Table 3.4.2-7 P.S.Abandon Occurrence and Subscriber Line Faults (PKG-T6)
Measured on 15 May (2:00 ~ 2:25) 1992

Tel. NO	Occurence	%	Sub. Category	Test Results	Cause of Fault
331-9878	242	48.5	Ordinary	Short CCT	In side house
331-3563	100	20.0	Ordinary	Low ins.	In side house
331-1719	35	7.0	Ordinary	Open CCT	In side house
331-3485	23	4.6	Ordinary	Short CCT	In side house
331-2373	20	4.0	Ordinary	Short CCT	Drop wire
332-5530	16	3.2	Ordinary	Short CCT	In side house
331-0447	7	1.4	Public	-	Tele. set (Reset)
332-1091	6	1.2	Ordinary	Low ins.	In side house
331-7125	5	1.0	Ordinary	Short CCT	In side house
4 x 2 sub	8	1.6			
3 x 2 sub	6	1.2			
2 x 2 sub	4	0.8			
1 x 27 sub	27	5.4			
Total	499	100.0			

APPENDIX

3.8 Traffic and Network Management

3.8.4 Transition of Improving the Call Completion Ratio in Japan

a) Foundation of Study Group (1949)

Telecommunications facilities in japan were seriously damaged by the World War II. As a result, the call completion ratio also decreased. For example, in Tokyo, the call completion ratio for the local services in 1945, just after the war, went down to 31%. In order to improve the situation, a study group was set up in 1949. From 1950 to 1951, the study group proposed some countermeasures such as improvement of operation and setting up necessary regulations. At the same time the study group enforced them. The study group laid a good foundation for improving the call completion ratio.

*) Telephone subscription priority standard:
Considering the necessity of telephones for the public benefits, NTT established the following telephone installation priorities.

1st Priority	Requests made by the government offices and public installation such as local public telephones, new agencies, radio broadcasting stations, transportation companies, and hospitals.
2nd Priority:	Requests whose acceptance would ease congested subscriber lines.
3rd Priority:	Requests left unfilled for a long period of time.
4th Priority:	Requests made by business (for business use)
5th Priority:	Requests made by residential users

b) Incoming Call Only Service

Incoming calls only service to ease subscriber line congestion, which had been proposed by the study group, was put into operation in 1955. It has played an important role in improving the quality of telephone services in the postwar Japan. NTT installed about 100,000 telephones to ease subscriber congestion and provided pilot number service to about 40,000 congested subscriber lines from 1952-1960. The call completion ratio in the 10 largest cities was gradually improved from 55% in 1952 to 66% in 1960. However, it turned out that the decrease in the junction line and facility defects mostly contributed to this gradually improved performance. On the other hand, the called customer busy

rate showed a sight decrease of about 4%. After having reached at its peak in 1959, it tended rather to show less signs of improvement.

*) The incoming calls only service, which is regarded as a kind of leased line service, have directory numbers in the same way as the ordinary telephone service, but cannot originate calls. Customers must pay the ordinary installation charge and monthly basic rate but need not buy any subscriber bond for the incoming calls only service. Sales promotion of the incoming calls only service, together with PBXs and key telephones, had showed satisfactory results in the relief of customer congestion.

c) Foundation of Sub-Committee (1961)

The advisory sub-committee on the quality of telephone services was set up in 1961 under the following circumstances:

i) There was a need for countermeasures for subscriber line congestion, such as collection of congested subscriber line information and provision of pilot number facilities, to decrease the called customer busy rate, which was the main cause of calls not being completed.

ii) The necessity for improving the call completion ratio in large cities caused many discussions among people concerned, prior to the introduction of the long distance STD service which was opened between Tokyo and Nagoya in 1962.

iii) It was necessary to take vigorous repressive countermeasures against the worsening of the call completion ratio in major cities, especially in Tokyo, Osaka and Nagoya, with regards to the plan of new telephone installations.

iv) The advisory sub-committee drew the following conclusion after careful considerations and put forward a proposal for the foundation of a permanent organization which continuously bore a responsibility for taking the countermeasures and observing the results.

