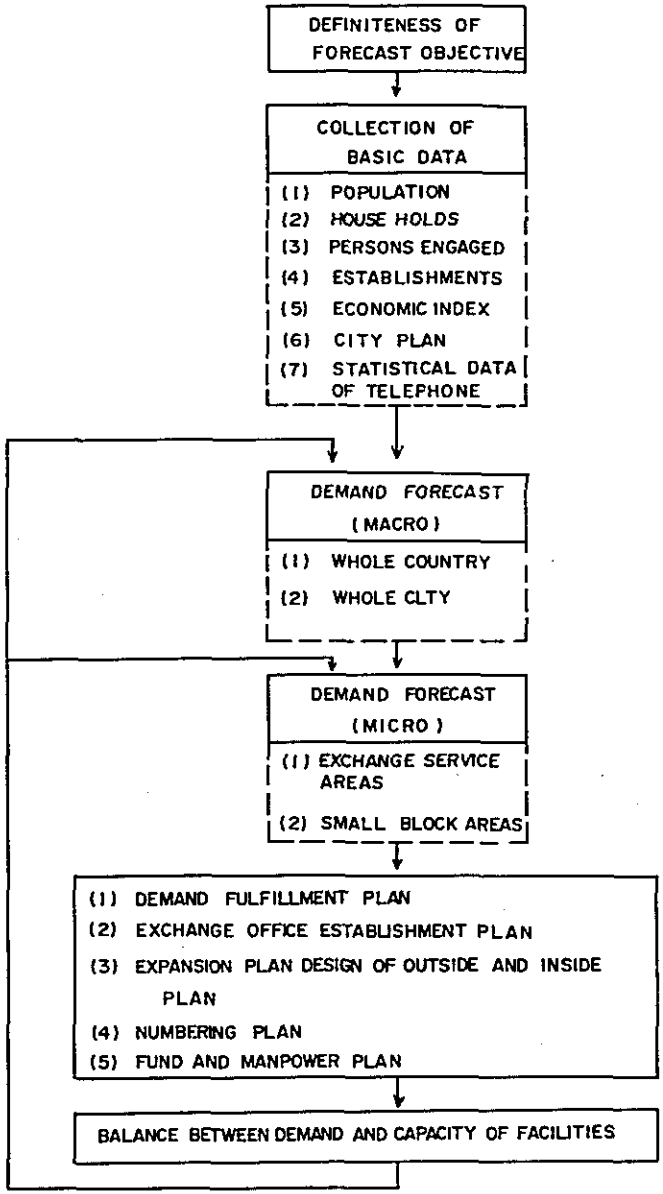


FIG. 12-3-(2)

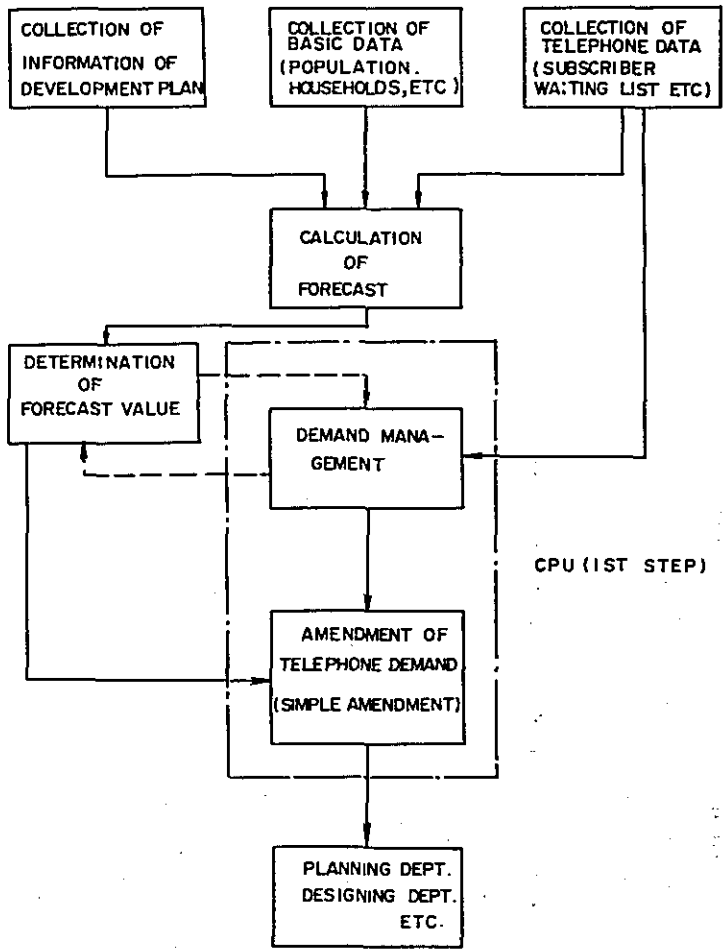


FIG. 12-3-(3)

Although three junction cables and ten primary cables have already been gas pressurized in the area under the jurisdiction of the Jakarta Telecommunication Bureau, the gas pressurization of all cables should be made as early as possible. The prevention of circuit faults means the improvement in services, as well as the increase in revenue.

12.4.2 Fault Control of Gas Pressurized Cables

Subscriber cards are on file at each telephone exchange office in Jakarta but there was no survey data on faults in gas pressurized cables. There have been frequent cases where the gas leakage due to pinholes, etc. of the gas pressurized cables does not lead to the conductor faults. Such cases should be counted in the number of gas pressurized cable faults, though not in the conductor faults. The frequent gas leakages in a certain cable is an indication of cracks and pin holes frequently taking place on that cable sheath. This is because the cable has deteriorated after long years of use, or the ground bed of the direct buried cable route is bad and the vibrations of the ground bed due to vehicular traffic have affected the cable sheath and caused frequent occurrence of faults in the jointing points. If the gas leakage is due to deterioration of the cable, the cable should be replaced at the earliest opportunity. That is, the foregoing classification of cable fault causes is necessary for the maintenance or restoration work of the cables. In classifying the causes for cable faults, the following items must be inserted which would be required in facilitating maintenance work or restoration work. The items are: kind of cables, method to discover gas leakage points, time required for repairs, cause of fault, and any other items based on which suitable measures can be taken for prevention of re-occurrence of faults.

12.4.3 Discovery of Leakage Point

The merit of gas pressurized cable is that the gas leakage point can be discovered and repaired before fault occurs on the cable conductor. The process of gas leakage point repair work available today is to learn gas leakage by gas alarm device, to mearure the gas pressure of each valve point of that cable and to searching the location of leakage. It is a difficult task and requires much time to measure the gas pressure of each valve point on a road with heavy traffic. If the gas pressure of the valve points on the road could be measured inside the exchange office building, it would be a great advantage from the standpoint of maintenance. This idea has been developed in Japan and the Bell System and is being put into practice. Under this system, elements (pressure transmitter) converting the gas pressure into electric signals are inserted in the cables – for local cables, 3 elements since the distance is 2 to 3 Km and for junction cables, 1 element for each 1.5 Km – and the gas pressure in the cables is continuously measured by the pressure indicator installed inside the exchange. When a drop in gas pressure occurs, the gas pressure distribution for the route is automatically printed out. Since all points are simultaneously measured and the accuracy is also high,

there is high expectation that this system will speed up the repairing of gas faults. Therefore, if this system is introduced the special skills for discovering gas leakage points required in the present-day method will be less, and each telephone exchange can locate the leakage points. The tendency hereafter is for leakage point discovery by this kind of method.

