Circuit Requirement for Intergateway Telephone Traffic

Japan, Hong Kong, Malaysia, Philippines,
Thailand, Taiwan, Singapore, and India (for 84~)
UK, Italy, Netherlands, Saudi Arabia, West
Germany, and France (for 87~)

To other countries

MDN ② JKT

①

Sumatra

Other regions
in Indonesia
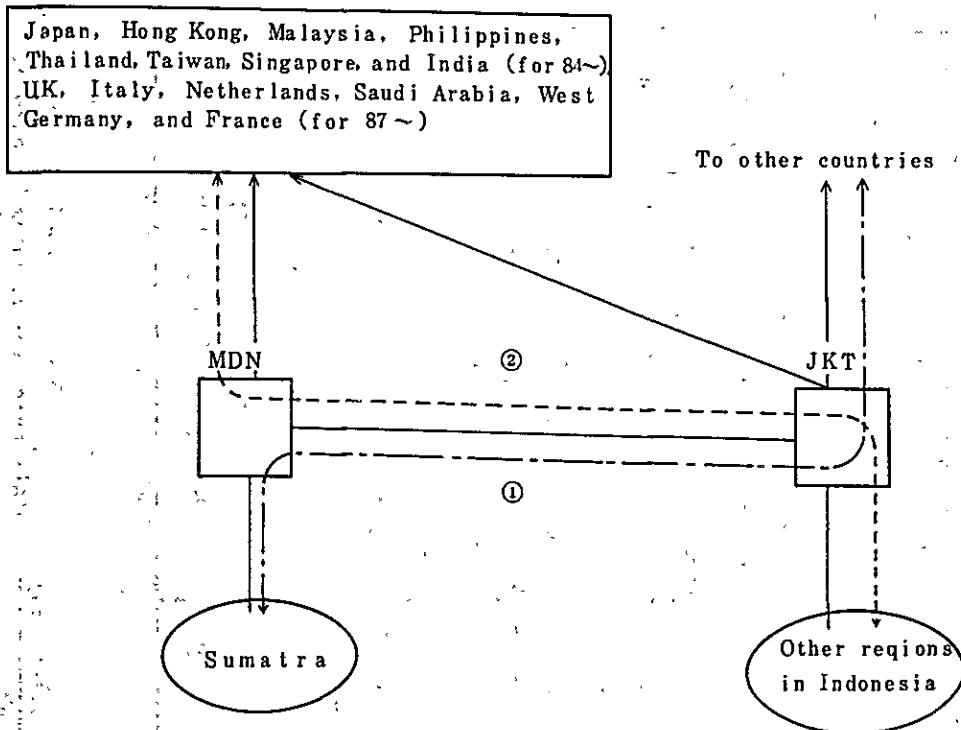
① Originating in Sumatra and terminating in other
countries

Terminating in Sumatra and orginating in other
countries

② Overflow of traffic (via Medan Gateway Office)
originating in other regions in Indonesia and
terminating in the countries shown in the
diagram above enclosed in [   ]

Traffic terminating in other regions in Indonesia
and originating in the countries enclosed in
[   ] via the Medan Gateway Office   } *

Emergency countermeasures

* ② is assumed here to be about 10% of traffic originating in
Sumatra and terminating in the countries enclosed in [   ].

Circuit Requirement for Telephone Intergateway Traffic

	1984	1985	1986	1987	1988	1989	1990	1994	1999	2000
Medan Total ×1,000 min (B)	7,063	9,237	12,444	15,722	20,858	27,398	35,229	65,827	120,864	133,389
Medan to Specified Countries	3,939	6,919	9,362	13,386	17,908	23,550	30,273	57,176	105,362	116,063
Medan to Other Countries (A)	3,124	2,318	3,082	2,336	2,950	3,848	4,956	8,651	15,502	17,326
① = A	3,124	2,318	3,082	2,336	2,950	3,848	4,956	8,651	15,502	17,326
② = B * 0.1	394	692	936	-1,339	1,791	2,355	3,027	5,718	10,536	11,606
Total = ① + ②	3,518	3,010	4,018	3,675	4,741	6,203	7,983	14,369	26,038	28,932
B H Erlang	30.36	25.98	34.68	31.72	40.91	53.53	68.89	124.00	224.7	249.68
Number of circuits	42	37	47	44	54	68	84	160	290	330

Ⓐ : from Appendix 4.4.1.7   Ⓑ = Medan Total − A

$$\text{B H Erlang}_t = \frac{\text{concenteation ratio}(.10) \times \text{holding/charging ratio}(1.35)}{60 \times \text{number of working days per year}(300)} \times \text{total chargeable minutes} \times \text{seasonal factor}(1.15)_t$$

Circuit Requirement for Telex Intergeteway Traffic

	1984	1985	1986	1987	1988	1989	1990	1994	1999	2000
Medan Total Ⓑ	1,945	2,600	3,379	4,299	5,344	6,529	7,851	11,570	16,047	16,878
Medan to Specified Countries Ⓑ	980	2,016	2,639	3,548	4,469	5,455	6,561	9,845	13,681	14,427
Medan to Other Countries Ⓐ	965	584	740	751	875	1,074	1,290	1,725	2,366	2,451
① = A(via JKT)	965	584	740	751	875	1,074	1,290	1,725	2,366	2,451
② = B * 0.1	98	202	264	355	447	546	656	985	1,368	1,443
Total	1,063	786	1,004	1,106	1,322	1,620	1,946	2,710	3,734	3,894
B H Erlang	14.67	10.85	13.86	15.26	18.24	22.36	26.85	37.4	51.53	53.74
Number of circuits	24	19	23	24	28	33	38	50	66	68

Ⓐ : from Appendix 4.5.1.7   Ⓑ= Medan Total − A

$$B\,H\ Erlang = \frac{concenteation\ ratio(.15) \times holding / charging\ ratio(1.35) \times total\ chargeable\ minutes \times seasonal\ factor(1.1)}{60 \times number\ of\ working\ days\ per\ year(270)}$$

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Telephone Minutes

Witel		83	84 9/91	85 10/90	86 11/89	87 12/888	88 13/87	89 14/86	90 15/85	94 17/83	99 19.5/80.5	2000 20/80
Witel I	%	3.7	4.8	5.4	5.9	6.4	7.0	7.5	8.0	9.1	10.5	10.7
	1000 min	1,971	3,287	4,667	6,271	8,381	11,230	14,679	18,790	35,262	65,127	71,435
″ II	%	1.92	2.5	2.7	3.1	3.4	3.6	3.9	4.2	4.7	5.4	5.6
	1000 min	1,023	1,712	2,333	3,295	4,452	5,775	7,633	9,864	18,212	33,494	37,386
″ III	%	1.28	1.7	1.9	2.0	2.2	2.4	2.6	2.8	3.2	3.6	3.7
	1000 min	682	1,164	1,642	2,126	2,881	3,850	5,089	6,576	12,399	22,329	24,702
″ IV	%	83.86	82.0	81.1	80.1	79.3	78.4	77.5	76.6	74.8	72.3	71.5
	1000 min	44,693	56,156	70,092	85,150	103,857	125,781	151,691	179,915	289,848	448,450	477,350
″ V	%	2.29	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.0	2.0	2.0
	1000 min	1,220	1,506	1,901	2,338	2,881	3,369	4,110	4,932	7,749	12,405	13,352
″ VI	%	1.23	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1
	1000 min	655	821	1,037	1,275	1,440	1,764	2,153	2,583	4,262	6,822	7,343
″ VII	%	2.73	2.7	2.6	2.6	2.6	2.6	2.5	2.5	2.4	2.4	2.3
	1000 min	1,454	1,849	2,247	2,763	3,405	4,171	4,893	5,871	9,299	14,886	15,355
″ VIII	%	1.36	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2
	1000 min	72,481	890	1,123	1,381	1,702	2,085	2,544	2,818	4,649	7,443	8,011
″ IX	%	0.90	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8
	1000 min	479	616	777	956	1,047	1,283	1,565	1,879	3,099	4,962	5,340
″ X	%	0.42	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	1000 min	223	273	345	425	523	641	782	939	1,549	2,481	2,670
″ XI	%	0.12	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	1000 min	63	68	86	106	130	160	195	234	387	620	667
″ XII	%	0.19	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	1000 min	101	136	172	212	261	320	391	469	774	1,240	1,335
Grand Total	%	100	100	100	100	100	100	100	100	100	100	100
	1000 min	53,295	68,484	86,427	106,305	130,968	160,436	195,731	234,877	387,498	620,264	667,623

% / 1000 minutes — share

Telephone BHE Classified into Call Types at Gateways

(erl)

Call / Year	Outgoing (Tie Lines)				Incoming (Tie Lines)				
	International Incoming	Call-back Connection	Charge Notice	Total	ISD	CLR	Booking	Information	Total
1984	346.11	133.72	9.26	489.09	108.25	75.33	21.68	0.77	206.03
	40.97	31.94	0.98	73.89	7.81	3.04	5.18	0.08	-16.11
1985	424.42	146.58	12.20	583.2	152.85	93.19	23.77	1.02	270.83
	52.90	32.44	1.44	86.78	15.52	5.79	5.26	0.12	26.69
1986	511.84	160.02	15.82	687.68	207.21	114.95	25.95	1.32	349.43
	70.31	31.51	2.07	103.89	26.16	9.75	5.11	0.17	41.19
1987	617.05	175.53	20.35	812.93	275.21	142.06	28.46	1.69	447.42
	88.58	31.63	2.92	123.13	39.58	15.26	5.13	0.24	60.21
1988	739.46	188.02	25.69	953.17	355.34	175.37	30.49	2.14	563.34
	115.93	36.48	4.03	156.44	55.78	21.94	5.91	0.33	83.96
1989	883.83	199.55	31.57	1,114.95	441.98	214.16	32.36	2.63	691.13
	150.51	42.24	5.38	198.13	75.31	29.86	6.85	0.45	112.47
1990	1,031.38	205.59	37.37	1,274.34	522.19	252.46	33.34	3.11	811.10
	182.01	45.07	6.60	233.68	92.17	37.0	7.89	0.56	137.62
1994	1,671.54	197.95	63.96	1,933.45	904.95	426.23	32.1	5.34	1,368.62
	342.36	52.11	13.10	407.57	185.33	77.61	8.45	1.10	272.49
1999	2,623.38	126.60	106.35	2,856.33	1,490.42	699.13	20.53	8.87	2,218.95
	646.09	42.49	26.19	714.77	367.07	162.45	6.89	2.18	538.59
2000	2,798.34	102.49	114.68	3,015.51	1,592.23	754.34	16.62	9.56	2,372.75
	699.58	38.42	28.67	766.67	398.04	178.10	6.23	2.40	584.77

NOTE

JAKARTA
MEDAN

International Telephone Traffic by Gateway Office and by Service Class

(x 1000)

			1984	1985	1986	1987	1988	1989	1990	1994	1999	2000
Indonesia		minute	68,484	86,427	106,305	130,968	160,436	195,731	234,877	387,498	620,264	667,623
		call	9,551	12,673	16,304	20,921	26,518	33,175	40,707	72,701	126,584	138,511
		minute	61,421	77,190	93,861	115,246	139,578	168,333	199,648	321,671	499,400	534,234
		Ave.minute	7.07	6.77	6.47	6.26	6.05	5.90	5.77	5.33	4.90	4.82
		call	8,691	11,406	14,511	18,410	23,071	28,530	34,601	60,342	101,900	110,809
JAKARTA	I S D	minute	10,955	15,751	21,798	29,126	38,266	48,465	59,160	103,375	170,489	183,666
		call	2,254	3,288	4,618	6,250	8,337	10,699	13,235	24,439	43,053	47,094
	NI OS ND	minute	17,004	20,154	22,746	26,787	30,834	35,663	40,656	57,325	78,973	83,107
		call	1,700	2,015	2,275	2,679	3,083	3,566	4,066	5,732	7,897	8,311
		minute	7,063	9,237	12,444	15,722	20,858	27,398	35,229	65,827	120,864	133,389
		Ave.minute	8.21	7.29	6.94	6.26	6.05	5.90	5.77	5.33	4.90	4.82
		call	860	1,267	1,793	2,511	3,447	4,645	6,106	12,359	24,684	27,702
MEDAN	I S D	minute	571	1,355	2,452	3,973	5,717	7,891	10,440	21,173	41,299	45,916
		call	117	283	520	852	1,246	1,742	2,334	5,005	10,429	11,773
	NI OS ND	minute	2,739	3,064	3,322	3,654	4,607	5,806	7,175	11,741	19,130	20,777
		call	274	306	332	365	461	581	717	1,174	1,913	2,078

Call x OG Ratio X ISD Ratio = ISD calls
ISD call x ISD Charge Min = ISD min.

Appendix 4.8.2-3

Telephone BHE Classified into Call Types at Gateways

(erl)

Call Year	Outgoing (Tie Lines)				ISD	Incoming (Tie Lines)			
	International Incoming	Call-back Connection	Charge Notice	Total		CLR	Booking	Information	Total
1984	346.11	133.72	9.26	489.09	108.25	75.33	21.68	0.77	206.03
	40.97	31.94	0.98	73.89	7.81	3.04	5.18	0.08	16.11
1985	424.42	146.58	12.20	583.20	152.85	93.19	23.77	1.02	270.83
	52.90	32.44	1.44	86.78	15.52	5.79	5.26	0.12	26.69
1986	511.84	160.02	15.82	687.68	207.21	114.95	25.95	1.32	349.43
	70.31	31.51	2.07	103.89	26.16	9.75	5.11	0.17	41.19
1987	617.05	175.53	20.35	812.93	275.21	142.06	28.46	1.69	447.42
	88.58	31.63	2.92	123.13	39.58	15.26	5.13	0.24	60.21
1988	739.46	188.02	25.69	953.17	355.34	175.37	30.49	2.14	563.34
	115.93	36.48	4.03	156.44	55.78	21.94	5.91	0.33	83.96
1989	883.83	199.55	31.57	1,114.95	441.98	214.16	32.36	2.63	691.13
	150.51	42.24	5.38	198.13	75.31	29.86	6.85	0.45	112.47
1990	1,031.38	205.59	37.37	1,274.34	522.19	252.46	33.34	3.11	811.10
	182.01	45.07	6.60	233.68	92.17	37.0	7.89	0.56	137.62
1994	1,671.54	197.95	63.96	1,933.45	904.95	426.23	32.10	5.34	1,368.62
	342.36	52.11	13.10	407.57	185.33	77.61	8.45	1.10	272.49
1999	2,623.38	126.60	106.35	2,856.33	1,490.42	699.13	20.53	8.87	2,218.95
	646.09	42.49	26.19	714.77	367.07	162.45	6.89	2.18	538.59
2000	2,798.34	102.49	114.68	3,015.51	1,592.23	754.34	16.62	9.56	2,372.75
	699.58	38.42	28.67	766.67	398.04	178.10	6.23	2.40	584.77

NOTE JAKARTA
MEDAN

Mean Holding Time (H) of Telephone Cables Classified into Call Types

(Minutes)

Legend (per cell):

T_1	T_2
T_3	

Call Type → Year ↓	International Incoming (T_1 | T_2 / T_3)	Call-Back Connection	Charge Notice	ISD	CLR	Booking	Information	Inter-Gateway
1984 * (Jakarta)	9.07 | 0.5 / 4.79	15 | 3.5 / 9.25	1.5 | 0.5 / 1.0	5.35 | 0.5 / 2.93	13 | 3.0 / 9.5	1.5	2.5	
1984 * (Medan)	10.21 | — / 5.36							
1985 * (Jakarta)	8.77 | 0.5 / 4.64	15 | 3.5 / 9.25	1.5 | 0.5 / 1.0	5.29 | 0.5 / 2.90	13 | 3.0 / 9.5	1.5	2.5	
1985 * (Medan)	9.29 | — / 4.90							
1986 * (Jakarta)	8.47 | 0.5 / 4.49	15 | 3.5 / 9.25	1.5 | 0.5 / 1.0	5.22 | 0.5 / 2.86	13 | 3.0 / 9.5	1.5	2.5	
1986 * (Medan)	— | — / 4.72							
1987	8.26 | 0.5 / 4.38	15 | 3.5 / 9.25	1.5 | 0.5 / 1.0	5.16 | 0.5 / 2.83	13 | 3.0 / 9.5	1.5	2.5	
1988	8.05 | 0.5 / 4.28	15 | 3.5 / 9.25	1.5 | 0.5 / 1.0	5.09 | 0.5 / 2.80	13 | 3.0 / 9.5	1.5	2.5	
1989	7.90 | 0.5 / 4.20	15 | 3.5 / 9.25	1.5 | 0.5 / 1.0	5.03 | 0.5 / 2.77	13 | 3.0 / 9.5	1.5	2.5	
1990	7.77 | 0.5 / 4.14	15 | 3.5 / 9.25	1.5 | 0.5 / 1.0	4.97 | 0.5 / 2.74	13 | 3.0 / 9.5	1.5	2.5	
1994	7.33 | 0.5 / 3.92	15 | 3.5 / 9.25	1.5 | 0.5 / 1.0	4.73 | 0.5 / 2.62	13 | 3.0 / 9.5	1.5	2.5	
1999	6.90 | 0.5 / 3.70	15 | 3.5 / 9.25	1.5 | 0.5 / 1.0	4.46 | 0.5 / 2.48	13 | 3.0 / 9.5	1.5	2.5	
2000	6.82 | 0.5 / 3.66	15 | 3.5 / 9.25	1.5 | 0.5 / 1.0	4.40 | 0.5 / 2.45	13 | 3.0 / 9.5	1.5	2.5	
η	η=0.5	η=0.5	η=0.5	η=0.5	η=0.65			η=0.5

Note 1 * Upper Jakarta, Lower Medan

Note 2 $T_3 = \eta T_1 + (1-\eta) T_2$

T_1: Holding Time of Complete Call
T_2: Holding Time of Incomplete Call
T_3: Mean Holding Time

Number of Telephone Calls Classified into Call Types at Gateways
(including incomplete calls)

x 1,000

Call Year	International Incoming	Call-back connection	Charge Notice	ISD	CLR	Booking	Information	Inter-Gateway
1984	9,473	2,040	1,186	4,508	1,046	2,040	40	762
	937	510	117	234	30	510	4	112
1985	12,204	2,297	1,591	6,576	1,333	2,297	53	636
	1,356	526	117	566	66	526	6	204
1986	15,237	2,457	2,068	9,236	1,610	2,457	69	888
	1,883	511	256	1,040	117	511	9	290
1987	18,962	2,733	2,679	12,500	2,020	2,733	89	746
	2,586	482	365	1,704	191	482	12	428
1988	23,302	2,960	3,426	16,674	2,466	2,960	114	976
	3,481	544	512	2,492	291	544	17	592
1989	28,530	3,138	4,280	21,398	3,072	3,138	143	1,304
	4,645	639	697	3,484	402	639	25	798
1990	34,601	3,334	5,190	26,470	3,691	3,334	173	1,718
	6,106	731	916	4,672	541	731	31	1,050
1994	60,342	3,210	9,051	48,878	6,349	3,210	302	3,246
	12,359	845	1,854	10,010	1,156	845	62	2,146
1999	101,900	2,053	15,285	86,106	10,570	2,053	510	6,328
	24,684	689	3,703	20,858	2,413	689	123	4,300
2000	110,809	1,662	16,621	94,188	11,508	1,662	554	7,190
	27,702	623	4,155	23,546	2,717	623	139	4,816

NOTE JAKARTA
MEDAN

Method of Calculating the Number of Calls Broken Down by Call
Type (Including Incomplete Calls)

1. International Incoming Calls

$$\frac{\text{Number of Calls (total)}}{\text{(Table 3-1)}} \times \frac{\text{Incoming Ratio}}{\text{(Table 3-3)}} \times \frac{1}{\eta(\text{Completion Ratio})}$$

2. Call-back Connection Calls

$$\frac{\text{Number of Non-ISD Calls}}{\text{(Table 3-1 \& 3-2)}} \times \frac{(1 - \text{CLR Ratio})}{\substack{\text{(Appendix} \\ \text{4.8.2-6)}}} \times \frac{1}{\eta}$$

3. Charge Notice Calls

$$\frac{\text{Number of Calls(total)}}{\text{(Table 3-1)}} \times \frac{\text{Outgoing Ratio}}{\text{(Table 3-3)}} \times 0.15 \times \frac{1}{\eta}$$

4. ISD Calls

$$\frac{\text{Number of ISD Calls}}{\text{(Table 3-1 \& 3-2)}} \times \frac{1}{\eta}$$

5. CLR Calls

$$\frac{\text{Number of Non-ISD Calls}}{} \times \frac{\text{CLR Ratio}}{\substack{\text{(Appendix} \\ \text{4.8.2-6)}}} \times \frac{1}{\eta}$$

6. Booking Calls

$$\frac{\text{Number of Non-ISD Calls}}{} \times \frac{(1 - \text{CLR Ratio})}{} \times \frac{1}{1-0.5(\text{Ratio of Cancellation of Calls Booked})}$$

7. Information Calls

$$\frac{\text{Number of Calls (total)}}{} \times \frac{\text{Outgoing Ratio}}{} \times 0.01$$

8. Inter-Gateway Transit Calls

$$\frac{\text{Number of Minutes of ② (Appendix 4.8.1-2)}}{\text{Ave. time per call at Jakarta gateway}} \times \frac{1}{\eta} \ldots \text{Medan}$$
$$\text{(Appendix 4.8.2-2)}$$

$$\frac{\text{Number of Minutes of ① (Appendix 4.8.1-2)}}{\text{Ave. minute per call of Medan gateway}} \times \frac{1}{\eta} \ldots \text{Jakarta}$$
$$\text{(Appendix 4.8.2-2)}$$

Completion Ratio of Each Call Type (η)

(1) International Incoming Calls : $\eta = 0.5$

(2) Call-back Connection Calls : $\eta = 0.5$

(3) Charge Notice Calls : $\eta = 0.5$

(4) ISD Calls : $\eta = 0.5$

(5) CLR Calls : $\eta = 0.65$

(6) Booking Calls : $\eta = 1.0$

(7) Information Calls : $\eta = 1.0$

(8) Inter-Gateway Transit Calls : $\eta = 0.5$

Forecast of CLR Ratio

CLR (combined line and recording) is also called
no-hang-up and is an efficient semiautomatic operation
system. One of the following two conditions must be
met in order to perform CLR operations.