d) Establishment of Advisory Committee

Based on the proposal, NTT determined to set up the "Advisory Committee on Quality of Telephone Services" in 1962, which become the permanent organization to push forward the improvement in call completion ratio. As a result of these countermeasures, a considerable improvement in the call completion ratio was gradually achieved. However, some exchange offices could

not attain the target figure because the increase in the rate of subscriber dialing failure offset the decrease in the rate of called customer busy.

e) Administration of STD Call Completion Ratio (1966)

The call completion ratio for the Subscriber Trunk Dialing (STD) service increased together with the increase in the call completion ratio for the local automatic service. However, there was a big difference between these two. Therefore, the following countermeasures were pushed forward by establishing the "Manual of Countermeasures for Improving the STD Call Completion Ratio" in 1965.

f) Provision of the "Manual of Countermeasures for Improving the STD Call Completion Ratio" (1966)

Concerning both local and STD calls, the increase in the subscriber dialing failure rate offset the effect of decreasing in the called customer busy rate. In order to cope with this situation, the "Manual of Countermeasures for Improving the STD Call Completion Ratio" was provided in 1966 to establish a policy of the countermeasures.

According to the outline of the countermeasures for subscriber dialing failures, the following countermeasures should be taken not only to the subscribers with frequent dialing failures, but also to other subscribers whose exchange offices had the high subscriber dialing failure rate, without regard to the result of comprehensive call completion ratio.

*) NTT campaigned through advertisements in the press, on TV, and through posters in buses and subways. "Dialing Instruction for STD Calls". Many pamphlets about the large percentage of "called customer busy" and "incomplete dialing" were distributed to PBX and large users.

g) Establishment of Long Term Targets (1970)

As a result of these countermeasures, the call completion ratio for the local automatic service was also improved from 66% in 1951 to 75% in 1968. The rate for the STD service was also improved from 62% in 1951 to 70% in 1968 in the 10 largest cities. It was considered that a fairly high level of service quality had been attained when compared with the levels in the other countries.

From the fall in 1970, data communication services using the public switched network was opened in Tokyo, Osaka and other cities. In order to provide the various new services, such as data communications, facsimile service, video telephones in the most economical manner, it was decided to build an integrated services network based on electronic switching systems. Continuous efforts for improving the call completion ratio was necessary to offer these new services. Judging from these circumstances, NTT set up a long term target as follows, lasted till the end of 1977, the end of the fifth five-year plan Taking customer satisfaction level, the situations in the other countries and actual values in Japan, the 15th advisory committee decided this target in 1968.

Long Term Target Values

Target value of call completion ratio for the local automatic service	75%
Target value of call completion ratio for the direct long distance calls	70%

The long term target of the call completion ratio was called the "Long term Telephone Call Service Quality Targets", as an index of service administrative activities in 1971.

When an Expert Committee under the Advisory Committee was formed, it determined which countermeasures would be pursued in each year.

i) The highest priority of an administrative target was given to the called customer busy rate because it had a close relationship with customers' dissatisfaction and has a strong influence upon facility usage efficiency. The various existing countermeasures were further promoted, such as sales pilot number services and call waiting service.

ii) It could not be expected that the publics relations alone could attain a great improvement in subscriber dialing failures, which were mainly caused by the subscriber dialing habits. However, from the viewpoint of traffic administration, subscriber dialing failures had the same influence on facility usage efficiency as called customer busy. Therefore, it was necessary to make continuous efforts in forming better subscriber dialing habits by informing the customers on the working principles of telephone facilities and the correct use of telephones.

iii) The call completion ratio had to be improved by promoting the development and popularization of convenient telephone services to meet the needs of customers.

iv) Since there were wide differences in the actual resulting figures among regional telecommunications bureaus, this target value was not considered adequate. Therefore, in order to achieve the efficient administration, an administrative limiting value had to be established for the time being, after due consideration of the situations in every telecommunications bureaus offices.