12.5 Time Charging System for Local Calls

12.5.1 Introduction

According to the present telephone charging system, there is no limit to the calling duration of a local call, and 20 Rupiahs are charged for each call. That is, the single pulse charging system is adopted. However, this single pulse charging system for local calls will pose a problem when the telephones in many cities have increased and the difference in size of the cities has become large in line with the economic development. Solution to this problem is studied in this section.

12.5.2 Introduction of Time Charging System for Local Calls

12.5.2.1 Adjustment of Difference in Charges Due to City Size

The whole Jakarta area, a large area running 30 Km east to west and 30 Km north to south, constitutes one local service area. Therefore the local calls within this area have no limitation on duration. On the other hand, many local service areas of the small and middle scale cities are less than 10 Km, both east to west and north to south.

In line with the expansion of the economic sphere, the progress in transport facilities, and the urbanization of surrounding areas due to the influx of people there, calls to outside the local service area will increase. However, these calls are handled as toll calls and the multiple pulse charging system is applied. This means that the subscribers in the large cities pay only 20 Rupiahs for any call within the local service areas, while the subscribers in the small and middle size cities must often pay heavier charges because many calls are handled as toll calls even if the connecting distance is same with that in the large cities.

At present, installation charges and basic charges in the large cities are higher than those in the small and middle size cities. However, such difference is too small to meet the compalints of the subscribers in the small and middle size cities. In order to solve the problem of this unfair charging system, introduction of the time charging system for local calls, too, is desirable.

12.5.2.2 Connection of Data Transmission Equipment to Telephone Circuit

With the development of economy, requests will arise for transmission and switching of data through machine-to-machine equipment, besides man-to-man communication service

hitherto provided. The call duration in the case of man-to-man communication is 100 – 130 seconds on an average, and 80% is less than three minutes. However, in the case of the machine-to-machine communication, the circuit holding duration may possibly become longer (more than several hours in some cases). From the viewpoint of fair use of the public communication facilities, it would be irrational to permit the use of the telephone circuits for such machine-to-machine communication under the single pulse charging system hitherto applied. For such communication, therefore, charges should depend upon the circuit holding duration.

Following are conceivable data transmission equipment and devices to be connected to the telephone circuits:

a) CPU data equipment
b) Photograph and picture transmission equipment
c) Telephone circuit typewriter
d) Other data transmission equipment

The connection of these data transmission equipment and devices to the telephone circuits should be controlled before the introduction of the time charging system for local calls. After the introduction of the time charging system, the following arrangements should be made in order not to disturb the general communication:

a) Provision of junction lines to meet the increased telephone traffic as the result of the introduction of the data transmission equipment.
b) Establishment of engineering and operational standards for connection of the data transmission equipment and devices to the telephone circuits.

12.5.3 Time Charging System for Local Calls

12.5.3.1 Unit Charging Time

From the viewpoint of the revenue of the telephone enterprise, shorter unit charging time for the use of the telephone circuit is preferable. For subscriber, however, the longer, the better.

In general, 80% of the local calls complete their purpose within three minutes.

Therefore, it will be reasonable to set the unit charging time at three minutes or less and no objection will be raised from subscribers against such unit time.

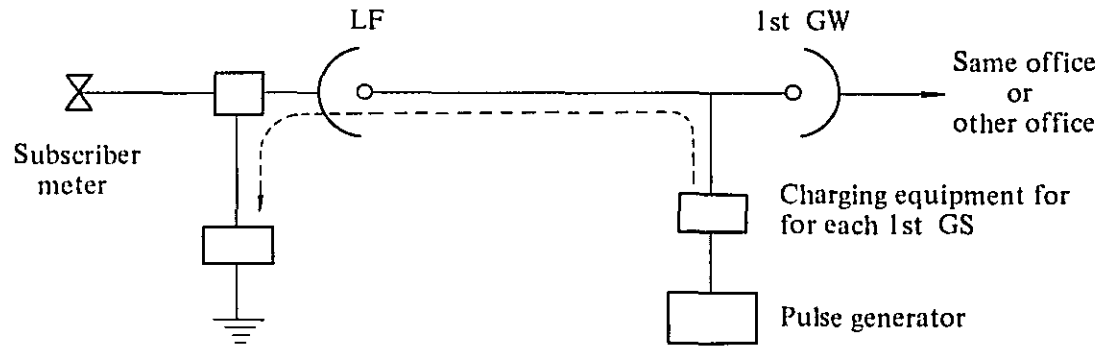
12.5.3.2 Charging Equipment

Two places are conceivable as the location of the charging equipment: originating side and terminating side. When the charging equipment is installed on the originating side, there is an advantage in that charging pulses need not be relayed between exchange offices.

The charging equipment is attached to each speech path for local call. When the

called subscriber has answered the call, the call duration is measured by the timer pulses. The subscriber meter of the calling party operates every three minutes. Refer to Fig. 12.5.3.2.(1).

Fig. 12.5.3.2.(1)



12.5.3.3 Charging Pulses

There are two types of timer pulse systems as described below.

(1) Divided Pulse System

Under this system, timer pulses are always generated at 18 second intervals by the pulse generator. When the called subscriber has answered the call, one charging pulse is sent to the subscriber meter of the calling subscriber. Thereafter, the charging equipment receives the timer pulse and starts counting. After the absorption of the first timer pulse, one charging pulse is sent to the subscriber meter of the calling subscriber at every 10 timer pulses. This system is suitable for small size exchange offices with a small number of charging circuits. Refer to 12.5.3.3.(1).

(2) Shift Phase Pulse System

Under this system, the pulse generator generates timer pulses of 10 phases at 180 second intervals. When the called subscriber has answered the call, one charge pulse is sent to the subscriber meter of the calling subscriber. Thereafter, the charging equipment seizes the pulse train of which phase is the nearest in time. After the absorption of the first timer pulse, one charging pulse is sent out to the subscriber meter of the calling subscriber at every 180 seconds. That is, charging pulses are sent to the calling subscriber meter based on a certain phase of meter pulse trains.

This system is suitable for large exchange offices with many charging circuits. Refer to Fig. 12.5.3.3.(2).