(i) The domestic network has a verification
network permitting operators to verify
calling subscriber telephone Nos. from
the international switchboard.

(ii) The telephone Nos. of calling subscribers
are sent from the domestic network by ANI
or SPC local switch permitting such
telephone Nos. to be displayed on the
international switchboard.

Condition (i) is possible inside the city of
Jakarta. Condition (ii) is the same as the condition
to allow ISD. Some subscribers prefer the semiautomatic
service to avoid language problems even though ISD is
possible. The CLR service is offered to these subscribers.

In 1985, the Jakarta Gateway will have SPC digital
exchanges, and displays will be installed on switchboards,

permitting CLR service to subscribers who can have ISD service. This means that ratio of CLR by the verification network will be decreased with the exception of area where ISD service is available.

ISD service will be offered by the Medan Gateway when it starts operation in 1983, and CLR will also be possible. Appendix 4.8.2-4 (3) shows the transition of CLR ratios in the Jakarta and Medan Gateways based on the foregoing premises.

$$\text{CLR ratio} = \frac{\text{Number of CLR calls}}{\text{Number of non-ISD calls}}$$

The result of forecasting CLR Ratio is described on the following table.

Year	CLR Ratio	
	Jakarta	Medan
1984	0.40	0.07
1985	0.43	0.14
1986	0.46	0.23
1987	0.49	0.34
1988	0.52	0.41
1989	0.56	0.45
1990	0.59	0.49
1994	0.72	0.64
1999	0.87	0.82
2000	0.90	0.85

Forecast of CLR Ratio

Telex Minutes by WITEL

Legend: % (top value) / 1000 minutes (bottom value)
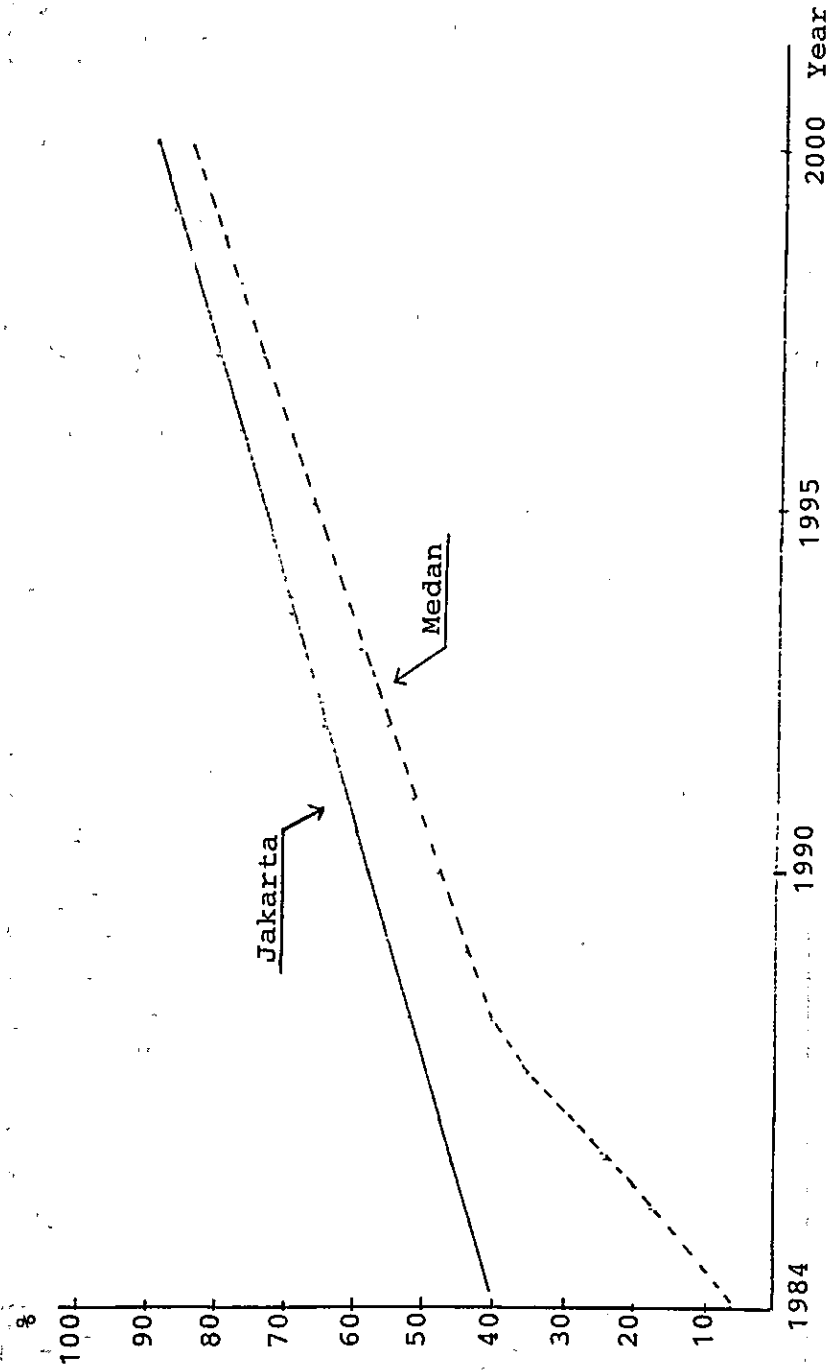
Year / Witel	83	84 7/93	85 8/92	86 9/91	87 10/90	88 11/89	89 12/88	90	94	99	2000
Witel I	4.44 / 1,054	5.9 / 1,639	6.8 / 2,210	7.6 / 2,853	8.5 / 3,654	9.3 / 4,518	10.2 / 5,550	11.0 / 6,643	12.7 / 9,796	14.8 / 13,571	15.3 / 14,346
" II	0.80 / 190	1.1 / 306	1.2 / 390	1.4 / 526	1.5 / 645	1.7 / 826	1.8 / 979	2.0 / 1,208	2.3 / 1,774	2.7 / 2,476	2.7 / 2,532
" III	1.22 / 290	1.2 / 333	1.2 / 390	1.2 / 451	1.2 / 516	1.1 / 534	1.1 / 598	1.1 / 664	1.1 / 848	1.1 / 1,009	1.1 / 1,031
" IV	84.17 / 19,988	82.5 / 22,922	81.7 / 26,558	80.7 / 30,300	79.9 / 34,349	79.0 / 38,377	78.2 / 42,547	77.2 / 46,623	75.5 / 58,235	73.3 / 67,212	72.8 / 68,259
" V	1.51 / 359	1.5 / 417	1.5 / 488	1.5 / 563	1.4 / 602	1.4 / 680	1.4 / 762	1.4 / 846	1.4 / 1,080	1.3 / 1,192	1.3 / 1,219
" VI	0.91 / 216	0.9 / 250	0.9 / 293	0.9 / 338	0.9 / 387	0.9 / 437	0.8 / 435	0.8 / 483	0.8 / 617	0.8 / 734	0.8 / 750
" VII	4.24 / 1,007	4.2 / 1,167	4.1 / 1,333	4.1 / 1,539	4.0 / 1,720	4.0 / 1,943	3.9 / 2,122	3.9 / 2,355	3.7 / 2,854	3.6 / 3,301	3.6 / 3,375
" VIII	1.07 / 254	1.1 / 306	1.0 / 325	1.0 / 375	1.0 / 430	1.0 / 486	1.0 / 544	1.0 / 604	1.0 / 771	0.9 / 825	0.9 / 844
" IX	0.94 / 223	0.9 / 250	0.9 / 293	0.9 / 338	0.9 / 387	0.9 / 437	0.9 / 490	0.9 / 544	0.8 / 617	0.8 / 734	0.8 / 750
" X	0.53 / 126	0.5 / 139	0.5 / 163	0.5 / 188	0.5 / 215	0.5 / 243	0.5 / 272	0.5 / 302	0.5 / 386	0.5 / 458	0.5 / 469
" XI	0.11 / 26	0.1 / 28	0.1 / 33	0.1 / 38	0.1 / 43	0.1 / 49	0.1 / 54	0.1 / 60	0.1 / 77	0.1 / 92	0.1 / 94
" XII	0.06 / 14	0.1 / 28	0.1 / 33	0.1 / 38	0.1 / 43	0.1 / 49	0.1 / 54	0.1 / 60	0.1 / 77	0.1 / 92	0.1 / 94
Grand Total	23,747	27,784	32,507	37,546	42,990	48,579	54,408	60,393	77,133	91,694	93,762

Telex Busy Hour Erlang by Witel

Witel	83	84	85	86	87	88	89	90	94	99	2000
Witel I	15.81	24.59	33.15	42.80	54.81	67.77	83.25	99.65	146.94	203.57	215.19
〃 II	2.85	4.59	5.85	7.89	9.68	12.39	14.69	18.12	26.61	37.14	37.98
〃 III	4.35	5.00	5.85	6.77	7.74	8.01	8.97	9.96	12.72	15.14	15.47
〃 IV	299.82	343.83	398.37	454.50	515.24	575.66	638.21	699.35	873.53	1,008.18	1,023.89
〃 V	5.39	6.26	7.32	8.45	9.03	10.20	11.43	12.69	16.20	17.88	18.29
〃 VI	3.24	3.75	4.40	5.07	5.81	6.56	6.53	7.25	9.26	11.01	11.25
〃 VII	15.11	17.51	20.00	23.09	25.80	29.15	31.83	35.33	42.81	49.52	50.63
〃 VIII	3.81	4.59	4.88	5.63	6.45	7.29	8.16	9.06	11.57	12.38	12.66
〃 IX	3.35	3.75	4.40	5.07	5.81	6.56	7.35	8.16	9.26	11.01	11.25
〃 X	1.89	2.09	2.45	2.82	3.23	3.65	4.08	4.53	5.79	6.87	7.04
〃 XI	0.39	0.42	0.50	0.57	0.65	0.74	0.81	0.90	1.16	1.38	1.41
〃 XII	0.21	0.42	0.50	0.57	0.65	0.74	0.81	0.90	1.16	1.38	1.41

$$BHE_t = \frac{.15 \times 1.35}{60 \times 270} \times T_t \times 1.2$$

BHE_t = Busy Hour Erlang for the planed year

T_t = Chargeable Minutes for the planned year

(See Appendix 4－7－2)

Estimated BHE and Number of Tie Lines by Each Tandem Exchange Group

		1984	1985	1986	1987	1988	1989	1990	1994	2000
MDN WITEL I,II	BHE(E of Y)	29.18	39.00	50.69	64.49	80.16	97.94	117.77	173.55	253.17
	No. of Tie Lines	41	52	65	80	96	115	140	195	277
JKT WITEL III-VI	BHE(E of Y)	358.84	415.94	474.79	537.82	600.43	665.14	729.25	911.71	1068.90
	No. of Tie Lines	384	442	501	565	629	693	758	941	1098
SRB WITEL VII,VIII,IX	BHE(E of Y)	25.85	29.28	33.79	38.06	43.00	47.34	52.55	63.64	74.54
	No. of Tie Lines	37	41	46	51	56	61	67	79	90
UJP WITEL X,XI XII	BHE(E of Y)	2.93	3.45	3.96	4.53	5.13	5.70	6.33	8.11	9.86
	No. of Tie Lines	8	9	10	11	11	12	13	16	18
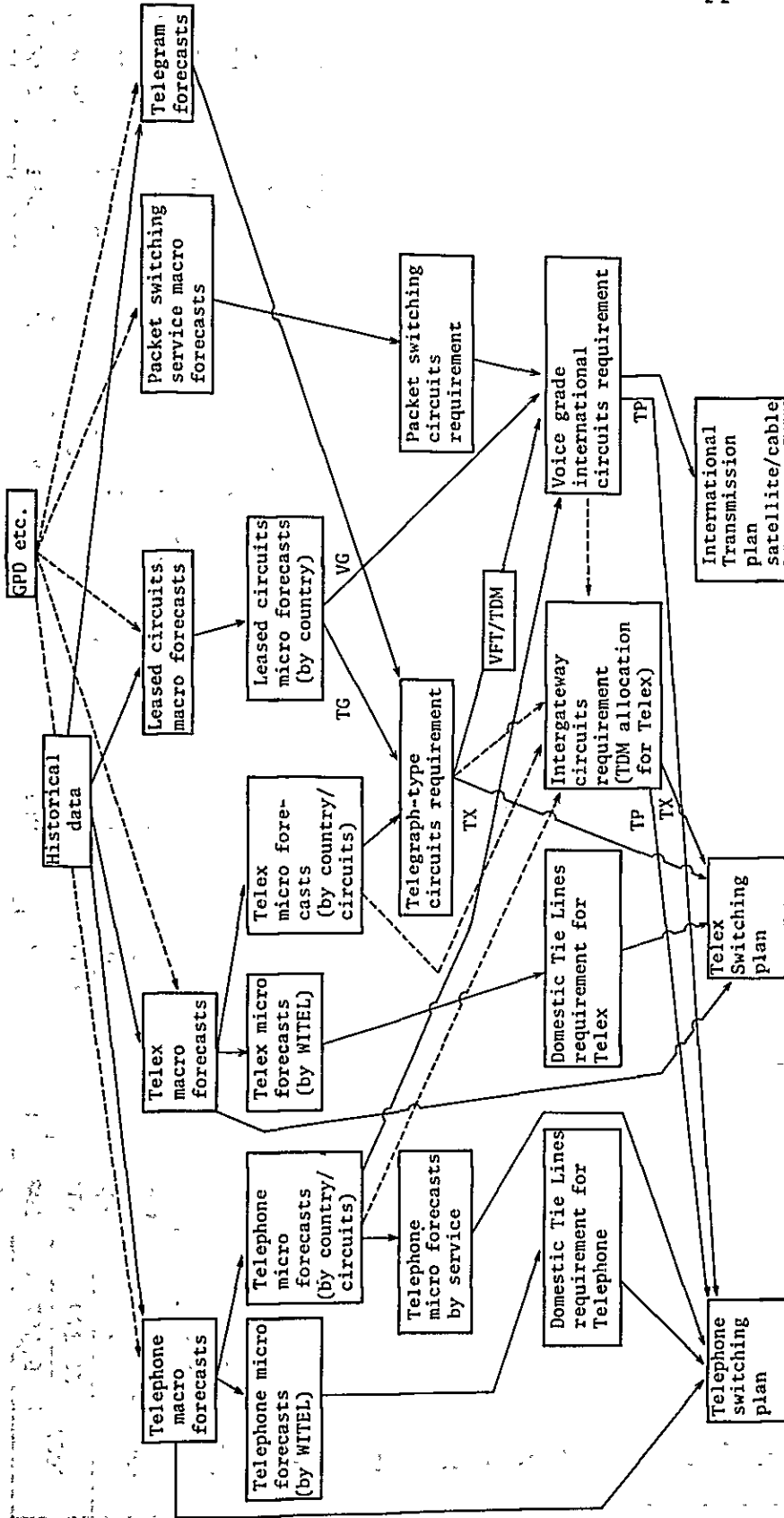
App   Appendix 4.8.2-10   Flow of Circuits and Facilities Plans of this Master Plan

Telephone BHC of Gateways

Year	Int.In-coming	Call-back	Charge Notice	ISD	CLR	Booking	Information	Inter-Gateway Transit	Int. OG. (Call-back)	Int. OG. (CLR)	Σ BHC
1984	3,613	723	463	1,847	397	723	16	254	556	396	8,989
	382	173	49	133	16	173	2	53	133	16	1,130
1985	4,574	792	610	2,635	491	792	20	254	610	491	11,269
	540	175	72	268	31	175	3	82	135	31	1,512
1986	5,700	865	791	3,623	605	865	26	296	666	605	14,042
	745	170	104	457	51	170	4	120	131	51	2,003
1987	7,044	948	1,018	4,862	748	948	34	287	730	748	17,367
	1,011	171	146	699	80	171	5	170	132	80	2,665
1988	8,639	1,016	1,284	6,345	923	1,016	43	380	783	923	21,352
	1,354	197	202	996	116	197	7	231	152	116	3,568
1989	10,522	1,079	1,578	7,978	1,127	1,079	53	503	831	1,127	25,877
	1,792	228	269	1,359	157	228	9	308	176	157	4,683
1990	12,456	1,111	1,868	9,706	1,353	1,111	62	658	856	1,353	30,534
	2,218	244	330	1,713	198	244	11	402	188	198	5,746
1994	21,321	1,070	3,198	17,515	2,645	1,070	107	1,243	824	2,645	51,638
	4,367	282	655	3,587	414	282	22	822	217	414	11,062
1999	35,452	684	5,138	30,049	3,680	684	177	2,250	527	3,680	82,501
	8,731	230	1,310	7,401	855	230	44	1,518	177	855	21,351
2000	38,229	554	5,734	32,967	4,028	554	191	2,753	427	4,028	89,465
	9,557	208	1,433	8,241	951	208	48	1,844	160	951	23,601

Note:

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Number of Calls per Year Broken Down by Call Types
(Including Incomplete Calls)

1. Relationship between Calls and Exchange Operations
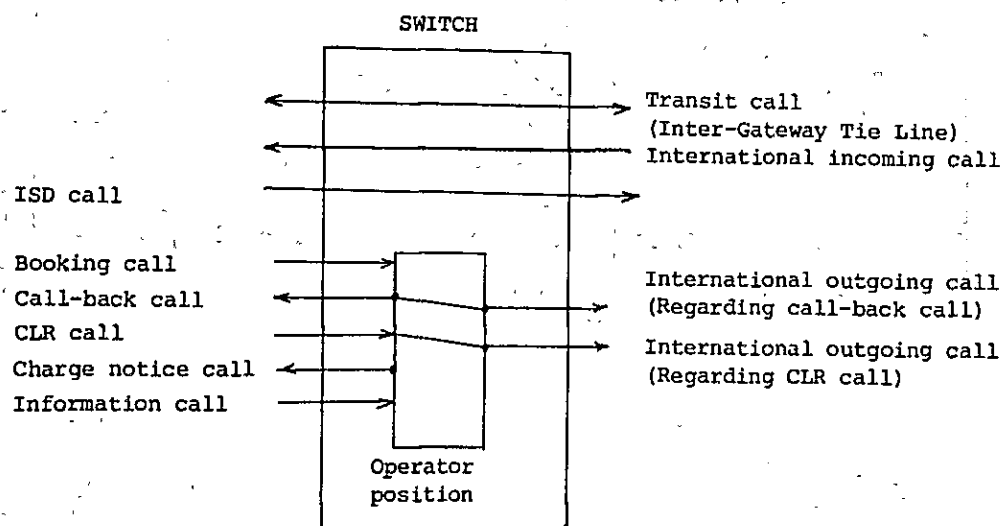
2. Call Types

From the standpoint of exchange operations, calls can be classified into ten categories. The number of telephone calls for these different types can be calculated as shown in the following based on the table "Appendix 4-8-2-3 (1) Number of Telephone Calls Classified into Call Types of Gateway."

$$A_t = \frac{C_t + C_{t=1}}{2}$$

where A_t: Number of calls in plan year

C_t: Number of calls in plan year (Appendix 4-8-2-3(1))

$C_{t=1}$: Number of calls in year following plan year

(Appendix 4-8-2-3(1))

International outgoing calls (regarding call-back calls) have a 0.65 completion ratio and can be calculated as follows:

$$\frac{0.5}{0.65} \text{ x Number of Call-back Calls}$$

3. Appendix 5-2-1-2(2) shows the number of calls per year broken down into call types.

Number of Telephone Calls Classified in Call Types of Gateways
(From the viewpoint of switching machine operation)

Year	International Incoming	Call-back	Charge Notice	ISD	CLR	Booking	Infor-mation	Transit Inter-Gateway	Int.OG (Call-back)	Int. OG (CLR)
1984	10,839	2,168	1,389	5,542	1,190	2,168	47	762	1,669	1,190
	1,147	518	147	400	48	518	5	158	399	48
1985	13,721	2,377	1,830	7,906	1,472	2,377	61	762	1,830	1,472
	1,620	526	217	803	92	526	8	247	405	92
1986	17,100	2,995	2,374	10,868	1,815	2,595	79	888	1,998	1,815
	2,235	511	311	1,372	154	511	11	359	393	154
1987	21,132	2,846	3,053	14,587	2,243	2,846	102	861	2,191	2,243
	3,034	513	439	2,098	241	513	15	510	395	241
1988	25,916	3,049	3,853	19,036	2,769	3,049	129	1,140	2,348	2,769
	4,063	591	605	2,988	347	591	20	695	455	347
1989	31,566	3,236	4,735	23,934	3,382	3,236	158	1,511	2,492	3,382
	5,376	685	807	4,078	472	685	27	924	527	472
1990	37,369	3,334	5,605	29,117	4,060	3,334	187	1,976	2,567	4,060
	6,653	739	989	5,140	595	731	33	1,208	563	595
1994	63,963	3,210	9,594	52,544	7,936	3,210	320	3,733	2,472	7,936
	13,101	845	1,965	10,761	1,243	845	66	2,468	651	1,243
1999	106,355	2,053	15,953	90,147	11,039	2,053	532	6,759	1,581	11,039
	26,193	689	3,929	22,202	2,565	689	131	4,558	531	2,565
2000	114,687	1,662	17,202	98,900	12,083	1,662	573	8,268	1,280	12,083
	28,672	623	4,300	24,723	2,853	623	144	5,538	480	2,853

NOTE: JAKARTA
MEDAN

5.2.2.(4)   KDD Experience for reference

 (a) Abbreviated dialling

   KDD has been providing this service with charge in choice

   i) since 1977, ten months after the introduction of the

   first INTS CT-10 in August 1976.

   The number of subscribers utilizing this service is

   approximately 500. (only 1.7% of total subscriber number)

 (b) Camp-on

   Number of repetition : three

   Intervals   : 30 sec.

 (c) Store-and-forward and Multi-address call

   The rate of Store-and-forward and Multi-address

   call : less than two percent.