Based on the above, the "Course of the Countermeasures for Improving the Call Completion Ratio" was established. It has been a guide of the countermeasures for improving the call completion ratio up to today

h) Latest Activities in Administrating Call Completion Ratio

The call completion ratio has been steadily improved by efforts of all NTT organizations with the priority given to the service administration system. As a result, the latest nation-wide mean value was improved from 72.3% in 1973 to 73.9% in 1979. This improvement depended chiefly on the steady improvement in the called customer busy rate, which decreased from 9.6% in 1973 to 8.0 in 1977. On the other hand, the subscriber dialing failures remained at the same level, 16,9% in 1963 and 17.3% in 1979.

Under the changing circumstances and conditions such as the increase in the number of residential telephones, which influence the call completion ratio, a question arose in finding the ideal way of improving the call completion ratio, especially in the subscriber dialing failures.

In 1979, the 18th Advisory Committee discussed the course of the administrating the call completion ratio pursued in the future. The committee reached a conclusion that it would not introduce any change in the existing system of administrating the call completion ratio and service quality targets.

CHAPTER 4 IMPLEMENTATION PLAN

APPENDIX

4.1.3 Ranking of Project

(Cost Unit: Million Baht)

No.	Field	Project Number	Project Name	Work Volume		Total Evaluation	Point A+B+C	Point A+B C+D	Evaluation									
									Fault Repair Field					CCR Field				
									Effect	Point A	Cost	Unit	Point B	Effect	Point C	Cost	Unit	Point D
1	Outside Plant		1) Rehabilitation of Subscriber Line															
		OSP-1	Rearrengement of Distribution Point	(Unit: DPs)	8,250	*A*			2.90%		12							
		OSP-2	Replacement of Drop Wire with Cable	(Unit: Pair-Km)	94,000	*A*	206	197	26.00%	100.0	524	18.5	97.2	5.21%	8.6			
		OSP-3	Renewal Drop Wire	(Unit: Drop Wire)	200,000	*A*	150	146	13.70%	47.4	121	8.8	98.7	2.47%	4.1			
		OSP-4	Replacement of Secondary Cable	(Unit: Pair-Km)	187,000	*B*	115	112	11.20%	38.8	2,006	179.1	73.1	2.02%	3.3			
		OSP-5	Replacement of Primary Cable	(Unit: Pairs)	343,500	*C*	34	33	4.40%	15.2	2,405	546.6	17.8	0.79%	1.3			
			2) Customer Premises															
		OSP-6	Check and Consulting for Customer Premises	(Unit: Subscriber)	187,000	*A*	172	137	10.80%	37.4	24	2.2	99.7	21.10%	34.7			
			3) Replacement of Public Telephone															
		OSP-7	Replacement of Public Telephone Set	(Unit: Set)	6,158	*A*	137	133	10.30%	35.6	205	19.9	97.0	2.64%	4.3			
		OSP-8	Replacement of Protector	(Unit: Protector)	17,500	*B*	106	106	1.80%	6.2	8	4.4	99.3	0.46%	0.8			
2	Switching	S&T-1	Replacement of Line Protector	(Unit: Sub. Line)	855,066	*B*	101	101	3.80%	13.1	313	82.4	87.6		0.0			
	& Transmission	S&T-2	Replacement of XB Switches with SPC Switches	(Unit: Sub. Line)	245,250	*C*	9	9	2.70%	9.3	2,248	664.8	0.0		0.0			
		S&T-3	Replacement of Circuits	(Unit: No.of Circuit)	3,154	*C*					53							
		S&T-4	Installation of Automatic Howling Tone Services	(Unit: Equipment)	239	*C*		100						0.30%	1.9	6	2000	98
		S&T-5	Subscriber Line Accomodation Adjustment			*1) B*		102						0.30%	1.9		0	100
		S&T-6	Introduction of Record Announcement	(Unit: Equipment)	61	*B*		109						1.50%	9.3	1	67	100
		S&T-7	Changing P.D. Timing			*A*		133						5.30%	32.9		0	100
		S&T-8	Improvement of Periodic Maintenance			*B*		119						3.10%	19.3		0	100
		S&T-9	Replacement of PCM System with DTI	(Unit: No.of DTI)	1,144	*C*	0	0	0.00%	0.0	847	847.0	0.0		0.0			
		S&T-10	Increasing Number of Circuit	(Unit: No.of Circuits)	3,295	*A*		145						7.40%	46.0	55	743	99
3	Others	OT-1	Expansion of Subscriber Lines	(Unit: Sub.)	500,000	*2) A*		100						16.10%	100.0	19,127	101447	0
		OT-2	Promotion of Multi-hunting-system			*A*		184						13.60%	84.5		0	100
		OT-3	Promotion of Call-waiting Services			*B*		119						3.10%	19.3		0	100
		OT-4	Dial Consulting Activities (User Campaign)			*A*		152						8.40%	52.2		0	100
		OT-5	Promotion of Automatic Answer Telephone			*B*		112						1.90%	11.8		0	100
		OT-6	Promotion of Call Transfer Service			*C*		104						0.60%	3.7		0	100
		OT-7	Management on Operator's Answer Delay Time			*C*		104						0.60%	3.7		0	100
		OT-8	Introduction of Information Service for Changed Numbe	(Unit: Switch unit)	1	*B*		117						3.10%	19.3	70	2258	98
			Reduction of Test OK						12.40%									
	Total								100%		8,766			100%		19,259		

