CHAPTER VI. PROBLEMS IN PROJECT IMPLEMENTATION

CHAPTER VI. PROBLEMS IN PROJECT IMPLEMENTATION

This section enumerates the requirements to be fulfilled or decisions to be made by ANTELCO prior to commencing the implementation of the projects.

1. International Subscriber Dialling System Introduction Project

(1) In implementing this project, internationally open bidding should be allowed at the invitation for tenders to help minimize rises in the asset prices of existing facilities. For this purpose, proper consulting service should be sought in the various phases of the project implementation - preparation of the tender specifications, tender examination, work supervision, and testing.

(2) The installation space for additional equipment in each local office is to be provided by ANTELCO as part of its telephone extension work scheduled from 1982 to 1987.

(3) For system economy's sake, practically reasonable flexibility should be allowed in the already established policies of total, unconditional provision of ISD service and of unchanging the present subscriber numbers.

(4) ISD rates should be charged by the minute. As an incentive to encourage the public use of ISD, the rate for the first three minutes of a person-to-person call should be changed from the current 3 minutes plus one minute basis (person-to-person call) to three minutes

plus two minutes basis (person-to-person call).

(5) In the international scene, the domestic telephone situation in Argentina is especially poor at present so that connection to that country is often laborious and time-consuming. It will be necessary, therefore, for ANTELCO to conduct fact-finding investigations into Argentina and call upon the nation's ENTEL for cooperation in the project so that its telephone situation can be refurbished by the end of 1984 in which ISD introduction is scheduled.

2. Digital Telephone Switching System Introduction Project

Because of the inadequate capacity of the secondary cables in the existing subscriber line facilities, the distribution areas are currently interlinked to one another by aerial rubber-coated wires to complement the deficiency of the secondary cables. These aerial rubber-coated wires are liable to intermittent disconnection and contacts, which might have a detrimental effect on exchange performance. It should be essential, therefore, to make drastic improvement on the present scheme of distributing the secondary cables and also make efforts to eliminate aerial rubber-covered wires.

3. Rural Telephone System Introduction Project

(1) The subscriber terminals in the automatic telephone office necessary to house the MAS system should be furnished under a separate contract.

(2) The radio frequency band to be employed in this project should be specified.

(3) A site for the MAS base station should be reserved.

(4) A tariff system for the MAS system should be established.

CHAPTER VII. OVERALL EVALUATION

CHAPTER VII. OVERALL EVALUATION

1. Overall Financial Analysis

Total investment amount, estimated annual revenues and expenses and internal rate of return (IFRR) for each of the international subscriber dialling, digital telephone switching and rural telephone systems are as described in CHAPTER III, IV and V, respectively. The IFRR can be summarized here again as follows.

(1) IFRR of each project:

International subscriber dialling system	:	41.63%
Digital telephone switching system	:	23.99%
Rural telephone system	:	-7.84%

(2) Combined financial analysis for the total domestic projects:

Financial analysis for the total of the digital telephone switching and rural telephone systems is as shown in Table VII-1, and the IFRR is 19.14%.

(3) Combined financial analysis for the international and domestic projects:

Financial analysis for the total of the international subscriber dialling, digital telephone switching and rural telephone systems is as shown in Table VII-2, and the IFRR is 23.68%.

The IFRR in both (2) and (3) above exceeds the loan interest in Paraguay which is 12 to 15% (short-term loan: 12%, long-term loan: around 15%, as of Feb. 1981).

It proves also that this project will sufficiently pay the installation cost which is to be covered by loans in local and foreign currencies. These tell that this project is feasible as viewed from its financial viewpoint.

Table VII-1 Combined IFRR Calculation (Financial Analysis) Table for Digital Telephone Switching and Rural Telephone Systems

(Unit: Million guaranies)

Item / Year	Business income	Cost				Business income - Cost
		Installation cost	Working capital	Operating cost	Maintenance cost	
1983	0	76.2	0	0	0	-76.2
1984	0	903.4	0	0	0	-903.4
1985	26.9	859.7	8.1	1.1	7.0	-849.0
1986	76.6	3,267.6	14.9	7.6	21.1	-3,234.6
1987	51.0	294.4	0	9.2	61.9	-314.5
1988	1,613.4	295.7	468.7	214.8	102.6	531.6
1989	1,931.2	0	95.3	268.9	102.6	1,464.4
1990	2,325.7	0	118.4	328.3	102.6	1,776.4
1991	1,999.7	0	0	360.0	102.6	1,537.1
1992	1,999.7	0	0	360.0	102.6	1,537.1
1993	1,999.7	0	0	360.0	102.6	1,537.1
1994	1,999.7	0	0	360.0	102.6	1,537.1
1995	1,999.7	0	0	360.0	102.6	1,537.1
1996	1,999.7	0	0	360.0	102.6	1,537.1
1997	1,999.7	0	0	360.0	102.6	1,537.1
1998	1,999.7	0	0	360.0	102.6	1,537.1
1999	1,999.7	0	0	360.0	102.6	1,537.1
2000	1,999.7	0	0	360.0	102.6	1,537.1
2001	1,999.7	0	0	360.0	102.6	1,537.1
2002	1,999.7	0	0	360.0	102.6	1,537.1
2003	1,999.7	0	0	360.0	102.6	1,537.1
2004	1,999.7	0	(23.0) 0	360.0	102.6	* 1,560.1
2005	1,948.7	0	0	350.8	81.5	1,516.4
2006	1,948.7	0	0	350.8	81.5	1,516.4
2007	1,948.7	0	(682.4) 0	350.8	81.5	** 2,198.8

IFRR : 19.14%

Note (1) * and ** mark figures are calculated by Total of Working Capital at 2004 and at 2007 respectively according to the following equation:

{(Business income) - (Cost)} + (Total of Working Capital)

(2) Parenthesis figures at 2004 and at 2007 show Total of Working Capital of RT and DTS.

Table VII-2 Combined IFRR Calculation (Financial Analysis) Table for International Subscriber Dialling, Digital Telephone Switching and Rural Telephone Systems

(Unit: Million guaranies)

Item / Year	Business income	Cost			(Business income - (Cost))
		Installation cost	Working capital	Maintenance and Operating cost	
1983	0	211.2	0	0	-211.2
1984	0	1,341.4	0	0	-1,341.4
1985	26.9	873.7	8.1	25.1	-880.0
1986	439.6	3,350.6	123.9	47.7	-3,082.6
1987	460.0	294.4	14.0	93.1	58.5
1988	2,065.4	295.7	481.7	341.4	946.6
1989	2,431.2	0	109.3	398.5	1,923.4
1990	2,892.7	0	138.4	460.9	2,293.4
1991	2,594.7	0	8.0	496.6	2,090.1
1992	2,646.7	0	17.0	500.6	2,129.1
1993	2,699.7	0	16.0	505.6	2,178.1
1994	2,755.7	0	17.0	510.6	2,228.1
1995	2,813.7	0	17.0	516.6	2,280.1
1996	2,874.7	0	18.0	522.6	2,334.1
1997	2,937.7	0	19.0	529.6	2,389.1
1998	3,002.7	0	20.0	537.6	2,445.1
1999	3,069.7	0	20.0	546.6	2,503.1
2000	3,139.7	0	21.0	556.6	2,562.1
2001	3,211.7	0	22.0	567.6	2,622.1
2002	3,286.7	0	23.0	580.6	2,683.1
2003	3,363.7	0	23.0	594.6	2,746.1
2004	3,445.7	0	(459) 25.0	610.6	* 3,269.1
2005	1,948.7	0	0	432.3	1,516.4
2006	1,948.7	0	0	432.3	1,516.4
2007	1,948.7	0	(682.4) 0	432.3	** 2,198.8

IFRR : 23.68%

Note (1) * and ** mark figures are calculated by Total of Working Capital at 2004 and at 2007 respectively according to the following quation:

{(Business income) - (Cost)} + (Total of Working Capital)

(2) Parenthesis figures at 2004 and at 2007 show Total of Working Capital of ISD and RT, and that of DTS respectively.

2. Economic Analysis

2-1 Premises to Economic Analysis

The costs and benefits used in the economic analysis can be gained by converting each item of the costs and business incomes in the financial analysis in respective way.

The basic conceptual approaches to conversion factors for the financial data involved in the projects are as follows:

(1) Foreign currencies: CIF prices

(2) Local currencies : Standard conversion factor (SCF): 0.98

Calculated on the basis of fiscal 1980 Central Bank of Paraguay data.

(3) Wages (payable to skilled workers):

Propensity to consume x Consumer conversion factor (SCF): 0.72

Propensity to consume in fiscal 1979 is 81.8% in Japan and estimated at 90% for Paraguay. The consumer conversion factor was calculated to be 0.8 on the basis of fiscal 1979 national income statistics.

(4) Wages (payable to non-skilled workers):

Excluded from the scope of the projects.

(5) Consumer surplus:

The following (a) and (b) are added as consumer surplus of the benefits of the digital telephone switching system.

(a) The prevailing private price of telephone in Asuncion is estimated such that a premium of G200,000 is added to the official telephone installation charge of G130,000, according to fact-finding surveys in the city. Such premium was not considered for rural districts, as no telephone was available at present there.

(b) The amount of revenues from incoming toll calls was determined by multiplying the amount of toll calls charges by 0.7 and by 0.5.

2-2 Economic Analysis

(1) Internal rate of return (IRR)

In accordance with the premises above, the internal rate of return for economic analysis (IRR) for each project and for the combination of two or three of those, are shown as follows:

International subscriber dialling system: (Table VII-3)		41.85%
Digital telephone switching system (Table VII-4)	:	30.44%
Rural telephone system (Table VII-5)	:	-6.02%
Combined digital telephone switching and rural telephone systems (Table VII-6)	:	24.26%

Combined international subscriber dialling, digital telephone switching and rural telephone systems (Table VII-7) : 27.86%

As regards the socioeconomic influence in Paraguay, the benefits during the project life for the total of the ISD, DTS and RT systems exceeds the expenses by about 46.1 billion guaranies.

(2) Quantitatively unidentifiable benefits:

In addition to the quantitatively identified effects above, quantitatively unidentifiable merits are also expected to be derived from the system implementations.

-- International Subscriber Dialling System --

(a) Activation of international cultural interflow and trading:

Activation of cultural interflow and trading with Brasil, where Paraguay's economy is depending on in industrial fields and consumer markets, and with Argentine, where no small number of Paraguayan emigrants reside, and other adjacent countries as well as U.S.A., can be expected.

(b) Exaltation of national prestige to foreign countries:

Nationalism is very strong in South American countries. Completion of a modern telecommunication system provides

a powerful means to raise the prestige of Paraguay which has been outstripped by other countries in this phase.

-- Digital Telephone Switching and Rural Telephone -- Systems

(a) Enhancement of efficiency of administration and management, and improved citizen life in the capital Asunción:

The systems, when completed, will not only help simplify paperwork applications in the government agencies and enhance productivity and inventory turnovers in business in the capital Asunción, but also make for better citizen life in terms of social communication and daily living.

(b) Increased sales potentials in both domestic and international markets, and improved infrastructure of agriculture and stock-farming:

(c) Dispersion of the population into new areas:

Of the benefits enumerated above, (b) and (c) are of such significance as would determine the prosperity or decline of the future economy in the agricultural nation of Paraguay. These goals should also form the core of the nation's land development program.

(d) Maintenance of emergency medical systems (Life saving, health, etc.):

(e) Security (Emergency reporting system):

(f) Countermeasures against natural calamities (especially, heavy rains):

(d), (e), and (f) are essential prerequisites to assuring the people of safe and sound living conditions in countries like Paraguay where other infrastructural components (especially, roads and post) are not well-maintained.

(g) Narrowing information gaps:

Virtually very few online computer systems and data bases are available in Paraguay. Constructing a digital network in the nation will help to narrow information gaps in the nation's industry, academy, and defense.

(3) Sensitivity analysis

The analysis results presented above have been worked out on the assumption that (a) the revenue per line in the digital telephone switching system in the covered area will flatten at 7,603 guaranies after 1980 and that (b) installation cost, operating and maintenance costs are exclusive of any possible rises in work costs.

If the revenue per line should rise, at its traditional rate of progress, to 11,137 guaranies (including telephone rate revisions) in fiscal 1988, the internal rate of return for the digital telephone switching system will increase to 31.26%, with the result of growing investment effectiveness.

Table VII-3 International Subscribe Dialling System
IRR Calculation Table (Economic Analysis)

(Unit: Million guaranies)

Item / Year	Benefit	Cost			Benefit - Cost
		Installation cost	Working capital	Maintenance and operating expenses	
1983	0	134	0	0	-134
1984	0	435	0	0	-435
1985	0	14	0	12	-26
1986	356	82	107	14	153
1987	401	0	14	16	371
1988	443	0	13	17	413
1989	490	0	14	19	457
1990	556	0	20	22	514
1991	583	0	8	24	551
1992	634	0	17	27	590
1993	686	0	16	31	639
1994	741	0	17	35	685
1995	798	0	17	39	742
1996	858	0	18	43	797
1997	919	0	19	48	852
1998	983	0	20	54	909
1999	1,049	0	20	60	969
2000	1,117	0	21	68	1,028
2001	1,188	0	22	76	1,090
2002	1,261	0	23	85	1,153
2003	1,337	0	23	95	1,219
2004	1,417	0	24	107	* 1,719

IRR : 41.85%

Note: * mark figure is calculated by the following equation:
{(Business income) - (Cost)} + (Total of Working Capital)

Table VII-4 Digital Telephone Switching System IRR Calculation Table (Economic Analysis)

(Unit: Million guaranies)

Year \ Item	Benefit	Cost				Benefit - Cost
		Installation cost	Working capital	Operating cost	Maintenance cost	
1983	0	41.0	0	0	0	-41.0
1984	0	51.5	0	0	0	-51.5
1985	0	736.2	0	0	0	-736.2
1986	0	2,887.6	0	0	0	-2,887.6
1987	0	294.4	0	0	34.7	-329.1
1988	1,946.0	295.7	459.3	148.0	69.3	973.7
1989	2;296.0	0	93.4	187.0	69.3	1,946.3
1990	2,759.7	0	116.0	229.7	69.3	2,344.7
1991	2,119.2	0	0	252.6	69.3	1,797.3
1992	2,119.2	0	0	252.6	69.3	1,797.3
1993	2,119.2	0	0	252.6	69.3	1,797.3
1994	2,119.2	0	0	252.6	69.3	1,797.3
1995	2,119.2	0	0	252.6	69.3	1,797.3
1996	2,119.2	0	0	252.6	69.3	1,797.3
1997	2,119.2	0	0	252.6	69.3	1,797.3
1998	2,119.2	0	0	252.6	69.3	1,797.3
1999	2,119.2	0	0	252.6	69.3	1,797.3
2000	2,119.2	0	0	252.6	69.3	1,797.3
2001	2,119.2	0	0	252.6	69.3	1,797.3
2002	2,119.2	0	0	252.6	69.3	1,797.3
2003	2,119.2	0	0	252.6	69.3	1,797.3
2004	2,119.2	0	0	252.6	69.3	1,797.3
2005	2,119.2	0	0	252.6	69.3	1,797.3
2006	2,119.2	0	0	252.6	69.3	1,797.3
2007	2,119.2	0	0	252.6	69.3	* 2,466.0

IRR : 30.44%

Note: * mark figure is calculated by the following equation:
{(Business income) - (Cost)} + (Total of Working Capital)

Table VII-5 Rural Telephone System IRR Calculation Table (Economic Analysis)

(Unit: Million guaranies)

Item / Year	Benefit	Cost				Benefit - Cost
		Installa-tion cost	Working capital	Operating cost	Maintenance cost	
1983	0	35.2	0	0	0	-35.2
1984	0	804.4	0	0	0	-804.4
1985	26.4	114.1	7.9	0.8	6.0	-102.4
1986	75.1	141.8	14.6	5.5	17.9	-104.7
1987	50.0	0	0	6.6	17.9	25.5
1988	50.0	0	0	6.6	17.9	25.5
1989	50.0	0	0	6.6	17.9	25.5
1990	50.0	0	0	6.6	17.9	25.5
1991	50.0	0	0	6.6	17.9	25.5
1992	50.0	0	0	6.6	17.9	25.5
1993	50.0	0	0	6.6	17.9	25.5
1994	50.0	0	0	6.6	17.9	25.5
1995	50.0	0	0	6.6	17.9	25.5
1996	50.0	0	0	6.6	17.9	25.5
1997	50.0	0	0	6.6	17.9	25.5
1998	50.0	0	0	6.6	17.9	25.5
1999	50.0	0	0	6.6	17.9	25.5
2000	50.0	0	0	6.6	17.9	25.5
2001	50.0	0	0	6.6	17.9	25.5
2002	50.0	0	0	6.6	17.9	25.5
2003	50.0	0	0	6.6	17.9	25.5
2004	50.0	0	0	6.6	17.9	* 48.0

IRR : -6.02%

Note: * mark figure is calculated by the following equation:
{(Business income) - (Cost)} + (Total of Working Capital)

Table VII-6 Combined IRR Calculation (Economic Analysis) Table for Digital Telephone Switching System and Rural Telephone System

(Unit: Million guaranies)

Item / Year	Benefit	Cost				Benefit - Cost
		Installation cost	Working capital	Operating cost	Maintenance cost	
1983	0	76.2	0	0	0	-76.2
1984	0	855.9	0	0	0	-855.9
1985	26.4	850.3	7.9	0.8	6.0	-838.6
1986	75.1	3,029.4	14.6	5.5	17.9	-2,992.3
1987	50.0	294.4	0	6.6	52.6	-303.6
1988	1,996.0	295.7	459.3	154.6	87.2	999.2
1989	2,346.0	0	93.4	193.6	87.2	1,971.8
1990	2,809.7	0	116.0	236.3	87.2	2,370.2
1991	2,169.2	0	0	259.2	87.2	1,822.8
1992	2,169.2	0	0	259.2	87.2	1,822.8
1993	2,169.2	0	0	259.2	87.2	1,822.8
1994	2,169.2	0	0	259.2	87.2	1,822.8
1995	2,169.2	0	0	259.2	87.2	1,822.8
1996	2,169.2	0	0	259.2	87.2	1,822.8
1997	2,169.2	0	0	259.2	87.2	1,822.8
1998	2,169.2	0	0	259.2	87.2	1,822.8
1999	2,169.2	0	0	259.2	87.2	1,822.8
2000	2,169.2	0	0	259.2	87.2	1,822.8
2001	2,169.2	0	0	259.2	87.2	1,822.8
2002	2,169.2	0	0	259.2	87.2	1,822.8
2003	2,169.2	0	0	259.2	87.2	1,822.8
2004	2,169.2	0	(22.5)	259.2	87.2	* 1,845.3
2005	2,119.2	0	0	252.6	69.3	1,797.3
2006	2,119.2	0	0	252.6	69.3	1,797.3
2007	2,119.2	0	(668.7)	252.6	69.3	** 2,466.0

IRR : 24.26%

Note (1) * and ** mark figures are calculated by Total of Working Capital at 2004 and at 2007 respectively according to the following equation:

{(Business income) - (Cost)} + (Total of Working Capital)

(2) Parenthesis figures at 2004 and at 2007 show Total of Working Capital of RT. and DTS

Table VII-7 Combined IRR Calculation (Economic Analysis) Table for International Subscriber Dialling, Digital Telephone Switching and Rural Telephone Systems

(Unit: Million guaranies)

Item / Year	Benefit	Cost			Benefit - Cost
		Installation cost	Working capital	Maintenance and operating cost	
1983	0	210.2	0	0	-210.2
1984	0	1,290.9	0	0	-1,290.9
1985	26.4	864.3	7.9	18.8	-864.6
1986	431.1	3,111.4	121.6	37.4	-2,839.3
1987	451.0	294.4	14.0	75.2	67.4
1988	2,439.0	295.7	472.3	258.8	1,412.2
1989	2,836.0	0	107.4	299.8	2,428.8
1990	3,365.7	0	136.0	345.5	2,884.2
1991	2,752.2	0	8.0	370.4	2,373.8
1992	2,803.2	0	17.0	373.4	2,412.8
1993	2,855.2	0	16.0	377.4	2,461.8
1994	2,910.2	0	17.0	381.4	2,511.8
1995	2,967.2	0	17.0	385.4	2,564.8
1996	3,027.2	0	18.0	389.4	2,619.8
1997	3,088.2	0	19.0	394.4	2,674.8
1998	3,152.2	0	20.0	400.4	2,731.8
1999	3,218.2	0	20.0	406.4	2,791.8
2000	3,286.2	0	21.0	414.4	2,850.8
2001	3,357.2	0	22.0	422.4	2,912.8
2002	3,430.2	0	23.0	431.4	2,975.8
2003	3,506.2	0	23.0	441.4	3,041.8
2004	3,586.2	0	(455.5) 24.0	453.4	* 3,564.3
2005	2,119.2	0	0	321.9	1,797.3
2006	2,119.2	0	0	321.9	1,797.3
2007	2,119.2	0	(668.7) 0	321.9	** 2,466.0

IRR : 27.86%

Note (1) * and ** mark figures are calculated by Total of Working Capital at 2004 and at 2007 respectively according to the following equation:

{(Business income) - (Cost)} + (Total of Working Capital)

(2) Parenthesis figures at 2004 and at 2007 show Total of Working Capital of ISD and RT, and that of DTS respectively.