KDD's Back Up Plan for Telex Traffic

1. Back Up plan in the case of Two Gateways : Tokyo and Osaka

This plan covers the period 1982 to 1984.
Principles for the planning are as follows:

(i)   Scope of back up : In case of Tokyo exchange failure
                           (not including an emergency like earth-
                           quake)

(ii)   Back up concept on network diagram:
        See Fig. Appendix 5.2.2 (6)-1

(iii)   Effective utilization of normal operating circuits is
        intended and the corredsponding reserved circuits are
        prepared.

(iv)   Back up ratio objective : 30 % (This value comes from one
        which has been achieved with a conventional switch.)

(v)   Switching over time objective : 10 minutes (manually
        operated)

2. The Back Up Plan in the case of Three Gateways

After the completion of the third gateway in Oyama which is
located 70 Km north to Tokyo, telex traffic will be carried by
three gateways with a ratio 2 : 4 : 4 for Osaka : Tokyo : Oyama.

(i)   Scope of back up : Emergency (e.g. earthquake) and
                           exchange failure.

(ii)   The back up ratio objective in this stage is 75%. This
        criteria was set up in cosideration of traffic profile.

(iii)   See Fig. Appendix 5.2.2 (6)-2.

to/from Foreign Countries

Legend:

⬤ Gateway   ▢ Lower Stage Switch   —o〈 Normal Route / Back Up Route   Switch   ⌐¬ Stand by X-bar Switch
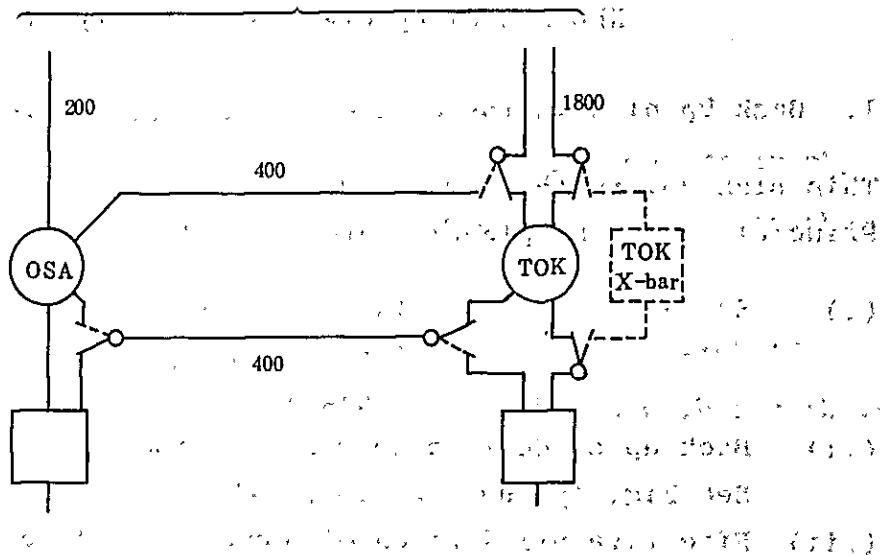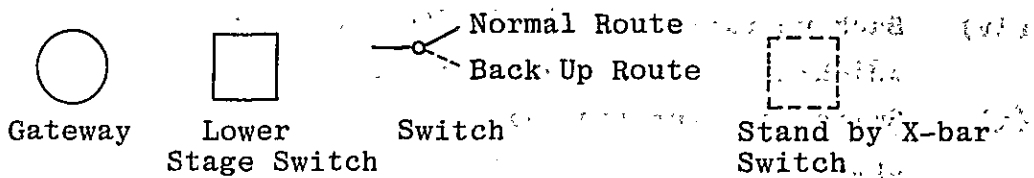
Note:

Numerals indicates the number of circuit.

Fig. Appendix 5.2.2(6)-1 Back Up Concept on Network Diagram
for Two Gateways (1982-1984)
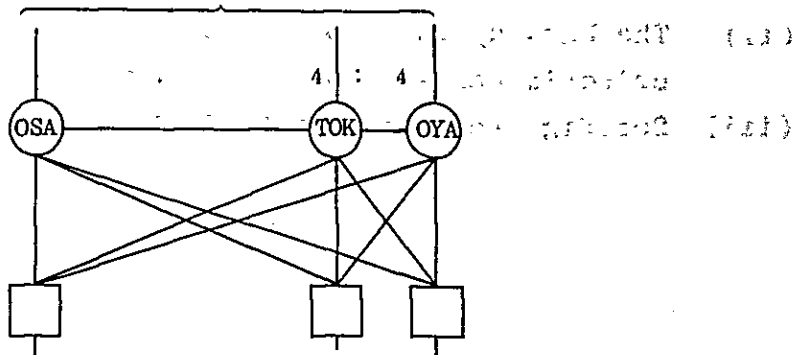
to/from Foreign Countries

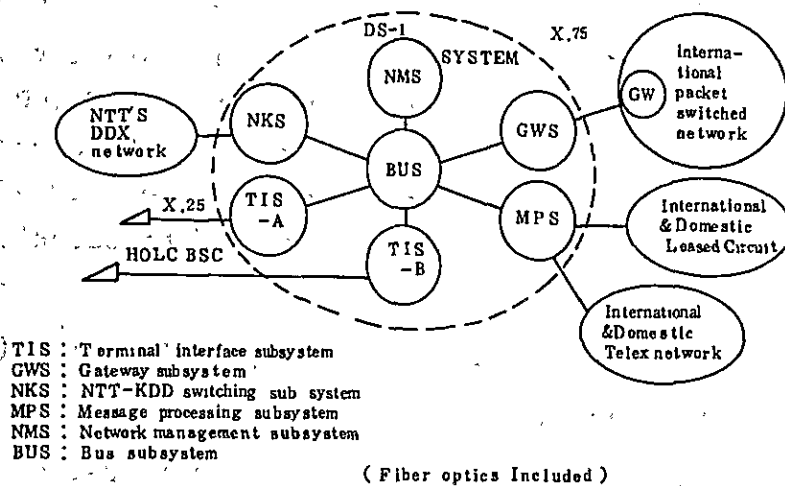Fig. Appendix 5.2.2(6)-2 Back Up Concept on Network
Diagram for Three Gateways

TIS : Terminal interface subsystem
GWS : Gateway subsystem
NKS : NTT-KDD switching sub system
MPS : Message processing subsystem
NMS : Network management subsystem
BUS : Bus subsystem

(Fiber optics Included)

Fig   5. 2. 3.(2)   System Struture of DS—1 *

System

* Data Switching System of KDD

Fill Factor Method

This is a method for examining the circuit capacity of a cable plan. For example, if there is an increase of 100 circuits every year, successively, to the original 100 circuits, on the assumption of the cable circuit capacity of 1200 circuits and the life of 25 years, the fill factor will be calculated as follows;

. Total cable circuit-months for the lifespan of cables (A)

   12 (month) x 25 (year) x 1200 (circuit) = 360,000

. Cable circuit-months unused for the lifespan of cables (B)

   12 (month) x [(1200 - 100) + (1200 - 200) + (1200 - 300)

   + ... + (1200 - 1100)] = 79,200

. Fill Factor = $\dfrac{A - B}{A}$ = $\dfrac{360,000 - 79,200}{360,000}$ = 0.78

The cable circuit capacity will be generally determined for the fill factor to take about 0.7 ∿ 0.8.

Seabed Topography and Geological Features in Indonesia

The plate tectonics theory is now the most remarkable theory in the geophysics field, and is accepted by many geologists. The theory says that a huge continent, which is called Pangea and existed in ancient times (about 300 mil years ago), was divided into such continents as South America, Africa, India, Australia and the Antarctica by force of mantle convection. Then these continents gradually separated away from each other and moved to the present locations. According to this theory, Australia plate separated from the Antarctica plate and went up to the north, and hit the Eurasia plate; the Pacific Ocean and Philippine Sea plates moved to the west; as a result, these plates collided and complicatedly affected each other in the Southeast Asia regions, particularly, in the Indonesia region. A trench is generally formed at the boundary where plates sunk under the continent. (Such boundary is called subduction zone.) Around here, along the continent, islands are formed in one row (island arc) or two rows (double islands arc). In the underground, distortion by subduction and friction between plates accumulate energy to cause volcanic activities and earthquakes.
(Reference: "Tectonics of the Indonesia Region")

Around Indonesia, there can be observed subduction zone mentioned above, islands and trenches formed by the subduction and deep sea parts which are thought to be formed owing to the subduction. They are:

Trench ..... Java Trench, North Sulawesi Trench,
New Guinea Trench

Trough ..... Timor Trough, Ceram Trough

Deep sea ...   Philippine Basin, Banda Basin, Flores Basin,
                Celebes Basin, Savu Basin

Island arc .   Sunda archipelago, Maluku Islands.

    In addition to them, there is the continental shelf which
was a part of the land during the glacial period:

Continental shelf ... Java Sea (central and western parts),
                    , Arafura Sea.

    Thus Indonesia is surrounded by some plates and has compli-
cated structure which is a mixture of; trenches and basins which
can be explained by the plate tectonics theory; and shallow sea
or continental shelves. On the other hand, the geological survey
on the land of Indonesian islands has already been conducted and
the result has been publicized. However, for the seabed, only
the bottom material survey report* on the Java Sea is available.
As for the other regions, data is described dispersedly in charts
only.

    *   Reference: "Underwater Handbook, South China and Japan
                    Sea, by Hydrographer of U.K. Navy", N.P.623.

    The following is a preliminary examination result of charts
and publicized ocean survey reports on each region.

(1) Central eastern part of Java Sea

    A continental shelf, extending from the Malay Peninsula,
·lies in between western and central part of the Java Sea.
The shelf is shallow and covered with sediment. According
to the references, the bottom material is mainly mud, but
mud/sand lie along coast of Java and Kalimantan. At the
end of the shelf, coral reefs lies in a row.

In the eastern part of the Java Sea, the Makassar Strait
and Flores Sea lie. They are 2,000m in depth and are studded
with small islands surrounded by coral reefs. According to
the charts, mud is the main geological feature in this
region, and stones and ooze are seen in some places.

(2) Flores Sea.

The western part is connected to the Java Sea and has
medium depth. The other parts are occupied by more than
2,000m deep basins. The bottom material consists of mud and
partially sand. Although there is few depth measurement
data, the slope is estimated to be steep (on the average,
15°). Many volcanic islands form island arc in the southern
part.

(3) Banda Sea

More than 3,000m deep basins lie in Banda Sea. The
bottom material is mud in many places, and the existence of
stone is reported in about 5,000m deep places. There are
mountains close to the coast. There are many stone beaches
but less sandy beaches. Coral reefs can also be found in
many places.

It is said that an arching subduction zone adjoining
Timor Trough lies in the east of the Banda Sea. Inside
the arch, there lie active volcanic islands.

(4) Molucca Sea and Halmahera Sea

Both seas have complicated seabeds. Eastern parts of
the Molucca Sea is more than 4,000m in depth and has steep
slopes; central western parts are about 2,000m in depth.
According to the charts, materials consist of mainly sand,
but stones, mud and ooze can be seen in some places as well.

There is an active volcanic belt in the east of the Molucca
Sea and in Halmahera Island. The depth of Halmahera Sea is
less than 2,000m. The coastline is formed of coral reefs.

(5) Ceram Sea

The subduction zone beginning from the east of the
Banda Sea continues up to the southern part of the Ceram
Sea. There are partly 5,000m deep seas. Since only a few
data are available, typical material cannot be specified,
but it is reported that bottom materials are clay, mud and
stones.

(6) Arafura Sea

The sea is a part of the shelf of continent including
Australia and New Guinea, so that most of the sea is less
than 200m deep. The bottom material is mainly mud.

(7) Savu Sea

The Savu Sea is a small sea which is surrounded by
such islands as Flores, Sumba and Timor. Insufficient depth
measurement data in charts gives no clear geography. The
depth is over 3,000m. It is thought that the sea was formed
by the activity of Timor Trough subduction. The bottom
material of deep part is mud.

(8) Pacific Ocean in northern Irian Jaya

The slope between the land and sea is practically steep
and goes down to about 3,000m deep bottom in the Pacific
Ocean. There are some faults near the land, and to the north
of them the existence of a subduction zone is known. Although
few depth data is available, it is assumed that the geography
is complicated near the land. The bottom material cannot be
typified owing to few data, but it is considered to be mud.

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Distance between Two Points on the Earth

The distance between two points on the earth will be measured as a great-circle distance, but a cable ship in practice navigates not along the great-circle but by a chart (mercator sailing).

When a submarine cable is laid, therefore, the distance between two points does not generally take the great-circle, and is obtained from meridional parts of the spheroid.

The method is as below;

1. A degree of meridional parts (y) from the equator ($\psi = 0°$) to any latitude is obtained by the following formula:

$$y = \int_0^\psi \frac{a(1 - e^2)}{(1 - e^2 \sin^2\psi)\cos\psi} \cdot d\psi$$

$$\doteqdot \frac{a}{M} \log_{10} \tan(\frac{\pi}{4} + \frac{\psi}{2}) - (ae^2\sin\psi + \frac{a}{3}e^4\sin^3\psi + \frac{a}{5}e^6\sin^5\psi + ..)$$

where a : the line of apsides of the earth, which is represented by the next formula when a longitude 1' on the equator is taken as a unit.

$$a = \frac{180 \times 60}{\pi}$$

M = 0.4342945   Modulus of common logarithms

$$\frac{a}{M} = 7915.704468'$$

$$e = \sqrt{\frac{a^2 - b^2}{a^2}} = 0.0816983 \quad \text{Eccentricity}$$

2. Distance of Sailing Path

a Get a difference between the degree of meridional parts of any

A point ($\psi_1\lambda_1$) and that of any D point ($\psi_2\lambda_2$) on the earth. $(y_D - y_A)/\Delta\psi = PR$

b $DB = \Delta\psi \times \ell \times PR$

     $AB = \Delta\lambda \times \ell$

     where Radius of the parallel $\ell = \dfrac{a \cos\psi_2}{(1 - e^2 \sin^2\psi_0)1/2}$

c $AD = DB/\text{cosec } (A)$

     $A = \tan^{-1} \dfrac{DB}{AB}$

d   Calculation of actual distance of AD obtained by calculating meridional parts.

     The distance of sailing path of AC $= \dfrac{AD}{PR} \times \dfrac{\ell_0}{\ell}$ (Median arc)
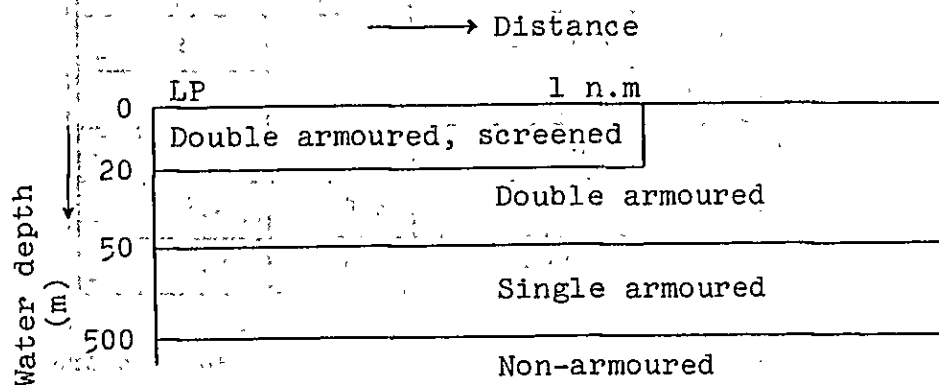
     wherein $\ell_0 = \dfrac{a(1 - e^2)}{(1 - e^2 \sin^2\psi_0)3/2}$:
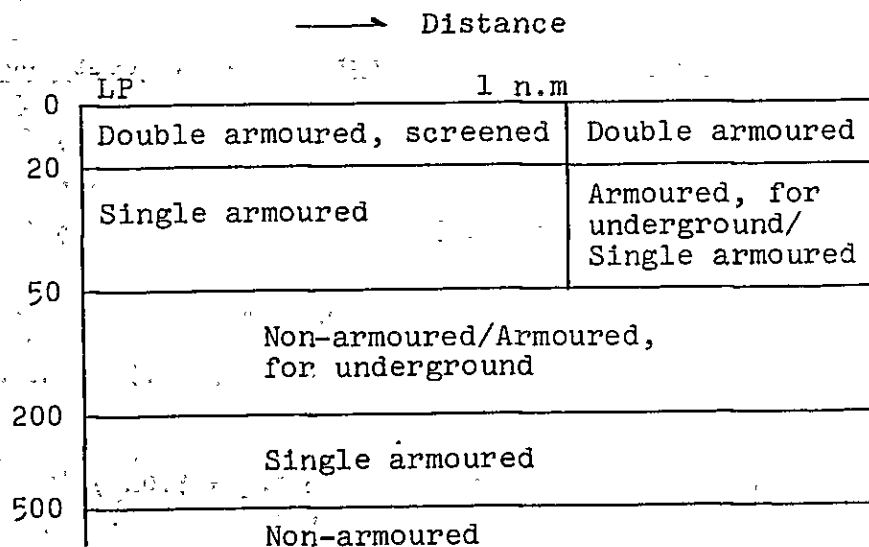
       (Radius of the Meridian)

1. Method of Calculating the Cost of Laying Cable

There is the principle that the kind of a cable depends on a water depth which it is used. Relative costs of cables are shown below.

a Where cables are not laid underground.

```
                          ──────→ Distance
        LP                            1 n.m
    0  ┌─────────────────────────────┐
       │ Double armoured, screened   │
   20  │                             │
       │          Double armoured
   50  ├─────────────────────────────────────
       │          Single armoured
  500  ├─────────────────────────────────────
       │          Non-armoured
```

Water depth (m)

b Where cables are laid underground.

```
                        ──────→ Distance
      LP                        1 n.m
  0  ┌──────────────────────────┬──────────────────┐
     │ Double armoured, screened │ Double armoured  │
 20  ├──────────────────────────┼──────────────────┤
     │                           │ Armoured, for    │
     │ Single armoured           │ underground/     │
     │                           │ Single armoured  │
 50  ├──────────────────────────┴──────────────────┤
     │     Non-armoured/Armoured,                   │
     │     for underground                          │
200  ├──────────────────────────────────────────────
     │     Single armoured                          │
500  ├──────────────────────────────────────────────
     │     Non-armoured                             │
```

Kind of cables and others	Relative costs	
1.0" non-armoured	1.0	
1.0" strengthened jacket	1.3	
1.0" armoured, for underground	2.2	
1.5" non-armoured		1.0
1.5" armoured, for underground		2.3
Single armoured	2.7	1.7
Single armoured, screened	4.7	3.0
Double armoured	5.4	3.5
Double armoured, screened	7.9	5.0

About 45% of variable costs is the cost of cable according to our experience, and 55% of the rest is the cost of repeater, equalizer, laying of cable, and investigation.

Consequently, the calculation of variable costs can be carried out by the following method.

(Example)

Type of cable	Length	Relative cost per n.m
Lightweight	L_1	1
Single armoured	L_2	1.7
Double armoured	L_3	3.5
Double armoured (screened)	L_4	5.0

Total cable length $= L_1 + L_2 + L_3 + L_4$

C = Variable cable cost per unit length using 100% lightweight cable

Variable cable cost
$$= 0.55\,C \cdot L + 0.45CL \times \frac{(L_1 + 1.7L_2 + 3.5L_3 + 5.0L_4)}{L}$$

I. Estimated Number of Personnel

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1994	1999	2000
Directors	3	3	3	3	3	3	4	4	4	5	5	5
Dupty Directors	2	4	5	6	6	6	13	13	13	17	17	17
Managers	13	20	23	34	34	34	44	44	44	58	58	58
Engineers	30	41	59	69	69	79	79	84	89	99	109	119
Technicians	128	169	237	284	286	286	286	316	338	338	338	338
Secletaries	15	22	25	26	26	26	36	41	41	55	55	55
Operatos (Telephone)	500	572	645	715	672	737	820	911	959	1274	1462	1529
Operators (Telegram)	106	126	121	116	111	106	101	96	91	71	46	41
Administrations Officers	78	93	108	118	123	128	128	138	148	148	148	148
Total	875	1050	1226	1371	1330	1405	1511	1647	1727	2065	2238	2310

*) Total number of personnel in 1982
is actual data.

*) Number of personnel for each
classification is estimated.

II. Increase and Decrease of Each Kind of Personnel (Estimate)

	1983	1984	1985	1986	1987	1988	1989	1990	1994	1999	2000	Total
Directors						+1			+1			+2
Dupty Directors	+2	+1	+1			+7			+4			+15
Managers	+7	+3	+11			+10			+14			+45
Engineers	+11	+18	+10		+10		+5	+5	+10	+10	+10	+89
Technicians	+41	+68	+47	+2			+30	+22				+210
Secletaries	+7	+3	+1			+10	+5		+14			+40
Operators (Telephone)	+72	+73	+70	Δ43	+65	+83	+91	+48	+315	+188	+67	+1029
Operators (Telex)	+20	-5	-5	-5	-5	-5	-5	-5	-20	-25	-5	-65
Administrations Officers	+15	+15	+10	+5	+5		+10	+10				+70
Total	+175	+176	+145	Δ41	+75	+106	+136	+80	+338	+173	+72	+1435

III. Personnel Plan of Engineers and Telephone Operators (Estimated)

		1983	1984	1985	1986	1987	1988	1989	1990	1994	1999	2000
Engineers	Telephone, Telex Designe	+5	+5									
	Transmission designe	+3	+3									
	Data Commu. designe	+3	+5	+5								
	Circuit cont. Equip. management		+5	+5								
	Increase duties					+10						
	Future tech. plan							+5	+5			
	Laboratory									+10	+10	+10
	Sub Total	+11	+18	+10		+10		+5	+5	+10	+10	+10
Telephone Operators	Medan Telephone	+50	+51	+3	Δ7	+7	+19	+24	+10	+56	+88	+14
	Increase Tele. call	+22	+22	+67	Δ36	+58	+64	+67	+38	+259	+100	+53
	Sub Total	+72	+73	+70	Δ43	+65	+83	+91	+48	+315	+188	+67

IV. Personnel Plan of Technicians (Estimate)

	1983	1984	1985	1986	1987	1988	1989	1990	1994	1999	2000	Remarks
Medan Tele. Exch	+10	+16					3rd gateway +10	+10				Circuit Cont. & Equip. Main.
" Telex Exch.		+10	+12				+10	+12				"
" IMC	+12						+10					
" Cable Station	+10	+5										Penang-Medan Cable
Jakarta Tele. Exch		+10	+16									J. New Bldg. circuit cont & equip. main.
" Telex Exch		+10	+12									"
" Data Commu.	+5	+5	+5									ICAS, PACKET Main. & Ope.
" New Service	+2		Video conf. +2	Teletex +2			Videotex +2					Bureau FAX, Audio graphic Video Conf.
Jatiluhul INMARSAT	+2	+7										INMARSAT mainte & ope
TDMA		+5										TDMA ope. & mainte.
Total	+41	+68	+47	+2			+32	+22				+212

Calculation of the Number of Persons Required for a Telephone
Office

(1) Calculation procedure

1) Calculate the total traffic a day handled by the operator
(TT) of every office.