Note: *1) The point for this project is low; however, it is ranked in the higher priority group according to the effective use of the existing switches.

*2) The point for this project is also low; however, it is ranked in the higher priority group according to the followings. a) High effect of CCR b) High revenue increase effect c) Reduction of the existing waiting applicants.

APPENDIX

4.4 Investment Cost

Estimating procedure for the investment cost of the projects is as follows:

4.4.1 Outside Plant

The investment cost in outside plant section is basically calculated on multiplying the unit cost by quantities. The detail of them are described in Section 2.2 of APPENDIX.

4.4.2 Switching

Investment costs for replacement of the crossbar switch are estimated as follows:

1) Replacement of XB Switch with SPC Switches (Project No. S&T-2)

a) Local Switch

i) Work Volume (R1)

$R1 = Ph\text{-}1B + Ph\text{-}1S$

Ph -1B : Total Number of Replacement of XB Local Switch Capacity in the BMA =234,824 lines.

Ph-1S; Total Number of Replacement of XB Local Switch Capacity in the Surrounding Area = 10,426 lines

$R1 = 245{,}250$ lines

ii) Unit Price (Un)

$Un = Sl + Rx + Rs$

Sl : Estimated Unit Price for New SPC Local Switch = 8,683.545 Baht / Line
(Long Term Plan = 6,955 Baht / Line)

Rx ; Estimated Unit Price for Removal of XB Local switch = 156 Baht / Line
(Long Term Plan = 1,363,636 Baht / Switch unit)

Rs : Estimated Unit Price for Relocating the Subscriber Line = 328 Baht / Line

(Long Term Plan = 0 Baht / Line)

Un = 9,167.545 Baht / Line

iii) Investment Cost = Rl x Un.

b) Tandem Switch (Project No. S&T-3)

- Replacement of XB Tandem Switch in KKM

i) Work Volume (Km)

Km : KKM T1 XB Tandem Switch Capacity = 1,505 circuits

ii) Unit Price

(Installation cost of new SPC tandem switch in KKM T1)
- Switching
St : Estimated Unit Price for New SPC Tandem Switch = 9,838.5 Baht / circuit

- Transmission
Tr : Estimated Unit Price for New Transmission System = 7,084.545 Baht / channel

(Removal cost of XB tandem switch in KKM)
Tc : Estimated Unit Price for Removal of XB Tandem Switch = 89 Baht / circuit

iii) Investment Cost = Ns + Nt + Nx

(Investment cost of new SPC tandem switch in KKM T1)
- Switching Ns = Km x St
- Transmission Nt = Km x Tr

(Investment cost for removal of XB tandem switch in KKM T1)
- Removal of XB tandem switch Nx = Km x Tc