Table VII-8 Sensitivity Analysis

(Digital Telephone Switching System)

(Unit: Million guaranies)

Item / Year	Benefit	Cost				Benefit - Cost
		Installation cost	Working capital	Operating cost	Maintenance cost	
1983	0	41.0	0	0	0	-41.0
1984	0	51.5	0	0	0	-51.5
1985	0	736.2	0	0	0	-736.2
1986	0	3,105.7	0	0	0	-3,105.7
1987	0	294.4	0	0	40.8	-335.2
1988	2,093.2	295.7	628.0	301.1	81.5	786.9
1989	2,550.8	0	137.3	380.4	81.5	1,951.6
1990	2,982.6	0	129.5	467.4	81.5	2,304.2
1991	2,854.5	0	0	513.8	81.5	2,259.2
1992	2,854.5	0	0	513.8	81.5	2,259.2
1993	2,854.5	0	0	513.8	81.5	2,259.2
1994	2,854.5	0	0	513.8	81.5	2,259.2
1995	2,854.5	0	0	513.8	81.5	2,259.2
1996	2,854.5	0	0	513.8	81.5	2,259.2
1997	2,854.5	0	0	513.8	81.5	2,259.2
1998	2,854.5	0	0	513.8	81.5	2,259.2
1999	2,854.5	0	0	513.8	81.5	2,259.2
2000	2,854.5	0	0	513.8	81.5	2,259.2
2001	2,854.5	0	0	513.8	81.5	2,259.2
2002	2,854.5	0	0	513.8	81.5	2,259.2
2003	2,854.5	0	0	513.8	81.5	2,259.2
2004	2,854.5	0	0	513.8	81.5	2,259.2
2005	2,854.5	0	0	513.8	81.5	2,259.2
2006	2,854.5	0	0	513.8	81.5	2,259.2
2007	2,854.5	0	0	513.8	81.5	* 3,154.0

IRR : 31.26%

Note: * mark figure is calculated by the following equation:
{(Business income) - (Cost)} + (Total of Working Capital)

3. Overall Evaluation

This report aims at the study of project feasibility of the international subscriber dialling, digital telephone switching and rural telephone systems which have a high priority in the Basic Telecommunication and Broadcasting Expansion Projects in the Republic of Paraguay. As a result of overall evaluation from various viewpoints for analysis described above which are summarized as follows, this project is judged feasible and justifiable.

(1) Feasibility and justification of this project as viewed from national background:

These projects are indispensable for the promotion of the most important policies in the National Development Planning in Paraguay, including development and expansion of international trade with adjacent countries, attainment of competitiveness of the agricultural and stock farming products, decentralized inhabitation in regional districts for national land development, emergency medical treatment and security of the society.

(2) Current status and long-term demand of telecommunications:

Telecommunications in Paraguay have not reached the world's average level in terms of the density of telephones. Drastic improvement in quality, such as improvement of subscriber telephone network, call completion ratio and waiting time, is urgently required.

Long-term demand for telecommunications is ample.

(3) Feasibility and justification of these projects in financial phase:

The total IFRR for these projects is 23.68%, which is financially sufficient for paying the loan.

The financial status of ANTELCO, which is the implementing agency of the projects, is good and is capable of appropriating the fund for reimbursement of the necessary loan.

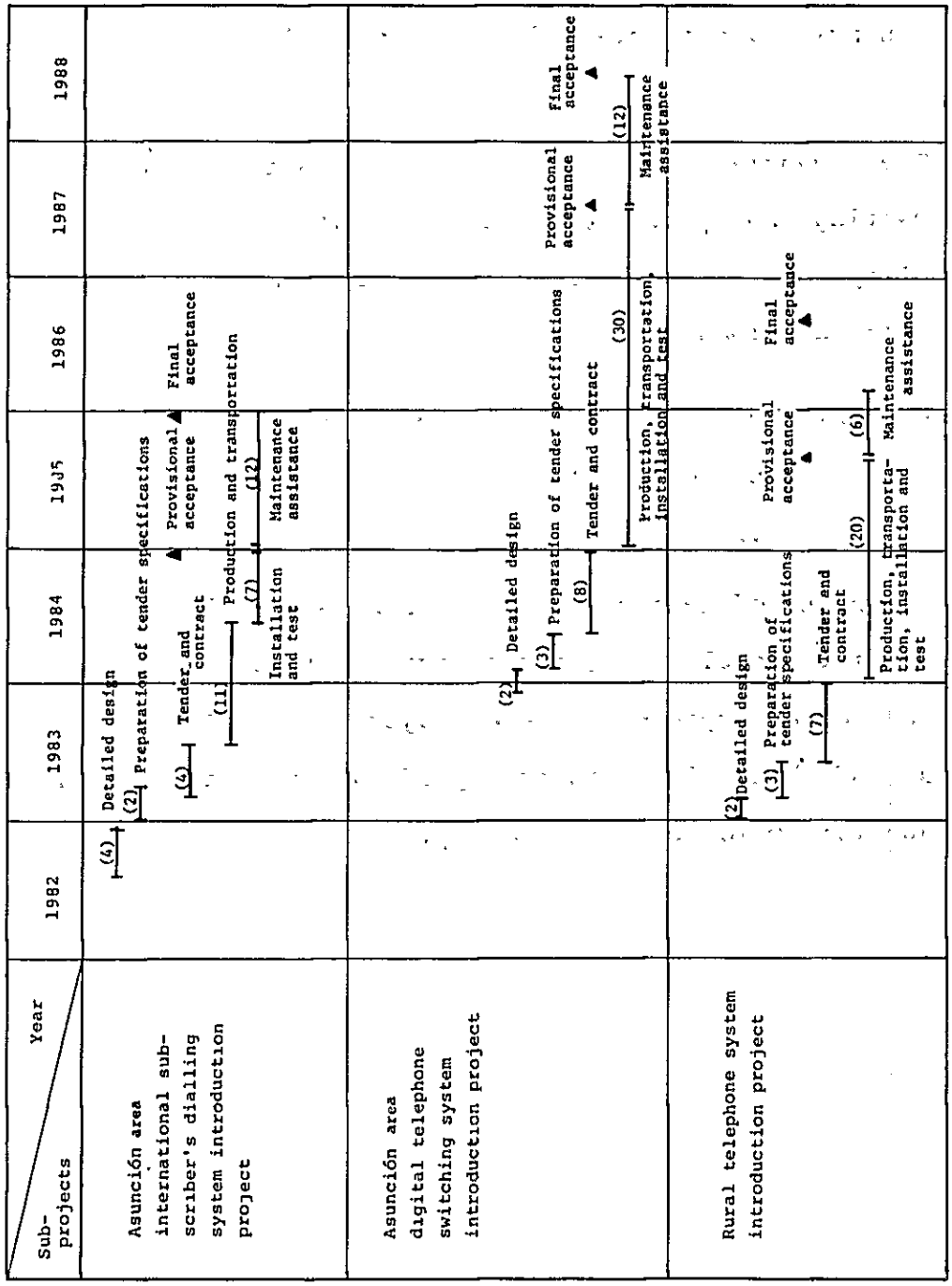
(4) Feasibility and justification of these projects in view of the economic effect:

The total IRR of these projects as viewed from the viewpoint of national economy is 27.86%. The social benefits resulting from the investment will well exceed the social expenses. These projects will also provide a good chance for bringing up of the domestic industries and for employment in Paraguay.

4. Project Execution Schedule Diagram

Table VII-8 shows the project execution schedule diagram for three projects.

Table VII-8 Project Execution Schedule Diagram



Note 1: Parenthesized figures show required periods (in number of months).

2: The Project Execution Schedule Diagram assumes smooth progress of all works without delay. It is naturally subject to modification according to the work progress status.

ANNEX I.

SUPPLEMENTS

TO

DIGITAL TELEPHONE SWITCHING SYSTEM

INTRODUCTION PROJECT

ANNEX I. SUPPLEMENTS TO DIGITAL TELEPHONE SWITCHING SYSTEM INTRODUCTION PROJECT

1. Supplement to Telephone Demand Forecast

1-1 Forecast of Telephone Demand

ANTELCO forecasts the telephone demand for the years 1980 to 1987, and we have derived from the ANTELCO's forecast data the formulas for approximating the telephone demand for respective telephone exchanges for the years 1988 to 1990.

ANTELCO's forecast values and the demand approximation formulas derived therefrom are listed in Tables I-1a and I-2a respectively.

Table I-1a ANTELCO's Forecast Values

Exchange \ Year	1980	1981	1982	1983	1984	1985	1986	1987
CENTRAL II	15,678	17,487	19,456	21,350	23,600	25,439	27,523	29,520
CENTRAL 30	4,732	5,487	6,386	7,475	8,704	9,781	11,074	12.389
CENTRAL I	16,790	18,607	20,309	22,356	24,587	26,542	28,658	30,659
CENTRAL 50	3,361	3,738	4,165	4,601	5,192	5,759	6,333	7,123
CENTRAL 6	7,748	8,528	9,609	10,586	11,772	13,014	14,310	15,772
CENTRAL 7	2,700	2,940	3,240	3,600	3,960	4,380	4,740	5,220
CENTRAL 8	4,095	4,524	5,017	5,569	6,169	6,805	7,482	8,421
CENTRAL 29	2,430	2,722	3,000	3,350	3,718	4,089	4,495	5,095
CENTRAL 5	2,268	2,545	2,871	3,231	3,658	4,118	4,662	5,278
CENTRAL 35	900	1,101	1,453	1,905	2,455	2,842	3,239	3,791
CENTRAL 67	2,268	2,545	2,871	3,231	3,658	4,131	4,691	5,263
Total	62,970	70,224	78,380	87,254	97,473	106,900	117,207	128,531
Number of installed terminals	57,000	57,000	57,000	57,000	57,000	57,000	57,000	57,000
Number of additional terminals required	5,970	13,224	21,380	30,254	40,473	49,900	60,207	71,531

Table I-2a Demand Forecast Formulas for Respective Exchanges

Exchange	Approximation formula		1987	1988	1989	1990
CENTRAL II	$y = 16{,}049 \times (1.0948)^t$	0.99694	29,520	33,123	36,263	39,700
CENTRAL 30	$y = 4{,}828 \times (1.1492)^t$	0.99808	12,389	14,687	16,878	19,397
CENTRAL I	$y = 17{,}068 \times (1.0904)^t$	0.99803	30,659	34,109	37,192	40,555
CENTRAL 50	$y = 3{,}360 \times (1.1129)^t$	0.99981	7,123	7,907	8,799	9,793
CENTRAL 6	$y = 7{,}772 \times (1.1075)^t$	0.99967	15,772	17,591	19,482	21,576
CENTRAL 7	$y = 2{,}692 \times (1.1000)^t$	0.99961	5,220	5,771	6,348	6,982
CENTRAL 8	$y = 4{,}091 \times (1.1075)^t$	0.99983	8,421	9,259	10,255	11,357
CENTRAL 29	$y = 2{,}442 \times (1.1094)^t$	0.99961	5,095	5,603	6,216	6,896
CENTRAL 5	$y = 2{,}257 \times (1.1284)^t$	0.99995	5,278	5,932	6,674	7,554
* CENTRAL 35	$y = 915 \times (1.2300)^t$	0.99870	3,791	4,794	5,896	7,252
CENTRAL 67	$y = 2{,}257 \times (1.1886)^t$	0.99994	5,263	5,941	6,705	7,567
TOTAL	$y = 63{,}676 \times (1.1078)^t$	0.99916	128,531	144,433	160,003	177,251

* For CENTRAL 35, the data for the years '83, '84 and '85 are not used.

1-2 Forecast of Telephone Demand Fulfillment

The telephone demand fulfillment is forecast according to the steps below.

① To forecast the national telephone demand fulfillment

② To estimate that part of the national telephone demand fulfillment which is to be allocated to Asunción.

③ To distribute Asunción's telephone demand fulfillment among its telephone exchanges.

(1) Forecast of national telephone demand fulfillment

(i) Forecast of PIB (Producto Interno Bruto Per Capita)

From the 1975-79 PIB values, shown in Table I-3a an exponential curve is obtained and reduced to the following approximation formula.

$$PIB = 353.338 \times (1.06777)^{t} \qquad t=0: \ 1975$$

Table I-3a Actual PIB Values Achieved

Item \ Year	1975	1976	1977	1978	1979
PIB	356	372	404	433	458

Base year: 1972 Price fixed at 1 US$ = 126 Garani

According to this approximation formula, PIB is forecast for the future years as shown in Table I-4a.

Table I-4a Forecast PIB Values for the Future Years

Item \ Year	1975	1976	1977	1978	1979	1980	1981	1982
PIB	353	377	403	430	459	490	524	559
Item \ Year	1983	1984	1985	1986	1987	1988	1989	1990
PIB	597	638	681	727	776	829	885	945

(ii) Calculation of telephone density from the telephone density vs. PIB curve

The calculated results are as shown in Table I-5a.

Table I-5a Forecast of Telephone Density

Item \ Year	1975	1976	1977	1978	1979	1980	1981	1982
Telephone Density	1.13	1.23	1.35	1.48	1.62	1.78	1.95	2.14
Item \ Year	1983	1984	1985	1986	1987	1988	1989	1990
Telephone Density	2.34	2.57	2.82	3.09	3.38	3.71	4.06	4.45

(per 100 persons)

$$\log D = -3.5074 + 1.39681 \log (PIB)$$

(iii) Determination of national telephone demand fulfillment from the Paraguayan Government's population forecast data (EL ESFUERZO NACIONAL Y LAS NECECIDADES DE FINANCIMIENTO EXTERNO P. 7)

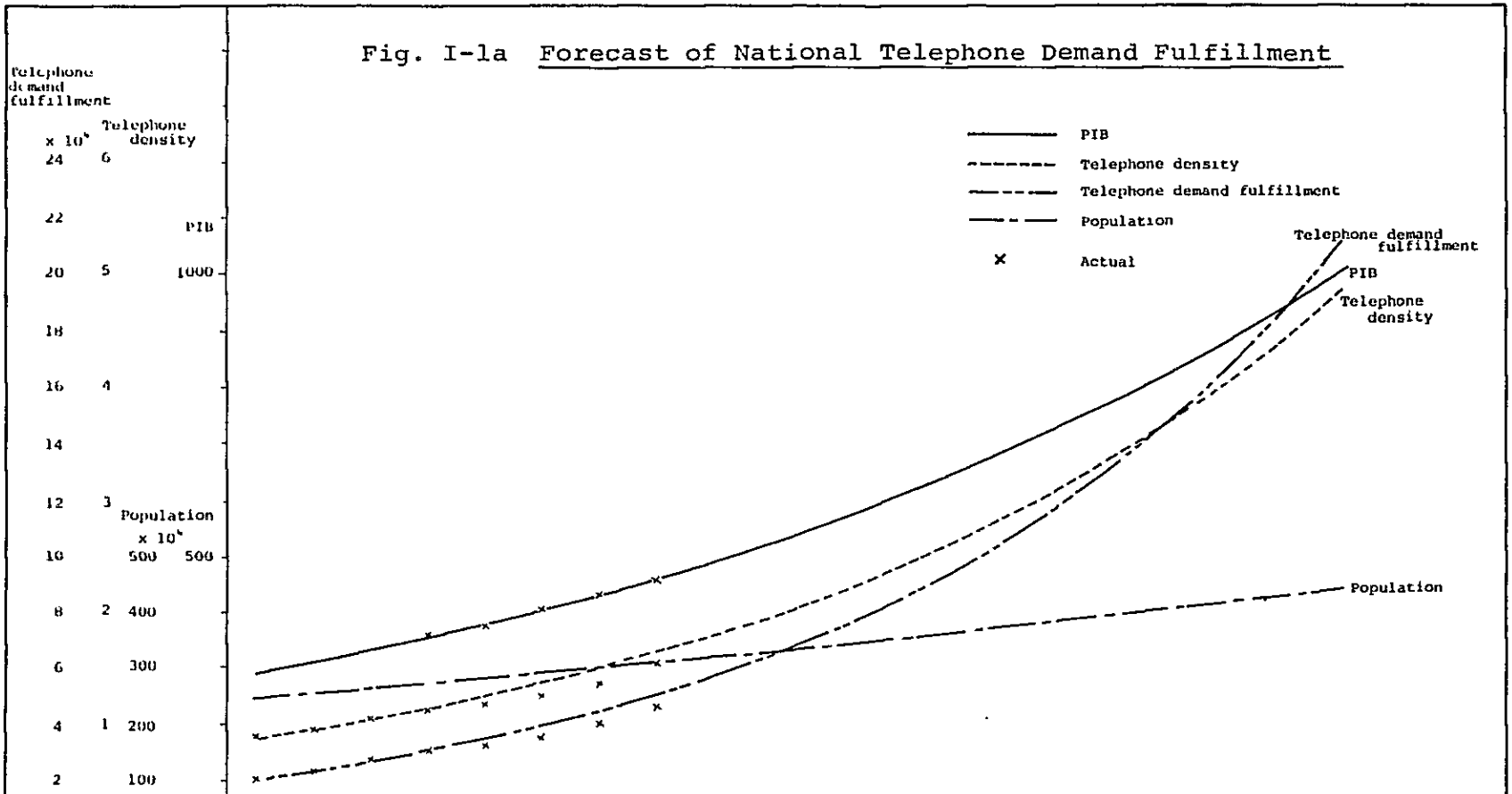
The results are as listed in Table I-6a.