Fig. 12.5.3.3.(1) Divided Pulse System

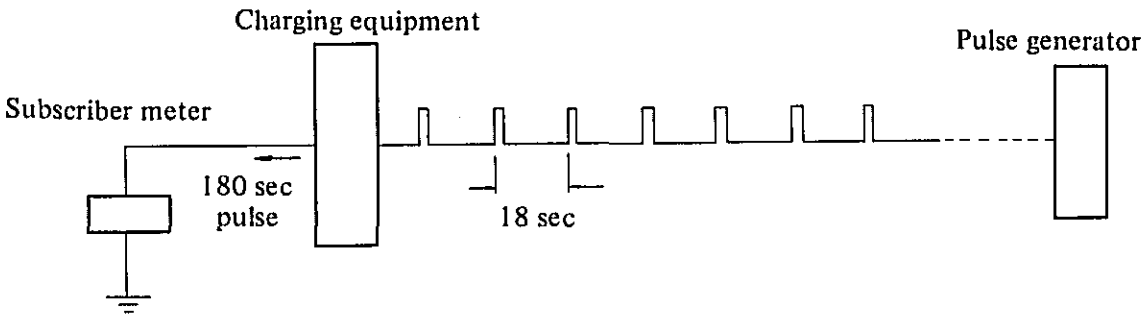
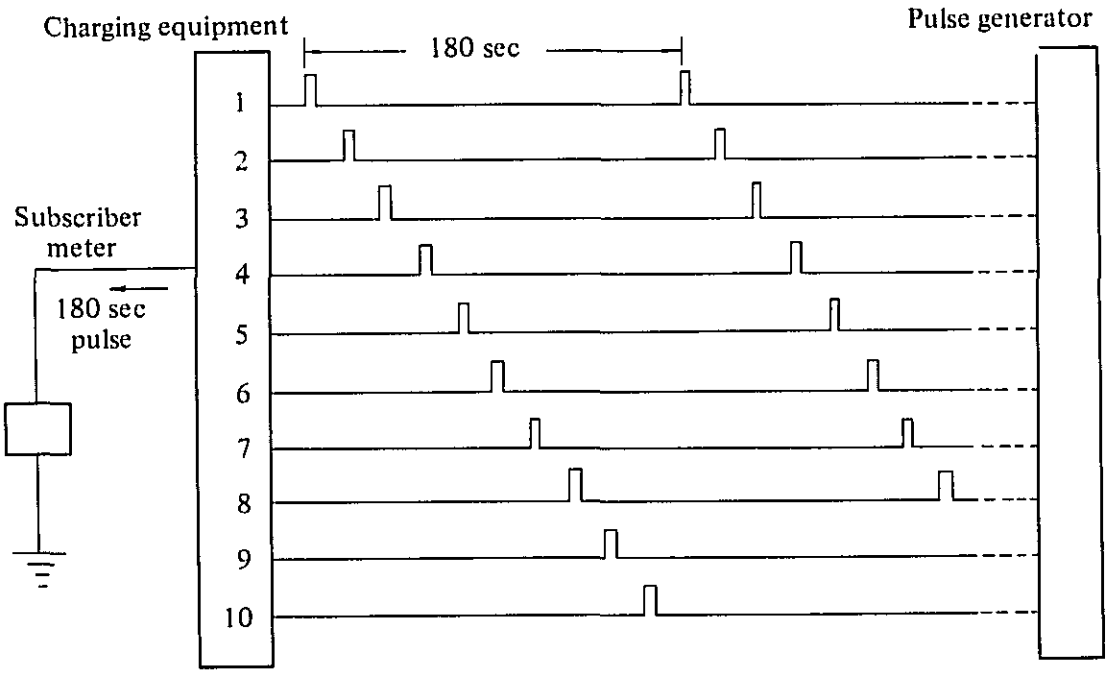


Fig. 12.5.3.3.(2) Shift Phase Pulse System



12.5.3.4 Charging for Public Telephone Call

Should the time charging system be introduced for local calls from general telephones, it must also be introduced for local calls by public telephones. Therefore, it is necessary to attach the 3-minute charging devices in the public telephone sets.

12.5.4 Introduction of Time Charging System for Local Calls

For the introduction of this system, two plans are conceivable: simultaneous introduction in all the cities of Indonesia and introduction only in the large cities.

In view of the fair use of a public communication network, the introduction on a nationwide scale is desirable, though some time lag in introduction is inevitable. Therefore, the introduction of this system will require preparation of implementation plan and detail design, procurement of the required manpower, materials and equipment.

As for the time of introduction, some time after 1978 when the tremendous subscriber line expansion work will be completed is most desirable.

The installation cost for introduction of this system is estimated at approximately US$100,000 in the case of a local exchange office of 10,000 line units, though it varies with the type of the switching equipment, the condition of exchange offices, and the telephone traffic.

The floor space required for the charging equipment in the introduction of this system will pose no problem. The capacity expansion for power facilities will also not be necessary.

PART IV

FIVE-YEAR PLAN

PART IV FIVE-YEAR PLAN

CHAPTER 1 INTRODUCTION

In principle, a five-year plan and/or annual plan should be drawn up, based on a long term plan. For some areas of this Five-Year Plan, however, this principle could not be followed because of its urgency.

As for the telephone demand and traffic forecast, values of the Long Term Plan were utilized as far as possible.

The same technical standards as adopted in the Long Term Plan were applied to the Five-Year Plan, too. Such standards include the numbering plan, transmission standard and DC resistance limit.

Under the above conditions, the subscriber primary cable network basic designing schemes necessary for detail designing have been prepared for the following exchange offices among those to be constructed under the World Bank Project.

Gambir, Kebayoran, Jatinegara, Cawang, Pasar Rebo, Gandaria

In addition, the subscriber cable basic plans (Key Map) have been prepared for 22 exchange offices including 19 exchange offices scheduled to be constructed anew or expanded under the PERUMTEL's Five-Year Plan, and 3 exchange offices added for reference.

CHAPTER 2 TELEPHONE DEMAND FORECAST IN 1979

Refer to Part III, Chapter 2 "Demand Forecast."

CHAPTER 3 TELEPHONE TRAFFIC FORECAST IN 1979

Refer to Part III, Chapter 3 "Telephone Traffic Forecast."

CHAPTER 4 TELEPHONE TRAFFIC FLOW FORECAST IN 1979

Refer to Part III, Chapter 4 "Telephone Traffic Flow Forecast."

CHAPTER 5 NUMBER OF JUNCTION CIRCUITS AND CABLES IN 1979

Refer to Part III, Chapter 7 "Junction Circuit and Junction Cable."

CHAPTER 6 DESIGNING OF SUBSCRIBER CABLE BASIC PLAN (KEY MAP)

6.1 Demand Forecast for Each Distribution Block Area

Each distribution block area is determined on the basis of the demand projected in accordance with the microscopic demand forecast method (refer to Part III, Chapter 2, Section 6), so as to meet the design standards described in Part III, Chapter 2, Section 7.

That is, the demand per unit area size 15 years after the commencement of the telephone service is calculated. Then, each distribution block area is so determined with the river, road, railroad, etc. as the boundary that the demand in each block area will be 600 on the standard and 700 at the maximum in the case of the cross connection area, and 800 on the standard and 1,800 at the maximum in the case of the direct service area.

6.2 Selection of Primary Cable Route (Conduit Route)

The conduits routes are selected in accordance with Part III, Chapter 6, Section 9, Paragraph 7.

6.3 Calculation of DC Resistance and Sending Reference Equivalent (S.R.E.) for Each Subscriber Line Route

The DC resistance and S.R.E. for each subscriber line route are calculated on the basis of the method described in Part III, Chapter 6, Section 7.

That is, the S.R.E. limit for subscriber line is 10.42 dB (1.2 Np).

$$\text{S.R.E.} = \alpha + \beta\ell$$

where

α = 0.87 dB (0.1 Np)

$\beta\ell$ = 9.55 dB (1.1 Np)

From the above, the limit of S.R.E. for the subscriber line excluding the telephone set is set at 9.55 dB (1.1 Np).

6.4 Object Exchange Offices in Designing the Key Map

The object exchange offices in designing the Key Map are as follows. For your reference, the Key Map is marked with the following drawing numbers as appearing in the attached drawings.