2) Divide the total traffic into complete outgoing calls
(CC) and incomplete outgoing calls (IC).

3) Find the CC and IC of 2) respectively according to the
type of handling shown below.

    The type of handling .... Booking

                                     Semi-automatic call

                                     Operator-operator call

                                     Information

                                     Others

4) Calculate the total traffic per hour (TpH) and concen-
trating rate of every hour for a day according to the
type in 3).

5) Repeat the fact-finding study for every office, and
calculate the average handling time (AHT) per man-call
of every kind of handling.

6) Calculate the traffic (Erl) from 4) and 5).

$$Erl = \frac{TpH \times AHT}{3600 \text{ sec.}}$$

7) Calculate the number of operators required for boards
of every hour capable of maintaining the standard of
service which the distribution rate of response time
larger than 11 seconds is smaller than 15%* from the
Erlang C formula.

    *Note: This value depends on the setting value of
service standard of every nation. The distri-
bution rate smaller than 15% is the value of
service standard in KDD.

8) Find the sum (NO) of the numbers of operators found for every kind of handling.

9) Add the number of surplus persons for rest and the number of supervisers, examiners, and traffic control persons to NO.

By the above procedure, the number of persons required for every hour per day will be found.

10) Find the maximum number of persons required (MO) from the hours of the maximum traffic of every work shift (day work, night work, midnight work), and add MO and the number of supplementary persons obtained from the rate of absence of MO.

The above procedure gives the number of persons required a day.

11) Other persons for telephone office

The total number of persons for the whole office will be found by adding managers, persons of general affairs, in-training supplementary persons, and others.

(2) Calculation of the Number of Operators of P.T. INDOSAT's Telephone Office

1) The handled-by-operator calls used the calls in Table 3.3.4, because the rates of outgoing and incoming calls were taken as 50% respectively and the rate of complete outgoing calls was taken as 50% of total number of calls accepted.

2) The calculation was carried out regarding all calls as semiautomatic because the rate of every handling was not known, and used 40% of the number of persons calculated as the number of persons required for supplementary works (cord switchboard, cord desk, recording desk, information desk, charge information desk, etc.).

3) Parameters necessary to obtain the traffic were supposed as follows:

. Concentration rate .... that of July, 1982 in KDD
. Average handling time .... (1) 210 seconds/call
                                 (2) 300 seconds/call

. Rate of distribution
of response time .... smaller than 15% for the
rate of distribution larger
than 11 seconds

4) The superviser was supposed as one per 15 operators.
5) The traffic controller was supposed as two.
6) The rate of operation resulting from rest time was
supposed as 80% and the rate of absence as 5%.
7) The number of operators was calculated for every office
and every average call-hour, and the minimum number of
operators on work of every hour for every classification
only in the first year of the plan was obtained.
8) The number of persons required a day was obtained by
the sum of the numbers of persons who were calculated
for the hour of the maximum concentration rate (00:00~
01:00, 10:00~11:00, and 17:00~18:00) of every of 8 hours
dividing a day.

The number of Telephone Operators required a day

Average handling time : 300 sec/call – 210 sec/call

Year (AHT) / Gateway	1984	1985	1986	1987	1988	1989	1990	1994	1999	2000
	(300)	(300)	(240)	(240)	(240)	(240)	(230)	(220)	(210)	(210)
JAKARTA	407	474	438	496	560	627	665	924	1024	1077
MEDAN	101	104	97	104	123	147	157	213	301	315
TOTAL	508	578	535 (Note)	600	683	774	822	1137	1325	1392

Note: The decrease in the number of personnels is caused from that average handling time is to be shortened by the introduction of CLR, new telephone exchange system and effective production of operators on calls.

Calls handled by operators per day

Average of weekday

Year / Gate-way	1984	1985	1986	1987	1988	1989	1990	1994	1999	2000
JAKARTA	11,193	12,830	14,700	16,963	19,393	22,060	24,647	37,153	43,640	45,817
MEDAN	1,887	2,060	2,217	2,513	3,127	3,857	4,420	6,960	10,847	11,587
TOTAL	13,080	14,890	16,917	19,476	22,520	25,917	29,067	44,113	54,487	57,404

Source:　Non-ISD calls by Telephone Office.
Number of calls handled by operators
is get from CLR calls and Booking/
Call-back calls

Caluculation:　Non-ISD calls/year ÷ 12 months ÷ 25
days

TELEPHONE : JAKARTA

(Calls)

Hour	Concentratio	Maximum	1984	1985	1986	1987	1988	1989	1990	1994	1999	2000
1	2.97	2.97	332	381	437	504	576	655	732	1,103	1,296	1,361
2	1.72		193	221	253	292	334	379	424	639	751	788
3	0.84		94	108	123	142	163	185	207	312	367	385
4	0.52		58	67	76	88	101	115	128	193	227	238
5	0.39		44	50	57	66	76	86	96	145	170	179
6	0.65		73	83	96	110	126	143	160	241	284	298
7	1.22		137	157	179	207	237	269	301	453	532	559
8	1.96		219	251	288	332	380	432	483	728	855	898
9	3.70		414	475	544	628	718	816	912	1,375	1,615	1,695
10	6.37		713	817	936	1,081	1,235	1,405	1,570	2,367	2,779	2,918
11	7.37	7.37	825	946	1,083	1,250	1,429	1,625	1,816	2,738	3,216	3,376
12	6.76		757	867	994	1,147	1,311	1,491	1,666	2,512	2,950	3,097
13	4.24		475	544	623	719	822	935	1,045	1,575	1,850	1,942
14	5.24		586	672	770	889	1,016	1,156	1,292	1,947	2,287	2,400
15	5.78		647	742	850	980	1,121	1,275	1,424	2,147	2,522	2,648
16	6.02		674	772	885	1,021	1,167	1,328	1,484	2,237	2,627	2,758
17	6.29		704	807	925	1,067	1,220	1,388	1,550	2,337	2,745	2,881
18	6.69	6.69	749	858	983	1,135	1,297	1,476	1,649	2,486	2,920	3,065
19	5.05		565	648	742	857	979	1,114	1,244	1,876	2,204	2,313
20	4.02		450	516	591	682	780	887	991	1,494	1,754	1,841
21	4.85		543	622	713	823	941	1,070	1,195	1,802	2,117	2,222
22	5.79		648	743	851	982	1,123	1,277	1,427	2,151	2,527	2,652
23	6.38		714	819	938	1,082	1,237	1,407	1,572	2,370	2,784	2,923
24	5.18		580	665	761	879	1,005	1,143	1,277	1,925	2,260	2,373
			11,193	12,830	14,700	16,963	19,393	22,060	24,647	37,153	43,640	45,817

Concentration ratio is addopted by that of KDD June 1982

TELEPHONE : MEDAN

(Calls : × 1,000)

Hour	Concentratio	Maximum	1984	1985	1986	1987	1988	1989	1990	1994	1999	2000
1	2.97		56	61	66	75	93	115	131	207	322	344
2	1.72		32	35	38	43	54	66	76	120	187	199
3	0.84		16	17	19	21	26	32	37	58	91	97
4	0.52	2.97	10	11	12	13	16	20	23	36	56	60
5	0.39		7	8	9	10	12	15	17	27	42	45
6	0.65		12	13	14	16	20	25	29	45	71	75
7	1.22		23	25	27	31	38	47	54	85	132	141
8	1.96		37	40	43	49	61	76	87	136	213	227
9	3.70		70	76	82	93	116	143	164	258	401	429
10	6.37		120	131	141	160	199	246	282	443	691	738
11	7.37		139	152	163	185	230	284	326	513	799	854
12	6.76		128	139	150	170	211	261	299	470	733	783
13	4.24	7.37	80	87	94	107	133	164	187	295	460	491
14	5.24		99	108	116	132	164	202	232	265	568	607
15	5.78		109	119	128	145	181	223	255	402	627	670
16	6.02		113	124	133	151	188	232	266	419	653	698
17	6.29		119	130	139	158	197	243	278	438	682	729
18	6.69		126	138	148	168	209	258	296	466	726	775
19	5.05		95	104	112	127	158	195	223	351	548	585
20	4.02	6.69	76	81	89	101	126	155	178	280	436	466
21	4.85		92	100	108	122	152	187	214	338	526	562
22	5.79		109	119	128	146	181	223	256	403	628	671
23	6.38		120	131	141	160	200	246	282	444	692	739
24	5.18		98	107	115	130	162	200	229	361	562	600
			1,887	2,060	2,217	2,513	3,127	3,857	4,420	6,960	10,847	11,587

TELEPHONE JKT (Year : 1984)

Appendix 7 · 2 · 1 — (1)

Average Holding Time=300 Sec
t > 11 seconds → 15 %

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
A	Maximum calls in 8hours in a day				332							825								749					
B	ERLANG				27.67							68.75									62.42				
C	OPERATORS required for connection				34								85								79				198
D	Add. OPERATORS for information, etc				14								34								32				
E	SUPERVISORS				3								8								7				
F	TRAFFIC CONTROL				3								6								6				
G	PERSONS required for rest				13								33								31				
H	PERSONS required for absent				3								8								8				
I	TOTAL OPERATORS				70								174								163				407
J	NUMBER of POSITIONS				57								143								133				143

NOTE

$A = \dfrac{\text{number of calls/year}}{12\,\text{months} \div 25\,\text{days}}$

$B = \dfrac{A \times AHT}{3600\,\text{Sec.}}$

$C = $ Erlang C formula

$D = C \times 0\,4$

$E = (C+D) \div 15$

$F = (C+D+E) \div 20$

$G = (C+D+E+F) - 0\,8 - (C+D+E+F)$

$H = (C+D+E+F+\dot{G}) \times 0.05$

$I = C+D+E+F+G+H$

$J = (C+D) \times 1.2$

— 250 —

TELEPHONE　　　JKT　　　(Year: 1985)

Average Holding Time=300 Sec　t > 11 seconds → 15

		1 … 7	8 … 16	17 … 23	
A	Maximum calls in 8 hours in a day	381	946	858	
B	ERLANG	31.75	78.83	71.5	
C	OPERATORS required for connection	44	97	89	
D	Add. OPERATORS for information, etc	18	39	36	
E	SUPERVISORS	4	9	8	
F	TRAFFIC CONTROL	3	7	7	
G	PERSONS required for rest	17	38	35	
H	PERSONS required for absent	4	10	9	
I	TOTAL OPERATORS	91	200	183	474
J	NUMBER of POSITIONS	74	163	150	163

NOTE:

$A = $ number of calls/year $\div$ 12 months $\div$ 25 days

$B = \dfrac{A \times AHT}{3600\ \text{Sec.}}$

$C = $ Erlang C formula

$D = C \times 0.4$

$E = (C+D) \div 15$

$F = (C+D+E) \div 20$

$G = (C+D+E+F) \div 0.8 - (C+D+E+F)$

$H = (C+D+E+F+G) \times 0.05$

$I = C+D+E+F+G+H$

$J = (C+D) \times 1.2$

TELEPHONE   JKT   (Year: 1986)   { Average Holding Time = 240 Sec   t > 11 seconds → 15 %

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
A	Maximum calls in 8 hours in a day			437							1,083									983					
B	ERLANG			29 13							72 20									65 53					
C	OPERATORS required for connection			41							90									82					
D	Add. OPERATORS for information, etc			16							36									33					
E	SUPERVISORS			4							8									8					
F	TRAFFIC CONTROL			3							7									6					
G	PERSONS required for rest			16							35									32					
H	PERSONS required for absent			4							9									8					
I	TOTAL OPERATORS			84							185									169				438	
J	NUMBER of POSITIONS			69							151									138				151	

NOTE:

A = number of calls/year ÷ 12months ÷ 25days

$B = \dfrac{A \times AHT}{3600\,Sec.}$

C = Erlang C formula

D = C × 0.4

E = (C+D) - 15

F = (C+D+E) ÷ 20

G = (C+D+E+F) ÷ 0.8 - (C+D+E+F)

H = (C+D+E+F+G) × 0 05

I = C+D+E+F+G+H

J = (C+D) × 1.2

TELEPHONE _____ JKT _____ (Year: 1987)

Average Holding Time=240 Sec
(t) >11 seconds → ...15 %

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
A	Maximum calls in 8 hours in a day				504							1,250							1,135					
B	ERLANG				33.6							83.33									75.67			
C	OPERATORS required for connection				46							102									93			
D	Add. OPERATORS for information, etc				18							41									37			
E	SUPERVISORS				4							10									9			
F	TRAFFIC CONTROL				3							8									7			
G	PERSONS required for rest				18							40									36			
H	PERSONS required for absent				5							10									9			
I	TOTAL OPERATORS				95							210									191			196
J	NUMBER of POSITIONS				77							171									156			171

NOTE:

$A = $ number of calls/year $\div$ 12months $\div$ 25 days

$B = \dfrac{A \times AHT}{3600\ Sec.}$

$C = $ Erlang C formula

$D = C \times 0.4$

$E = (C+D) - 15$

$F = (C+D+E) \div 20$

$G = (C+D+E+F) \div 0.8 - (C+D+E+F)$

$H = (C+D+E+F+G) \times 0.05$

$I = C+D+E+F+G+H$

$J = (C+D) \times 1.2$

TELEPHONE JKT (Year : 1988)

{ Average Holding Time=240 Sec
  t > 11 seconds → 15 % }

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
A	Maximum calls in 8 hours in a day				576							1,429								1,297				
B	ERLANG				38.40								95 27								86 47			
C	OPERATORS required for connection				52							115								105				
D	Add. OPERATORS for information, etc				21								46								42			
E	SUPERVISORS				5								11							10				
F	TRAFFIC CONTROL				4								9							8				
G	PERSONS required for rest				20								45							41				
H	PERSONS required for absent				5								11							10				
I	TOTAL OPERATORS				107								237								216		560		
J	NUMBER of POSITIONS				87								193								176		193		

NOTE.

$A = \dfrac{\text{number of calls/year}}{12\ \text{months} \div 25\ \text{days}}$

$B = \dfrac{A \times AHT}{3600\ \text{Sec}}$

$C = $ Erlang C formula

$D = C \times 0.4$

$E = (C + D) \div 15$

$F = (C + D + E) \div 20$

$G = (C + D + E + F) \div 0.8 - (C + D + E + F)$

$H = (C + D + E + F + G) \times 0.05$

$I = C + D + E + F + G + H$

$J = (C + D) \times 1.2$

TELEPHONE   JKT   (Year: 1989)

{ Average Holding Time=240 Sec, t > 11 seconds → 15% }

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
A	Maximum calls in 8 hours in a day			655								1,625								1,476				
B	ERLANG				43.67							108.33									98.40				
C	OPERATORS required for connection				58								129								118				
D	Add. OPERATORS for Information, etc				23								52								47				
E	SUPERVISORS				5								12								11				
F	TRAFFIC CONTROL				4								10								9				
G	PERSONS required for rest				23								51								46				
H	PERSONS required for absent				6								13								12				
I	TOTAL OPERATORS				119								265								243			627	
J	NUMBER of POSITIONS				97								217								198			217	

NOTE		
A = number of calls/year ÷ 12months ÷ 25 days	D = C × 0.4	G = (C+D+E+F) ÷ 0.8 — (C+D+E+F)
B = A×AHT / 3600 Sec	E = (C+D) ÷ 15	H = (C+D+E+F+G) × 0.05
C = Erlang C formula	F = (C+D+E) ÷ 20	I = C+D+E+F+G+H
		J = (C+D) × 1.2

TELEPHONE　　　　JKT　　　　(Year: 1990)

(Average Holding Time =230 Sec, $t > 11$ seconds → 15 u_0)

		4	11–12	19–20
A	Maximum calls in 8 hours in a day	732	1,816	1,649
B	ERLANG	46 77	116.02	105 35
C	OPERATORS required for connection	61	137	125
D	Add. OPERATORS for information, etc	24	55	50
E	SUPERVISORS	6	13	12
F	TRAFFIC CONTROL	5	10	9
G	PERSONS required for rest	24	54	49
H	PERSONS required for absent	6	13	12
I	TOTAL OPERATORS	126	282	257
J	NUMBER of POSITIONS	102	230	210

NOTE

$A = \dfrac{\text{number of calls/year}}{\div 12\text{months} \div 25 \text{ days}}$

$B = \dfrac{A \times AHT}{3600 \text{ Sec.}}$

$C = $ Erlang C formula

$D = C \times 0.4$

$E = (C+D) \div 15$

$F = (C+D+E) \div 20$

$G = (C+D+E+F) \div 0\ 8 \sim (C+D+E+F)$

$H = (C+D+E+F+G) \times 0.05$

$I = C+D+E+F+G+H$

$J = (C+D) \times 12$

TELEPHONE　　　　JKT　　　(Year: 1994)　　　{ Average Holding Time=220 Sec t>11 seconds → 15 % }

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
A	Maximum calls in 8 hours in a day				1,103							2,738									2,486				
B	ERLANG				67.41							167.32									151.92				
C	OPERATORS required for connection				84							191									174				
D	Add. OPERATORS for information, etc				34							76									70				
E	SUPERVISORS				8							18									16				
F	TRAFFIC CONTROL				6							14									13				
G	PERSONS required for rest				33							75									68				
H	PERSONS required for absent				8							19									17				
I	TOTAL OPERATORS				173							393									358			924	
J	NUMBER of POSITIONS				141							321									292			321	

NOTE

$A = \dfrac{\text{number of calls/year}}{12\text{months} \div 25\,\text{days}}$

$B = \dfrac{A \times AHT}{3600\,\text{Sec}}$

$C = \text{Erlang C formula}$

$D = C \times 0.4$

$E = (C+D) \div 15$

$F = (C+D+E) \div 20$

$G = (C+D+E+F) \div 0.8 - (C+D+E+F)$

$H = (C+D+E+F+G) \times 0.05$

$I = C+D+E+F+G+H$

$J = (C+D) \times 1.2$

TELEPHONE JKT (Year: 1999)

(Average Holding Time = 210 Sec
t > 11 seconds → 15 %)

		2–10	11–18	19–23	Total
A	Maximum calls in 8 hours in a day	1,296	3,216	2,920	
B	ERLANG	75.60	187.60	170.33	
C	OPERATORS required for connection	92	212	191	
D	Add. OPERATORS for information, etc	37	85	78	
E	SUPERVISORS	9	20	18	
F	TRAFFIC CONTROL	7	16	14	
G	PERSONS required for rest	36	83	76	
H	PERSONS required for absent	9	21	19	
I	TOTAL OPERATORS	189	436	399	1,024
J	NUMBER of POSITIONS	155	356	326	356

NOTE

$A = $ number of calls/year $\div$ 12months $\div$ 25 days

$B = \dfrac{A \times AHT}{3600\,Sec.}$

$C = $ Erlang C formula

$D = C \times 0.4$

$E = (C+D) \div 15$

$F = (C+D+E) \div 20$

$G = (C+D+E+F) \div 0.8 - (C+D+E+F)$

$H = (C+D+E+F+G) \times 0.05$

$I = C+D+E+F+G+H$

$J = (C+D) \times 1.2$

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TELEPHONE　　　　JKT　　　　(Year: 2000)

{ Average Holding Time=210 Sec
  t > 11 seconds → 15 % }

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
A	Maximum calls in 8 hours in a day			1,361									3,376							3,065				
B	ERLANG				79.39								199.93								178.79			
C	OPERATORS required for connection			97									224								202			
D	Add. OPERATORS for information, etc			39								90									81			
E	SUPERVISORS			9									21								19			
F	TRAFFIC CONTROL			7									17								15			
G	PERSONS required for rest			38									88								79			
H	PERSONS required for absent			10									22								20			
I	TOTAL OPERATORS			200									461								416		1,077	
J	NUMBER of POSITIONS			136									376								283		376	

NOTE

A = number of calls/year ÷ 12months—25 days

$B = \dfrac{A \times AHT}{3600\,Sec.}$

C = Erlang C formula

D = C × 0.4

E = (C+D) ÷ 15

F = (C+D+E) ÷ 20

G = (C+D+E+F) - 08 - (C+D+E+F)

H = (C+D+E+F+G) × 0.05

I = C+D+E+F+G+H

J = (C+D) × 1.2

TELEPHONE   MDN   (Year : 1984)

{ Average Holding Time=300 Sec
  t > 11 seconds → 15 % }

		1 2 3 4	5 6 7 8 9 10 11 12	13 14 15 16 17 18 19 20 21	22 23
A	Maximum calls in 8 hours in a day	56	139	126	
B	ERLANG	4 67	11. 58	10 50	
C	OPERATORS required for connection	11	20	18	
D	Add. OPERATORS for information, etc	4	8	7	
E	SUPERVISORS	1	2	2	
F	TRAFFIC CONTROL	1	1	1	
G	PERSONS required for rest	4	8	7	
H	PERSONS required for absent	1	2	2	
I	TOTAL OPERATORS	23	41	37	101
J	NUMBER of POSITIONS	18	34	30	34

NOTE:

$A = \dfrac{\text{number of calls/year}}{\div 12\text{months} \div 25\text{ days}}$