Table I-6a Forecast of Telephone Demand Fulfillment

Item \ Year	1975	1976	1977	1978	1979	1980	1981	1982
PIB	353	377	403	430	459	490	524	559
Telephone density	1.13	1.23	1.35	1.48	1.62	1.78	1.95	2.14
Population	268.6	277.9	287.3	297.0	306.8	316.8	326.8	337.0
Telephone demand fulfillment	3.04	3.42	3.88	4.40	4.97	5.64	6.37	7.21
Item \ Year	1983	1984	1985	1986	1987	1988	1989	1990
PIB	597	638	681	727	776	829	885	945
Telephone density	2.34	2.57	2.82	3.09	3.38	3.71	4.06	4.45
Population	347.2	257.6	368.1	378.8	390.0	400.7	411.8	423.1
Telephone demand fulfillment	8.12	9.19	10.38	11.70	13.18	14.87	16.72	18.83

(iv) PIB, telephone density, population and telephone demand fulfillment are plotted in Fig. I-1a.

Fig. I-1a Forecast of National Telephone Demand Fulfillment



Item \ Year	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
PIB	290	310	331	353	377	403	430	459	490	524	559	597	638	681	727	776	829	885	945	1009
Telephone density	0.86	0.94	1.03	1.13	1.23	1.35	1.48	1.62	1.78	1.95	2.14	2.34	2.57	2.82	3.09	3.38	3.71	4.06	4.45	4.88
Population ($x10^4$)	243.3	251.3	259.7	268.6	277.9	287.3	297.0	306.8	316.8	326.8	337.0	347.2	357.6	368.1	378.8	390.0	400.7	411.8	423.1	434.3
Telephone demand fulfillment ($x10^4$)	2.09	2.36	2.67	3.04	3.42	3.88	4.40	4.97	5.64	6.37	7.21	8.11	9.19	10.38	11.70	13.18	14.87	16.72	18.83	21.19

(2) Telephone demand fulfillment in Asunción

(i) Forecast of population growth from ANTELCO's five-year population data (1976-80) (Table I-7a)

Based on this forecast data, the annual population growth rate is estimated at 3.17%, by which the population growth in Asunción is forecast in Table I-8a.

Table I-7a Population Data Submitted by ANTELCO

Zone \ Year		1976	1977	1978	1979	1980	Remarks
Asunción		435,875	449,632	463,856	478,563	493,772	Annual average population growth during the 1976-80 period: 3.17%
URBANO	F. de la Morra	-	-	-	-	82,403	Assumed to be the same as in Asunción city
	Lambaré	-	-	-	-	72,256	Ditto
Asunción area, total		-	-	-	-	648,431	

Table I-8a Forecast of Population Growth in Asunción Area

Zone \ Year		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Asunción		493,772	509,425	525,573	542,234	559,423	577,157	595,452	614,328	633,802	653,894	674,622
URBANO	F. de la Morra	82,403	85,015	87,710	90,491	93,359	96,319	99,372	102,522	105,772	107,125	112,584
	Lambaré	72,256	74,547	76,910	79,348	81,863	84,458	87,135	89,898	92,747	95,687	98,721
Asunción area, total		648,431	668,987	690,193	712,073	734,645	757,934	781,959	806,748	832,321	858,706	885,927

$$y = \begin{Bmatrix} 493.772 \\ 82.403 \\ 72.256 \end{Bmatrix} \times (1.0317)^t \qquad t = 0: \ 1980$$

(ii) The population, PIB and telephone demand fulfillment have interrelation, and the telephone concentration in Asunción area is calculated using the following formula in which population concentration and PIB are correlated, and is used to determine the telephone demand fulfillment assigned for Asunción area. The results are as shown in Table I-9a.

$$y = 39.1 + 1.288\ x_1 - 7.6458 \times 10^{-3}\ x_2$$

where, y: Telephone concentration, %

x_1: Population concentration, %

x_2: Per capita GDP (PIB), US$

Table I-9a Annual Data of the Entire Country and of Asunción

Item \ Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Population, national total (x 10^4)	316.8	326.8	337.0	347.2	357.6	368.1	378.8	390.0	400.7	411.8	423.1
Population in Asunción area (x 10^4)	64.8	66.9	69.0	71.2	73.5	75.8	78.2	80.7	83.2	85.9	88.6
Population concentration in Asunción area (%)	20.5	20.5	20.5	20.6	20.6	20.6	20.6	20.7	20.8	20.9	20.9
PIB	490	524	559	597	638	681	727	776	829	885	945
Telephone concentration in Asunción area (%)	61.8	61.5	61.2	60.9	60.8	60.4	60.1	59.8	59.6	59.3	58.2
National telephone demand fulfillment (x 10^4)	5.64	6.37	7.21	8.12	9.19	10.38	11.70	13.18	14.87	16.72	18.83
Telephone demand fulfillment in Asunción area (x 10^4)	3.49	3.92	4.41	4.95	5.59	6.27	7.03	7.88	8.86	9.91	11.07

(iii) According to the forecast formula, the telephone concentration in 1997, the last year of the Third Five-year plan, is expected to be 55.7%.

The actual telephone concentration in 1980 is as given in Table I-10a, and is expected to grow straight to 55.7% in 1997. (See Fig. I-2a.)

Table I-10a Telephone Concentration in 1980

Year	National telephone demand fulfillment	Telephone demand fulfillment in Asunción area	Local telephone demand fulfillment	Telephone concentration in Asunción area
1980	49,508	37,829	11,679	76.4%

Table I-11a Telephone Demand Fulfillment in Asunción Area

Item \ Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
National total telephone demand fulfillment ($x\ 10^4$)	5.64	6.37	7.21	8.12	9.19	10.38	11.70	13.18	14.87	16.72	18.83
Telephone concentration in Asunción area	76.4	75.2	74.0	72.7	71.5	70.3	69.1	67.9	66.7	65.4	64.2
Telephone demand fulfillment in Asunción area ($x\ 10^4$)	4.31	4.79	5.34	5.90	6.57	7.30	8.08	8.95	9.92	10.93	12.09
Telephone density per 100 persons	6.65	7.16	7.73	8.29	8.94	9.63	10.34	11.09	11.92	12.73	13.64

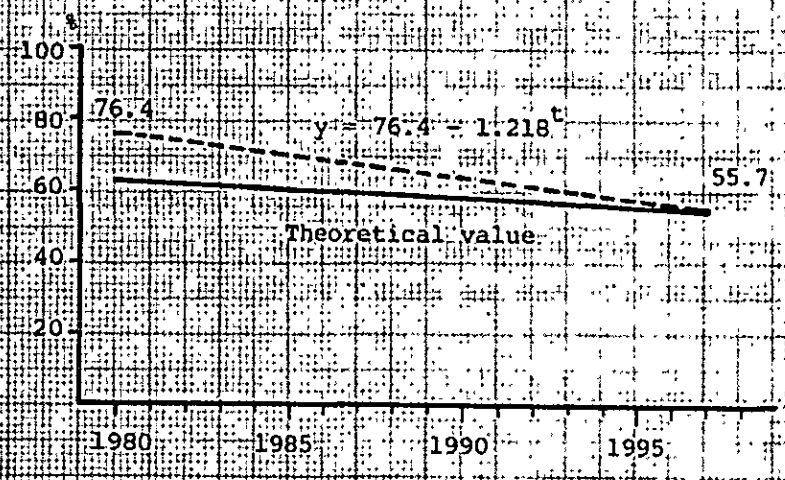


Fig. I-2a Telephone Concentration in Asunción Area

(iv) The telephone demand fulfillment in Asunción area is as shown in Fig. I-3a and Table I-11a.

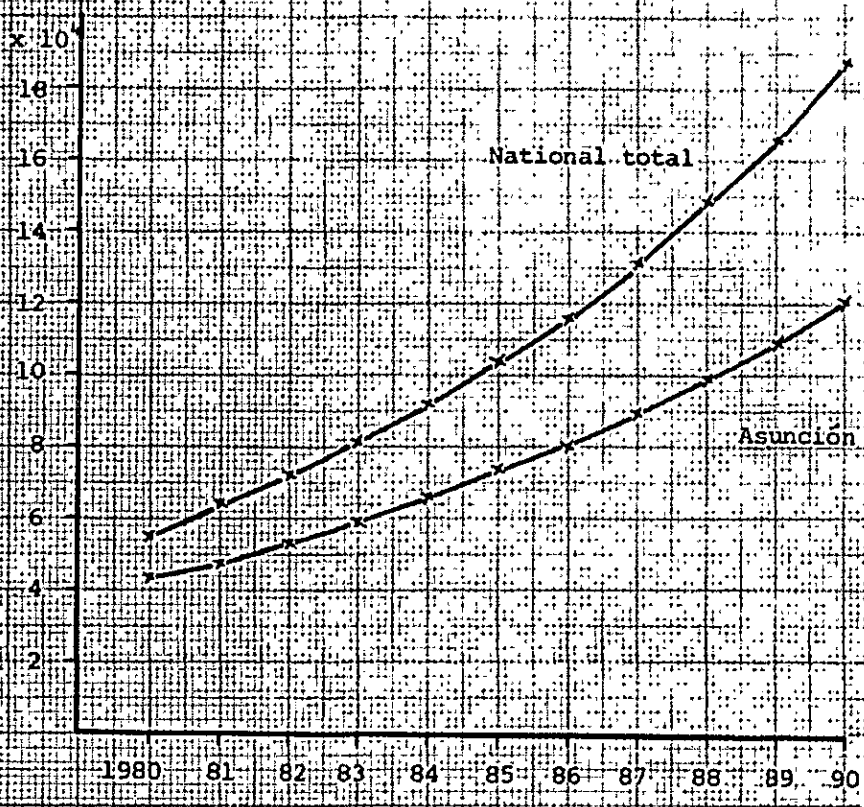


Fig. I-3a Telephone Demand Fulfillment in Asunción Area

(3) Distribution prorate of the telephone demand fulfillment in Asunción area among the telephone exchanges

According to the demand ratios for respective exchanges projected by ANTELCO, the telephone demand fulfillment in Asunción area is distributed among the telephone exchanges. The results are as shown in Table I-12a.

Table I-12a Telephone Demand Fulfillment by Exchanges

Exchange \ Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
CENTRAL II	10,560	11,640	12,869	14,101	15,571	17,082	18,746	20,585	22,618	24,702	26,961
CENTRAL 30	3,146	3,688	4,272	4,897	5,650	6,570	7,514	8,592	9,821	11,149	12,815
CENTRAL I	11,249	12,310	13,564	14,809	16,228	17,812	19,473	21,212	23,213	25,248	27,444
CENTRAL 50	2,371	2,635	2,937	3,245	3,614	4,015	4,444	4,923	5,456	6,012	6,650
CENTRAL 6	5,301	5,892	6,568	7,257	8,081	8,979	9,938	11,009	12,202	13,444	14,871
CENTRAL 7	1,767	1,964	2,189	2,419	2,694	2,993	3,313	3,670	4,067	4,481	4,957
CENTRAL 8	2,802	3,114	3,471	3,835	4,271	4,745	5,252	5,818	6,448	7,105	7,859
CENTRAL 29	1,724	1,916	2,136	2,360	2,628	2,920	3,232	3,580	3,968	4,372	4,836
CENTRAL 5	1,767	1,964	2,189	2,419	2,694	2,993	3,313	3,670	4,067	4,481	4,957
CENTRAL 35	647	814	1,015	1,239	1,577	1,898	2,262	2,775	3,274	3,826	4,594
CENTRAL 67	1,767	1,964	2,189	2,419	2,694	2,993	3,313	3,670	4,067	4,481	4,957
TOTAL ($x10^4$)	4.31	4.79	5.34	5.90	6.57	7.30	8.08	8.95	9.92	10.93	12.09

2. Supplementary Explanation of Telephone Traffic Forecast

2-1 Forecast of Subscriber's calling rate (CR) given in Table IV-6a is calculated according to the following formula.

$$CR = \text{Subscriber's calling rate } (CR_o) \times \text{Traffic growth rate } (\alpha)$$

The value CR_o (basic traffic) which is the basis of the forecast is the design value employed in the Third Expansion Plan. They are presented in Table I-13a.

The traffic growth rate (α) is determined using the following formula with account taken of the transition of the traffic in Asunción during the 1974-78 period.

$$\alpha = 1 + 0.0104 \times n$$

n: The number of years from the base year (1987) to the year of forecast. ($\therefore n = 3$)

Table I-13a Subscriber's Calling Rate

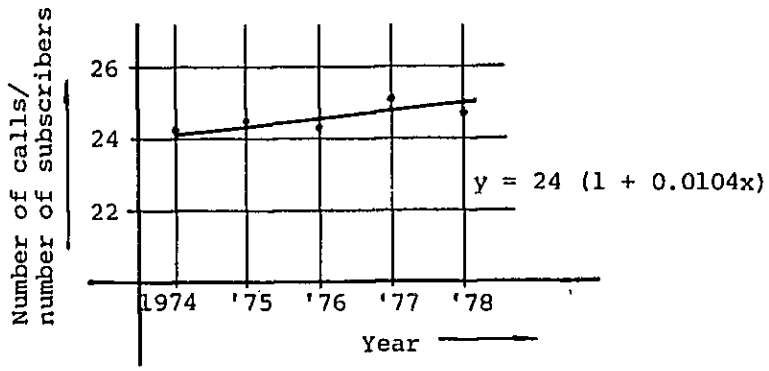
Exchange	Calling rate	Called rate (ref. only)
CENTRAL II (2)	0.066	0.064
CENTRAL 29	0.051	0.050
CENTRAL 30	0.051	0.051
CENTRAL 35	0.041*	-
CENTRAL I (4)	0.067	0.067
CENTRAL I (9)	0.070	0.066
CENTRAL 5	0.053	0.053
CENTRAL 50	0.043*	-
CENTRAL 6	0.048	0.040
CENTRAL 67	0.038*	-
CENTRAL 7	0.047	0.040
CENTRAL 8	0.047	0.040

* : The calling rates for CENTRALs "35", "50" and "67" are the estimates calculated by multiplying the calling rates of CENTRALs "30", "5" and "6" by 0.8.

Table I-14a Transition of Subscribers and Number of Calls in Asunción (with Figure)

Item \ Year	1974	1975	1976	1977	1978
Number of subscribers	27,401	29,977	31,957	35,271	40,153
Number of calls in Asunción city	622,481	733,374	776,208	885,840	988,778

(Source: ANTELCO ANNUAL REPORT, 1980)



2-2 Calculation of Traffic Distribution Ratio

2-2-1 Inter-Switching Unit Calling Rate

The inter-switching unit calling rate which serves as a basis for the calculation of the total calling traffic distribution ratios of originating switching units to terminating switching units is calculated from the following formula.

Inter-switching unit calling rate
= [Section busy hour traffic (BHT)/Total UR]

Total UR = (Total number of subscribers of originating switching unit) x (Total number of subscribers of terminating switching unit)

The section busy hour traffic and the total number of subscribers (terminal capacity here) for each switching unit are at the design values employed in the Third Expansion Plan. They are as shown in Table I-15a. For the newly installed exchanges, the forecast is made by taking into account the subscriber's calling rate and inter-exchange distance.
The calculated results are as shown in Table I-16a.

2-2-2 Traffic Distribution Ratios between Switching Units

The traffic distribution ratios between exchange units are calculated following the procedure below.

With reference to Table I-17a, for example, the ratio of traffic distribution from the originating exchange, Y_i, to the terminating exchange, X_j, is calculated as follows.

$$d(Y_i, X_j) = CR_{ij}y_ix_i/(\sum_{j=1}^{n} CR_{ij}y_ix_j)$$

Table I-15a Inter-Exchange Traffic
(Design Values for the Third Expansion Plan)

Unit: erlang

Terminating exchange / Terminal capacity / Terminal capacity / Originating exchange		2	29	30	35	4	9	50	6	7	8	0
		14,000	3,000	3,200	900	8,000	8,600	4,000	8,600	3,000	4,600	-
2	14,000		136.8	89.6		190.8	245.69	76.0	157.88	53.5	77.8	51.0
29	3,000	143.2	11.4									
30	3,200	55.8		11.2	35.4	20.0	38.4	10.2	15.1	5.01	7.29	9.65
35	900	15.1		3.13		5.57	8.46	2.50	4.46	1.36	2.50	3.15
4	8,000	149.65		20.0		106.5	122.5	23.7	40.3	18.1	28.6	32.3
9	8,600	203.84		26.8		124.9	155.99	34.1	64.8	20.0	31.1	34.50
50	4,000	55.8		10.8		27.4	43.3	20.5	26.1	7.29	11.4	12.6
6	8,600	121.4		17.5		47.5	75.4	24.3	75.4	12.0	17.5	26.3
7	3,000	42.00		6.71		23.70	26.80	8.46	12.60	8.8	8.46	9.65
8	4,600	60.10		11.40		32.90	40.9	13.2	20.0	8.46	21.2	14.0

Table I-16a Inter-Switching Unit Calling Rate

Unit: x 10^{-6} erlang

Terminating exchange / Terminal capacity / Originating exchange		2	29	30	35	4, 9	5	50	6	67	7	8	"0"
Terminal capacity		27,000	4,900	13,200	4,600	27,600	5,000	8,500	15,100	5,000	5,000	7,900	-
2	27,000	1.913	1.278	1.372	0.898	1.887	1.258	1.012	1.212	0.855	1.181	1.112	0.35
29	4,000	1.278	1.584	1.144	0.858	1.221	1.149	0.775	1.289	0.921	1.035	0.886	0.32
30	13,200	1.372	1.144	1.438	1.369	1.435	1.055	0.798	0.726	0.715	0.683	0.712	0.32
35	4,600	0.898	0.858	1.369	1.515	1.018	0.943	0.858	0.572	0.543	0.832	0.923	0.3
4, 9	27,600	1.887	1.221	1.435	1.018	2.093	1.344	1.018	1.138	0.909	1.358	1.412	0.4
5	5,000	1.258	1.149	1.055	0.943	1.344	1.801	1.201	1.146	0.841	0.955	0.972	0.32
50	8,500	1.012	0.775	0.798	0.858	1.018	1.201	1.515	0.858	0.786	0.726	0.755	0.32
6	15,100	1.212	1.289	0.726	0.572	1.138	1.146	0.858	1.329	1.144	0.769	0.818	0.33
67	5,000	0.855	0.921	0.715	0.543	0.909	0.841	0.786	1.144	1.430	0.586	0.626	0.3
7	5,000	1.181	1.035	0.683	0.832	1.358	0.955	0.726	0.769	0.586	1.541	0.961	0.32
8	7,900	1.112	0.886	0.712	0.923	1.412	0.972	0.755	0.818	0.626	0.961	1.515	0.32
"0"	-	0.35	0.32	0.32	0.3	0.4	0.32	0.32	0.33	0.3	0.32	0.32	

Remarks: For "0" alone, the originating (terminating) calling rate of originating (terminating) exchange per subscriber is given.