- Increasing number of circuits related to replacement of XB local switch in another area in the BMA

i) Work Volume (Rc)

Rc : Total Number of circuits related to replacement of XB local switch in another area =1,649 circuits

ii) Unit Price

(Installation cost of new SPC tandem switch in another area)
- Switching
St : Estimated Unit Price for New SPC Tandem Switch = 9,838.5 Baht / circuit

- Transmission
Tr : Estimated Unit Price for New Transmission System = 7,084.545 Baht / channel

iii) Investment Cost = Is + It

(Investment cost of new SPC tandem switches in another area)
- Switching IS = Rc x St
- Transmission It = Rc x Tr

2) Increasing Number of Circuits (Project No. S&T-10)

(The necessary number of trunk lines to reduce the traffic congestion)

a) Work Volume (In)

In = Sh + Mt

In : Differences between the necessary and present Number of Trunk Lines for each Final Routes in Phase-1.
Sh : Total Number of Shortage of Out-going and Incoming Trunk Lines of SPC Tandem is 3,041 circuits

Between Tandem and Local = 2,606 circuits
Between Tandem and Tandem = 274 circuits
Between Tandem and TC = 161 circuits

Mt : Total Number of Shortage of MTX Trunk is 254 circuits

Between MTX and Pstn = 165 circuits

Between MTX and Base station = 89 circuit

In = 3,295 circuits

b) Unit Price

- Switching

Ut : Estimated Unit Price for New SPC Switch = 9,838.5 Baht / circuit

- Transmission

Ti : Estimated Unit Price for New Transmission System = 7,084.545 Baht / channel

c) Investment Cost = Iv x Iw

- Switching Iv = In x Ut
- Transmission Iw = In x Ti

3) Others

a) Replacement of Line Protector (Project No. S&T-1)

i) Work Volume

Pr : Total Number of Replacement of Line Protectors is 855,066 Lines

ii) Unit Price (Ul)

Ul : 365.635 Baht / per line

iii) Investment Cost = Pr x Ul

b) Installation of Automatic Howling Tone Service (Project No. S&T-4)

i) Work Volume

H1 : Number of Howler Oscillator in BMA = (Total Number of Lines at the end of FY 1992 / 5,000 Lines per Howler Oscillator) = 1,192,082 lines / 5,000 line = 239 Howler Oscillators

H2 : Number of Howler Trunk in BMA =(Total Number of Lines at the end of FY 1992 / 5,000 Lines per Howler Trunk) x 3 Trunk per 1 System = (1,192,082 lines / 5,000 line) x 3 Trunks = 717 Trunks.

ii) Unit Price (Hu)

Hu = Ho + Ht

Ho : Howler Oscillator Units Price = 5,629 Baht / Oscillator
Ht : Howler Trunk Units Price = 6,654 Baht / Trunk

iii) Investment Cost = (H1 x Ho) + (H2 x Ht)

c) Introduction of Record Announcement (Project No. S&T-6)

i) Work Volume

Ne : Number of Host Switch Units in the BMA (61 Units)

ii) Unit Price

Ur : 12,545 Baht / Unit

iii) Investment Cost = Ne x Ur

d) Introduction of Information Service for Changed Number (Project No. O&T-8)

i) Work Volume

Ai : 1 Switch Unit

ii) Unit Price

A2 : 69,546,000 Baht / Switch Unit

iii) Investment Cost = Ai x A2

4.4.3 Transmission

The investment cost to replace PCM-30 system in the BMA is estimated as follows:

Total cost is calculated by multiplying

The investment cost in transmission section is basically calculated on multiplying unit cost by quantities as in the following.

Tc = Tu x Nc
where
Tc: total investment cost,
Tu : unit cost = 24,6795 Baht/channel
Nc : the number of channels = 34,320 channels.

Note; As the unit price for new transmission system in the previous section, 7,084 Baht/channel is applied. The Study Team, applied 24,685 Baht/channel for the replacement of PCM taking the average route distance and removal cost of the PCM system into consideration.

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