(1)	Jakarta Kota	KM–19–1, KM–19–2, KM–19–3
(2)	Ancol	KM–16
(3)	Pluit	KM–1–1, KM–1–2
(4)	Cengkareng	KM–14
(5)	Tegal Alur	KM–18
(6)	Semanggi	KM–13–1, KM–13–2
(7)	Slip	KM–5–1, KM–5–2
(8)	Pal Merah	KM–10–1, KM–10–2
(9)	Cempaka Putih	KM–11–1, KM–11–2
(10)	Rawamangun	KM–12–1, KM–12–2
(11)	Pulo Gadung	KM–3

(12)	Tanjung Priok	KM–7–1, KM–7–2
(13)	Cilincing	KM–15–1, KM–15–2
(14)	Cipete	KM–9–1, KM–9–2
(15)	Kalibata	KM–6–1, KM–6–2
(16)	Pasar Minggu	KM–4
(17)	Jagakarsa	KM–17
(18)	Klender	KM–8–1, KM–8–2
(19)	Tebet	KM–2–1, KM–2–2
(20)	Kedeya	KM–20
(21)	Meruya	KM–21
(22)	Penggilingan	KM–22

CHAPTER 7 SUBSCRIBER PRIMARY CABLE NETWORK BASIC DESIGNING SCHEMES FOR URGENT AREAS (6 EXCHANGE OFFICES)

7.1 Gambir Exchange Office Subscriber Primary Cable Basic Designing Scheme

7.1.1 Design Basis

(1) General Description

This design scheme has been prepared for the World Bank Project expected to be completed by 1977. The following conditions are the basis in designing:

1) The exchange office service area is based on PERUMTEL's 2nd Five-Year Plan (March 1, 1973). As shown in Table 7.1.(1), the service area comprises 20 kelurahans.

Table 7.1.(1)

Kecamatan	Kelurahan	Kecamatan	Kelurahan
1. Gambir	Cideng	4. Menteng	Kebon Sirih
	Duri Pulo		Gondangdia
	Petojo Utara		Cikini
	Petojo Selatan		Menteng
	Kebon Kelapa		Pegangsaan
	Gambir		
		5. Tanah Abang	Kampung Bali
2. Sawah Besar	Pasar Baru		Kebon Kacang
			Kebon Melati
3. Senen	Senen		
	Kwitang		
	Kenari		
	Kramat		

2) Various facilities are presently accommodated in Gambir Exchange Office. The number of existing subscriber line units is 17,000 as of the end of 1973, and the maximum capacity of the switching room is 20,000 line units. Therefore, an increase of 3,000 line units is possible hereafter. However, the installation of more than that number is not practicable and the expansion of the switching room is also impossible.

3) The telephone demand in the service area of the future Gambir Exchange Office will be over 90,000 in 1992. Consequently, it will be necessary to divide this office service area into two areas of the northern part and the southern part as shown in the attached Key Map.

4) The new branch exchange office (A) will be constructed in the northern area and will accommodate the existing and new subscribers in this area. (Refer to Fig. 7.1.(2).)

5) After the shift of the existing subscribers in the northern area to the new branch exchange office (A), some line units in the existing Gambir Exchange Office will become idle. After 1977, these idle line units will be used and new subscribers in the southern area will be accommodated in existing Gambir Exchange Office until all the line units have been occupied with no idle line left.

6) Before the existing Gambir Exchange Office is entirely filled, another new branch exchange office (B) will be constructed in the southern area.

(2) Result of Study on Facilities Plan for This Area

1) Toll Exchange Building Expansion Plan

(a) Existing Gambir Exchange Office accommodates the various facilities for local, toll and international switching, radio and carrier systems, as well as international and domestic telex and telegram systems. Location of Gambir Exchange Office in the center of Jakarta is suitable for the site of a toll exchange office. Therefore, Gambir Exchange Office should be used mainly as a toll exchange office in the future.

(b) Expansion of toll and international switching equipment during 1975 to 1976 is impossible because of the limitation on room space, and the existing equipment capacity is insufficient to handle the forecasted traffic. Therefore, an additional toll and international switching equipment room should be constructed in existing Gambir Exchange Office site or in an adjacent site.

(c) Therefore, it is desirable that no expansion or modification of the building be made for local switching equipment in existing Gambir Exchange Office site.

2) Construction Plan for New Branch Exchange Office (A) in the Northern Area

The maximum capacity of local telephone switching equipment in existing Gambir Exchange Office is 20,000 line units. After the increase of 3,000 line

units in 1975, there will be no space for further expansion. The 20,000 line units capacity will be insufficient to meet the demand, as shown in Fig. 7.1.(3). Therefore, in order to cope with the telephone demand, it is necessary to construct a new branch exchange office in the Gambir Exchange Office service area as soon as possible.

In the future Gambir Exchange Office service area, a telephone demand of more than 90,000 will be created in 1992. Fig. 7.1.(2) presents several future office establishment plans for this area. In view of the demand management, operation, maintenance, supervision of employees and distribution of danger at the time of disasters, classification No. 2 of Fig. 7.1.(2) was adopted. As shown in the Key Map, the Gambir Exchange Office service area boundary line in the future will pass, from east to west, near the center of this area dividing the area into the northern part and the southern part.

The new branch exchange office (A) will be constructed in the northern area, and the existing subscribers in this area will be all shifted for accommodation in this new exchange office (A). Idle lines resulting from the shift can be utilized by existing Gambir Exchange Office to cope with the demand up to about 1981. Besides this branch exchange office, another branch exchange office (B) will be constructed in the southern area by 1981, as shown in Fig. 7.1.(4).

(3) Pre-conditions in Designing Outside Plant Facilities

1) Separate designs were made for the outside plant facilities of the two service areas in the north and the south.

2) In the design scheme of each area of the new branch exchanges (A) and (B), the existing small size cables will not be used.

3) The 92 entrance ducts and the MDF space for 45,000 terminal pairs of existing Gambir Exchange Office are sufficient to accommodate the subscriber cables necessary to meet the demand in the southern area and the required number of junction cables during the five years from 1977 to 1982.

(4) Telephone Demand

Year	Northern Area	Southern Area
1982	25,000	21,900
1992	51,300	42,000

(Inclusive of miscellaneous circuits)

7.1.2 Design Standards

(1) Provision Period

A. Subscriber primary cables ..... 5 years

B. Underground facilities.....15 years

C. Subscriber secondary cables .....15 years (for reference)

(2) DC Resistance Limit and Sending Reference Equivalent (S.R.E.) Limit for Subscriber Lines

DC resistance limit .....1,200 ohms (excluding telephone set)

S.R.E. limit.....9.55 dB (excluding telephone set)

(3) Capacity of Cross Connection Cabinet

The cross connection cabinet capacities are in the two classification of for 800 pairs and for 1,600 pairs. Their applications are given in the primary cable designs.

7.1.3 Total Amount of Principal Works

As the result of the basic design for Gambir Exchange Office, the amount of the main outside plant and civil works is obtained as shown in Table 7.1.(5).

7.1.4 Subscriber Primary Cable Network Basic Designing Scheme

(1) Key Map

The following are indicated on the Key Map:

1) Conduit route

2) Distribution route

3) Location of cross connection cabinet

4) Telephone demand

(2) DC Resistance and S.R.E. for Subscriber Line

(3) Primary Cable Design (1982)

(4) Primary Cable Future Plan (1992)

(5) MDF Cable Terminating Plan (1982)

7.2 Kebayoran Exchange Office Subscriber Primary Cable Network Basic Designing Scheme

7.2.1 Design Basis

(1) General Description

This design scheme has been prepared for the World Bank Project expected to be completed by 1977. The following conditions are the basis in designing:

1) The object area is the future Kebayoran Exchange Office service area determined by the 2nd Five-Year Plan of PERUMTEL, as shown in Table 7.2.(1).

Table 7.2.(1)

Kecamatan	Kelurahan
Kebayoran Baru	Rawa Barat
	Selong
	Gunung
	Kramat Pela
	Melawai
	Petogogan
	Pulo
	Gandaria Ilir
	Cipete Ilir
Kebayoran Lama	Grogol Selatan
	Cipulir
	Kebayoran Lama

2) The capacity of the switching room of existing Kebayoran Exchange Office is 10,000 line units.