Table I-17a Inter-Switching Unit Calling Rate

Terminating exchange / Terminal capacity / Terminal capacity / Originating exchange		X_1	X_2	------	X_j	------	X_n
		x_1	x_2	------	x_j	------	x_n
Y_1	y_1	CR_{11}	CR_{12}	------	CR_{1j}	------	CR_{1n}
Y_2	y_2	CR_{21}	CR_{22}	------	CR_{2j}	------	CR_{2n}
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
Y_i	y_i	CR_{i1}	CR_{i2}	------	CR_{ij}	------	CR_{in}
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
Y_n	y_n	CR_{n1}	CR_{n2}	------	CR_{nj}	------	CR_{nn}

The traffic distribution ratios calculated using the data shown in Table I-16a are given in Table I-18a.

2-3 Calculation of Inter-Switching Unit Busy Hour Traffic

The busy hour traffic, BHT (Y_i, X_j), from the originating exchange Yi, to the terminating exchange X_j, is calculated according to the following formula.

BHT (Y_i, X_j) = (Total originating traffic from Yi exchange) x (Inter-switching unit traffic distribution ratio, $d(Y_i, X_j)$)
= (Y_i exchange calling rate) x (Y_i exchange total number of subscribers) x $[d(Y_i, X_j O]$

The busy hour traffic between switching units is calculated by making use of the data on Table I-16a, and the result is shown in Table IV-7.

2-4 Traffic between the Exchanges to be installed according to the Project

The busy hour traffic relating to the digital switching units to be installed in CENTRAL-I(9) and CENTRAL-30 is given in Table I-19a.

Table I-18a Inter-Switching Unit Traffic Distribution Ratio

(Unit: %)

Terminating exchange / Terminal capacity / Terminal capacity / Originating exchange		2	29	30	35	4, 9	5	50	6	67	7	8	"0"
		27,000	4,900	13,200	4,600	27,600	5,000	8,500	15,100	5,000	5,000	7,900	-
2	27,000	26.56	3.24	9.32	2.12	26.79	3.24	4.42	9.42	2.2	3.04	4.52	5.15
29	4,900	22.67	5.08	9.87	2.58	22.04	3.76	4.31	12.74	3.01	3.39	4.58	5.98
30	13.200	24.32	3.68	12.46	4.13	26.00	3.46	4.45	7.20	2.35	2.24	3.69	6.01
35	4,600	19.40	3.36	14.46	5.58	22.48	3.78	5.83	6.91	2.17	3.33	5.84	6.86
4, 9	27,600	24.82	2.91	9.23	2.28	28.37	3.27	4.21	8.37	2.21	3.31	5.44	5.57
5	5,000	21.60	3.58	8.85	2.76	23.58	5.73	6.49	11.01	2.67	3.04	4.88	5.82
50	8,500	21.31	2.96	8.21	3.08	21.91	4.68	10.05	10.10	3.07	2.83	4.65	7.14
6	15,100	23.18	4.47	6.79	1.86	22.24	4.06	5.16	14.21	4.05	2.72	4.57	6.68
67	5,000	19.83	3.88	8.11	2.15	21.56	3.61	5.74	14.84	6.14	2.52	4.25	7.37
7	5,000	23.24	3.70	6.57	2.79	27.31	3.48	4.50	8.46	2.14	5.62	5.53	6.67
8	7,900	21.50	3.11	6.73	3.04	27.91	3.48	4.59	8.84	2.24	3.44	8.57	6.55
"0"	-			(Same as toll originating traffic)									

Table I-19a Inter-Exchange Traffic Flow (Relating to DTS)

Unit: erlang

Terminating exchange / Terminal capacity / Originating exchange / Terminal capacity		2	29	30	35	4	9	5	50	6	67	7	8	"0"	Total	Remarks
		27,000	4,900	13,200	4,600	8,000	19,600	5,000	8,500	15,100	5,000	5,000	7,900	-		
2	27,000	-	-	171.09	-	-	349.27	-	-	-	-	-	-	-	-	EMD
29	4,900	-	-	25.87	-	-	41.04	-	-	-	-	-	-	-	-	EMD
30	13,200	171.09	25.87	87.60	29.11	52.15	127.76	24.32	31.31	50.59	16.50	16.98	28.65	42.24	704.17	DTS
35	4,600	-	-	29.11	-	-	32.11	-	-	-	-	-	-	-	-	EMD
4	8,000	-	-	52.15	-	-	115.76	-	-	-	-	-	-	-	-	EMD
9	19,600	349.27	41.04	127.76	32.11	115.76	283.61	46.07	59.33	123.66	31.18	46.54	76.46	78.40	1411.19	DTS
5	5,000	-	-	24.32	-	-	46.07	-	-	-	-	-	-	-	-	EMD
50	8,500	-	-	31.31	-	-	59.33	-	-	-	-	-	-	-	-	EMD
6	15,100	-	-	50.59	-	-	123.66	-	-	-	-	-	-	-	-	EMD
67	5,000	-	-	16.50	-	-	31.18	-	-	-	-	-	-	-	-	EMD
7	5,000	-	-	16.98	-	-	46.54	-	-	-	-	-	-	-	-	EMD
8	7,900	-	-	28.65	-	-	76.46	-	-	-	-	-	-	-	-	EMD
"0"	-	-	-	42.24	-	-	78.40	-	-	-	-	-	-	-	-	EMD
Total		-	-	704.17	-	-	1411.19	-	-	-	-	-	-	-	-	

Table I-20a General Equipment Installation Schedule

Classification of equipment / Plan	Exchange equipment		Outside Plant	Transmission Lines	Remarks
	Switching Facilities	Power Supply Facilities			
The EMD telephone switching of CENTRAL-I(9) and CENTRAL-30 are to be replaced with digital telephone switching, and at the same time, the terminal capacity is to be expanded.	Digital telephone equipments: 2 units Capacity: CENTRAL-I, 19,600 terminals CENTRAL-30, 13,200 terminals Relocation: CENTRAL-I, 14,600 terminals CENTRAL-30, 7,200 terminals	Number of stations requiring power facilities: 2 Battery: 2 sets Rectifier: 2 sets Inverter: 2 sets Engine generator: 550 kV x 1 Air conditioning system: 3 sets Mobile power station: 150 kV x 1	Total number of cable pairs required: 14,300 Total number of termination jointing cables: 11 Aggregate length of primary cables: 19.7 km (in terms of 1,000-pair cables) Number of newly installed Armario: 23 Aggregate length of secondary cables: 127.1 km (in terms of 100-pair cables)	Number of sections requiring the installation of transmission lines: 11 Number of circuits: 4,397 metallic circuits 592 digital circuits Number of optical cable transmission line sections: 1 Optical fiber cable system: 32 Mb/s x 2 systems	• Battery backup time: 1 hr. of exchange w/diesel generator 4 hrs. for exchange w/o diesel generator • Primary cable: 130% of the telephone demand fulfilment expected three years after commissioning • Secondary cable: To cover the total demand expected 15 years after commissioning • Optical fiber cable system: Active/standby changeover system on the same route

3. Supplementary Explanation of Equipment Installation Schedule

The equipment installation schedule planned according to IV-8-1 "Planning Policies" is shown below.

3-1 General Equipment Installation Schedule

As per Table I-20a.

3-2 Exchange Equipment

The schedule for the installation of the exchange equipment (DTS and power facilities) is shown in Table I-21a.

3-3 Outside Plant

The schedule for the installation of the outside plant (subscriber lines) is shown in Table I-22a.

3-4 Transmission Lines

The cable network for Asunción area and the number of inter-zone circuits are shown in Fig. I-4a.
The optical fiber cable network is shown in Fig. I-5a.

Table I-21a Exchange Equipment

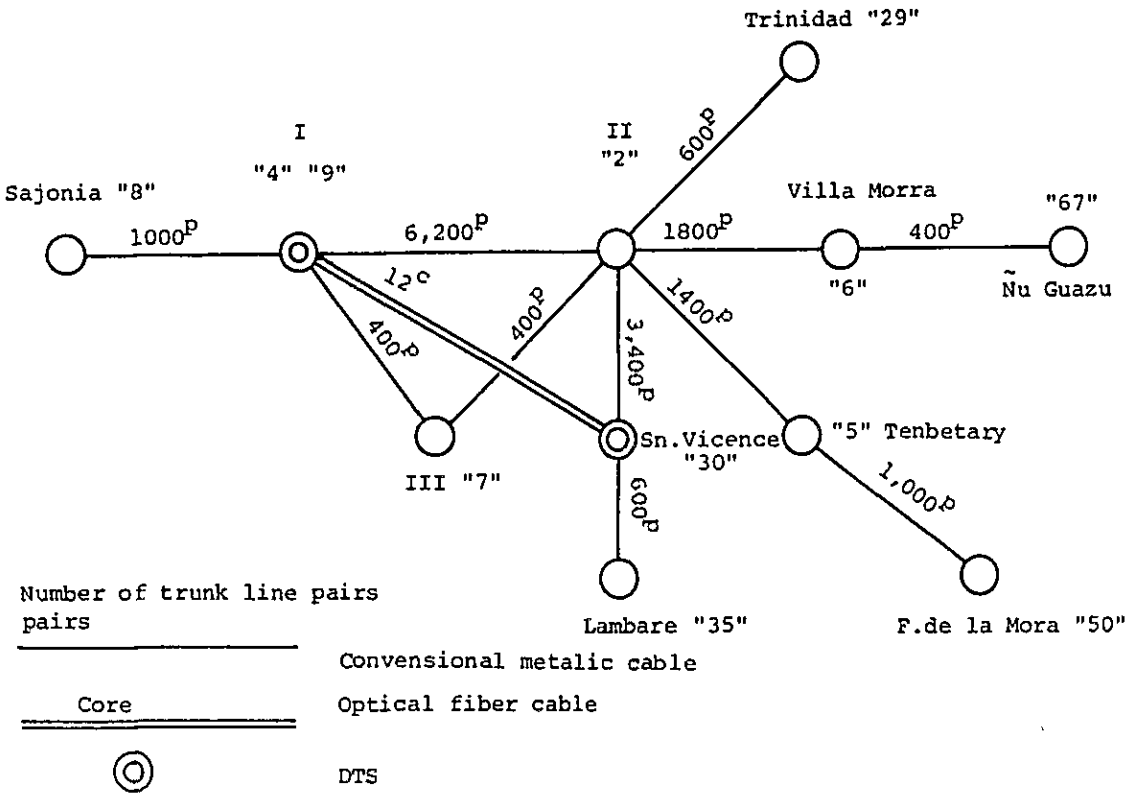
Exchange \ Item		Digital telephone switching facilities		Power supply facilities				
		Additional terminals	Relocation	Battery	Rectifier	Inverter	Engine generator	Air conditioning system
CENTRAL II	2 -LS	(7,000)	-	-	-	-	-	-
	-TS	-	-	-	-	-	-	-
CENTRAL 30		6,000	7,200	$5,000^{AH}$	800^{A} x 2	20^{A} x 1	*150^{KVA} x 1	4
CENTRAL I	4	-	-	$6,000^{AH}$	800^{A} x 3	20^{A} x 1	550^{KVA} x 1	5
	9	5,000	14,600					
CENTRAL 50		(500)	-	-	-	-	-	-
CENTRAL 6		(3,500)	-	-	-	-	-	-
CENTRAL 7		(1,000)	-	-	-	-	-	-
CENTRAL 8		(1,700)	-	-	-	-	-	-
CENTRAL 29		(900)	-	-	-	-	-	-
CENTRAL 5		(1,400)	-	-	-	-	-	-
CENTRAL 35		(1,200)	-	-	-	-	-	-
CENTRAL 67		(3,000)	-	-	-	-	-	-
Total		11,000 (20,200)	21,800	$5,000^{AH}$ x 1 $6,000^{AH}$ x 1	800^{A} x 5	20^{A} x 2	550^{KVA} x 1 150^{KVA} x 1	9

Notes: The values in parentheses denote additional terminals by EMD switching units.

Mobile power station

Table I-22a Outside Plant

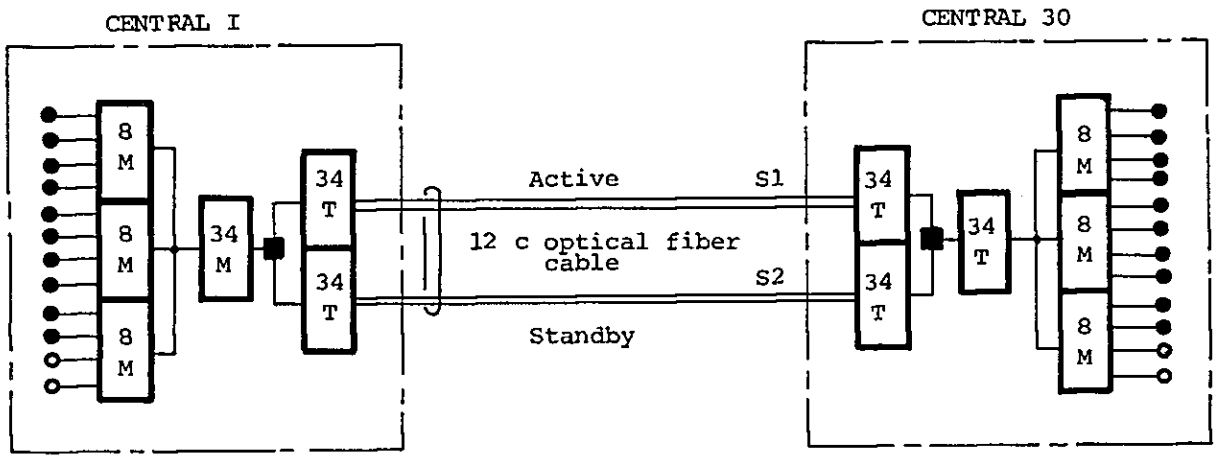
Exchange \ Item		Total number of cable pairs required	Total number of termination jointing cable pairs	Aggregate length of primary cables (in terms of 1,000-pair cables)	Number of newly installed armario	Aggregate length of secondary cables (in terms of 100-pair cables)
CENTRAL II	LS	-	-	-	-	-
	TS	-	-	-	-	-
CENTRAL 30		7,800	$1,500^p$ x 5 300^p x 1	12.5	18	62.4
CENTRAL I	4	6,500	$1,500^p$ x 4 500^p x 1	7.2	5	64.7
	9					
CENTRAL 50		-	-	-	-	-
CENTRAL 6		-	-	-	-	-
CENTRAL 7		-	-	-	-	-
CENTRAL 8		-	-	-	-	-
CENTRAL 29		-	-	-	-	-
CENTRAL 5		-	-	-	-	-
CENTRAL 35		-	-	-	-	-
CENTRAL 67		-	-	-	-	-
Total		14,300	$1,500^p$ x 9 500^p x 1 300^p x 1	19.7	23	127.1



Ex-change	2	29	30	35	4	5	50	6	67	7	8	9	0
30	483	83	—	92	160	78	98	151	57	58	90	296	67
9	968	114	296	101	459	140	158	352	98	140	222	-	228

The values in the bold boxes denote the number of circuits accommodated by the optical fiber cable systems.

Fig. I-4a Cable Network and the Number of Inter-zone Circuits within the Asunción Area



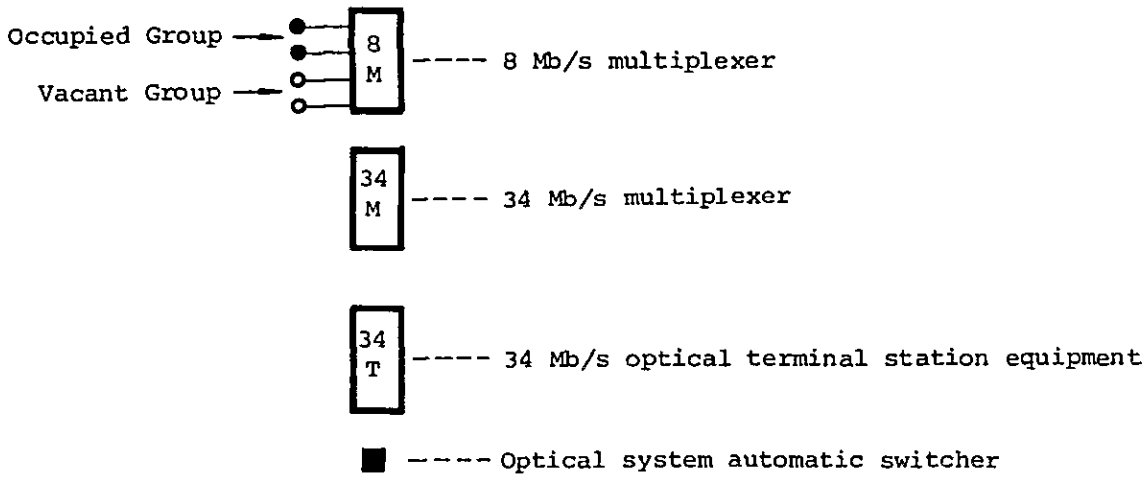


Fig. I-5a Transmission Line Configuration

4. Annexed Figures and Tables Attached

The telephone density vs. per capita GDP relationship which is used for the projection of the national telephone demand fulfillment is shown in Fig. I-6a and Table I-23a.

The relationships between installed exchange capacity, forecast demand and forecast telephone demand fulfillment for the exchanges within the Asunción area are given in Figs. I-7a through I-18a.