$B = \dfrac{A \times AHT}{3600 \text{ Sec.}}$

$C = $ Erlang C formula

$D = C \times 0.4$

$E = (C+D) \div 15$

$F = (C+D+E) \div 20$

$G = (C+D+E+F) \div 0 8 - (C+D+E+F)$

$H = (C+D+E+F+G) \times 0.05$

$I = C+D+E+F+G+H$

$J = (C+D) \times 1.2$

TELEPHONE　　MDN　　(Year: 1985)　　Average Holding Time=300 Sec, t>11 seconds → 15%

		1	2 3 4 5	6 7 8	9 10 11 12	13 14 15 16	17 18 19 20 21	22 23	
A	Maximum calls in 8 hours in a day		61		152		138		
B	ERLANG		5.08		12.67		11.50		
C	OPERATORS required for connection		11		21		19		
D	Add. OPERATORS for information, etc		4		8		8		
E	SUPERVISORS		1		2		2		
F	TRAFFIC CONTROL		1		2		1		
G	PERSONS required for rest		4		8		7		
H	PERSONS required for absent		1		2		2		
I	TOTAL OPERATORS		22		43		39		104
J	NUMBER of POSITIONS		18		35		32		35

NOTE:

$A = $ number of calls/year $\div$ 12months $\div$ 25 days

$B = \dfrac{A \times AHT}{3600\ Sec.}$

$C = $ Erlang C formula

$D = C \times 0.1$

$E = (C+D) \div 15$

$F = (C+D+E) \div 20$

$G = (C+D+E+F) \div 0.8 - (C+D+E+F)$

$H = (C+D+E+F+G) \times 0.05$

$I = C+D+E+F+G+H$

$J = (C+D) \times 1.2$

TELEPHONE   MDN   (Year: 1986)

Average Holding Time = 240 Sec
{ t > 11 seconds — 15 %

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
A	Maximum calls in 8 hours in a day			66								163								148				
B	ERLANG				4 40							10.87								9.87				
C	OPERATORS required for connection			10								19								18				
D	Add. OPERATORS for information, etc			4								8								7				
E	SUPERVISORS			1								2								2				
F	TRAFFIC CONTROL			1								1								1				
G	PERSONS required for rest			4								7								7				
H	PERSONS required for absent			1								2								2				
I	TOTAL OPERATORS			21								39								37			97	
J	NUMBER of POSITIONS			17								32								30			32	

NOTE:

A = number of calls/year ÷ 12months ÷ 25 days

$B = \dfrac{A \times AHT}{3600 \, Sec.}$

C = Erlang C formula

D = C × 0.4

E = (C+D) ÷ 15

F = (C+D+E) ÷ 20

G = (C+D+E+F) ÷ 0.8 − (C+D+E+F)

H = (C+D+E+F+G) × 0.05

I = C+D+E+F+G+H

J = (C+D) × 1.2

TELEPHONE _____ MDN _____ (Year: 1987)   ⎧ Average Holding Time = 240 Sec
⎩ (t > 11 seconds → 15 %)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
A	Maximum calls in 8 hours in a day			75								185									168				
B	ERLANG			5.00									12.33									11.20			
C	OPERATORS required for connection			11									21									19			
D	Add. OPERATORS for information, etc			4									8									8			
E	SUPERVISORS			1									2									2			
F	TRAFFIC CONTROL			1									2									1			
G	PERSONS required for rest			4									8									7			
H	PERSONS required for absent			1									2									2			
I	TOTAL OPERATORS			22									13									39		104	
J	NUMBER of POSITIONS			18									35									32		35	

NOTE:

A = number of calls/year ÷ 12months−25 days

$B = \dfrac{A \times AHT}{3600\ Sec.}$

C = Erlang C formula

D = C × 0.4

E = (C + D) ÷ 15

F = (C + D + E) ÷ 20

G = (C + D + E + F) ÷ 0.8 − (C + D + E + F)

H = (C + D + E + F + G) × 0.05

I = C + D + E + F + G + H

J = (C + D) × 12

TELEPHONE   MDN   (Year: 1988)

$\left\{\begin{array}{l}\text{Average Holding Time} = 240 \text{ Sec} \\ t > 11 \text{ seconds} \quad \rightarrow \quad 15\ \%\end{array}\right.$

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
A	Maximum calls in 8 hours in a day				93								230								209				
B	ERLANG				6.20								15.33								13.93				
C	OPERATORS required for connection				13								24								23				
D	Add. OPERATORS for information, etc				5								10								9				
E	SUPERVISORS				1								2								2				
F	TRAFFIC CONTROL				1								2								2				
G	PERSONS required for rest				5								9								9				
H	PERSONS required for absent				1								2								2				
I	TOTAL OPERATORS				27								49								47			123	
J	NUMBER of POSITIONS				22								40								39			40	

NOTE:

A = number of calls/year ÷ 12months ÷ 25 days

$B = \dfrac{A \times AHT}{3600 \text{ Sec.}}$

C = Erlang C formula

D = C × 0.4

E = (C+D) ÷ 15

F = (C+D+E) ÷ 20

G = (C+D+E+F) ÷ 0.8 − (C+D+E+F)

H = (C+D+E+F+G) × 0.05

I = C+D+E+F+G+H

J = (C+D) × 1.2

TELEPHONE   MDN   (Year: 1989)

Average Holding Time=240 Sec, t>11 seconds 15%

Appendix 7·2·1-06

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
A	Maximum calls in 8 hours in a day				115								284								258			
B	ERLANG				7.67								18.93								17.20			
C	OPERATORS required for connection				15								29								27			
D	Add. OPERATORS for information, etc				6								12								11			
E	SUPERVISORS				1								3								3			
F	TRAFFIC CONTROL				1								2								2			
G	PERSONS required for rest				6								11								11			
H	PERSONS required for absent				1								3								3			
I	TOTAL OPERATORS				31								60								56		147	
J	NUMBER of POSITIONS				25								49								45		49	

NOTE:

A = number of calls/year ÷ 12months ÷ 25 days

$B = \frac{A \times AHT}{3600\ Sec.}$

C - Erlang C formula

$D = C \times 0.4$

$E = (C+D) \div 15$

$F = (C+D+E) \div 20$

$G = (C+D+E+F) \div 0.8 - (C+D+E+F)$

$H = (C+D+E+F+G) \times 0.05$

$I = C+D+E+F+G+H$

$J = (C+D) \times 1.2$

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TELEPHONE MDN (Year: 1990)

{ Average Holding Time=230 Sec, t > 11 seconds → 15 % }

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
A	Maximum calls in 8 hours in a day			131								326									296			
B	ERLANG				8.37								20.83							18.91				
C	OPERATORS required for connection				16							31									29			
D	Add. OPERATORS for information, etc				6								12								12			
E	SUPERVISORS				1								3								3			
F	TRAFFIC CONTROL				1								2								2			
G	PERSONS required for rest				6								12								11			
H	PERSONS required for absent				2								3								3			
I	TOTAL OPERATORS			33								64									60		157	
J	NUMBER of POSITIONS			27								52									49		52	

NOTE:

A = number of calls/year ÷ 12months ÷ 25 days

$B = \dfrac{A \times AHT}{3,600 \text{ Sec.}}$

C = Erlang C formula

D = C × 0.4

E = (C+D) ÷ 15

F = (C+D+E) ÷ 20

G = (C+D+E+F) ÷ 0.8 − (C+D+E+F)

H = (C+D+E+F+G) × 0.05

I = C+D+E+F+G+H

J = (C+D) × 1.2

TELEPHONE __ MDN __ (Year: 1994)   { Average Holding Time = 220 Sec, $t > 11$ seconds → 15 % }

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
A	Maximum calls in 8 hours in a day			207								513								466					
B	ERLANG			12 65								31 35								28.48					
C	OPERATORS required for connection			21								43								40					
D	Add. OPERATORS for information, etc			8								17								16					
E	SUPERVISORS			2								4								4					
F	TRAFFIC CONTROL			2								3								3					
G	PERSONS required for rest			8								17								16					
H	PERSONS required for absent			2								4								4					
I	TOTAL OPERATORS			43								88								82		213			
J	NUMBER of POSITIONS			35								72								67		72			

NOTE

$A = \dfrac{\text{number of calls/year}}{12\text{months} \div 25\text{ days}}$

$B = \dfrac{A \times AHT}{3600\,\text{Sec.}}$

$C =$ Erlang C formula

$D = C \times 0.4$

$E = (C+D) \div 15$

$F = (C+D+E) \div 20$

$G = (C+D+E+F) - 0.8 - (C+D+E+F) \times 0.05$

$H = (C+D+E+F+G) \times 0.05$

$I = C+D+E+F+G+H$

$J = (C+D) \times 1.2$

TELEPHONE MDN (Year: 1999)

{ Average Holding Time = 210 Sec
(t > 11 seconds → 15 "b"

		3-4		11-12		19-20		23
A	Maximum calls in 8 hours in a day	322		799		726		
B	ERLANG	18.78		46.61		42.35		
C	OPERATORS required for connection	29		61		56		
D	Add. OPERATORS for information, etc	12		24		22		
E	SUPERVISORS	3		6		6		
F	TRAFFIC CONTROL	2		5		4		
G	PERSONS required for rest	11		24		22		
H	PERSONS required for absent	3		6		5		
I	TOTAL OPERATORS	60		126		115		301
J	NUMBER of POSITIONS	49		102		94		102

NOTE:

A = number of calls/year ÷ 12 months ÷ 25 days

$B = \dfrac{A \times AHT}{3600\ Sec}$

C = Erlang C formula

$D = C \times 0.4$

$E = (C + D) \div 15$

$F = (C + D + E) \div 20$

$G = (C + D + E + F) - 0.8 - (C + D + E + F)$

$H = (C + D + E + F + G) \times 0.05$

$I = C + D + E + F + G + H$

$J = (C + D) \times 1.2$

TELEPHONE   MDN   (Year: 2000)   {Average Holding Time=210 Sec, t > 11 seconds → 15 %}

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
A	Maximum calls in 8 hours in a day			344								854								775				
B	ERLANG			20.07								49.82								45.21				
C	OPERATORS required for connection			30								64								59				
D	Add. OPERATORS for information, etc			12								26								24				
E	SUPERVISORS			3								6								6				
F	TRAFFIC CONTROL			2								5								4				
G	PERSONS required for rest			12								25								23				
H	PERSONS required for absent			3								6								6				
I	TOTAL OPERATORS			62								132								121				315
J	NUMBER of POSITIONS			50								108								99				108

NOTE:

A = number of calls/year ÷ 12 months ÷ 25 days

$B = \dfrac{A \times AHT}{3600 \text{ Sec}}$

C = Erlang C formula

$D = C \times 0.4$

$E = (C+D) \div 15$

$F = (C+D+E) \div 20$

$G = (C+D+E+F) - 0.8 - (C+D+E+F)$

$H = (C+D+E+F+G) \times 0.05$

$I = C+D+E+F+G+H$

$J = (C+D) \times 12$

Calculation of the Number of Switchboards

The number of switchboards was calculated on the following basis:

1) The minimum number of persons at work for the maximum concerntration rate a day was taken from Table 8.2.1 as the basic data.

2) The minimum number of persons at work is namely the minimum number of switchboards required.

3) The number of switchboards required in every fiscal year was found by adding the value of d) considered as the total number of preparatory seats to the minimum number of switchboards required in consideration of the following items.

    a) the minimum number of switchboards required
    b) the number of switchboards for OJT of new persons (5% of a)
    c) the number of preparatory seats required for switch-board failure, repair work, regular inspection, etc. (1% of a)
    d) the number of preparatory seats resulting from the increase of traffic for special events - Christmas, year-end, New Year, etc. (20% of a)

Number of Switchboard

1. Average handling time: 300 sec/call – 210 sec/call

Year (AHT) / Gateway	1984 (300)	1985 (300)	1986 (240)	1987 (240)	1988 (240)	1989 (240)	1990 (230)	1994 (220)	1999 (210)	2000 (210)
JAKARTA	143	163	151	171	193	217	230	321	356	376
MEDAN	34	35	32	35	40	49	52	72	102	108
TOTAL	177	198	183	206	233	266	282	393	458	484

Plan for Automation of Telex Call

Year	Destination Country
* 1983	Andorra, Belize, Gibraltar, Khmer, Macao, Malta, Mauritius, American-Samoa, Sierra Leone, Turks and Caicos Is., Anguilla, Burundi, Muscat(Oman), Nepal (14)
1984	Afghanistan, Albania, Cook Is., Malta Mongolia, Western-Samoa (6)
1985	Falkland Is., Laos, Yemen PDR (3)
1986	Comoro Is., Ghana, Guinea, Rwanda (4)
1987	Affars & Iaasa, Bolivia, China PR., Greenland, Guyana, Shipsore, Tortolla Vietnam (8)

*For reference; because countries in this year have been operated as full-automatic between KDD and those countries.

INDOSAT/JAKARTA

PERUMTEL/JAKARTA

OVERSEAS

SWITCHING POSITION

P.T. INDOSAT'S
MEDAN/JAKARTA TIE LINE

INDOSAT/MEDAN

PERUMTEL/MEDAN

OVERSEAS

SUBSCRIBERS in WITELL II

———— AFTER OPENING MEDAN GATEWAY (FUTURE)

- - - - BEFORE   "   (PRESENT)

———— AUTOMATIC CALL
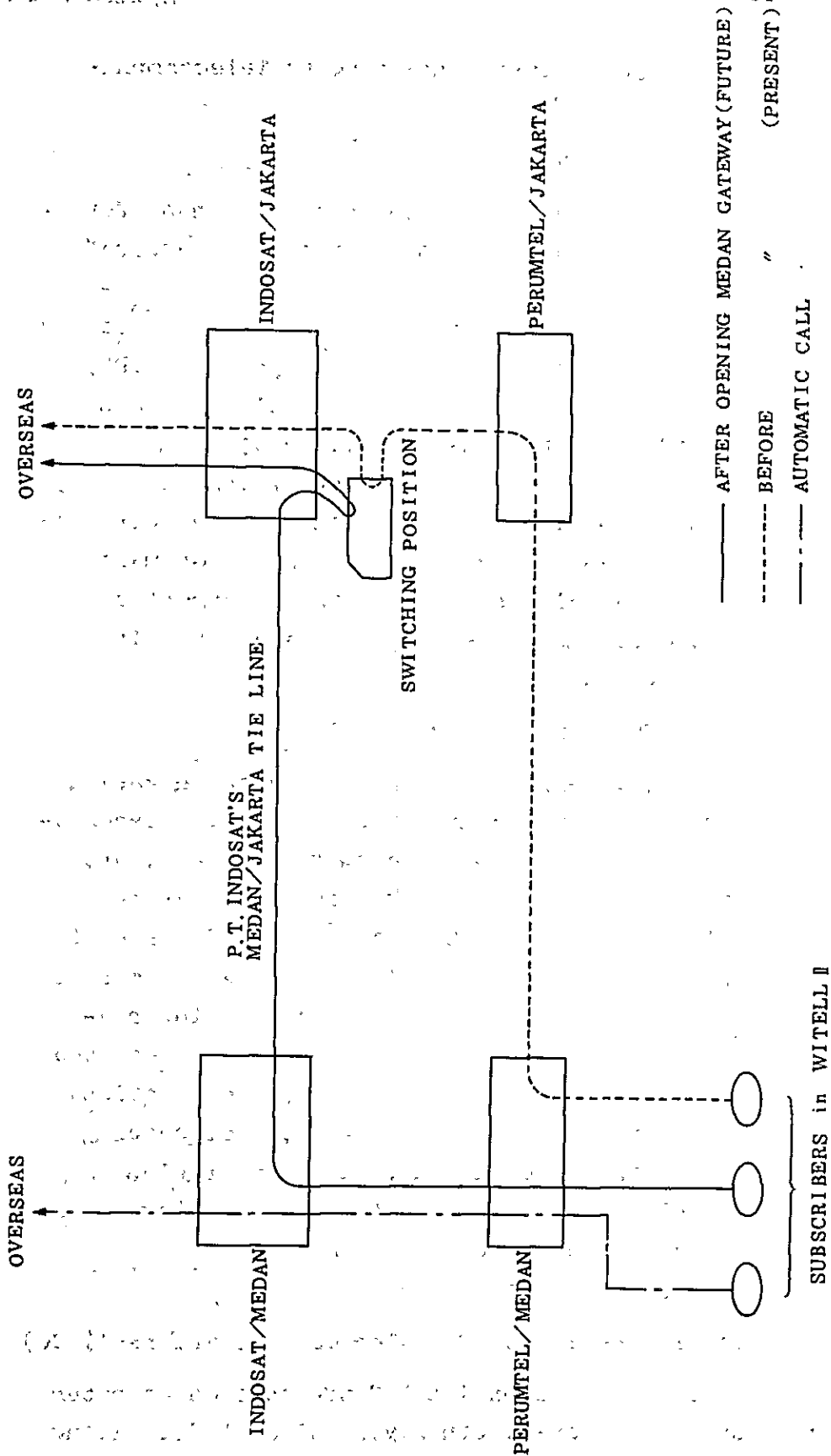
Appendix 7.2.1.9   ROUTING for MANUAL TELEX CALL ORIGINATING
from SOBSCRIBERS in WITEL I. II

International Organizations Relating to Telecommuni-
cations

(1) Council of Europe (CE)

It is noticable that CE adopted the "Agreement for
protection of private data in its automatic processing"
in September, 1980 as the activity in information pro-
cessing and electric communication fields, and established
the principle of trunk distributing frame problem (TDF)
in a local level taking the initiative. This agreement
of CE has the effect of the law of ratification countries.
CE has the mass media committee as internal organization,
which is examining the international side of free circula-
tion of information and the role of the nation on mass
media in its first special committee, the electronics
media in its second, and wire-broadcast and satellite
broadcast in its third.

(2) International Chamber of Commerce (ICC)

It raised the international data circulation working
group to the status of the computer processing, telecommu-
nications, and information policy committee (CTIP), and
established the telecommunication working group as the
substructure in April, 1981. CTIP sets the influence of
international data circulation in international commerce,
relation between multinational enterprises and interna-
tional data circulation, etc. to the central subject, and
establishes an ad hoc working group for the international
data circulation problem of developing nations, showing
strong concern on the international data circulation
problem. The telecomunication working group is investiga-
ting "the liberalization of utilization of tele-
communications" as the present theme.

(3) International Council for Computer Communications (ICCC)

It has held the international Conference on Computer
Communications: ICCC every other year since 1972, aiming

to the promotion of scientific research, development and
application of computer communications. The first
Conference in 1972 received financial help from the
National Science Foundation (NSF) in U.S.A.

Interest in investigating the Asian area in the
Council has grown since 1980; the work of making the draft
is has been in progress with the Asian Committee, since
the beginning of 1981, toward fulfilling the idea of an
Asian workshop. The purpose of this workshop would be to
select a concrete theme from problems in the computer
communication field, and to discuss it.

ICCC stands on the telecomunications side in the
computer communication field.

(4) International Federation for Information Processing
    (IFIP)

This is a non-profit international research body to
develop and promote general information processing.

The World Computer Congress held every third year is
its largest activity; the 8th Congress was under the joint
auspices of Japan (Tokyo) and Australia (Melbourne) in
1980. IFIP has 8 technical committees (TC) for every field
of information processing, each of which is making a special
study. TC 6 has a share in investigating data communica-
tions and includes three working groups - international
packet switching (WG 6.1), local computer networks (WG 6.4),
and international message systems (WG 6.5). WG 6.5 made a
recommendation concerning the operation of computer base
message service, international data circulation, and the
principle of telecommunication charges. IFIP stands on
the computer side in the computer communication field.

(5) International Organization for Standardization (ISO)

ISO is admitted to participate the Administration
Conference of ITU as an observer, and also participates
in the investigating activities of CCITT, because it is
required to cooperate with ITU concerning the technical

standard of telecommunication equipment. The activity
of the special committee TC 97 (electronic computer and
information processing) of ISO is in close relation to the
telecommunications field. TC 97 includes 16 sectional
committees and is establishing bases for standardization
in each subject of the character set for text communication
(SC2), communications protocol, interface with public net-
works (SC 6, SC 16), etc. Each standardizing work results
in the international standard through the approval of the
board of directors of ISO.

(6) International Press Telecommunications Council (IPTC)

This is studying computer and telecommunications
technologies related to the promotion of international
news exchange, and achieving requests relating to tele-
communications of the international press field through
approaching international institutions, including the
Administration of every nation and ITU.

It will participate in meetings and the like of
CCITT in the capacity of an observer of ITU. When the
general meeting of CCITT in 1976 considered the proposal
of abolishing the international press telegraph charge
system because of the remarkable decline of the rate of
use and more unprofitable trend, IPTC asserted that it
is improper to abolish the telegraph for the press in the
third world, where telex is not widely used, and managed
to block the proposal by the approval of telecommunication
authorities of the third.world participating the general
meeting. IPTC has three technological committees, and
the introduction of the special press charge system for
press bulletin services, etc. and the problems involved
in satellite communications, are noticeable among its
recent activities.

(7) International Telecommunication Users Group (INTUG)

INTUG researches the need of international telecommuni-
cations users, and reflects these to the policy decision-

makers of the Telecommunications Administration of every
nation, international institutions, etc.

INTUG is proposing to CCITT, etc. in the capacity
of observer of ITU. Because of its particularly strong
concern about telecommunications charges, it sent
delegates to the CCITT.SG III meeting in September, 1981,
and discussed and proposed concrete recommendations on
the principle of charges for new and special services,
including leased telephone and telegraph circuits,
international digital data transmission equipment, network
services, and public data networks.

(8) Organization for Economic Cooperation and Development
(OECD)

The activity in the telecommunication field is
carried out by the working group on information, computer
and communication policy: ICCP being the substructure of
the committee of science and technology policy (CSTP).
The main projects of ICCP are international data circula-
tion, data network policy, economic analysis of informa-
tion activity, government and information policy, technolo-
gical information transfer to developing nations, brittleness
in computer society, the influence of microelectronics
on production and employment, etc. It adopted the "guide-
line for the protection of privacy and international
circulation of individual data" in September, 1980. It is
presently advancing the investigation of non-individual
data in the problem of international data circulation.