3) A new exchange office building is to be constructed adjacent to the existing exchange office building in order to accommodate the subscriber switching equipment to be installed for capacity increase.

4) It is presumed that a new exchange office building will be constructed by 1984 in the Kebayoran Lama area. The location of this new building is assumed to be in the vicinity of the wire center calculated by the computer, as shown in the Key Map attached.

(2) Result of Study on Facilities Plan for This Area Study of Exchange Office Establishment Plan

1) The existing exchange office is located far distant from the wire center of the Kebayoran Exchange Office service area.

2) The telephone demand within this service area is comparatively large, and the area size, too, is large as compared with the size generally adopted in foreign countries.

3) Construction of a large number of conduits between the existing exchange office and Kebayoran Lama should preferably be avoided, since conduits there may, in some cases in the future, have to be transferred in line with the road improvement.

4) As can be seen in Table 7.2.(5), difference in construction cost between the one exchange office construction plan and the two exchange offices construction plan is approximately 690 million Rupiahs.

It is clear from the aforementioned conditions that the plan to construct a new branch exchange office in Kebayoran Lama would be much more advantageous than the plan to concentrate all the subscriber lines in one exchange office. As indicated in the Key Map, the boundary of the service area is the boundary between Kebayoran Baru and Kebayoran Lama. The location of both exchange offices is indicated in the Key Map.

Fig. 7.2.(6) shows that adjustments should be made so that there will be no large number of idle facilities or no facilities kept idle over a long period.

For this purpose, it is desirable to construct a new branch exchange office by 1984.

(3) Pre-conditions in Designing Outside Plant Facilities

1) Separate designs were made for the outside plant facilities of the two office service areas.

2) The new entrance cables were all designed to be terminated at the newly constructed exchange buildings. In consideration of the cable entrance and maintenance, existing entrance cable should be transferred to the new exchange office to be constructed in the adjacent area to the existing exchange office from time to time.

3) The switching equipment to be accommodated in the new exchange offices should operate as multi-units with the existing switching equipment. For this purpose, tie cables will be laid between the new and existing exchange offices.

4) In consideration of the construction of a new branch office in the Kebayoran Lama area by 1984, it would be desirable to set the provision period for subscriber secondary cables in the Kebayoran Lama area at 5 years.

5) The existing cross connection cabinets can be utilized if new terminal blocks are installed additionally.

(4) Those subscribers who at present are accommodated in this exchange office but are scheduled to be shifted to Semanggi and Kalibata exchange offices in the near future should be accommodated in these exchange offices at the time of the exchange office expansion work. This is preferable from the viewpoint of maintenance, too.

(5) The telephone demand including miscellaneous circuits is shown in Table 7.2.(2).

Table 7.2.(2)

Year	Number of Telephone Demand		
	Kebayoran Baru	Kebayoran Lama	Total
1982	14,880	4,765	19,645
1992	24,965	14,105	39,070

7.2.2 Design Standards

(1) Provision Period

a) Subscriber primary cables .....5 years

b) Underground facilities .....15 years

c) Subscriber secondary cables .....15 years (for reference)

(2) DC Resistance Limit and Sending Reference Equivalent (S.R.E.) Limit for Subscriber Lines

DC resistance limit .....1,200 ohms (excluding telephone set)

S.R.E. limit .....9.55 dB (excluding telephone set)

(3) Capacity of Cross Connection Cabinet

Two types of the cross connection cabinets are to be used, i.e., 800-pair cabinet (hereinafter referred to as Type A) and 1,600-pair cabinet (hereinafter referred to as Type B). Their respective applications are given in the primary cable designs.

(4) Others

The number of pairs of tie cables required between the new and existing exchange office is 6,600 pairs (including tie cable of 600 pairs for junction).

7.2.3 Total Amount of Principal Works

(1) Subscriber primary cable

Shown in Table 7.2.(3).

Table 7.2.(3)

Classification of Cable		Amount (km)	Total (km)
0.4 mm	200 pairs	0.7	23.7
	300 "	1.0	
	400 "	2.9	
	600 "	5.5	
	800 "	2.1	
	1,000 "	2.6	
	1,200 "	8.8	
0.6 mm	300 "	2.1	20.5
	400 "	1.3	
	600 "	1.4	
	800 "	1.3	
	1,000 "	0.6	
	1,200 "	13.8	
TOTAL		44.2	

(2) Underground facilities

1) Conduits

Shown in Table 7.2.(4).

2) Manholes

Approximately 180 manholes (excluding existing manholes)

(3) Cross Connection Cabinet

Type A	(800 pairs)	5
Type B	(1,600 pairs)	36

Table 7.2.(4)

Number of Conduits	Amount (km)
2	5.4
4	7.8
6	4.0
9	0.8
12	2.4
16	1.9
20	0.7
30	0.3
36	0.1

(4) Subscriber Secondary Cable

Approximately 130 Km (for reference).

7.2.4 Subscriber Primary Cable Network Basic Designing Scheme

(1) Key Map

The following are indicated on the Key Map:

1) Conduit route
2) Distribution block area
3) Location of cross connection cabinet
4) Telephone demand

(2) DC Resistance and S.R.E for Subscriber Line

(3) Primary Cable Design (1982)

(4) Primary Cable Future Plan (1992)

(5) MDF Cable Terminating Plan (1982)

7.3 Jatinegara Exchange Office Subscriber Primary Cable Network Basic Designing Scheme

7.3.1 Design Basis

(1) General Description

This design scheme has been prepared for the World Bank Project expected to be completed by 1977. The following conditions are the basis in designing:

1) The object area is the future Jatinegara Exchange Office service area determined by the 2nd Five-Year Plan of PERUMTEL, as shwon in Table 7.3.(1).

TABLE 7-2-(5)

COST COMPARISON BETWEEN PLANS FOR KEBAYORAN

ITEM	PLAN 1 (ONE KEBAYORAN SERVICE AREA)	PLAN 2 (TWO KEBAYORAN SERVICE AREAS)
DISTANCE BETWEEN KEBAYORAN (A) TO FUTURE KEBAYORAN (B)	—	2.8 KM
NUMBER OF SUBSCRIBER LINES AS OF 1993 BEYOND FUTURE KEBAYORAN (B)	0.6 mm --------- 10,655	—
NUMBER OF NECESSARY JUNCTION CIRCUITS AS OF 1993		0.4 mm --------- 943 0.6 mm --------- 174 0.8 mm --------- 366
INSTALLATION COST FOR PRIMARY CABLE INCLUDING CIVIL WORK (COST DIFFERENCE ONLY)	(MILLION RP.) 947	—
INSTALLATION COST FOR JUNCTION CABLE INCLUDING CIVIL WORK (COST DIFFERENCE ONLY)	—	(MILLION RP.) 134
INSTALLATION COST FOR SWITCH (COST DIFFERENCE ONLY)	15,374 T —	15,371 T (MILLION RP.) 124
TOTAL	(MILLION RP.) 947	(MILLION RP.) 258
COST DIFFERENCE		(MILLION RP.) — 689