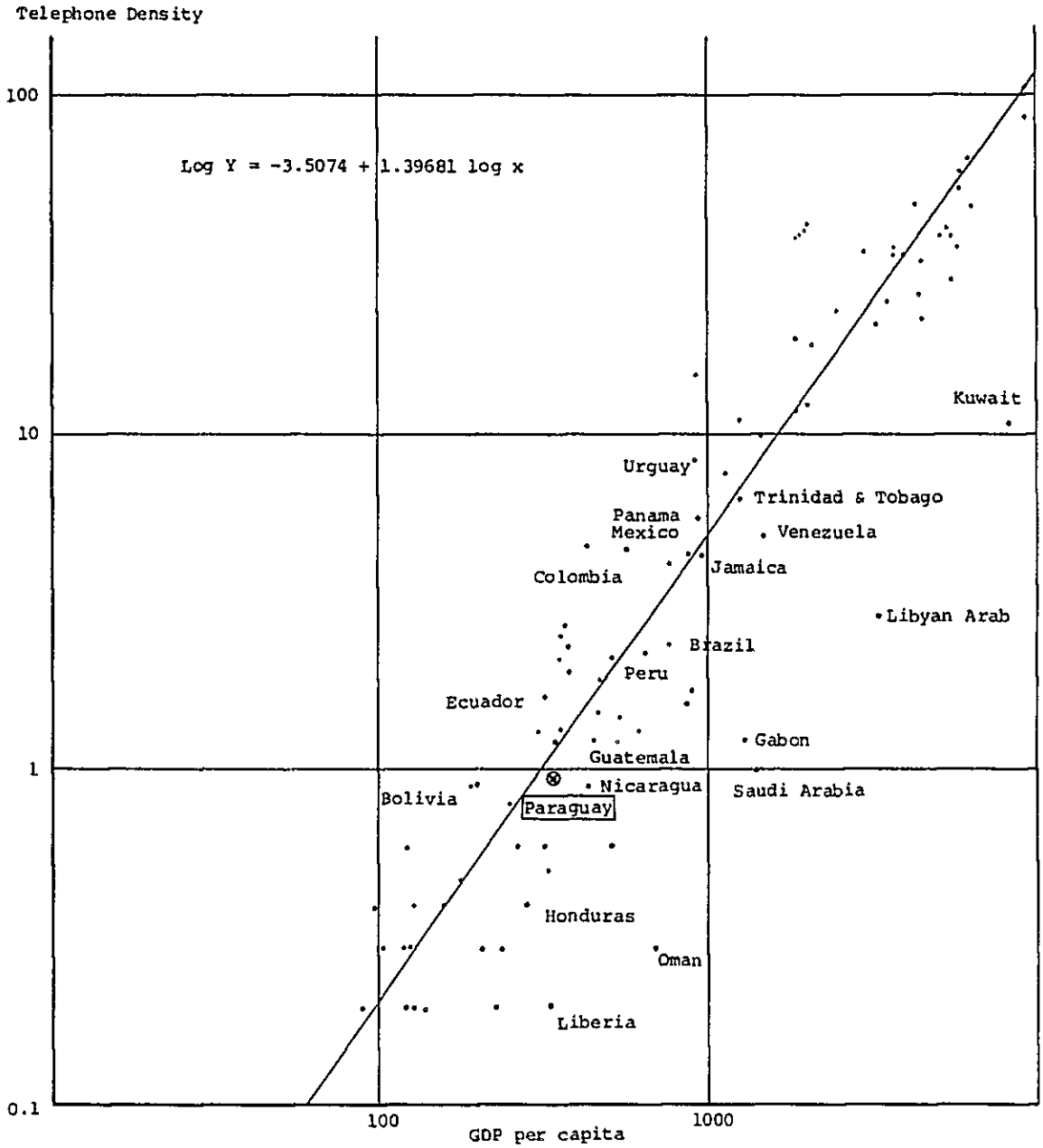


Fig. I-6a Telephone Density vs. per Capita GDP (based on 1973 data)

Table I-23a (1) Per Capita GDP vs. Telephone Density per 100 Persons

Name of Country	GDP in 1973 Million (*Billion)	Exchange Rate per US $	National Currency	Population in 1973 (Million)	GDP per Capita (US$)	Telephone Density per 100 Inhabitants
Algeria	* 29.7	4.185	Dinar	15.77	450	1.4
Australia	* 50.7	0.672	Dollar	13.13	5,746	35.5
Austria	* 533.3	19.85	Schilling	7.53	3,568	24.6
Bangladesh	* 69.1	8.165	Taka	73.21	116	0.1
Barbados	425.9	2.07	Dollar	0.24	857	15.6
Belgium	* 1,774.0	41.32	Franc	9.74	4,408	25.7
Benin	* 73.6	235.4	Franc	2.95	106	0.3
Bolivia	21,459.0	20.0	Peso	5.33	201	0.9
Botswana	* 192.1	0.6712	Pula	0.65	440	0.9
Brazil	* 477.2	6.22	Cruzeiro	100.56	763	2.3
Burma	11,735.0	4.862	Kyat	29.04	83	0.1
Canada	* 124.5	0.9958	Dollar	22.13	5,650	52.8
Colombia	* 243.2	24.89	Peso	22.27	439	4.6
Costa Rica	10,162.0	6.65	Colon	1.87	818	4.6
Cyprus	335.7	0.361	Pound	0.62	1,500	9.7
Denmark	164.9	6.29	Krone	5.02	5,222	40.0
Dominica Republic	2,345.0	1.00	Peso	4.43	529	1.9
Ecuador	* 64.6	25.0	Sucre	6.73	384	1.9
Egypt	3,663.0	0.3913	Pound	35.62	263	1.3
El Salvador	3,332.0	2.5	Colon	3.77	354	1.2
Ethiopia	5,005.0	2.09	Birr	26.55	90	0.2
Fiji	338.3	0.8092	Dollar	0.55	760	4.1
Finland	* 66.7	3.85	Markka	4.67	3,710	32.9
France	* 1,114.2	4.708	Franc	52.18	4,535	21.7
Gabon	* 161.1	235.4	Franc	0.52	1,316	1.2
German	* 918.6	2.703	D. Mark	61.97	5,484	28.7
Ghana	3,501.0	1.15	Cadi	9.36	325	0.6
Greece	* 484.0	29.7	Drachma	8.93	1,825	18.7
Guatemala	2,569.0	1.00	Quetzal	5.74	448	1.0
Guyana	643.4	2.24	Dollar	0.76	378	2.3
Haiti	3,129.0	5.00	Gourde	4.44	141	0.2
Honduras	1,814.0	2.0	Lempira	2.78	326	0.5
Iceland	* 95.4	83.81	Krone	0.21	5,420	38.1
India	* 576.8	8.13	Rupee	574.42	124	0.3

Table I-23a (2) Per Capita GDP vs. Telephone Density per 100 Persons

Name of Country	GDP in 1973 Million (*Billion)	Exchange Rate per US $	National Currency	Population in 1973 (Million)	GDP per Capita (US$)	Telephone Density per 100 Inhabitants
Indonesia	* 6,753.0	415.0	Rupiah	129.15	126	0.2
Iran	* 1,861.0	67.63	Rial	31.3	879	1.7
Iraq	1,626.0	0.2961	Dinar	10.41	528	1.2
Ireland	2,689.0	0.4305	Pound	3.05	2,048	12.0
Israel	41,875.0	4.2	Pound	3.21	3,106	20.8
Italy	* 82,143.0	607.92	Lira	54.91	2,461	22.9
Ivory Coast	* 556.2	235.4	Franc	4.65	508	0.6
Jamaica	1,752.0	0.9091	Dollar	1.98	973	4.3
Japan	*111,061.0	280.0	Yen	108.70	3,649	35.7
Jordan	268.5	0.3289	Dinar	2.54	321	1.6
Kenya	829.0	0.345	Pound	112.48	193	0.9
Korea Republic	* 4,939.0	398.0	Won	34.10	364	2.5
Kuwait	2,111.0	0.2967	Dinar	0.89	7,994	10.7
Lesotho	84.1	0.6712	Rand	0.99	127	0.3
Liberia	544.9	1.0	Dollar	1.63	334	0.2
Libyan Arab Jamahiriya	2,246.0	0.2961	Dinar	2.25	3,371	2.8
Luxembourg	* 72.7	41.32	Franc	0.35	5,027	38.2
Madagascar	* 297.6	235.4	Franc	7.57	167	0.4
Malawi	400.0	0.8475	Kwacha	4.79	99	0.4
Malaysia	14,401.0	2.45	Ringitt	11.31	520	2.1
Malta	115.7	0.3867	Pound	0.32	935	14.4
Mauritius	1,852.0	5.739	Rupee	0.86	375	2.7
Mexico	* 619.6	12.5	Peso	56.16	883	4.2
Morocco	* 21.3	4.29	Dirham	16.31	304	1.3
Nepal	9,969.0	10.56	Rupee	12.07	78	0.1
Netherlands	* 168.1	2.824	Ghilder	13.44	4,429	32.0
New Zealand	8,767.0	0.7001	Dollar	2.95	4,245	47.5
Nicaragua	7,655.0	7,026	Cordoba	2.01	542	0.8
Nigeria	9,001.0	0.6579	Naira	59.66	229	0.2
Norway	* 111.8	5.73	Krone	3.96	4,927	32.9
Omen	169.4	0.3454	Rialamani	0.72	681	0.3
Pakistan	* 86.2	9.931	Rupee	66.23	131	0.3

Table I-23a (3) Per Capita GDP vs. Telephone Density per 100 Persons

Name of Country	GDP in 1973 Million (*Billion)	Exchange Rate per US $	National Currency	Population in 1973 (Million)	GDP per Capita (US$)	Telephone Density per 100 Inhabitants
Panama	1,472.0	1.0	Balbou	1.57	938	5.5
Papua New Ginea	1,040.6	0.672	Kina	2.56	605	1.3
Paraguay	* 125.4	126.0	Guarani	2.50	398	1.0
Peru	* 381.9	38.7	Sol	14.71	671	2.2
Phillippines	* 71.8	6.74	Peos	40.12	266	1.0
Portugal	* 281.1	25.85	Escudo	8.56	1,270	10.9
Saudi Arabia	* 40.6	3.55	Riyal	8.45	1,353	1.0
Senegal	* 230.6	235.4	Franc	3.87	253	0.8
Seychelles	168.0	5.739	Rupee	0.06	488	4.5
Sierra Leone	478.0	0.8609	Leone	2.67	208	0.3
Singapore	10,205.0	2.49	Dollar	2.19	1,871	11.4
South Africa	19,074.0	0.6712	Rand	24.31	1,169	7.5
Spain	* 4,129.0	56.85	Peseta	34.86	2,083	18.1
Sri Lanka	17,053.0	6.748	Rupee	13.25	191	0.5
Sudan	1,246.0	0.3482	Pound	15.0	239	0.3
Sweden	* 220.2	4.588	Krone	8.14	5,896	59.4
Switzerland	* 130.1	3.244	Franc	6.43	6,237	56.0
Syrian Arab Republic	9,413.0	3.8	Pound	6.89	360	2.1
Thailand	* 216.5	20.38	Baht	39.69	268	0.6
Trinidad & Tobago	2,689.0	2.07	Dollar	1.06	1,226	6.3
Tunisia	1,163.0	0.445	Dinar	5.44	480	1.8
Turkey	* 296.0	14.15	Lira	37.36	560	2.1
United Kingdom	* 72.0	0.4304	Pound	55.93	2,991	34.0
United Republic of Cameroon	* 416.0	235.4	Franc	6.17	286	0.4
Tanzania	13,103.0	6.9	Shilling	14.37	132	0.4
U.S.A.	* 1,302.0	1.0	Dollar	210.41	6,188	65.7
Uruguay	* 2,537.5	937.0	Peso	2.99	906	8.3
Venezuela	* 72.5	4.28	Bolivar	11.28	1,502	4.6
Yemen	3,710.0	4.575	Rial	6.29	129	0.1
Yemen Democratic	68.0	0.3454	Dinar	1.56	126	0.6
Zaire	1,501.8	0.5	Zaire	23.56	127	0.2
Zambia	1,616.0	0.6435	Kwacha	4.64	541	1.4

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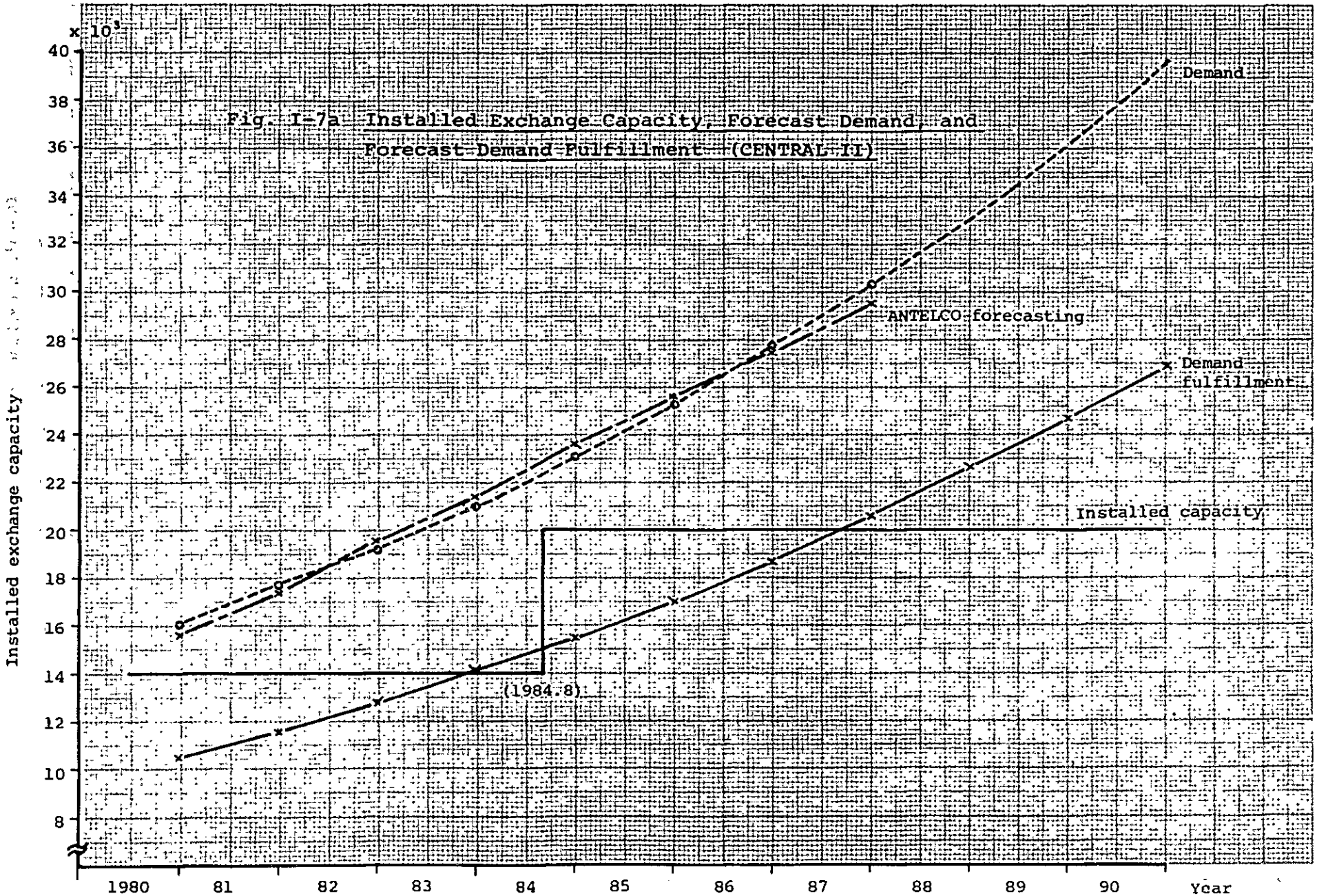
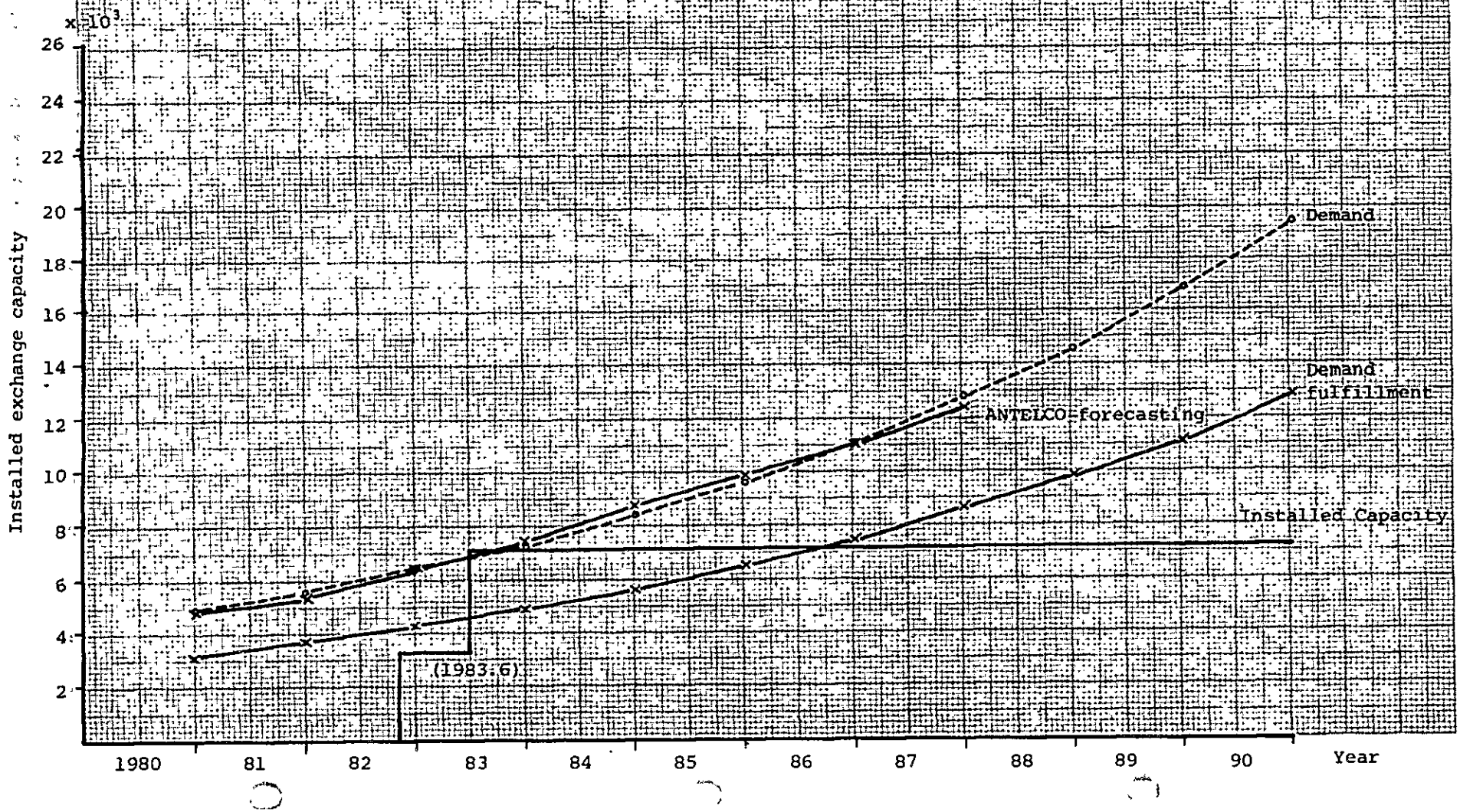