(9) Pacific Telecommunications Council (PTC)

PTC is concerned with the exchange of information, opinion,
etc. about telecommunications in the Pacific area,
highlighting common problems in the area, and, on the
other hand, clarifying peculiar problems of long- and
short-terms through the promotion of exchange of opinions
and requests by holding meetings and seminars.

One of the main activities of PTC is the Pacific
Telecommunications Conference (PTC), which has been held
three times so far. (The first and second were held before
PTC acquired a juridical status.)

PTC gathered about 400 participants from 26 nations
to PTC' 81 held in January, 1981, which showed again the
diversity of telecommunications problems in the Pacific
area, and, characteristic alloy tried to comprehend and
evaluate telecommunications from the standpoint of users
and regional needs, and emphasizing consideration for
developing nations and isolated islands.

(10) United Nations Educational, Scientific and Cultural
Organization (UNESCO)

For UNESCO Telecommunications problems is one link
in the chain of communication problems. The agency's
activity began to be noticeable early in the 1970s, and
particularly the adoption of mass media declaration and
movement in the processing which that was adopted clarified
the idea of new worldwide information order. On the
other hand, UNESCO encouraged the formation of an inter-
national committee to study communication problems (alias
MacBride Committee'), and the final report (many voices,
one world) presented by the committee became the form of
the general frame of a systematic approach to a new world-
wide information order. This has led to the fulfillment
of the physical side by an infrastructure, thereafter
advanced through the International Programme for the
Development of Communication (IPDC) established in UNESCO
in 1980.

(11) Asia-Pacific Telecommunity (APT)

This permanent institution has a character as follows:
it is convinced of the necessity that balanced development
of telecommunications business in the ESCAP area keeps
pace with its economical and social development,

it considers necessary the cooperation of present future
detailed plan and operation of telecommunications business
in the area in the light of present rapid development of
telecommunications and realization of an Asian telecommuni-
cations network in the area,

it recognizes the necessity of establishing the conference
to dissolve the telecommunications problems possible to be
corrected locally, and

it aims to co-ordinate or inter-relate the plans and
operations of domestic telecommunications organizations
in the area.

(12) Conference of European Postal and Telecommunications
     Administration (CEPT)

     CEPT's aims are to keep close cooperation among the
Administrations of post and telecommunications of
European nations, and strives for the adjustment and prac-
tical improvement of their administrative business. It
consists of local administrative unions, general conference,
special committees, working groups and a secretariat
established in 1959. Resolution of the general conference
imply recommendation to the Administration of every nation.

REFERENCE TO FINANCIAL PLAN

Revenues

	1980	1981	1982~
Telephone	O	O	O
Telex	×	×	O
Telegram	×	×	O
Television	O	O	O
AVD	O	O	O
LC-TG	×	×	O
Local line (telegrraph line to PERUMTEL)	O	O	×
New Services			
Bureau Fax	×	×	O
Packet Switching	×	×	O 85
Return from shared capital contribution			
INTELSAT	×	×	O 83
TDMA Reference Station fee	×	×	O 84

Method of Calculation of Revenues from Services

In this plan, estimated revenue of each service is obtained by multiplying the unit charge by the production estimate of the service. The production estimates of individual services are shown in Table A-11-1-1, and the calculation procedures for unit charges and their results are shown below and Table A-11-1-2/3 respectively.

1. International Telephone

    The unit charge per minute was calculated by taking the average of total revenues for 1979, 1980 and 1981, divided by the total number of minutes shown in the POSTEL ANNUAL REPORT 1981.

2. International Telex

    The unit charge per minute was calculated by taking the average of total revenues for 1980 and 1981, divided by the total number of minutes shown in the POSTEL ANNUAL REPORT 1981.

3. International Telegram

    The unit charge per message was calculated by the same method as 2. above.

4. Leased Circuit

    a) The telegraph circuit revenue was calculated by multiplying Rp 1,562,500/ch (the rate per annum for a 50 Band circuit) by the estimated number of circuits, on the assumption that all circuits are 50 Bands/Full speed.

    b) The voice grade circuit revenue was calculated by multiplying Rp 4,678,500/ch by the estimated number of circuits

5. TV Transmission

    The transmission revenue was calculated by multiplying Rp 1,843,750 (weighted average charge per transmission) by the total number of minutes of transmission of the planned year divided by 80 on the assumption that one transmission is approximately 80 minutes.

6. Packet Exchange Service
   a) The basis for the calculation of packet exchange service
      charges is shown in Appendix 11.1.1.
   b) The estimated revenue was calculated on the assumption,
      that the service unit charge in Indonesia is R_P 120/minute
      (connection charge) and R_p 7.0/segment (transmission
      charge), which were deduced from the average of charges of
      the four nations given, because many obscure points exist
      in the calculation of revenue for the period projected.
      About a half of the above will become INDOSAT's revenue.
      (The other half goes to foreign administrations.)

7. Maritime Satellite Telecommunication Service
   a) The method of service charge calculation is similar to
      a) of 5.
   b) The calculation method for revenue is similar to b) of 5.
      The service unit charges were assumed to be R_p 5,600 for
      telephone and R_p 3,000 for telex.

8. Bureau Facsimile
   The calculation method for revenues from Bureau Facsimile is
   similar to b) of 5.
   The service unit charges for Bureau Facsimile were assumed
   to be R_p 6,200/sheet.

Table A-11-1-1 Production Forecast (Outgoing + Incoming)

	1983	1984	1985	1986	1987	1988	1989
Int'l Telephone (10³ minutes)	53,295	68,484	86,429	106,305	130,968	160,436	195,731
Int'l telex (10³ minutes)	23,747	27,784	32,507	37,546	42,990	48,579	54,408
Leased circuit/AVD (circuits)	18	23	29	34	40	46	52
Leased circuit/TTY (circuits)	136	144	150	156	161	165	168
Telegram (10³ messages)	378	331	291	256	225	199	177
Television Trans. (minutes)	4024	4413	4802	5192	5581	5970	6360
Packet Switching (10⁶ segments)	0	0	4	39	65	106	156
(10³ minutes)	0	0	133	337	757	1378	2091
Bureau Fax (pages)	550	1380	3024	5530	8398	11322	14333

Table A-11-1-2   Unit Charge of Each Service   for this plan

Telephone

	1977	1978	1979	1980	1981
Revenue (million Rp)	7,775	11,861	16,024	17,777	25,733
Total minutes (thousands)	11,075	13,503	15,114	18,471	24,557
Revenue/minute (Rp/min)	702	878	1,060	962	1,048
Unit Charge/min for this plan	Rp 1,023 ($\frac{1060+962+1048}{3}$)				

Telex

	1977	1978	1979	1980	1981
Revenue (million Rp)	5,889	7,477	16,672	15,905	20,357
Total minutes (thousands)	7,770	9,022	11,016	13,885	16,331
Revenue/minute (Rp/min)	758	829	1,513	1,146	1,247
Unit Charge/min for this plan	Rp 1,197 ($\frac{1146+1247}{2}$) .				

Telegram

	1977	1978	1979	1980	1981
Revenue (million Rp)	1,546	1,399	2,795	1,486	1,278
Total messages (thousands)	857	750	652	564	502
Revenue/message (Rp/msg)	1,803	1,865	4,287	2,630	2,546
Unit Charge/msg for this plan	Rp 2,588 ($\frac{2630+2546}{2}$)				

Table A-11-1-3 Unit Chage of Each Service

(Rupiah)

		JPN	SIN	USA	U K	Average	Unit Charge for this Plan
Bureau Facsimile	per Page	6,500 (¥2600)	5,875 (S$21)	5,811 ($10)	6,592 (£6.05)	6,194	6,200
INMARSAT	Telephone per Min	4,750 (¥1900)	-	6,770 ($11.65)	5,285 (£4.85)	5,601	5,600
	Telex per Min	2,500 (¥1000)	-	3,940 ($6.78)	2,778 (£2.55)	3,072	3,000
Packet Exchange	per Min	112 (¥45)	139 (S$.5)	116 ($.2)	108 (£.1)	118	120
I C A S	Per Seg	7.5 (¥3)	6.7 (S$.024)	9.22 ($.016)	4.3 (£.004)	6.9	7.0

(NOTE)

1.   The figures in parenthesis are the service rates of each country.

2.   Conversion rate: Rp1.0=¥0.4, S$1.0=¥111.91, $1.0=¥232.45, £1.0=¥435.89

(As of Feb., 1982)

Return from Shared Capital Contribution (INTELSAT)

	1983	1984	1985	1986	1987	1988	1989
Projected Revenue* (million $)	390.8	464.8	523.9	593.2	672.7	760.2	859.0
Projected Expenses* (million $)	82.9	98.1	113.6	129.2	144.4	158.8	174.7
Projected Profit (=return for signatories) (million $)	307.9	366.7	410.3	464.0	528.3	601.4	684.3
INDOSAT Share ** (%)	0.51	0.46	0.46	0.48	0.48	0.48	0.48
Return to INDOSAT (million $)	1.57	1.69	1.89	2.23	2.54	2.89	3.28
$/Rp Conversion	625	625	625	625	625	625	625
Return to INDOSAT (million Rp)	981	1,056	1,181	1,394	1,588	1,806	2,050

(Notes)

* Projection from 1983 through 1987 is taken from the financial report of
  INTELSAT secretariate. That for 1988 and 1989 is our estimate (13% growth
  for Revenue and 10% growth for Expenses)

** Indonesia's share at end 1981 was 0.509701%. Change of share is based on KDD's
   projection of its own change of share. (% change)

TDMA Reference Station Fee

Contracted fee for five years : US$ 1,359,708
 (final: set at 51st council)

Start month : September 1984

Assumption : equal payment per year/start and end
             year = fraction of months/continue
             after 1989 with the same fee.

Year	1984	1985	1986	1987	1988	1989
Fee to INDOSAT ($)	90,647.2	271,941.6	"	"	"	"
Conversion (R$_p$/$)	625	"	"	"	"	"
Fee to INDOSAT (Mil R$_p$)	57	170	170	170	170	170

Expenses :

(The following items were considered)

1) Personnel Expenses

2) Operation Expenses
   Compensation to PERUMTEL
   Satellite circuit
   Cable circuit
   etc

3) Maintenance Expenses
   Buildings
   Exchanges
   Transmission facilities

4) Depreciation

5) General Administration Expenses

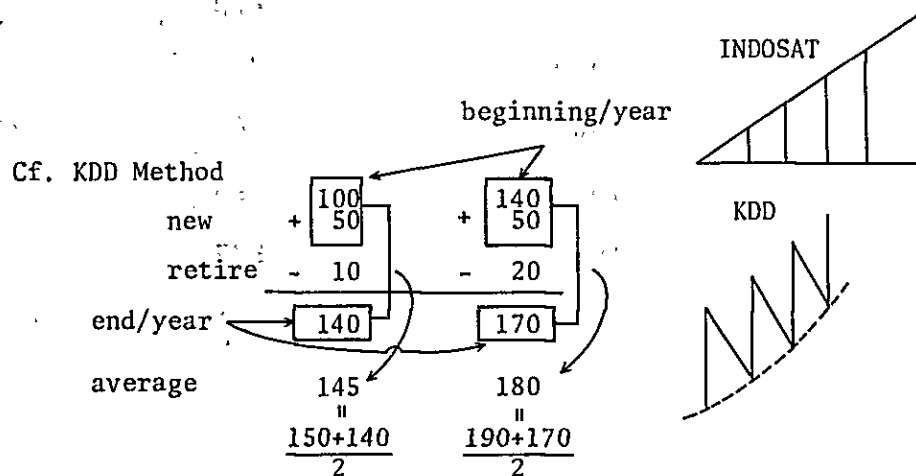6) Amortization of goodwill

7) Interest expenses

1) Personnel Expenses : Cost/person (Rp·4.5mil/person) x # of
employees in the mid. year x CPI/CPI of
the initial year.

(Note)

# of personnel should be the figure in the mid-year

Method in this master plan: $\dfrac{P_{t-1} + P_t}{2}$

Where P_t stands for the number of personnel at the end of year t.

Cf. KDD Method

		beginning/year	
new	+ 100 / 50	+ 140 / 50	
retire	- 10	- 20	
end/year	140	170	
average	145	180	
	= 150+140 / 2	= 190+170 / 2	

INDOSAT

KDD

Indonesia, where work force movement is flexible, Indosat can make up for the retirement whenever it occurs. In this situation, the number of employees for the year t is just the average of year end figures of the previous (t-1) and the planned (t) years. On the other hand, in the situation of rigid work force movement, the supply of new employees can be made only once a year, say, in March, when graduates from various schools join the work force.

Personnel

year	Expected Number of Personnel (at year end)	Consumer Price Index (1973:100)
1979	118	294
1980	133	348
1981	168	391
1982	791	432
1983	1009	496
1984	1226	556
1985	1371	620
1986	1330	714
1987	1405	791
1988	1511	893
1989	1647	977

2) Operating Expenses:

•Compensation to PERUMTEL

    Traffic handling charges (or the rent for domestic circuits)

Telephone	$80^\sim$	$\left.\right\}$ $20 \sim 25\%$ of each revenue (For details, see below)
Telex	$82^\sim$	
Telegram	$82^\sim$	— 30% of TG revenue
Others services		
Intergateway circuits	$83^\sim$	(For details, see below)
Domestic-Int'l link	$82^\sim$	(for details, see below)
Floor space rental	$\left.\right\}\sim 84$	Rp $8,125/m^2/mo \times 2000m^2 \times 12 = 195$ mil
Telephone Exch.(BTM10C)		Rp 25 mil/mo $\times$ 12 = 300 mil
Utilities + Air Conditioning		Rp 12 mil/mo $\times$ 12 = 144 mil
HF back up transmitter		
10 kw		Rp 67,000/hr $\left.\right\}$ Assumed to be zero for this plan
20 kw		Rp 85,000/hr
Maintenance fee for telephone and telex exchanges ~ 84		Rp 204 mil(telex) Rp 132 mil(telephone)

•Capital Contribution to INTELSAT : $83^\sim$ (for details, see below)

•Satellite circuit lease

    INTELSAT $80 \sim$ \$ 390/mo/hf.cct = \$ 4,680.yr/hf.cct

Number of circuits in the mid-year

$$= \frac{\text{number of circuits}_{t-1} + \text{number of circuits}_t}{2}$$

•Floor space at Wisma Antara $84 \sim$ Rp 100,000/m^2/yr $\times$ 2,000m^2 = Rp 200 mil
    and others (cars. JL Gondangdia etc)

•Border Communications:
    expenditure for border communication at initial year $\times$ $\dfrac{\text{telephone minutes}}{\text{telephone minutes at initial year}}$

•International service improvement:
    expenditure for service improvement at initial year $\times$ $\dfrac{\text{total revenues}}{\text{total revenues at initial year}}$

•Other operating expenses:
    other operating expense at initial year $\times$ $\dfrac{\text{CPI}}{\text{CPI at initial year}}$

Method of Calculating the Rent for Domestic Circuits

The rent of domestic circuits used for the transmission of international telephone and telex was calculated by the following formula:

$$Py = \sum_{W}^{12} (MINyw \times RPw)$$

Where Py .... payment of the year y

MINyw ..... total number of minutes of the year y for WITEL w (outgoing + incoming)

RPw ...... Unit charge for one minute for WITELw

Charge for one minute by WITEL is as follows:

Telephone

WITEL	①─Medam─	II	III	ⓘⓥ	V	──────── VI	VII ──	──────── VIII	IX	X──Jakarta──	XI	XII
Pulse/Min	60	1200	1800	60	720	1200		1800				

Telex

WITEL	①	II	III	ⓘⓥ	V	VI	VII	VIII	IX	X	XI	XII
Pulse/Min	300	600	600	300	450	600		1200				

─Medam─────────────Jakarta─────

ASSUMPTIONS:

1. The compensation to PERUMTEL for handling telephone and telex traffics is based on the existing PERUMTEL tariff.

2. The calculation of compensation is made on the basis of international chargeable minutes (i.e., excluding minutes for booking, call back and call handling and/or unsuccessful calls).

Domestic Line Use Charge

(UNIT: Mill Rp)

		1984	1985	1986	1987	1988	1989	1990	1994	1999	2000
Jakarta	Telephone	11,226	14,021	17,183	20,713	25,175	30,375	35,900	58,067	92,031	97,916
	Telex	9,017	10,415	11,914	13,492	15,084	16,697	18,353	22,860	26,367	26,823
	Total	20,243	24,436	29,097	34,205	40,259	47,072	54,253	80,927	118,398	124,739
Medan	Telephone	4,346	6,036	8,157	11,031	14,534	19,237	24,801	46,288	84,293	93,613
	Telex	676	897	1,172	1,483	1,851	2,252	2,718	4,003	5,557	5,823
	Total	5,022	6,933	9,329	12,514	16,385	21,489	27,519	50,291	89,850	99,436
Grand Total		25,265	31,369	38,426	46,719	56,644	68,561	81,772	131,218	208,248	223,175

Intergateway circuit compensation

(2 x RM1 + RM2) x 12 x Number of circuits

= Rp. 34.2 mil x Number of circuits

Year	Circuits (TDM+TP)*	mil Rp.
1984	43	1479
1985	38	1300
1986	48	1642
1987	45	1537
1988	55	1881
1989	69	2360

* See Table 4-4 at page 139 of the Master Plan

Medan   Jakarta

INDOSAT

RM1   PERUMTEL   RM1

RM2
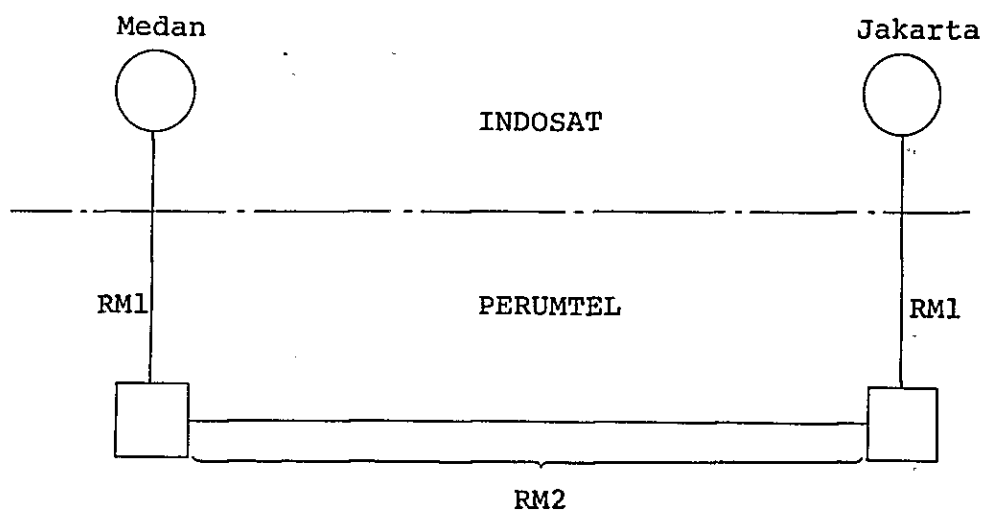
RM1 : Monthly rate for a voice grade leased circuit within
       a city on a governmental basis.

RM2 : Monthly rate for a voice grade leased circuit between
       two cities with distance over 1000 Km on a governmental
       basis.

Domestic - International links compensation

PERUMTEL tariff per annum for city tie line (i.e., R_p. 75,000) x $\frac{1}{2}$x Number of circuits = R_p. 0.0375 mil x Number of circuits

Year	Jakarta		Medan		Circuits (Voice)	Million Rp.
	TP *	TX **	TP *	TX **		
1984	465	10	58	1	534	20
1985	570	11	75	2	658	25
1986	695	13	98	2	808	30
1987	840	14	118	2	974	37
1988	1010	16	150	3	1179	44
1989	1205	17	200	3	1425	53

  * A half of the figures shown in Table 4-5 at page 143 of the Master Plan.

** The TDM equivalent of the figures shown in Table 4-7 at page 145 of the Master Plan.

INTELSAT

Capital Contribution to INTELSAT

Year	1983	1984	1985	1986	1987	1988	1989
Capital Contribution* (million Rp)	471.8	442.4	305.1	315.7	401.9	388	388
INDOSAT Share** (%)	0.51	0.46	0.46	0.48	0.48	0.48	0.48
INDOSAT Contribution (million $)	2.41	2.04	1.40	1.52	1.93	1.86	1.86
$/Rp Conversion	625	625	625	625	625	625	625
INDOSAT Contribution (million Rp)	1,504	1,272	877	947	1,206	1,164	1,164

(Notes)

* The figures for 1983 through 1987 are taken from the financial report of INTELSAT Secretariate. Those for 1988 and 1989 are our estimates (average of past 5 years)

** Same as that used before.

3) Maintenance Expenses:

        Maintenance expenses for cable:

              2.5 % of investment per year

        Maintenance expense for other facilities:

              8 % of investment per year

4) Depreciation Expenses

* Straight line method

* Salvation value : zero

* Initial year :

Except for routine improvement, started to be depreciated from the next year to the introduction

* Depreciation period :

I	Earth Station No.1	25 years
II	Earth Station No.2	25 years
III	ASEAN Cable	25 years
IV	Non-ASEAN Cable/IRU	25 years
V	Building/Housing/Office	30∿40 years
VI	Office Furniture	5 years
VII	Vehicles	5 years

5) General Administration

(Fixed Cost + Variable Cost per employee x number of
employees) x CPI / CPI of initial year of the plan.

Assumptions:

Fixed Cost   = Rp. 362 mil

Variable Cost = Rp. 1.2 mil

Table A-11-1-4 shows the aggregate of the new fixed assets classified by investment type. The detailed schedule of their introduction is shown by Table A-11-1-5 through 7. On the other hand, Table A-11-1-8 shows the estimate of loans to be used for major projects.