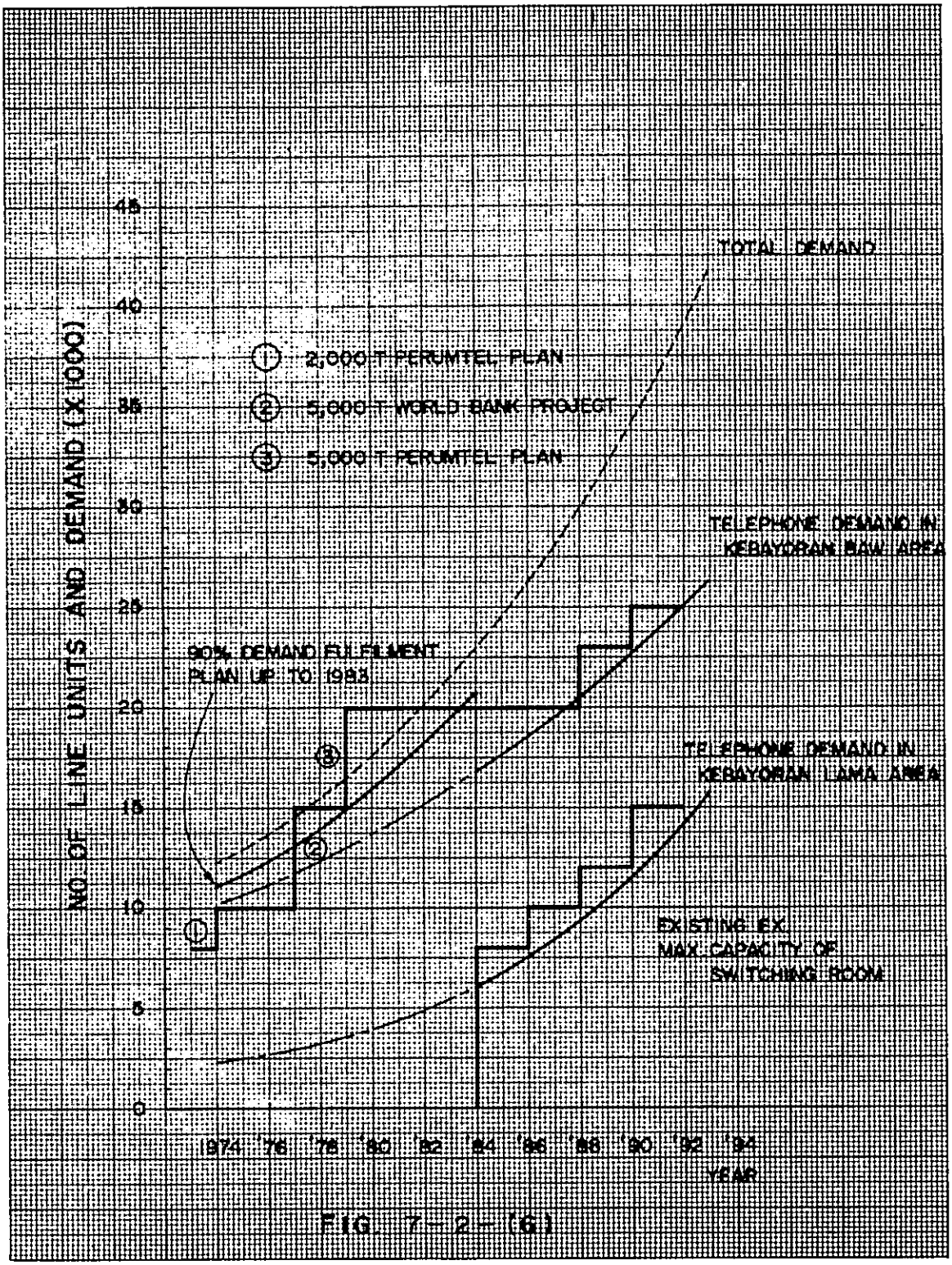

NO OF LINE UNITS AND DEMAND (X 1000)
45
40
35
30
25
20
15
10
5
0
1974 '76 '78 '80 '82 '84 '86 '88 '90 '92 '94
YEAR
TOTAL DEMAND
① 2,000 T PERUMTEL PLAN
② 5,000 T WORLD BANK PROJECT
③ 5,000 T PERUMTEL PLAN
TELEPHONE DEMAND IN KEBAYORAN BAW AREA
90% DEMAND FULFILMENT PLAN UP TO 1985
TELEPHONE DEMAND IN KEBAYORAN LAMA AREA
EXISTING EX. MAX CAPACITY OF SWITCHING ROOM

FIG. 7-2-(6)

Table 7.3.(1)

Kecamatan	Kelurahan
Matraman	Kebon Manggis
	Pal Meriam
	Kayu Manis
	Utan Kayu
	Pisangan Baru
Jatinegara	Kampung Melayu
	Bali Mester
	Bidara Cina
	Cipinang Cempedak
	Rawa Bangke
	Cipinang Besar
	Cipinang Muara

2) The capacity of the switching room of existing Jatinegara Exchange Office is 4,000 line units.

3) The size of the existing exchange office building is small, and there is no possibility of an increase in line units.

4) The location of the new exchange office building (Jatinegara II) has already been determined (as shown in the Key Map).

5) In 1975, another project, that is, the mobile exchange project is to be implemented in this service area.

(2) Result of Study on Facilities Plan for This Area

From the viewpoint of the facilities construction cost, it would be advantageous to divide this service area into two areas as shown in Table 7.3.(8).

As can be seen from Table 7.3.(8), the difference in construction cost between the plan for concentrating all the subscriber lines in one exchange office and the plan for dividing them into two exchange offices is approximately 750 million Rupiahs.

In case of dividing the service area into two areas, the line is the boundary between kecamatan Matraman (hereinafter referred to as Jatinegara A) and kecamatan Jatinegara (hereinafter referred to as Jatinegara B), as shown on the Key Map. The location of both exchanges is also indicated on the Key Map.

(3) Pre-conditions in Designing Outside Plant Facilities

1) The outside plant facilities designs were prepared separately for the two exchange office service areas.

2) The switching room and MDF of the existing exchange office is at present almost in full capacity. In order to start the operation of the switching equipment of the new exchange office by 1980 as multi units with the existing equipment, it is necessary to construct the new exchange office adjacent to or in the vicinity of the existing exchange office.

3) The primary cable design and primary cable future plan were so designed that the switching equipment in the new exchange office can be operated when the new exchange office is constructed and the tie cable is laid between the new and existing exchange offices.

4) The existing MDF is in full capacity and the expansion is impossible. Therefore, some of the MDF blocks must be replaced with large capacity blocks. The terminating cables at the MDF should also be replaced. (Refer to the MDF Cable Terminating Plan 1982.)

The cables to be replaced are subscriber cables to be accommodated in other exchange offices in the future. The cable replacement must be carried out after the expansion of the facilities in the Gambir, Cempaka Putih and Tebet Exchange Office service areas.

5) Construction of Mobile Exchange

According to the result of the field survey for determining the object area of the outside plant facilities construction work for introduction of the mobile exchange, it is desirable to construct the facilities in the shopping area in the western part of the Jatinegara B Exchange Office service area.

The subscriber cable design for the introduction of the mobile exchange is given in the "Primary Cable Design (1980) for Mobile Exchange."

The subscriber cable design for the World Bank Project was prepared on the assumption that the outside plant facilities for the mobile exchange were completed.

(4) Telephone Demand including Miscellaneous Circuits

Shown in Table 7.3.(2).