Fig. I-7a Installed Exchange Capacity, Forecast Demand, and Forecast Demand Fulfillment (CENTRAL II)

Fig. I-8a Installed Exchange Capacity, Forecast Demand and Forecast Demand Fulfillment (CENTRAL 30)



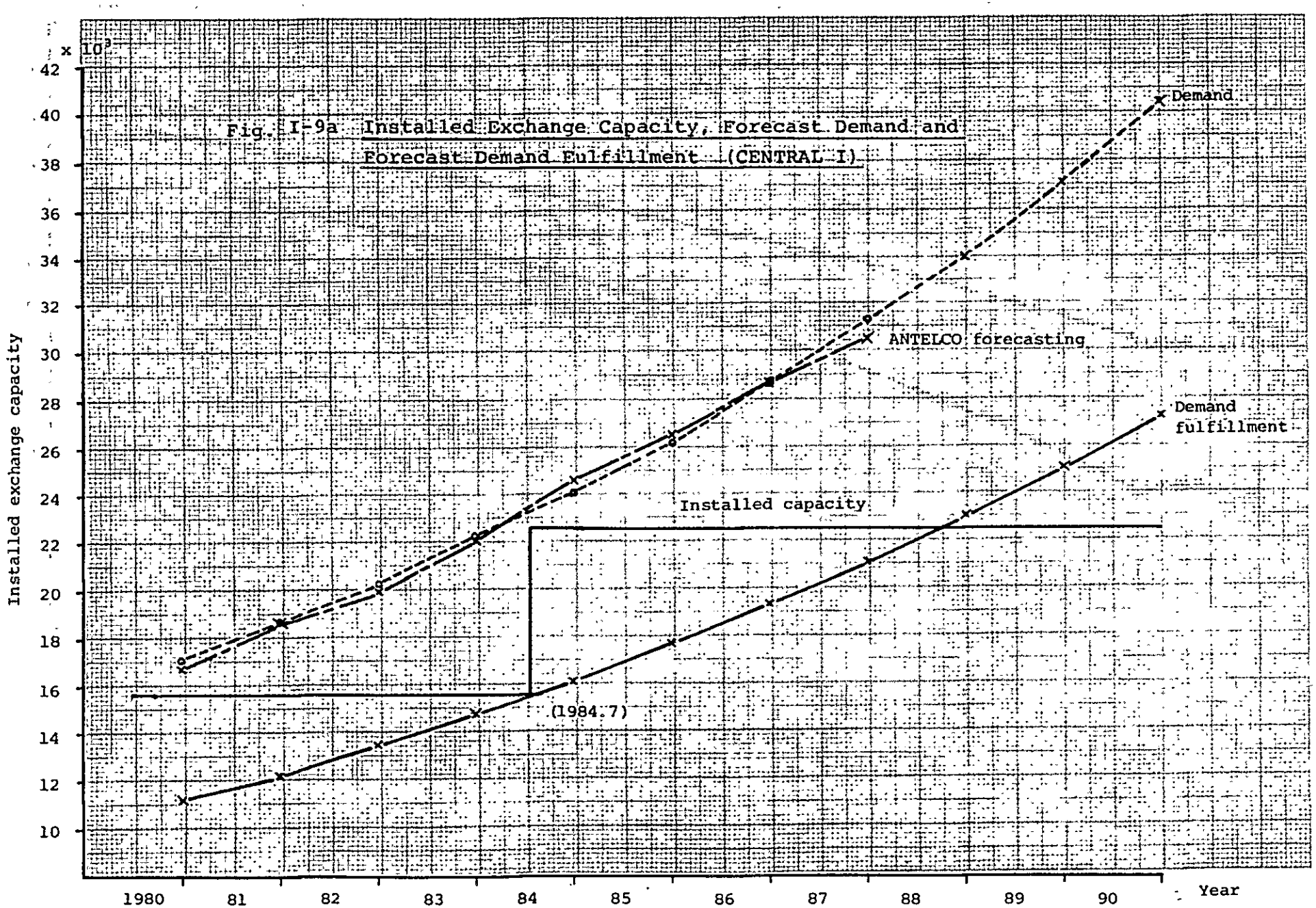


Fig. I-9a Installed Exchange Capacity, Forecast Demand and Forecast Demand Fulfillment (CENTRAL I)

Fig. I-10a Installed Exchange Capacity, Forecast Demand and Forecast Demand Fulfillment (CENTRAL 50)

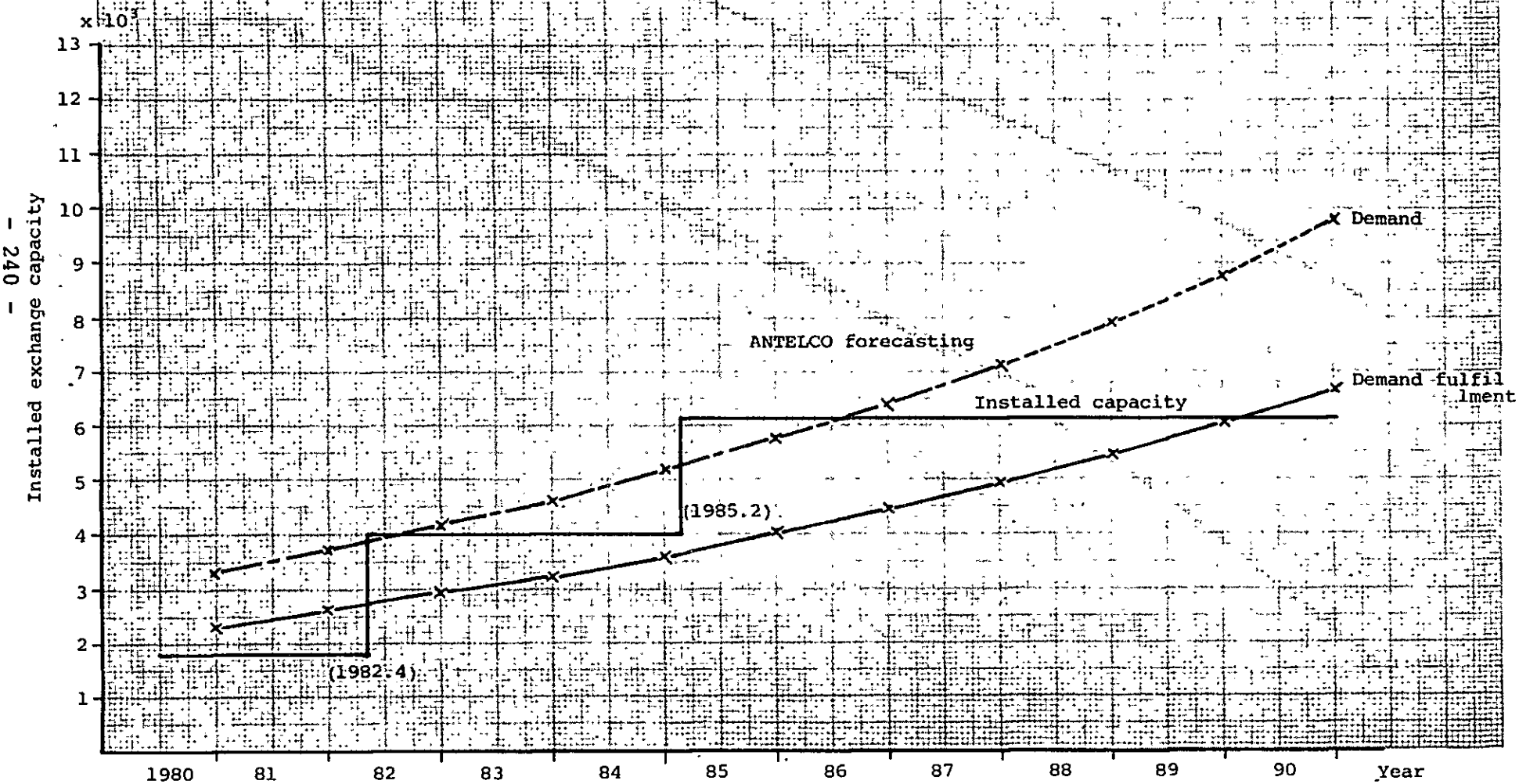


Fig. I-11a Installed Exchange Capacity, Forecast Demand and Forecast Demand Fulfillment (CENTRAL 6)

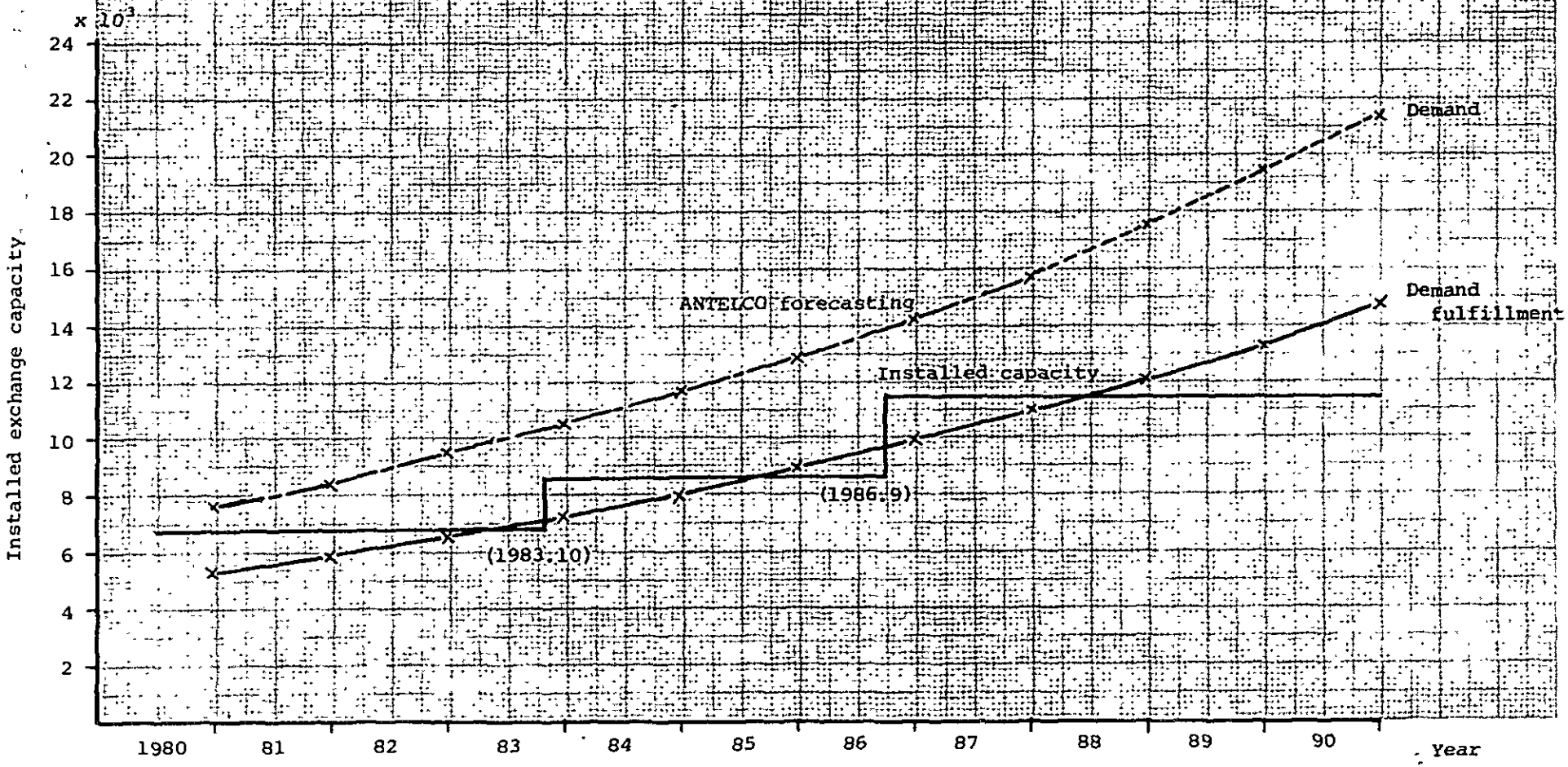


Fig. I-12a Installed Exchange Capacity, Forecast Demand, and Forecast Demand Fulfillment (CENTRAL 7)

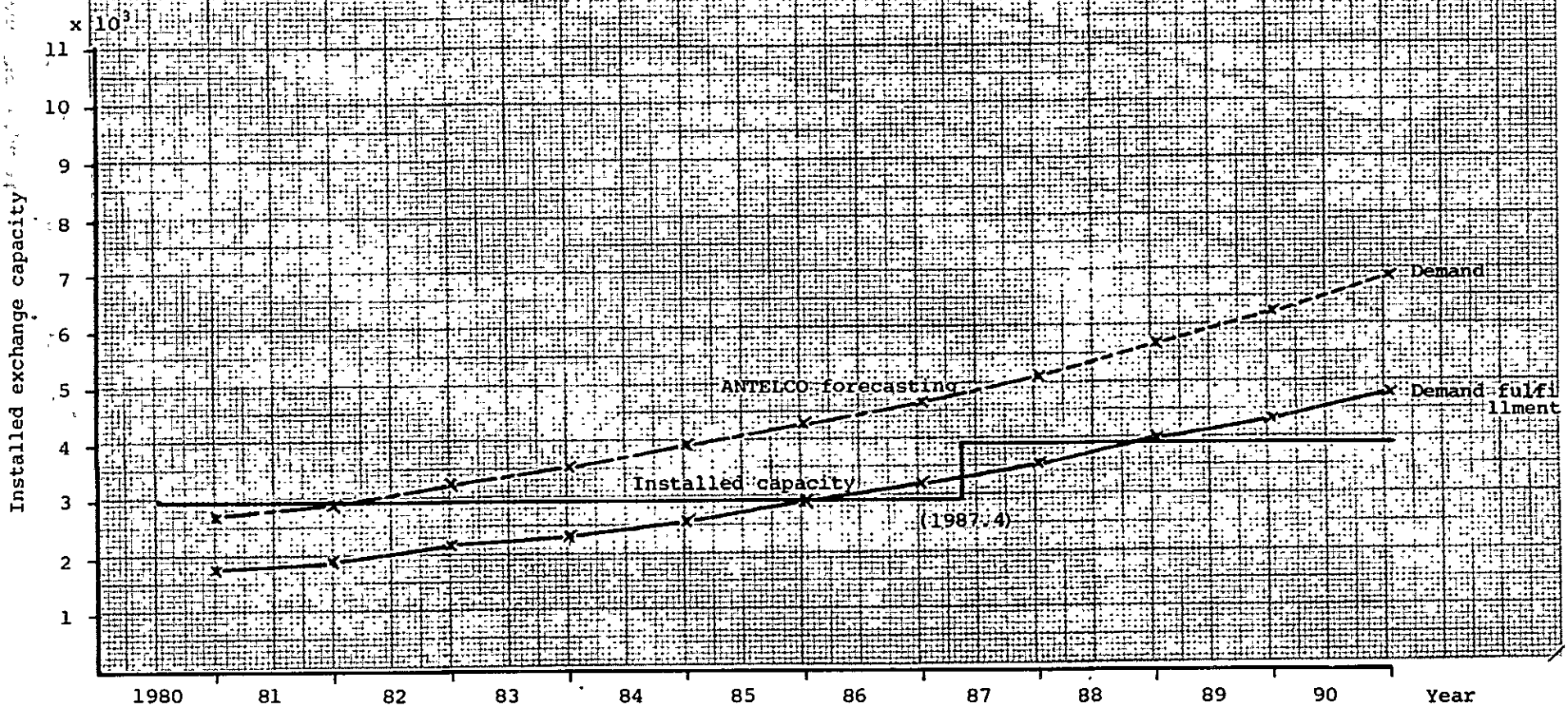


Fig. I-13a Installed Exchange Capacity, Forecast Demand, and Forecast Demand Fulfillment (CENTRAL 8)

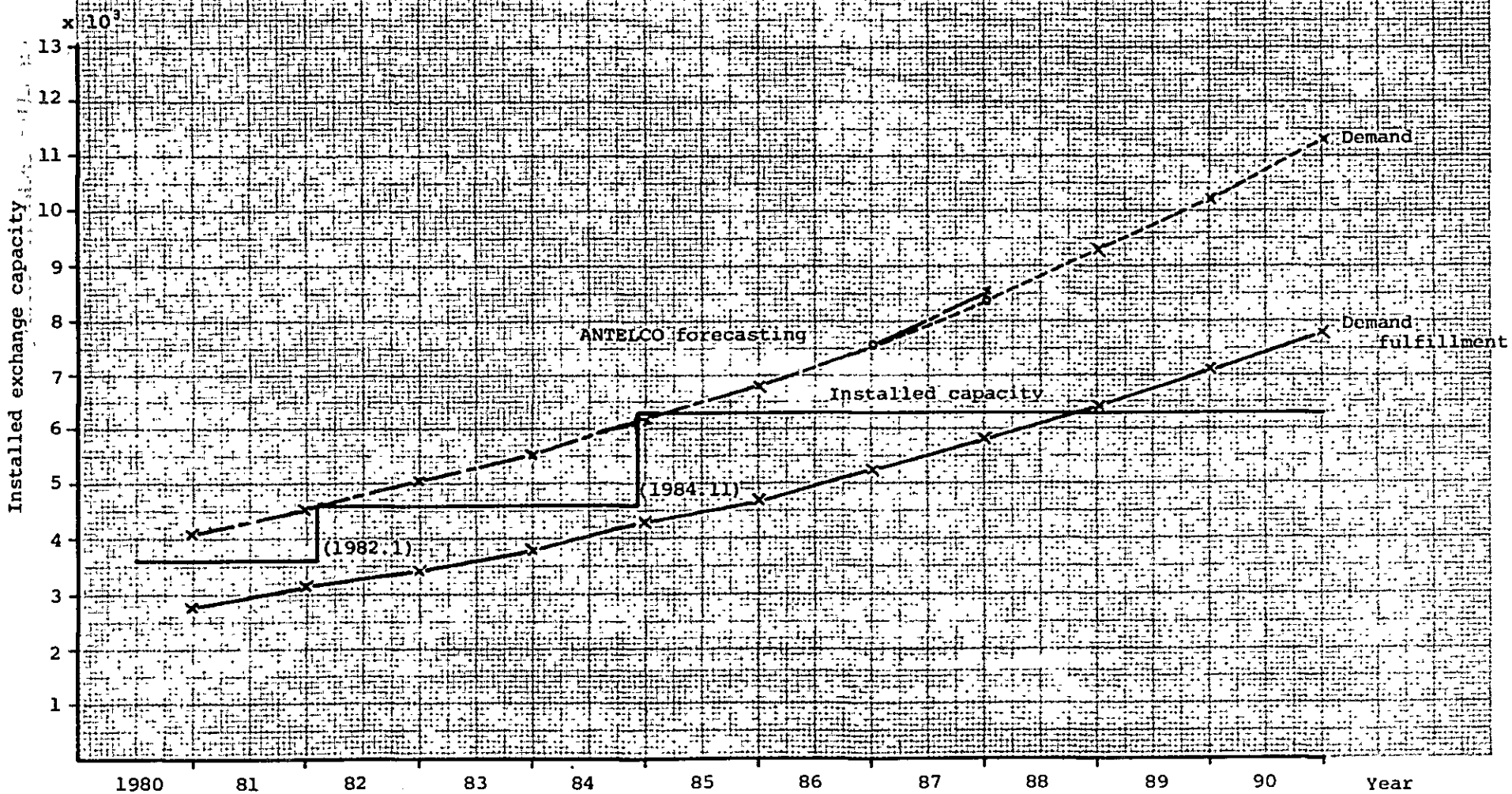


Fig. I-14a Installed Exchange Capacity, Forecast Demand and Forecast Demand Fulfillment (CENTRAL 29)