Table A-11-1-4 New Fixed Assets by Classification

(Unit: Mill, Rp)

	1983	1984	1985	1986	1987	1988	1989
I Earth Station No. 1	302	365	725	450	500	1,025	950
II Earth Station No. 2	363	415	500	500	500	1,000	1,000
III ASEAN Cable	1,235	9,351	15,620	25,523	20,030	3,505	4,835
IV Non-ASEAN Cable/IRU	48	50	50	50	50	50	50
V Bldg/Hsg/Office	0	0	8,610	13,714	0	3,150	0
VI Office Equipment	80	100	100	250	500	750	750
VII Cars	32	100	100	250	500	250	250
Total	2,060	10,381	25,705	40,737	22,080	9,730	7,835
Assets on Construction (=Previous year A.O.C. + Investment - New Fixed Assets)	30,514	46,389	52,686	21,614	8,264	7,964	10,964

	1983	1984	1985	1986	1987	1988	1989
Additional Depreciation for Bldg/Hsg/Office	-	-	264	313	-	105	-

Table A-11-1-5   Investment Schedule

(UNIT: Mill. Rp)

	1983	1984	1985	1986	1987	1988	1989	Total	Classification
Routine Improvement (See Table A-11-1-6 for details)	775	1,030	1,200	1,500	2,000	3,000	3,000	-	-
Headquarter Building and Land	8,000	4,600	1,114	-	-	-	-	13,714	V
Medan Gateway including Facilities	6,044	686	-	-	-	-	-	8,610	V
Telephone Exchange -Jakarta	50	750	4,400	-	-	-	-	5,200	III
Telex Exchange -Jakarta	50	750	4,000	-	-	-	-	4,800	III
New Services -Jakarta	40	600	3,360	-	-	-	-	4,000	III
Medan-Singapore Cable	1,200	10,875	-	-	-	-	-	12,705	III
Medan-Penang Cable	7,781	-	-	-	-	-	-	8,966	III
Medan-Colombo Cable	200	350	697	-	-	-	-	1,247	III
Jakarta-Perth-Singapore Cable	500	1,500	8,100	1,400	-	-	-	11,500	III
TDMA System - IOR	1,500	380	-	-	-	-	-	2,000	III
TDMA System - POR*									
TTC & M	1,000	300	1,000	-	-	-	-	5,000	III
Jatiluhur - Jakarta Tie Line	100	400	1,841	-	-	-	-	2,341	III

	1983	1984	1985	1986	1987	1988	1989	Total	Classi-fication
Ancor - Jakarta Tie Line*	-	100	250	1,000	-	-	-	1,350	III
Carrier Equipment* (100 Mbps)	100	400	1,500	-	-	-	-	2,000	III
Network Control System*	20	50	600	-	-	-	-	670	III
Data Processing System*	100	400	500	500	-	-	-	1,500	III
System Expansion* (See Table A-11-1-7 for details)	285	385	1,190	265	2,730	430	2,835	-	-
Branch Offices and Public Booths*	-	-	1,150	1,000	1,000	-	-	3,150	V
Border Communication	-	-	1,000	2,000	-	2,000	-	5,000	III
Others*	-	-	1,000	2,000	3,000	4,000	5,000	15,000	
TOTAL	27,745	26,256	32,002	9,665	8,730	9,430	10,835	-	

Classification		Depreciation Period
I	Earth Station No. 1	25 Years
II	Earth Station No. 2	25 Years
III	ASEAN Cable	25 Years
IV	Non-ASEAN Cable/IRU	25 Years
V	Bldg/Hsg/Office	30~40 Years
VI	Office Furniture	5 Years
VII	Vehicles	5 Years

(NOTE) Items with * mark are those modified or added to the P.T. INDOSAT's corporate plan.

Table A-11-1-6 Routine Improuvement

(UNIT: Mill . Rp)

	1983	1984	1985	1986	1987	1988	1989	Classi-fication
Earth Station 1	252	365	450	450	450	950	950	I
Earth Station 2	-363	415	500	500	500	1,000	1,000	II
I R U	48	50	50	50	50	50	50	IV
Office Furniture	80	100	100	250	500	750	750	VI
Cars	32	100	100	250	500	250	250	VII
TOTAL	775	1,030	1,200	1,500	2,000	3,00	3,000	

Table A-11-1-7   System Expansion & Improvement

(UNIT: Mill. Rp)

	1983	1984	1985	1986	1987	1988	1989	Classification
Telephone Exchange −Jakarta	100	100	100	100	2,000	100	2,100	III
Telephone Exchange −Medan	50	50	250	50	550	50	650	III
Telex Exchange −Jakarta	50	50	50	50	50	50	50	III
Telex Exchange −Medan	25	25	25	25	25	25	25	III
V F T / T D M	0	150	480	30	45	120	0	III
(# of system)	(0)	(10)	(32)	(2)	(3)	(8)	(0)	
Satellite Receiving	50	0	275	0	50	75	0	I
Route Increase	(2)	(0)	(11)	(0)	(2)	(3)	(0)	
Telegram Operation	10	10	10	10	10	10	10	III
TOTAL	285	385	1,190	265	2,730	430	2,835	

Table A-11-1-8   Estimate of Loans

(UNIT: Mill. Rp)

		1983	1984	1985	1986	1987	1988	1989
Philippines-Singapore Cable		1,015	675	338	-	-	-	-
Metaconta 10-C		2,453	1,840	1,227	613	-	-	-
Indonesia-Singapore Cable		4,733	3,681	2,630	1,579	528	-	-
E A B		2,500	-	-	-	-	-	-
Medan-Penang Cable		8,900	8,010	7,120	6,230	5,340	4,450	3,560
Medan-Singapore Cable		1,656	10,600	9,540	8,480	7,420	6,360	5,300
Medan Gateway		750	4,500	4,050	3,600	3,150	2,700	2,250
Jakarta Central Switching		-	1,500	10,000	9,000	8,000	7,000	6,000
S - M - T Cable		900	800	700	600	500	400	300
Special Services		-	600	4,000	3,600	3,200	2,800	2,400
Jakarta-Australia Cable		-	-	8,100	9,500	8,550	7,600	6,650
TOTAL		22,907	32,207	47,705	43,202	36,688	31,310	26,460
Current Portion of Long Term Loan	2,004	7,900	6,602	6,713	6,514	5,378	4,850	4,850
Long Term Loan Less Current Portion	13,311	15,007	25,605	40,992	36,688	31,310	26,460	21,610

Accounts with outside organizations

　　　In this financial plan, the balance sheet items associated
with accounts with outside organizations (e.g., account receivable,
account payable, tax payable at the year end) were forecasted by
defining them as functions of certain income statement items.(e.g.,
revenues, compensation to PERUMTEL, corporate tax for the year).

1.　Revenue (through PERUMTEL)

		actual		
Revenue { telephone telex telegram		1980	1981	1982
		17,777	25,733	63,923
A/R from PERUMTEL at year end		2,407 (14%)	4,681 (18%)	6,972 (10.9%)

　　　ASSUMPTION: Account receivable as percentage of revenue
　　　　　　　　　(at year end) ≈ 8.333% (= 1/12)
　　　　　　　　　　(cf. KDD 8~9% 1/12)

2.　Payment to PERUMTEL

	actual		
	1980	1981	1982
Compensation to PERUMTEL	–	–	12,300
A/P to PERUMTEL at year end	1,210	2,018	575

　　　ASSUMPTION: A/P to PERUMTEL as percentage of compensation
　　　　　　　　　to PERUMTEL (at year end) = 8.333%
　　　　　　　　　　(cf. KDD 1/12)

3.　Revenue and payment from overseas administrations

	actual		
	1980	1981	1982
Revenue from O.A.			
A/R from O.A.	791	1,083	5,836
Payment to O.A.			
A/P to O.A.	391	854	4,563
average	591	969	5,200
		(3.3% of revenues)	(3.8% of revenues)

(Cancelled out in the long run)

　　　ASSUMPTION: A/R and A/P to/from O.A. as percentage of
　　　　　　　　　revenues = 3.5%

4. Payment to INTELSAT (satellite channel lease)

	actual		
	1980	1981	1982
	Rp. 590 mil (estimated)	Rp. 702 mil (estimated)	890
A/P	Rp. 178 (30%)	Rp. 163 mil (23%)	475 (53%)

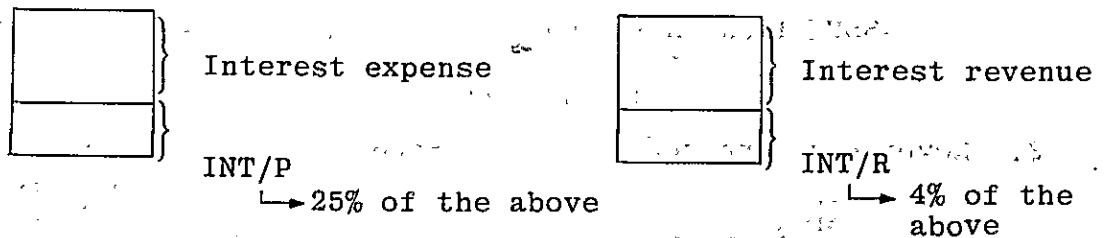ASSUMPTION: A/P to INTELSAT as percentage to satellite circuit lease = 8.333%

5. Payment for cable maintenance

	actual		
	1980	1981	1982
	>≈ 500	>≈ 600	
A/P	425 (85%)	509 (85%)	794

ASSUMPTION: A/P for cable maintenance as percentage of cable maintenance expense = 8.333%

6. Interest payment

Interest expense

INT/P
└─► 25% of the above

Interest income

Interest revenue

INT/R
└─► 4% of the above

7. Corporate tax

	actual		
	1980	1981	1982
Corp. tax	4,784	7,097	18,886
Tax/P	2,184 (46%)	2,609 (37%)	6,159 (32.6%)

ASSUMPTION: Tax/P as percentage of corporate tax = 8.333%

Remaining Items for Balance Sheet

The estimates of the above items were made based on the following assumptions:

   Cash = fixed percentage (10% in this plan) of required cash
          and time deposit, while required cash and time deposit
          is determined as fixed percentage (also 10% in this
          plan) of total expenditures.
   Time Deposit = Cash and Time Deposit - Cash
          (Calculated in cash flow analysis)
   Advance Payment = fixed percentage (2% in this plan) of
          revenues.
   Other Current Liabilities = The difference between the required
          cash and time deposit, and cash and time deposit esti-
          mated in cash flow analysis. If the amount of the
          estimated cash and time deposit is greater than the
          required figure, then this item will be nill. This
          item is assumed to be incurred on short term basis.
   Development Fund = Previous year development fund + 35% of
          previous year profit after tax.

Cash Flow

(1) Operation income = operation revenues $-\Delta$A/P from PERUMTEL

$- \Delta$A/R from foreign PTT $- \Delta$advance payment

(2) Interest income = interest from deposit $- \Delta$INT/P

(3) New loans = current portion of long-term loan $+ \Delta$long-term loan + other current liabilities

(4) Total income = (1) + (2) + (3)

(5) Total costs = total expenses - depreciation - amortization of goodwill
    - interest expense $- \Delta$A/P to PERUMTEL
    $- \Delta$A/P to foreign PTT $- \Delta$cable maintenance/P
    $- \Delta$satellite circuit lease/P

(6) Investment = new fixed assets $+ \Delta$assets on construction

(7) Dividend = previous year profit after tax x 60%

(8) Corporate tax = tax $- \Delta$Tax/P

(9) Repayment of loans = previous year's current portion of long-term loan + previous year's other current liabilities

(10) Employee benefit = previous year profit after tax x 5%

(11) Interest expense = interest expense $- \Delta$INT/P

(12) Expenditures total = (6) + (7) + (8) + (9) + (10) + (11)

(13) Cash In/Out = (4) - (5) - (12)

(14) Beginning of year cash and time deposit = previous year cash and time deposit

(15) End of year cash and time deposit = (14) + (13)

(Note) The left hand side of the equations represents the figures adjusted for cash basis.

Ratios for Financial Analysis

$$\text{Return on owners equity} = \frac{\text{Profit after tax}}{\text{Owners equity}} \times 100 \ (\%)$$

$$\text{Operating return} = \frac{\text{Operating revenues} - \text{Operating expenses}}{\text{Total assets}} \times 100 \ (\%)$$

$$\text{Profit margin} = \frac{\text{Profit after tax}}{\text{Operating revenues}} \times 100 \ (\%)$$

$$\text{Assets turn over} = \frac{\text{Operating revenues}}{\text{Total assets}}$$

$$\text{Growth rate of revenue} = \frac{(\text{Operating revenues} - \text{operating revenues} \ (-1))}{\text{Operating revenues} \ (-1)} \times 100 \ (\%)$$

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liability}} \times 100 \ (\%)$$

$$\text{Debt/equity ratio} = \frac{\text{Long term loan}}{\text{Owners equity}} \times 100 \ (\%)$$

$$\text{Operating ratio} = \frac{\text{Operating expenses}}{\text{Operating revenues}} \times 100 \ (\%)$$

(Note) (-1) denotes the previous year.

	Exports of goods. FOB (mil US$)	Exp. of petrolium (mil US$)	Imports of goods (mil US$)	Consumer price index (1973=100)
	INBPEXGDZ	INEXPTDZ	INBPIMGDZ	INPCI
48	NA	97.800	NA	NA
49	NA	139.800	NA	NA
50	NA	147.500	NA	NA
51	NA	184.900	NA	NA
52	NA	191.300	NA	NA
53	NA	201.000	NA	NA
54	NA	226.700	NA	NA
55	NA	212.500	NA	NA
56	NA	224.900	NA	NA
57	NA	260.900	NA	NA
58	647.000	282.900	487.000	NA
59	817.000	238.000	582.000	NA
60	881.000	220.700	749.000	NA
61	766.000	260.200	1056.000	NA
62	711.000	215.800	737.000	NA
63	656.000	268.700	602.000	NA
64	631.000	266.600	589.000	NA
65	633.000	271.900	609.000	NA
66	714.000	203.400	596.000	8.557
67	771.000	239.600	805.000	23.154
68	872.000	297.500	831.000	52.852
69	995.000	382.900	995.000	61.074
70	1173.000	446.300	1116.000	68.792
71	1311.000	564.800	1230.000	71.812
72	1793.000	913.100	1445.000	76.342
73	3215.000	1608.700	2663.000	100.000
74	7265.000	5211.400	4634.000	140.604
75	6888.000	5310.800	5469.000	167.785
76	8613.000	6004.100	6815.000	200.671
77	10763.000	7297.900	7478.000	222.819
78	11035.000	7438.500	8386.000	241.443
79	15154.000	8870.800	9245.000	294.295
80	21757.000	12858.800	12603.000	348.825
81	23120.000	14465.000	16923.000	391.307
82	18877.900	11350.700	17819.600	432.488
83	21135.200	11854.900	18909.200	496.102
84	24194.900	13281.200	21338.600	555.571
85	27798.400	14780.500	23660.700	620.222
86	31865.600	16728.600	25669.300	713.610
87	36035.000	18839.800	27740.300	791.214
88	40391.200	19866.400	31206.500	892.569
89	44933.200	21066.400	34628.300	977.337
90	51044.100	23536.000	38622.000	1070.070
91	55758.100	25389.100	41880.800	1185.390

	Inplicit GDP deflator	Exchange rate (Rp/US$)	G D P (tril Rp)	G D P (1973 tril Rp)
	INPGDP	INEXR	INGDPZ	INGDP
60	0.011	NA	4.00000E-04	3.580
61	0.013	NA	0.001	3.765
62	0.034	NA	0.001	3.856
63	0.085	NA	0.003	3.765
64	0.182	NA	0.007	3.909
65	0.606	235.000	0.024	3.909
66	7.899	235.000	0.316	3.999
67	20.726	153.670	0.848	4.090
68	46.133	300.080	2.097	4.545
69	55.863	326.000	2.718	4.866
70	64.462	365.000	3.340	5.182
71	66.229	393.420	3.672	5.544
72	75.225	415.000	4.564	6.067
73	100.000	415.000	6.753	6.753
74	147.313	415.000	10.708	7.269
75	165.673	415.000	12.643	7.631
76	189.633	415.000	15.467	8.156
77	214.308	415.000	19.011	8.871
78	236.819	442.050	22.458	9.483
79	310.546	623.051	31.023	9.990
80	399.538	627.000	43.765	10.954
81	480.061	631.760	56.569	11.784
82	530.248	664.611	65.853	12.419
83	601.736	735.000	79.449	13.203
84	668.593	755.000	94.967	14.204
85	741.246	770.000	112.371	15.160
86	846.208	814.981	135.809	16.049
87	933.420	821.501	159.344	17.071
88	1047.310	847.789	190.092	18.151
89	1142.600	860.506	219.928	19.248
90	1246.880	864.808	256.139	20.542
91	1376.450	873.456	298.765	21.706

Parameters & Series Supplied for the Financial Simulation Model

For Income Statement	Abbreviation		
Telephone chargeable minutes	TPM	×	10^3
" unit charge (per minute)	TPU	×	"
Telex chargeable minutes	TXM	×	"
" unit charge (per minute)	TXU		"
Telegram messages	TGM		"
" unit charge (per minute)	TGU		"
Number of leased circuits (telegraph type)	LCG		
" unit charge (per circuit)	LGU	×	10^6
Number of leased circuit (voice grade)	LCV		
" unit charge (per circuit)	LVU	×	10^6
Television Transmission minutes	TVM		
" unit charge (per 80 minutes)	TVU	×	10^6
Packet Switching Service Segments	PSS		"
" unit charge (per segment)	PUS		
" minutes	PSM	×	10^3
" unit charge (per minute)	PUM		"
Bureau fax pages	BFP		
" unit charge (per page)	BFU	×	10^6
Return from capital contribution to satellite space segment - INTELSAT	TSR	×	10^6
TDMA reference station fee	TDM		"
Number of employees	NME		
Cost per employee at initial year	CPE		
Consumer price index	CPI		
Domestic traffic handling charge - telephone	THP		
" - telex	THX		
" as percentage of revenue - telegram	RTG		
Intergateway circuit lease	IGC		
Domestic-International links compensation	DIL		
Floor space rental (from PERUMTEL)	FSR		
Telephone exchange (BTM10C) rental	BTM		
Utilities including air conditioning	UAC		
Capital contribution - INTELSAT	CAP		
Satellite circuit lease unit charge ($/yr/hf.cct)	SCT		

For Income Statement	Abbreviation
Amortization of goodwill	AGW
Cable (including IRU) maintenance fee as percentage of investment	RCM
Telex exchange (+VFT) maintenance fee (to PERUMTEL)	XEM
Telephone exchange (BTM10C) maintenance fee	PEM
Fixed general administration expense	FGA
Other operating expenses at initial year	OOE
Expenditure for int'l service improvement at initial year	SVC
Expenditure for border communication at initial year	BOR
Other maintenance fee as percentage of investment	ROM
Variable general administration expense as incremental expense per additional employee	VGA
Number of satellite circuits (from INTELSAT)	NSC
R_p/$ coversion rate	RPD
Interest rate for short term loan	RSINT
Interest rate for long term loan	RLINT
Long term loan	L
Current portion of L. T. L.	CPU

For Balance Sheet	
Required cash and time deposit as percentage of expenditures	RRCAT
Required cash as percentage of cash and time deposit	RCASH
Account receivable from PERUMTEL as percentage of telephone, telex and telegram revenues	RAR
Account receivable from foreign PTTs as percentage of revenue	RARPTT
Interest receivable as percentage of interest income	RINTR
Advance payment as percentage of revenue	RADP
New Earth Station No.1 facilities	NES1
" " No.2 facilities	NES2
New ASEAN Cable	NCBL
New IRU	NIRU

For Balance Sheet	Abbreviation
New building	NBLG
New office furniture	NFUR
New cars	NCAR
Additional depreciation for buildings	NDBLG
Assets on constraction	ADC
Goodwill	GDW
Tax payable as percentage of corporate tax	RTAXP
Account payable to PERUMTEL as percentage of compensation	RAP
Account payable to foreign PTTs as percentage of revenue	RAPPTT
Cable maintenance payable as percentage	RCMP
Satellite circuit lease payable as percentage	RSCP
Interest payable as percentage of interest payment	RINTP
Difference between transfer assets with PERUMTEL	TRF
Paid stock	STK
Cable maintenance payable	CMP
Satellite circuit lease payable	SCP
Interest payable	INTP
Other current loans	OCL
Total current liabilities	CL
Development fund	DVF
Total liabilities	LIAB
Required cash and time deposit	RCAT
Depreciation of Earth Station 1	DES1
" " 2	DES2
" Cable	DCBL
" I R U	DIRU
" Building	DBLG
" Office Furniture	DFUR
" Cars	DCAR

Unknowns

For Income Statement	Abbreviation
Telephone revenue	TPR
Telex revenue	TXR
Telegram revenue	TGR
Leased circuit (telegraph type) revenue	LGR
Leased circuit (voice grade) revenue	LVR
Television Transmission revenue	TVR
Packet switching revenue	PSR
Bureau fax revenue	BFR
Total operating revenue	OPR
Interest from deposit	IFD
Total revenue	REVENUE
Personnel expense	PSE
Traffic handling charges	THC
Traffic handling charge for telegram	THG
Compensation to PERUMTEL	CPERUM
Satellite circuit lease	SCL
Interest expenses from long-term loan	LINT
Interest expenses of short-term loan (ther current liabilities)	SINT
Operating expense	OPE
Maintenance expense for cable	MCB
Maintenance expense	MTE
Depreciation expense	DPE
Interest expense (amortization of goodwill)	INE
General administration expense	GAE
Total expenses	EXPENSES
Corporate tax rate in percent	T
Profit before tax	PBT
Corporate tax	TAX
Profit after tax	PAT

For Ballance Sheet	Abbreviation
Cash and Bank	CASH
Time deposit	TIME
Account receivable from PERUMTEL	AR
Account receivable from foreign carriers	ARPTT
Interest receivable	INTR
Advance payment	ADP
Total current assets	CA
Earth Station No.1	ES1
" " No.2	ES2
ASEAN Cable	DBL
Non-ASEAN Cable/IRU	IRU
Building/Housing/Office	BLG
Office furniture	FUR
Vehicle	CAR
Total fixed costs	FA
Accumulated depreciation	ACD
Book value of fixed assets	BUK
Total assets	A
Tax payable	TAXP
Account payable to PERUMTEL	AP
Account payable to foreign carries	APPTT