Table 7.3.(2)

Year	Number of Telephone Demand		
	Matraman (Jatinegara A)	Jatinegara (Jatinegara B)	Total
1982	5,450	8,265	13,715
1992	16,030	18,675	34,705

7.3.2 Design Standards

(1) Provision Period

a) Subscriber primary cables ..... 5 years

b) Underground facilities .....15 years

c) Subscriber secondary cables .....15 years
(for reference)

(2) DC Resistance Limit and Sending Reference Equivalent (S.R.E.) Limit for Subscriber Lines

DC resistance limit .....1,200 ohms (excluding telephone set)

S.R.E. limit.....9.55 dB (excluding telephone set)

(3) Capacity of Cross Connection Cabinet

Two types of cross connection cabinets are to be used, i.e. 800-pair cabient (hereinafter referred to as Type A) and 1,600-pair cabinet (hereinafter referred to as Type B). Their respective applications are shown in the primary cable design.

7.3.3 Total Amount of Principal Works

(1) Subscriber Primary Cable

Shown in Table 7.3.(3).

Table 7.3.(3)

Classification of Cable		Jatinegara A For World Bank Project (km)	Jatinegara B	
			For Mobile Exchange Project (km)	For World Bank Project (km)
0.4 mm	200 pairs	0.2	—	0.1
	300 "	0.6	—	—
	400 "	0.5	0.6	0.1
	600 "	1.2	0.3	0.9
	800 "	0.9	1.2	1.9
	1,000 "	0.3	0.6	1.1
	1,200 "	0.6	3.2	3.0
	Sub Total	4.3	5.9	7.1
0.6 mm	200 pairs	0.3	0.5	—
	300 "	—	0.2	—
	400 "	0.3	1.5	—
	600 "	1.4	1.0	—
	800 "	0.2	—	—
	1,000 "	—	—	—
	1,200 "	1.3	1.7	—
	Sub Total	3.5	4.9	—
TOTAL		7.8	10.8	7.1

(2) Underground facilities

1) Conduits

Shown in Table 7.3.(4).

Table 7.3.(4)

Number of Conduits	Jatinegara A	Jatinegara B	
	For World Bank Project (km)	For Mobile Exchange Project (km)	For World Bank Project (km)
2	0.2	1.0	0.3
4	1.5	2.0	0.1
6	1.0	0.4	2.1
9	2.9	—	—
12	—	—	—
16	—	—	0.4
20	0.4	—	1.1
25	0.1	—	—
30	0.1	—	—
36	—	—	1.7
TOTAL	6.2	3.4	5.7

2) Manholes

Shown in Table 7.3.(5).

Table 7.3.(5)

Jatinegara A	Jatinegara B	
For World Bank Project	For Mobile Exchange Project	For World Bank Project
40	25	30

3) Cross Connection Cabinets

Shown in Table 7.3.(6).

Table 7.3.(6)

Type of Cabinet	Jatinegara A	Jatinegara B	
	For World Bank Project	For Mobile Exchange Project	For World Bank Project
Type A (800 pairs)	2	2	1
Type B (1,600 〃)	19	11	13
TOTAL	21	13	14

4) Subscriber Secondary Cable (for reference)

Shown in Table 7.3.(7).

Table 7.3.(7)

Jatinegara A	Jatinegara B	
For World Bank Project	For Mobile Exchange Project	For World Bank Project
30 km	30 km	30 km

7.3.4 Subscriber Primary Cable Network Basic Designing Scheme

(1) Key Map

The following are indicated on the Key Map.

1) Conduit route
2) Distribution block area
3) Location of cross connection cabinet
4) Telephone demand

(2) DC Resistance and S.R.E. for Subscriber Line

(3) Primary Cable Design (1982)

(4) Primary Cable Future Plan (1992)

(5) MDF Cable Terminating Plan (1982)

7.4 Cawang Exchange Office Subscriber Primary Cable Network Basic Designing Scheme

7.4.1 Design Basis

(1) General Description

This design scheme is for the mobile exchange project expected to be completed by 1975. The following conditions are the basis in designing:

TABLE 7-3-(8)

COST COMPARISON BETWEEN PLANS FOR JATINEGARA

ITEM	PLAN 1 (ONE JATINEGARA SERVICE AREA)	PLAN 2 (TWO JATINEGARA SERVICE AREAS)
DISTANCE BETWEEN JATINEGARA (A) TO JATINEGARA (B)	—	2.8 Km
NUMBER OF SUBSCRIBER LINES AS OF 1993 BEYOND JATINEGARA (B)	0.6 mm ---------- 5,909 0.8 mm ---------- 6,299	—
NUMBER OF NECESSARY JUNCTION CIRCUIT AS OF 1993		0.4 mm -------- 928 0.6 mm -------- 284 0.8 mm ------- 63
INSTALLATION COST FOR PRIMARY CABLE INCLUDING CIVIL WORK (COST DIFFERENCE ONLY)	(MILLION RP.) 978	—
INSTALLATION COST FOR JUNCTION CABLE INCLUDING CIVIL WORK (COST DIFFERENCE ONLY)	—	(MILLION RP.) 101
INSTALLATION COST FOR SWITCH (COST DIFFERENCE ONLY)	20,823 T —	20,823 T (MILLION RP.) 123
TOTAL	(MILLION RP.) 978	(MILLION RP.) 224
COST DIFFERENCE		(MILLION RP.) — 754

1) The object area is the future Cawang Exchange Office service area determined by the 2nd Five-Year Plan of PERUMTEL, as shown in Table 7.4.(1).

Table 7.4.(1)

Kecamatan	Kelurahan
Kramat Jati	Cawang
	Cipinang Melayu
	Cililitan
	Kramat Jati
	Kebon Pala
	Halim Perdana
	Condet Batu Ampar
	Condet Bale Kembang
	Kampung Makasar

2) According to the PERUMTEL's plan, the new mobile exchange is to be constructed on the site where the office building type exchange will be constructed in the future.

However, the new exchange office site has not yet been decided. Therefore, JTP prepared the design on the assumption that the new exchange office site will be near the wire center calculated by JTP, following the discussion held on June 4, 1974.

(2) Result of Study on Facilities Plan for This Area

For this service area was adopted a special design, that is, the two-route distribution for the Halim International Airport.

There are important subscribers at the Halim International Airport. Besides the new cables for the Halim International Airport from the mobile exchange designed by JTP, there exist 120 pairs of subscriber secondary cables between the existing cross connection cabinet (RK IV) and the Airport. Therefore, the two-route distribution system was adopted so as to utilize the existing cables.

(3) Telephone Demand including Miscellaneous Circuits

Shown in Table 7.4.(2).

Table 7.4.(2)

Year	Number of Telephone Demand
1980	2,740
1990	14,510

7.4.2 Design Standard

(1) Provision Period

a) Subscriber primary cables ..... 5 years

b) Underground facilities.....15 years

c) Subscriber secondary cables .....15 years

(for reference)

(2) DC Resistance Limit and Sending Reference Equivalent (S.R.E.) Limit for Subscriber Lines

DC resistance limit .....1,500 ohms (excluding telephone set)

S.R.E. limit.....9.55 dB (excluding telephone set)

(3) Capacity of Cross Connection Cabinet

Two types of the cross connection cabinets are to be used, i.e., 800-pair cabinet (hereinafter referred to as Type A) and 1,600-pair cabinet (hereinafter referred to as Type B). Their respective applications are given in the primary cable designs.

7.4.3 Total Amount of Principal Works

(1) Subscriber Primary Cable

Shown in Table 7.4.(3).

(2) Underground Facilities

1) Conduits

Shown in Table 7.4.(4).

2) Manholes

Approximately 90 manholes.