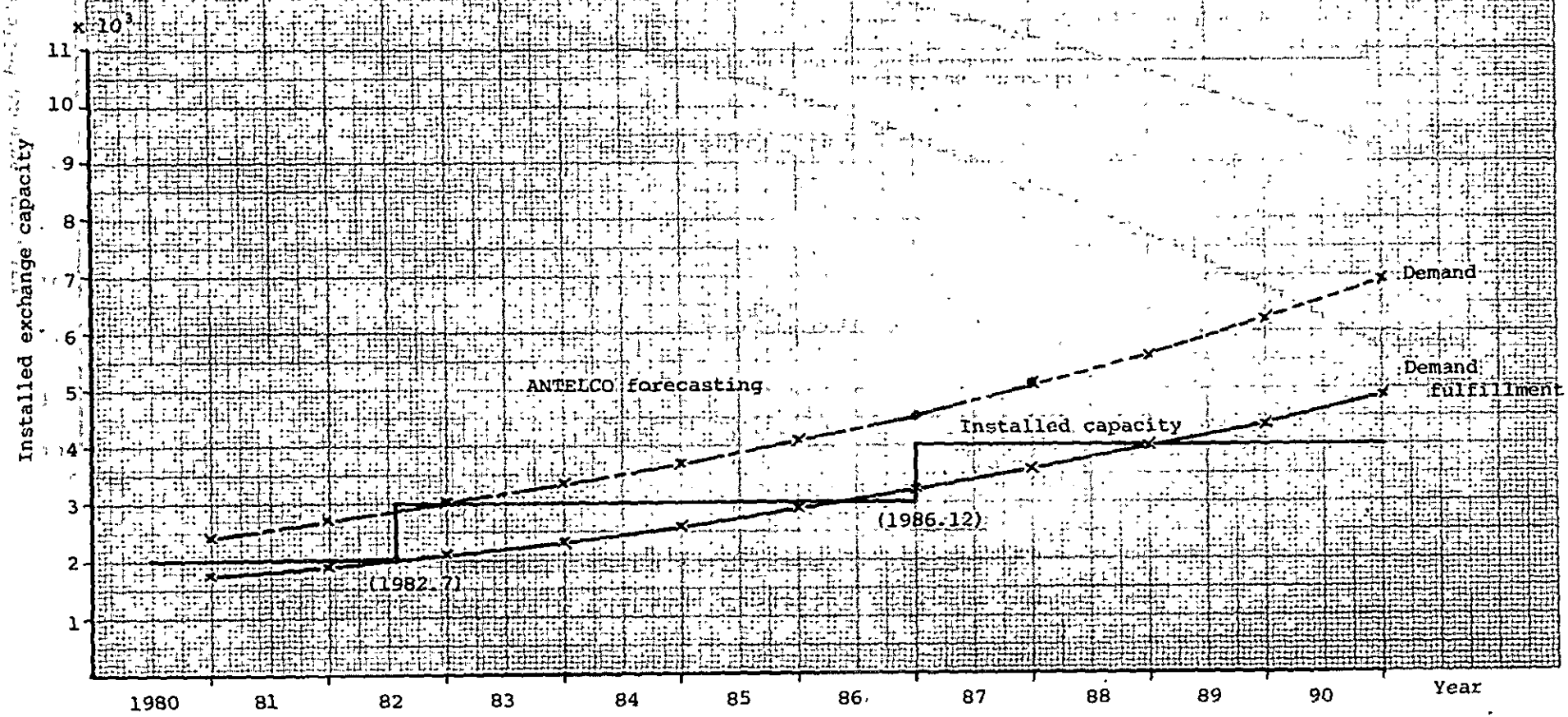


Fig. I-15a Installed Exchange Capacity, Forecast Demand and Forecast Demand Fulfillment (CENTRAL 5)

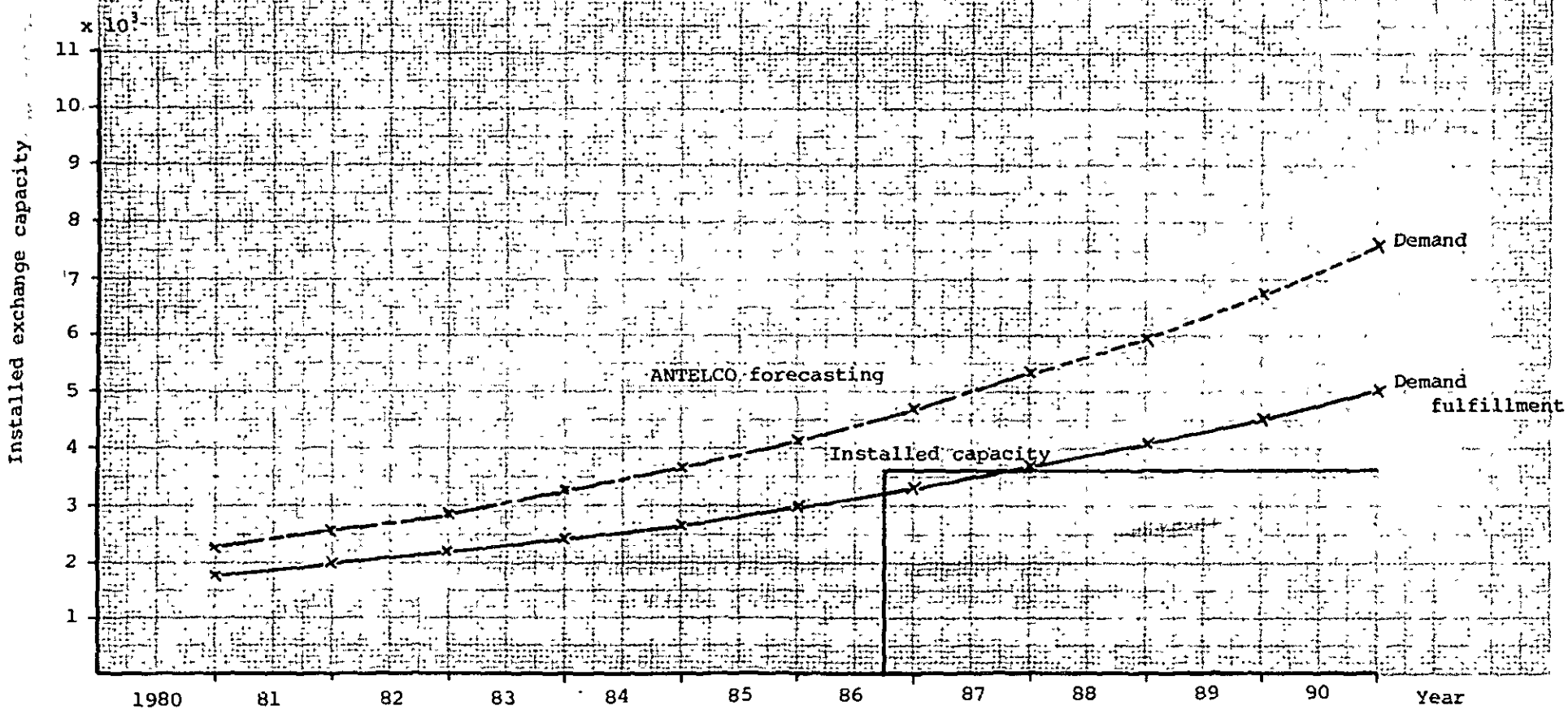


Fig. I-16a Installed Exchange Capacity, Forecast Demand, and Forecast Demand Fulfillment (CENTRAL 35)

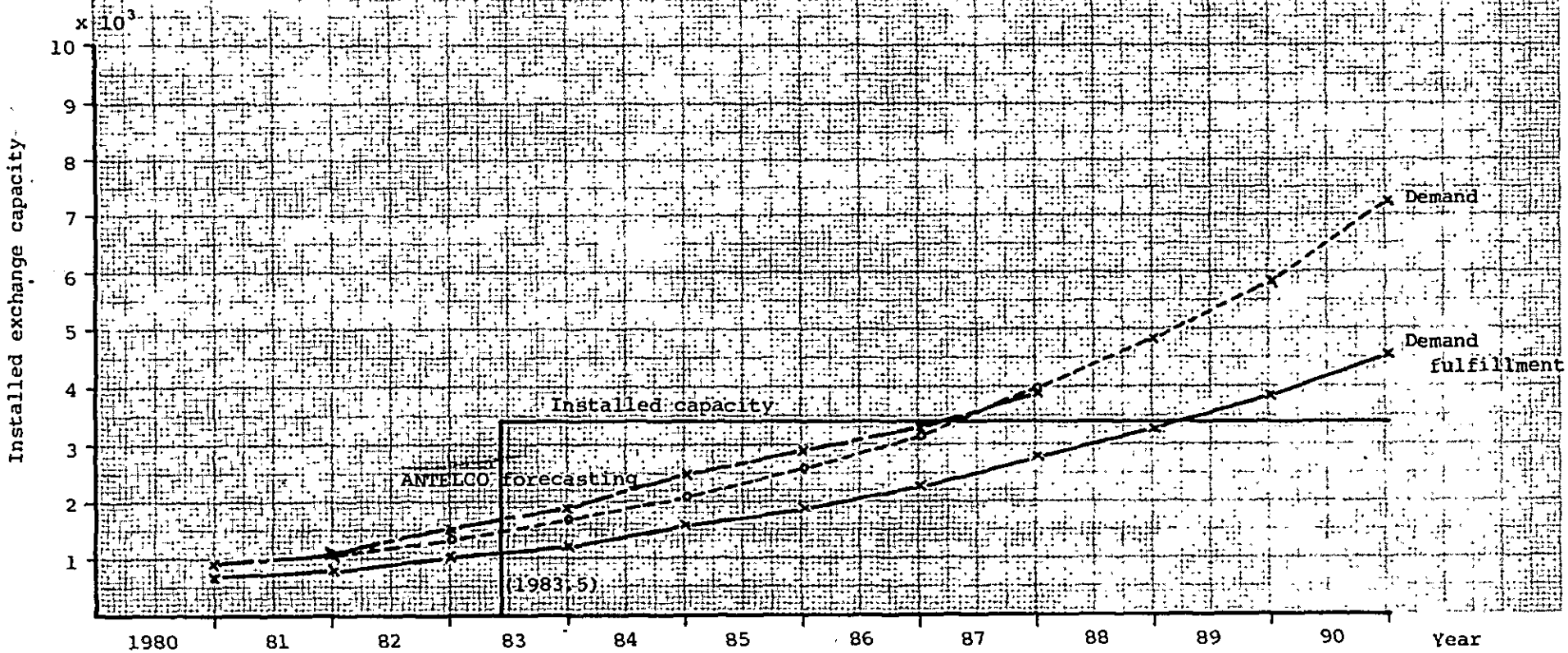
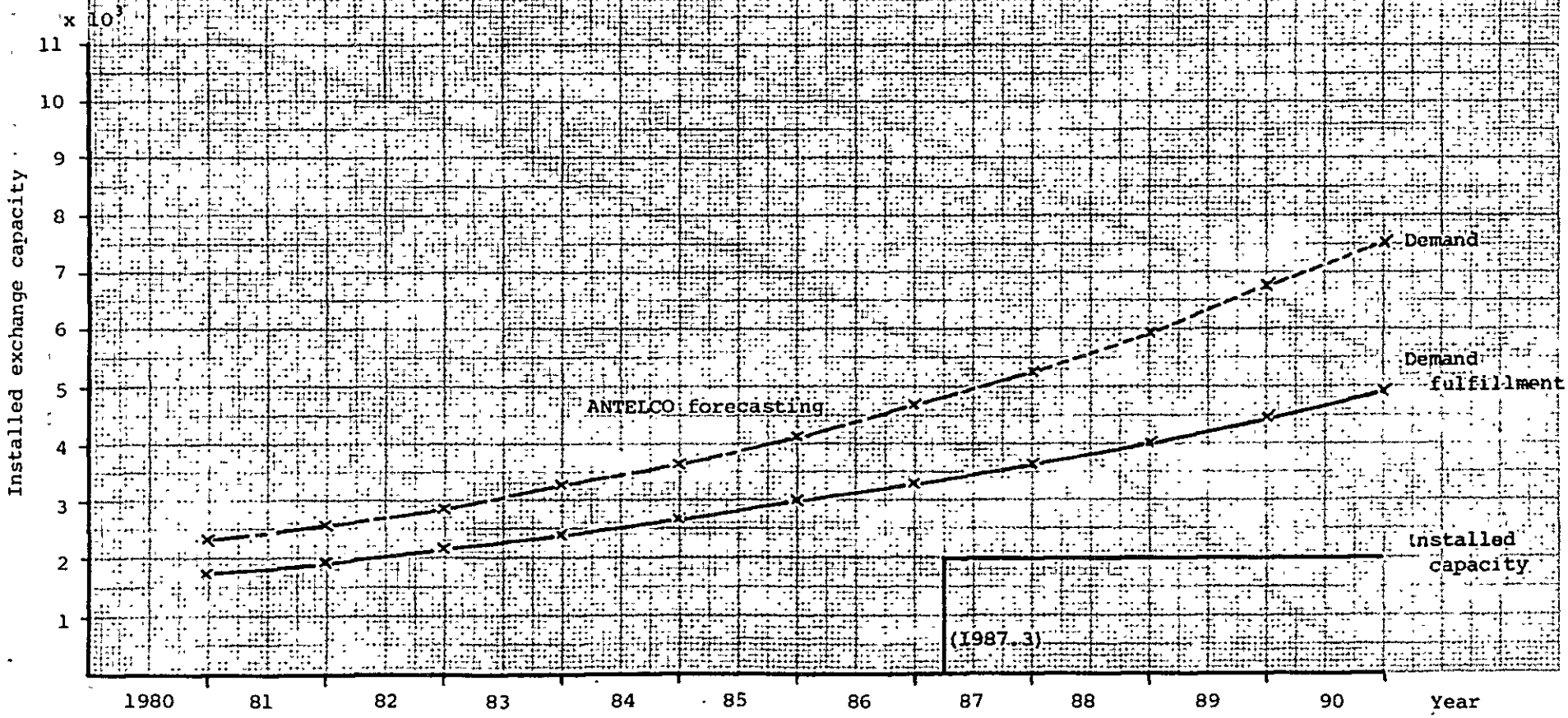


Fig. I-17a Installed Exchange Capacity, Forecast Demand, and Forecast Demand Fulfillment (CENTRAL 67)



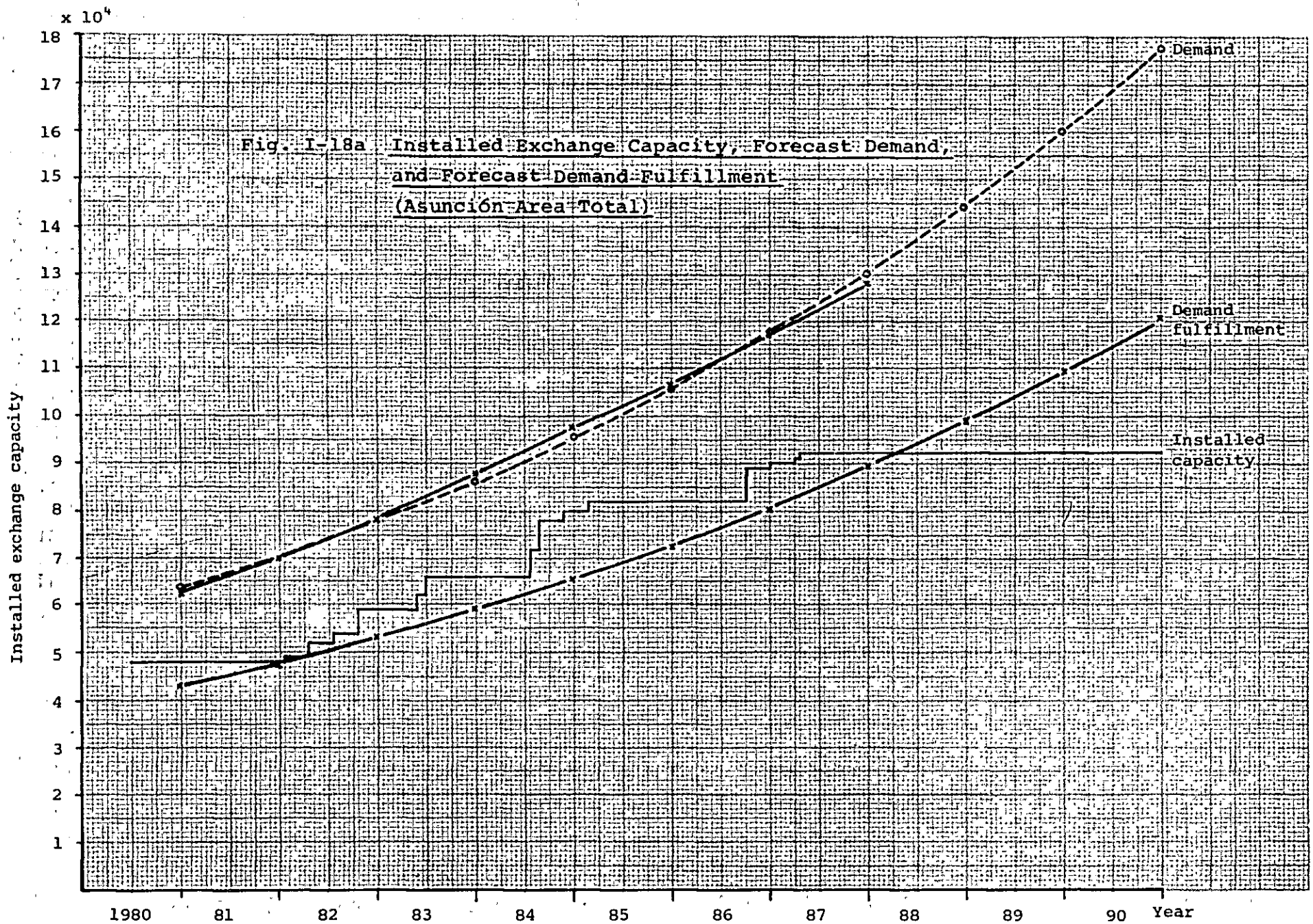


Fig. I-18a Installed Exchange Capacity, Forecast Demand, and Forecast Demand Fulfillment (Asunción Area Total)

ANNEX II.