For Cash Flow	
Adjusted operation revenues	AOR
" new loans	NL
" interest revenue	AIR
" total revenue	ATR
" total expenses	ATE
Investment	INV
Dividdend	DIV
Corporate tax	ATX
Repayment of loans	RPL
Interest expense	AIE
Benefit to employee	BEN
Adjusted cash expenditures	AEX
Cash in/out	CIO
Ballance of cash (beginning of year)	BCS
Ballance of dash (end of year)	CAT

Financial Simulation Model

INDOSAT I -

TPR=TPM*TPU,
TXR=TXM*TXU,
TGR=TGM*TGU,
LGR=(LCG(-I)+LCG)/2*LGU,
LVR=(LCV(-I)+LCV)/2*LVU,
TVR=TVM/80*TVU,
PSR=PSS*PUS+PSM*PUM,
BFR=BFP*BFU,

OPR=TPR+TXR+TGR+LGR+LVR+TVR+PSR+BFR+TSR+TDM,

IFD=IFD(-I)+400,

REVENUE=OPR+IFD,

PSE=CPE*CPI/432*(NME(-I)+NME)/2,
THC=THP+THX+THG,
THG=TGR*RTG/I00,
CPERUM=THC+IGC+DIL+FSR+BTM+UAC+XEM+PEM,
SCL=(SCT*(NSC(-I)+NSC)/2)*RPD/I000000,
OPE=CPERUM+SCL+CAP+BOR*TPM/40045
          +SVC*REVENUE/66479
          +OOE*CPI/432,
MCB=(CBL+IRU)*RCM/I00,
MTE=MCB+(FA-CBL-IRU)*ROM/I00,
GAE=(FGA+VGA*(NME(-I)+NME)/2)*CPI/432,
SINT=RSINT/I00*OCL,
LINT=RLINT/I00*(L+CPL),
INE=LINT+SINT,

EXPENSE=PSE+OPE+MTE+DPE+GAE+INE+AGW,
PBT=REVENUE-EXPENSE,
T=IF PBT GT I050 THEN 45 ELSE IF PBT GT 450 THEN 30 ELSE 20,
TAX=PBT*T/I00,
PAT=PBT-TAX,

RCAT=RRCAT/I00*(ATE+AEX),
CASH=RCASH/I00*CAT,
TIME=CAT-CASH,
AR=(TPR+TXR+TGR)*RAR/I00,
ARPTT=(TPR+TXR+TGR+BFR+PSR)*RARPTT/I00,
INTR=RINTR/I00*IFD,
ADP=RADP/I00*REVENUE,

CA=CASH+TIME+AR+ARPTT+INTR+ADP,

```
ESI=ESI(-I)+NESI,
ES2=ES2(-I)+NES2,
CBL=CBL(-I)+NCBL,
IRU=IRU(-I)+NIRU,
BLG=BLG(-I)+NBLG,
FUR=FUR(-I)+NFUR,
CAR=CAR(-I)+NCAR,

NFA=NESI+NES2+NCBL+NIRU+NBLG+NFUR+NCAR,
FA=ESI+ES2+CBL+IRU+BLG+FUR+CAR,

DESI=DESI(-I)+NESI/25,
DES2=DES2(-I)+NES2/25,
DCBL=DCBL(-I)+NCBL/25,
DIRU=DIRU(-I)+NIRU/25,
DBLG=DBLG(-I)+NDBLG,
DFUR=DFUR(-I)+NFUR/5,
DCAR=DCAR(-I)+NCAR/5,
DPE=DESI+DES2+DCBL+DIRU+DBLG+DFUR+DCAR,
ACD=ACD(-I)+DPE,
BUK=FA-ACD,

A=CA+BUK+AOC+GDW,

TAXP=TAX*RTAXP/I00,
AP=CPERUM*RAP/I00,
APPTT=(TPR+TXR+TGR+BFR+BSR)*RAPPTT/I00,
CMP=MCB*RCMP/I00,
SCP=SCL*RSCP/I00,
INTP=INE*RINTP/I00,
OCL=IF RCAT-CAT GT O THEN RCAT-CAT ELSE O,

CL=TAXP+AP+APPTT+CMP+SCP+INTP+OCL+CPL,

DVF=DVF(-I)+PAT(-I)*.35,

LIAB=CL+L+TRF+STK+DVF+PAT,

AOR=OPR-AR+AR(-I)-ARPTT+ARPTT(-I)-ADP+ADP(-I),
AIR=IFD-INTR+INTR(-I),
NL=CPL+L-L(-I)+OCL,
ATR=AOR+AIR+NL,

ATE=EXPENSE-DPE-AGW-INE-AP+AP(-I)-APPTT+APPTT(-I)
        -CMP+CMP(-I)-SCP+SCP(-I),
```

```
INV=NFA+AOC-AOC(-1),
DIV=PAT(-1)*0.6,
ATX=TAX-TAXP+TAXP(-1),
RPL=CPL(-1)+OCL(-1),
AIE=INE-INTP+INTP(-1),
BEN=PAT(-1)*0.05,

AEX=INV+DIV+ATX+RPL+AIE+BEN,

CIO=ATR-ATE-AEX,
BCS=CAT(-1),
CAT=CAT(-1)+CIO,

ROE=PAT/(STK+DVF+PAT)*100,
ORN=(REVENUE-IFD-EXPENSE)/A*100,
PRM=PAT/(REVENUE-IFD)*100,
ATO=(REVENUE-IFD)/A,
GRR=(OPR-ORP(-1))/OPR(-1)*100,
CRR=CA/CL*100,
DEQ=(L+CPL)/(STK+DVF+PAT)*100,
ORO=EXPENSE/OPR*100,
```

Data Supplied for the Financial Simulation Model (exogenous variables)

	82	83	84	85	86	87	88	89
TPM	NA	53295.000	68484.000	86429.000	106305.000	130968.000	160436.000	195731.000
TPU	NA	1.023	1.023	1.023	1.023	1.023	1.023	1.023
TXM	NA	23747.000	27784.000	32507.000	37546.000	42990.000	48579.000	54408.000
TXU	NA	1.197	1.197	1.197	1.197	1.197	1.197	1.197
TGM	NA	378.000	331.000	291.000	256.000	225.000	199.000	177.000
TGU	NA	2.588	2.588	2.588	2.588	2.588	2.588	2.588
LCG	123.000	136.000	144.000	150.000	156.000	161.000	165.000	168.000
LGU	NA	1.563	1.563	1.563	1.563	1.563	1.563	1.563
LCV	15.000	18.000	23.000	29.000	34.000	40.000	46.000	52.000
LVU	NA	4.679	4.679	4.679	4.679	4.679	4.679	4.679
TVM	NA	4024.000	4413.000	4802.000	5192.000	5581.000	5970.000	6360.000
TVU	NA	1.843	1.843	1.843	1.843	1.843	1.843	1.843
PSS	NA	0.000	0.000	4.000	39.000	65.000	106.000	156.000
PUS	NA	7.000	7.000	7.000	7.000	7.000	7.000	7.000
PSM	NA	0.000	0.000	133.000	337.000	757.000	1378.000	2091.000
PUM	NA	0.120	0.120	0.120	0.120	0.120	0.120	0.120
BFP	NA	550.000	1380.000	3024.000	5530.000	8398.000	11322.000	14333.000
BFU	NA	0.006	0.006	0.006	0.006	0.006	0.006	0.006
TSR	NA	981.000	1138.000	1181.000	1394.000	1588.000	1806.000	2050.000
TDM	NA	0.000	57.000	170.000	170.000	170.000	170.000	170.000
CPE	NA	5.000	5.000	5.000	5.000	5.000	5.000	5.000
CPI	NA	496.000	556.000	620.000	714.000	791.000	893.000	977.000
NME	791.000	1009.000	1226.000	1371.000	1330.000	1405.000	1511.000	1647.000
THP	NA	10422.000	15572.000	20057.000	25340.000	31744.000	39709.000	49612.000
THX	NA	5746.000	9693.000	11312.000	13086.000	14975.000	16935.000	18949.000
RTG	NA	30.000	30.000	30.000	30.000	30.000	30.000	30.000
IGC	NA	0.000	1471.000	1300.000	1642.000	1539.000	1881.000	2360.000
DIL	NA	15.000	20.000	25.000	30.000	37.000	44.000	53.000
FSR	NA	195.000	195.000	0.000	0.000	0.000	0.000	0.000
BTM	NA	300.000	300.000	0.000	0.000	0.000	0.000	0.000
UAC	NA	144.000	144.000	0.000	0.000	0.000	0.000	0.000
XEM	NA	204.000	204.000	0.000	0.000	0.000	0.000	0.000
PEM	NA	132.000	132.000	0.000	0.000	0.000	0.000	0.000
SCT	NA	4680.000	4680.000	4680.000	4680.000	4680.000	4680.000	4680.000
NSC	307.000	438.000	568.000	701.000	805.000	985.000	1156.000	1342.000
RPD	NA	735.000	755.000	770.000	814.000	821.000	847.000	860.000
CAP	NA	1504.000	1272.000	877.000	947.000	1206.000	1164.000	1164.000

	82	83	84	85	86	87	88	89
BOR	NA	200.000	200.000	200.000	200.000	200.000	200.000	200.000
SVC	NA	800.000	800.000	800.000	800.000	800.000	800.000	800.000
OOE	NA	1000.000	1000.000	1000.000	1000.000	1000.000	1000.000	1000.000
RCM	NA	2.500	2.500	2.500	2.500	2.500	2.500	2.500
ROM	NA	8.000	8.000	8.000	8.000	8.000	8.000	8.000
FGA	NA	362.000	362.000	362.000	362.000	362.000	362.000	362.000
VGA	NA	1.200	1.200	1.200	1.200	1.200	1.200	1.200
RSINT	NA	5.000	5.000	5.000	5.000	5.000	5.000	5.000
RLINT	NA	15.000	15.000	15.000	15.000	15.000	15.000	15.000
L	13311.000	15007.000	25605.000	40992.000	36688.000	31310.000	26460.000	21610.000
CPL	2004.000	7900.000	6602.000	6713.000	6514.000	5378.000	4850.000	4850.000
AGW	NA	1901.700	1901.700	1901.700	1901.700	1901.700	1901.700	1901.700
RRCAT	NA	10.000	10.000	10.000	10.000	10.000	10.000	10.000
RCASH	NA	10.000	10.000	10.000	10.000	10.000	10.000	10.000
RAR	NA	8.333	8.333	8.333	8.333	8.333	8.333	8.333
RARPTT	NA	3.500	3.500	3.500	3.500	3.500	3.500	3.500
RINTR	NA	4.000	4.000	4.000	4.000	4.000	4.000	4.000
RADP	NA	2.000	2.000	2.000	2.000	2.000	2.000	2.000
NESI	NA	302.000	365.000	725.000	450.000	500.000	1025.000	950.000
NES2	NA	363.000	415.000	500.000	500.000	500.000	1000.000	1000.000
NCBL	NA	1235.000	9351.000	15620.000	25523.000	20030.000	3505.000	4835.000
NIRU	NA	48.000	50.000	50.000	50.000	50.000	50.000	50.000
NBLG	NA	0.000	0.000	8610.000	13714.000	0.000	3150.000	0.000
NFUR	NA	80.000	100.000	100.000	250.000	500.000	750.000	750.000
NCAR	NA	32.000	100.000	100.000	250.000	500.000	250.000	250.000
NDBLG	NA	0.000	0.000	264.000	313.000	0.000	105.000	0.000
AOC	4829.000	30514.000	46389.000	52686.000	21614.000	8264.000	7964.000	10964.000
GDW	NA	11411.000	9509.000	7607.000	5705.000	3803.000	1901.000	0.000
RTAXP	NA	8.333	8.333	8.333	8.333	8.333	8.333	8.333
RAP	NA	8.333	8.333	8.333	8.333	8.333	8.333	8.333
RAPPTT	NA	3.500	3.500	3.500	3.500	3.500	3.500	3.500
RCMP	NA	8.333	8.333	8.333	8.333	8.333	8.333	8.333
RSCP	NA	8.333	8.333	8.333	8.333	8.333	8.333	8.333
RINTP	NA	25.000	25.000	25.000	25.000	25.000	25.000	25.000
TRF	NA	-5107.000	-5107.000	-5107.000	-5107.000	-5107.000	-5107.000	-5107.000
STK	NA	27260.000	27260.000	27260.000	27260.000	27260.000	27260.000	27260.000

Data obtained from the financial simulation model (endogenous variables)

	82	83	84	85	86	87	88	89
TPR	NA	54520.800	70059.100	88416.800	108750.000	133980.000	164126.000	200233.000
TXR	NA	28425.100	33257.400	38910.900	44942.500	51459.000	58149.000	65126.300
TGR	NA	978.264	856.628	753.108	662.528	582.300	515.012	458.076
LGR	NA	205.469	218.750	229.687	239.062	247.656	254.687	260.156
LVR	NA	77.195	95.909	121.641	147.373	173.104	201.176	229.247
TVR	NA	92.716	101.678	110.641	119.627	128.590	137.553	146.538
PSR	NA	0.000	0.000	43.960	313.440	545.840	907.360	1342.920
BFR	NA	3.410	8.556	18.749	34.286	52.068	70.196	88.865
OPR	66479.000	85283.800	105793.000	129956.000	156773.000	188927.000	226337.000	270105.000
IFD	3300.000	3700.000	4100.000	4500.000	4900.000	5300.000	5700.000	6100.000
REVENUE	NA	88983.800	109893.000	134456.000	161673.000	194227.000	232037.000	276205.000
PSE	NA	5166.660	7191.320	9317.940	11160.400	12519.600	15069.400	17855.100
THC	NA	16461.500	25522.000	31594.900	38624.800	46893.700	56798.500	68698.400
THG	NA	293.479	256.988	225.932	198.758	174.690	154.504	137.423
CPERUM	NA	17451.500	27988.000	32919.900	40296.800	48469.700	58723.500	71111.400
SCL	NA	1281.330	1777.300	2286.000	2868.570	3438.840	4243.420	5026.970
OPE	NA	22721.900	33988.800	39568.300	48241.600	57936.900	69791.600	83865.100
MCB	NA	614.500	849.525	1241.270	1880.600	2382.600	2471.470	2593.600
CBL	22586.000	23821.000	33172.000	48792.000	74315.000	94345.000	97850.000	102685.000
IRU	711.000	759.000	809.000	859.000	909.000	959.000	1009.000	1059.000
MTE	NA	1408.340	1721.760	2916.310	4768.760	5430.760	6013.630	6371.760
FA	NA	34503.000	44884.000	70589.000	111326.000	133406.000	143136.000	150971.000
GAE	NA	1655.630	2191.820	2755.840	3276.800	3667.530	4364.950	5103.920
SINT	NA	0.000	41.961	0.000	0.000	0.000	0.000	0.000
OCL	1084.000	0.000	839.227	0.000	0.000	0.000	0.000	0.000
LINT	NA	3436.050	4831.050	7155.750	6480.300	5503.200	4696.500	3969.000
INE	NA	3436.050	4873.000	7155.750	6480.300	5503.200	4696.500	3969.000
EXPENSE	NA	37855.600	53880.900	66608.100	80295.600	92469.100	107875.000	125578.000
DPE	NA	1565.320	2012.560	2992.360	4466.280	5509.470	6037.670	6511.070
PBT	NA	51128.200	56011.900	67848.100	81377.000	101757.000	124162.000	150627.000
T	NA	45.000	45.000	45.000	45.000	45.000	45.000	45.000
TAX	NA	23007.700	25205.300	30531.600	36619.600	45790.900	55872.700	67782.100
PAT	23083.000	28120.500	30806.500	37316.500	44757.400	55966.600	68288.800	82844.900

	82	83	84	85	86	87	88	89
RCAT	NA	10860.300	12541.600	14937.400	14919.600	17277.700	20412.000	24157.100
ATE	NA	32809.900	43445.800	53233.600	65800.900	77666.900	93009.900	110566.000
AEX	NA	75793.300	81970.200	96140.200	83395.100	95110.200	111117.000	131013.000
CASH	NA	1201.700	1170.240	1554.640	2655.330	4357.960	6635.300	9497.160
CAT	19121.000	12017.000	11702.400	15546.400	26553.300	43579.600	66353.000	94971.700
TIME	NA	10815.300	10532.100	13991.700	23898.000	39221.700	59717.700	85474.500
AR	6972.000	6993.390	8680.740	10673.000	12862.400	15501.200	18565.100	22150.500
ARPTT	5836.000	2937.460	3646.350	4485.020	5414.590	6531.670	7831.860	9353.710
INTR	300.000	148.000	164.000	180.000	196.000	212.000	228.000	244.000
ADP	1670.000	1779.680	2197.860	2689.120	3233.450	3884.530	4640.730	5524.090
CA	NA	23875.500	26391.300	33573.500	48259.700	69708.900	97618.500	132244.000
ESI	4946.000	5248.000	5613.000	6338.000	6788.000	7288.000	8313.000	9263.000
ES2	2847.000	3210.000	3625.000	4125.000	4625.000	5125.000	6125.000	7125.000
BLG	279.000	279.000	279.000	8889.000	22603.000	22603.000	25753.000	25753.000
FUR	734.000	814.000	914.000	1014.000	1264.000	1764.000	2514.000	3264.000
CAR	340.000	372.000	472.000	572.000	822.000	1322.000	1572.000	1822.000
NFA	NA	2060.000	10381.000	25705.000	40737.000	22080.000	9730.000	7835.000
DES1	198.000	210.080	224.680	253.680	271.680	291.680	332.680	370.680
DES2	114.000	128.520	145.120	165.120	185.120	205.120	245.120	285.120
DCBL	903.000	952.400	1326.440	1951.240	2972.160	3773.360	3913.560	4106.960
DIRU	28.000	29.920	31.920	33.920	35.920	37.920	39.920	41.920
DBLG	7.000	7.000	7.000	271.000	584.000	584.000	689.000	689.000
DFUR	147.000	163.000	183.000	203.000	253.000	353.000	503.000	653.000
DCAR	68.000	74.400	94.400	114.400	164.400	264.400	314.400	364.400
ACD	7068.000	8633.320	10645.900	13638.200	18104.500	23614.000	29651.700	36162.700
BUK	NA	25869.700	34238.100	56950.800	93221.400	109792.000	113484.000	114808.000
A.	NA	91670.200	116527.000	150817.000	168800.000	191568.000	220968.000	258016.000

	82	83	84	85	86	87	88	89
TAXP	6159.000	1917.230	2100.360	2544.200	3051.510	3815.750	4655.870	5648.280
AP	575.000	1454.230	2332.240	2743.220	3357.930	4038.980	4893.430	5925.710
APPTT	4563.000	2937.460	3646.350	4485.020	5414.590	6531.670	7831.860	9353.710
CMP	794.000	51.206	70.791	103.435	156.710	198.542	205.948	216.125
SCP	475.000	106.773	148.102	190.533	239.038	286.558	353.604	418.897
INTP	130.000	859.012	1218.250	1788.940	1620.070	1375.800	1174.120	992.249
CL	NA	15225.900	16957.300	18568.300	20353.800	21625.300	23964.800	27405.000
DVF	3084.000	11163.000	21005.200	31787.500	44848.300	60513.300	80101.600	104003.000
LIAB	NA	91669.400	116527.000	150817.000	168800.000	191568.000	220968.000	258016.000
AOR	NA	88051.200	102978.000	126634.000	153109.000	184519.000	221216.000	264114.000
AIR	NA	3852.000	4084.000	4484.000	4884.000	5284.000	5684.000	6084.000
NL	NA	9596.000	18039.200	22100.000	2210.000	0.000	0.000	0.000
ATR	NA	101499.000	125101.000	153218.000	160203.000	189803.000	226900.000	270198.000
INV	NA	27745.000	26256.000	32002.000	9665.000	8730.000	9430.000	10835.000
DIV	NA	13849.800	16872.300	18483.900	22389.900	26854.400	33580.000	40973.300
ATX	NA	27249.400	25022.200	30087.800	36112.300	45026.600	55032.600	66789.700
RPL	NA	3088.000	7900.000	7441.230	6713.000	6514.000	5378.000	4850.000
AIE	NA	2707.040	4513.760	6585.060	6649.160	5747.460	4898.170	4150.870
BEN	NA	1154.150	1406.030	1540.330	1865.820	2237.870	2798.330	3414.440
CIO	NA	-7104.000	-314.625	3844.000	11006.900	17026.300	22773.400	28618.700
BCS	NA	19121.000	12017.000	11702.400	15546.400	26553.300	43579.600	66353.000
ROE	NA	42.259	38.960	38.725	38.298	38.936	38.878	38.693
ORN	NA	51.738	44.549	42.003	45.306	50.352	53.610	56.015
PRM	NA	32.973	29.120	28.715	28.549	29.624	30.171	30.671
ATO	NA	0.930	0.908	0.862	0.929	0.986	1.024	1.047
GRR	NA	28.287	24.048	22.840	20.635	20.510	19.801	19.338
CRR	NA	156.808	155.634	180.810	237.104	322.349	407.341	482.554
DEO	NA	34.424	40.731	49.505	36.967	25.524	17.825	12.358
ORO	NA	44.388	50.931	51.254	51.218	48.944	47.661	46.492

(Note)

In this financial plan, a technique of using a financial simulation model is used to generate pro forma (forecasted) income statement, pro forma balance sheet and pro forma cash flow statement. The technique is particularly useful in solving the interdependent relationships between variables in a firm's financial structure (e.g., level of cash determines other current liabilities, which determines interest expenses, which becomes a part of total expenses, which in return sets the required level of cash, back again!) The value of building a model also lies in the fact that once a model is built, such analysis as sensitivity analysis and risk analysis will be greatly facilitated.

At present, various kinds of software packages are commercially available for this purpose. In this master plan, the XSIM simulation language was chosen as a tool for building a model.

Reference:
Robert S. Pindyck and Daniel L. Rubinfeld, Econometric Models and Economic Forecasts, McGraw-Hill Book Company.
Chapter 12 Example of Simulation Models
12.3 A Simulation Model for Corporate Financial Planning.
Richard Breahy and Stewart Myers, Principles of Corporate Finance, McGraw-Hill Book Company.
Chapter 29 Approaches to Financial Planning.