(3) Cross Connection Cabinet and Indoor Terminal Box

1) Cross connection cabinet

Type A	(800 pairs)	–
Type B	(1,600 pairs)	12

2) Indoor Terminal Box for Halim International Airport

400 pairs 1

(4) Subscriber Secondary Cable

Approximately 40 km (for reference).

Table 7.4.(3)

Classification of Cable		Amount (km)	Total (km)
0.4 mm	200 pairs	0.7	6.0
	300 "	0.8	
	400 "	1.5	
	600 "	0.5	
	800 "	1.0	
	1,000 "	0.6	
	1,200 "	0.9	
0.6 mm	200 "	0.8	3.6
	300 "	0.1	
	600 "	0.2	
	800 "	1.8	
	1,000 "	0.4	
	1,200 "	0.3	
TOTAL		9.6	

Table 7.4.(4)

Number of Conduits	Amount (km)
2	0.1
4	0.5
6	1.6
9	5.5
12	1.4
16	1.5
20	0.8

7.4.4 Subscriber Primary Cable Network Basic Designing Scheme

(1) Key Map

The following are indicated on the Key Map:

1) Conduit route
2) Distribution block area
3) Location of cross connection cabinet
4) Telephone demand

(2) DC Resistance and S.R.E. for Subscriber Line

(3) Primary Cable Design (1980)

(4) Primary Cable Future Plan (1990)

7.5 Pasar Rebo Exchange Office Subscriber Primary Cable Network Basic Designing Scheme

7.5.1 Design Basis

(1) General Description

This design scheme is for the mobile exchange project expected to be completed by 1975. The following conditions are the basis in designing.

1) The object area is the future Pasar Rebo Exchange Office service area determined by the 2nd Five-Year Plan of PERUMTEL as shown in Table 7.5.(1).

Table 7.5.(1)

Kecamatan	Kelurahan
Kramat Jati	Kampung Tengah
	Kampung Dukuh
Pasar Rebo	Lubang Buaya
	Rambutan
	Pekayon
	Ceger
	Bambu Apus
	Setu
	Cipayung
	Susukan
	Cijantung
	Kampung Baru

2) According to PERUMTEL's plan, the new mobile exchange is to be constructed on the site where the office building type exchange will be constructed in the future.

However, the new exchange office site has not yet been decided. Therefore, JTP prepared the design on the assumption that the new exchange office site will be near the wire center calculated by JTP.

(2) Telephone Demand including Miscellaneous Circuits

Shown in Table 7.5.(2).

Table 7.5.(2)

Year	Number of Telephone Demand
1980	1,090
1990	7,710

7.5.2 Design Standards

(1) Provision Period

a) Subscriber primary cables ..... 5 years

b) Underground facilities.....15 years

c) Subscriber secondary cables .....15 years

(for reference)

(2) DC Resistance Limit and Sending Reference Equivalent (S.R.E.) Limit for Subscriber Lines

DC resistance limit .....1,500 ohms (excluding telephone set)

S.R.E. limit.....9.55 dB (excluding telephone set)

(3) Capacity of Cross Connection Cabinet

Two types of the cross connection cabinets are to be used, i.e., 800-pair cabinet (hereinafter referred to as Type A) and 1,600-pair cabinet (hereinafter referred to as Type B). Their respective applications are given in the primary cable designs.

7.5.3 Total Amount of Principal Works

(1) Subscriber Primary Cable

Shown in Table 7.5.(3).

(2) Underground Facilities

1) Conduits

Shown in Table 7.5.(4).

2) Manholes

Approximately 40 manholes

Table 7.5.(3)

Classification of Cable		Amount (km)	Total (km)
0.4 mm	200 pairs	0.5	1.3
	400 "	0.7	
	600 "	0.1	
0.6 mm	300 "	0.2	4.4
	400 "	3.0	
	600 "	1.2	
Total		5.7	

Table 7.5.(4)

Number of Conduits	Amount (km)
4	1.9
6	0.5
12	1.9
16	1.2

(3) Cross Connection Cabinets

Type A (800 pairs) 1

Type B (1,600 pairs) 4

(4) Subscriber Secondary Cables

Approximately 15 km (for reference).

7.5.4 Subscriber Primary Cable Network Basic Designing Scheme

(1) Key Map

The following are indicated on the Key Map.

1) Conduit route
2) Distribution block area
3) Location of cross connection cabinet
4) Telephone demand

(2) DC Resistance and S.R.E. for Subscriber Lines

(3) Subscriber Primary Cable Design (1980)

(4) Subscriber Primary Cable Future Plan (1990)

7.6 Gandaria Exchange Office Subscriber Primary Cable Network Basic Designing Scheme

7.6.1 Design Basis

(1) General Description

This design scheme is for the mobile exchange project expected to be completed by 1975. The following conditions are the basis in designing:

1) The object area is the future Gandaria Exchange Office service area determined by the 2nd Five-Year Plan of PERUMTEL as shown in Table 7.6.(1).

Table 7.6.(1)

Kecamatan	Kelurahan
Pasar Rebo	Ciracas
	Gedong
	Kali Mati
	Kelapa Dua Wetan
	Cilangkap
	Muncul
	Cibubur
	Pondok Ranggon

2) According to the PERUMTEL's plan, the new mobile exchange will be constructed on the site where the office building type exchange will be constructed in the future.

However, the new exchange office site has not yeat been decided. Therefore, JTP prepared the design on the assumption that the new exchange site will be near the wire center calculated by JTP as shown on the Key Map, following the discussion held on June 4, 1974.

(2) Telephone Demand including Miscellaneous Circuits

Shown in Table 7.6.(2).

Table 7.6.(2)

Year	Number of Telephone Demand
1980	945
1990	5,705

7.6.2 Design Standards

(1) Provision Period

a) Subscriber primary cables ..... 5 years

b) Underground facilities.....15 years

c) Subscriber secondary cables .....15 years

(for reference)

(2) DC Resistance Limit and Sending Reference Equivalent (S.R.E.) Limit for Subscriber Lines

DC resistance limit .....1,500 ohms (excluding telephone set)

S.R.E. limit.....9.55 dB (excluding telephone set)

(3) Capacity of Cross Connection Cabinets

Two types of the cross connection cabinets are to be used, i.e., 800-pair cabinet (hereinafter referred to as Type A) and 1,600-pair cabinet (hereinafter referred to as Type B). Their respective applications are indicated in the primary cable designs.

7.6.3 Total Amount of Principal Works

(1) Subscriber Primary Cable

Shown in Table 7.6.(3).

Table 7.6.(3)

Classification of Cable		Amount (km)	Total (km)
0.4 mm	300 pairs	1.1	1.6
	400 "	0.3	
	800 "	0.1	
	1,000 "	0.1	
TOTAL		1.6	

(2) Underground Facilities

1) Conduits

Shown in Table 7.6.(4).

2) Manholes

Approximately 15 manholes

(3) Cross Connection Cabinets

Type A (800 pairs) ..... –

Type B (1,600 pairs).....2

(4) Subscriber Secondary Cables

Approximately 15 km (for reference).

Table 7.6.(4)

Number of Conduits	Amount (km)
4	0.1
9	0.4
12	1.1

7.6.4 Subscriber Primary Cable Network Basic Designing Scheme

(1) Key Map

The Key Map indicates the following:

1) Conduit route
2) Distribution block area
3) Location of cross connection cabinet
4) Telephone demand

(2) Limits of DC Resistance and S.R.E. for Subscriber Line

(3) Primary Cable Design (1980)

(4) Primary Cable Future Plan (1990)