SUPPLEMENTS

TO

RURAL TELEPHONE SYSTEM

INTRODUCTION PROJECT

ANNEX II. SUPPLEMENTS TO RURAL TELEPHONE SYSTEM INTRODUCTION PROJECT

1. Supplement to Traffic Forecast

The rural telephones are intended installing for the areas where the population density is lower than the service area currently covered by manual telephone exchanges. The subscribers of the manual telephone exchange use their telephones mainly for toll services, and rarely for local services. In the case of rural telephones, the same tendency will appear, and the majority of traffic will be accounted for by toll calls.

As the rural telephones are to be accommodated by the automatic telephone exchanges for subscriber trunk dialling, their toll calling rate is expected to be nearly on a level with that of the automatic telephone exchange subscribers. Table II-1a shows the toll call traffic data of the automatic telephone exchanges in the five areas where the rural telephone system is to be introduced.

From the data in Table II-1a and the discussion above, the terminating and originating calling rate of the rural telephone is estimated at 0.03 to 0.04 erlang in which the future increase in traffic is allowed for.

Table II-1a Toll Call Traffic Data (Automatic Exchanges)

Busy hours

Exchange	Number of Subscriber	June 1980		July 1980		August 1980	
		Traffic (Erl.)	Calling rate	Traffic (Erl.)	Calling rate	Traffic (Erl.)	Calling rate
Concepción	462	4.04	0.009	4.82	0.010	7.37	0.016
San Pedro	139	1.06	0.008	1.40	0.010	1.21	0.009
Villarrica	584	3.67	0.006	4.91	0.008	4.21	0.007
Carapeguá	89	0.84	0.009	0.84	0.009	0.64	0.007
Hohemau	94	-	-	1.34	0.014	1.24	0.013

Exchange	Number of Subscriber	January 1981		February 1981		March 1981	
		Traffic (Erl.)	Calling rate	Traffic (Erl.)	Calling rate	Traffic (Erl.)	Calling rate
Concepción	472	4.49	0.010	4.57	0.010	5.20	0.011
San Pedro	148	1.59	0.011	1.59	0.011	1.76	0.012
Villarrica	596	4.22	0.007	4.70	0.008	5.27	0.009
Carapeguá	104	0.94	0.009	0.91	0.009	1.28	0.012
Hohenau	81	1.27	0.016	1.36	0.017	1.61	0.020

2. Figures and Tables Attached

(1) The location of the base stations according to the MAS system plan is shown in Table II-2a, and the service areas in Figs. II-1a through II-3a.

(2) The configuration of the rural telephone system is shown in Figs. II-4a through II-8a as classified by service areas.

(3) The principal installation schedule for the rural telephone system is shown in Table II-3a (1/3 ∿ 3/3).

Table II-2a Location of MAS Base Stations

Base station \ Area	Concepción	San Pedro	Villarrica	Carapeguá	Hohenau
Base No. 1	Concepción Existing Telephone Office	San Pedro Existing Telephone Office	Vista Alegre 56° 16' 20" W 25° 43' 10" S	56° 52' 30" W 25° 55' 54" S	Col. Chaves 55° 50' 53" W 27° 03' 07" S
Base No. 2	Col. Santa María 56° 42' 27" W 23° 07' 11" S	Loma Clavel 56° 28' 37" W 24° 00' 08" S	San José 56° 21' 08" W 26° 06' 35" S		Col. Vacay 55° 37' 08" W 26° 55' 31" S

Fig. II-1a Service Area of MAS System (Concepción, San Pedro)

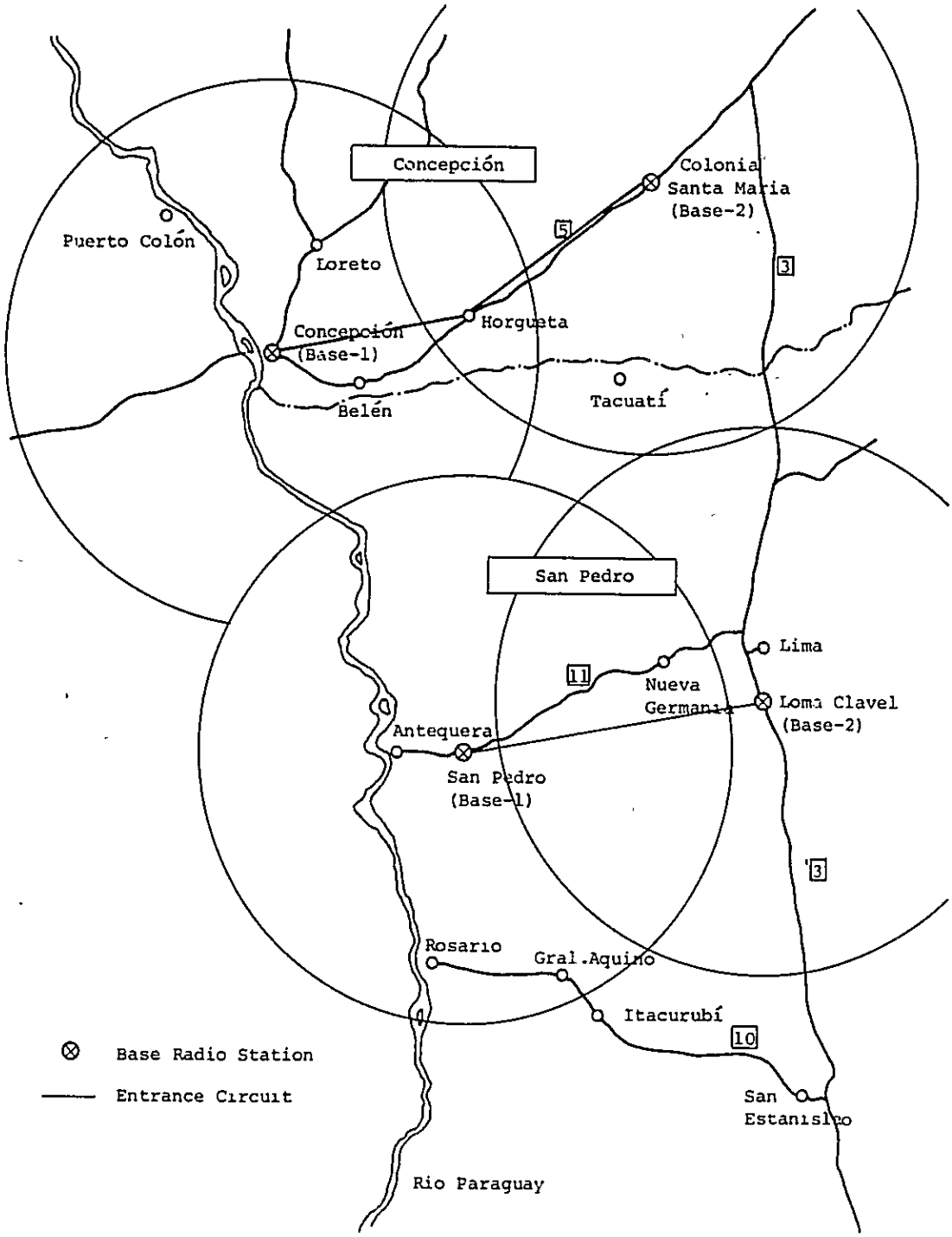


Fig. II-2a Service Area of MAS System (Villarrica, Carapeguá)

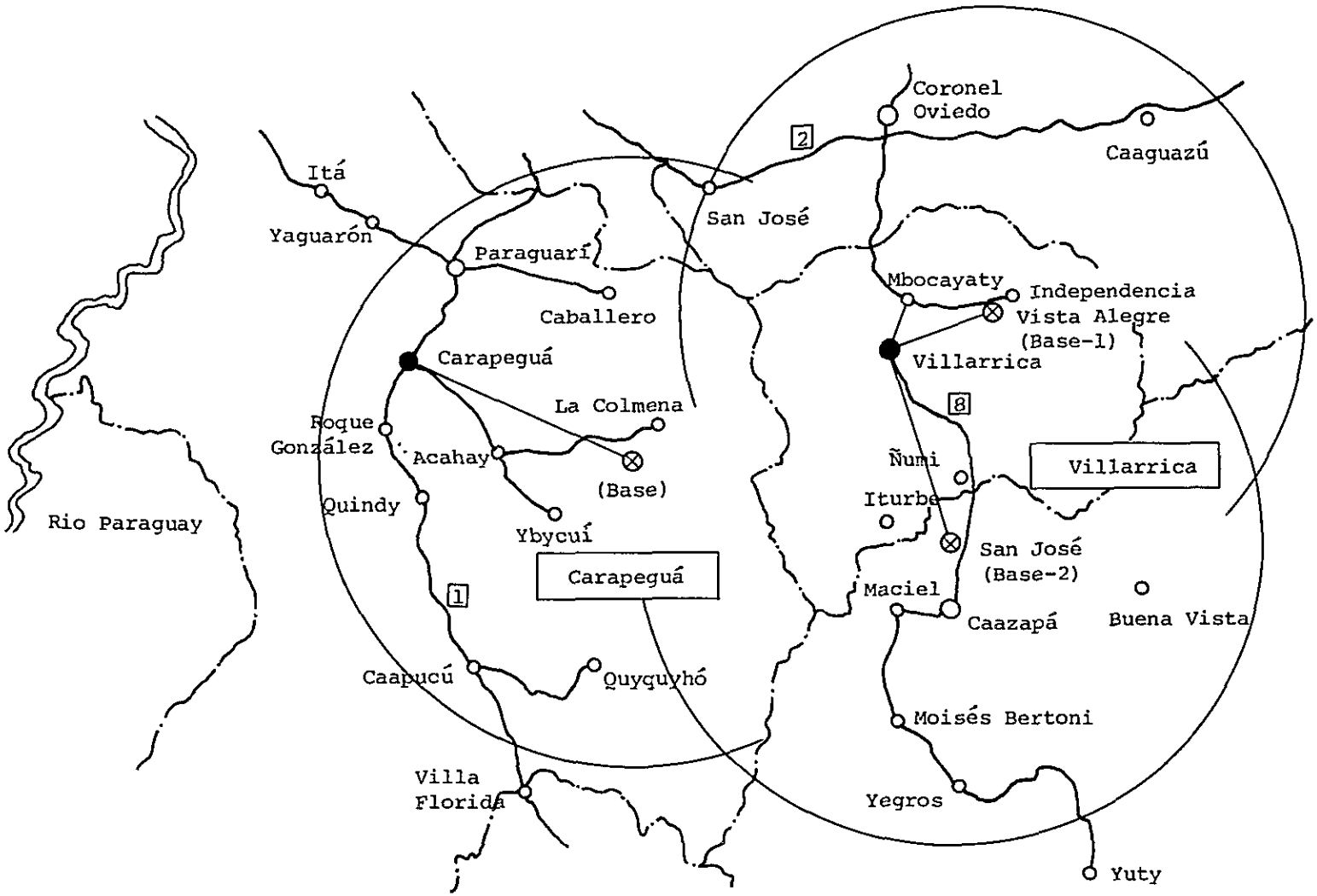


Fig. II-3a Service Area of MAS System (Hohenau)

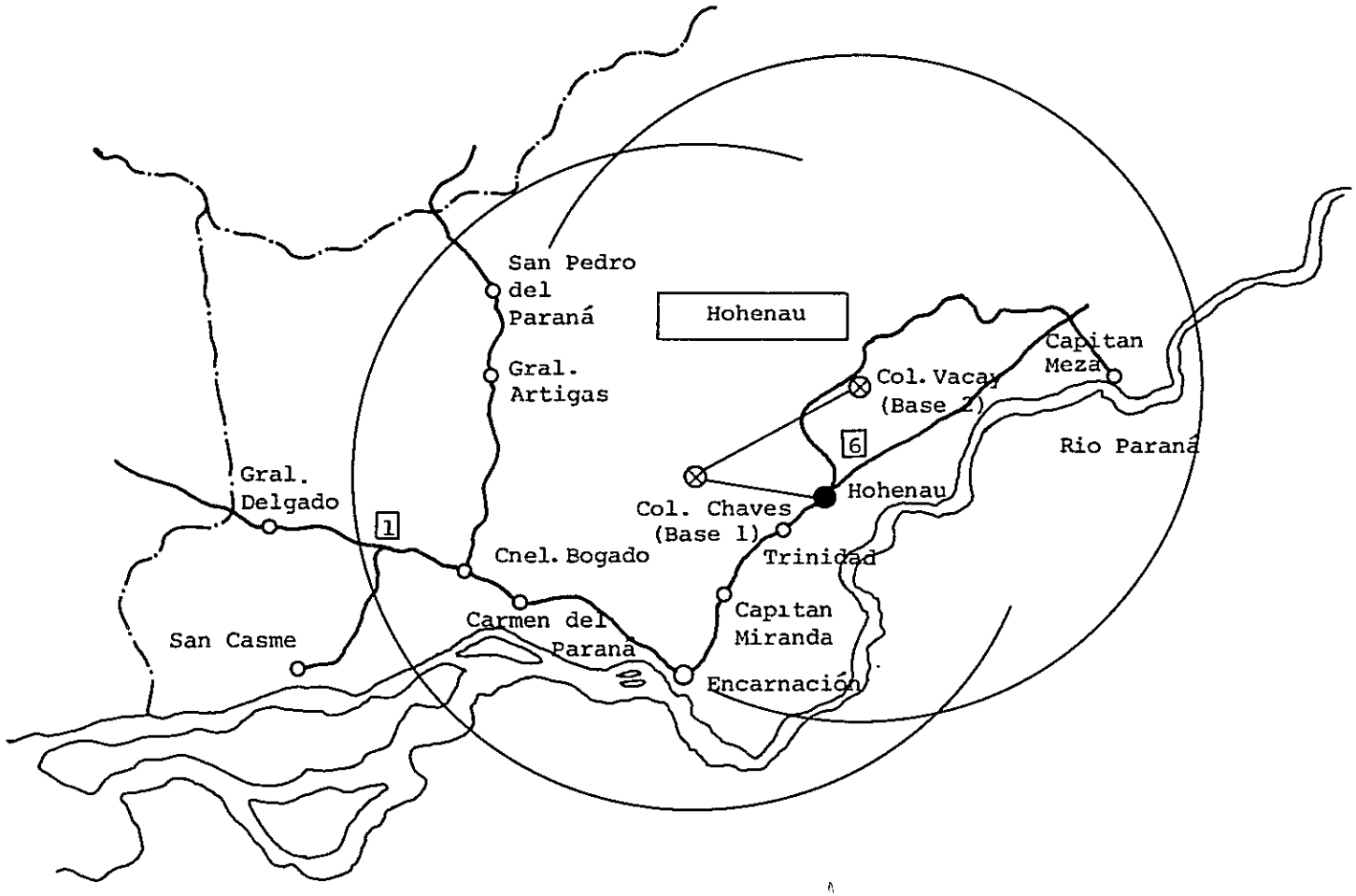


Fig. II-4a System Configuration (Concepción)

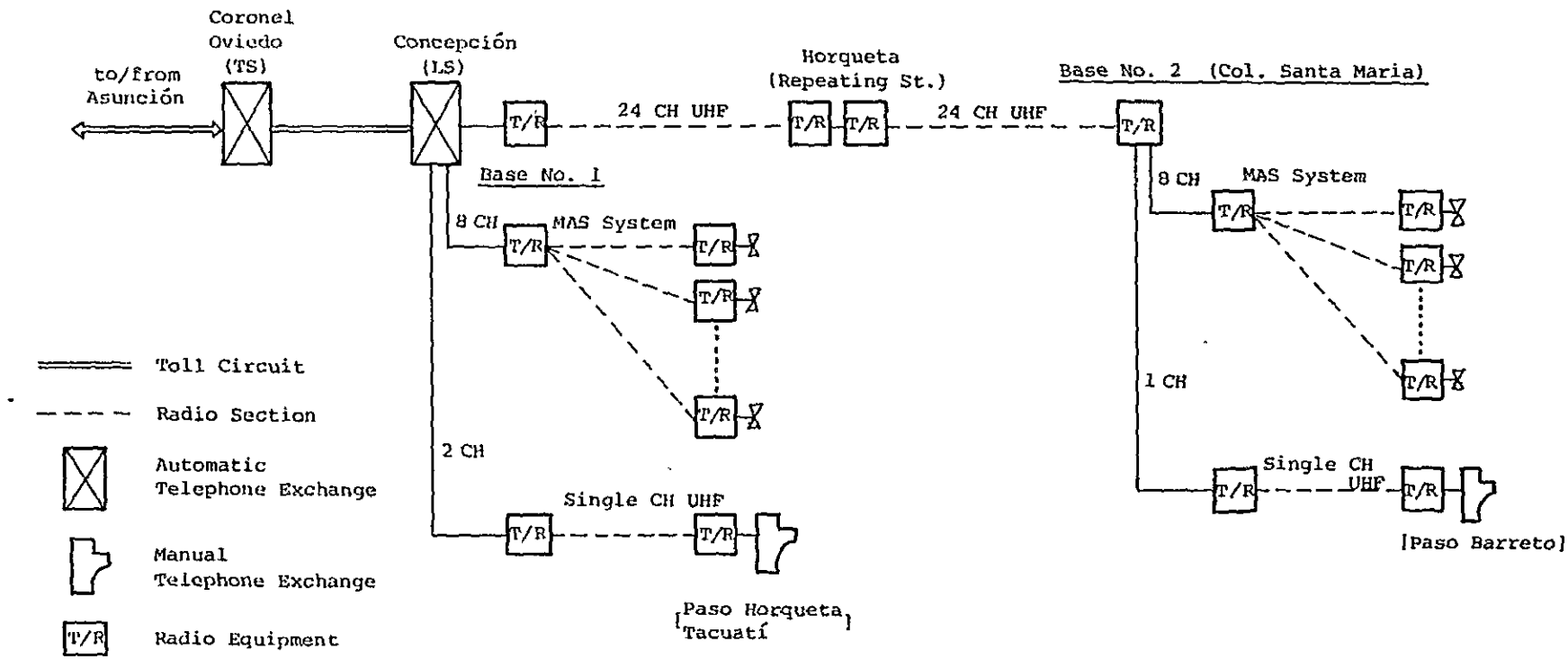


Fig. II-5a System Configuration (San Pedro)

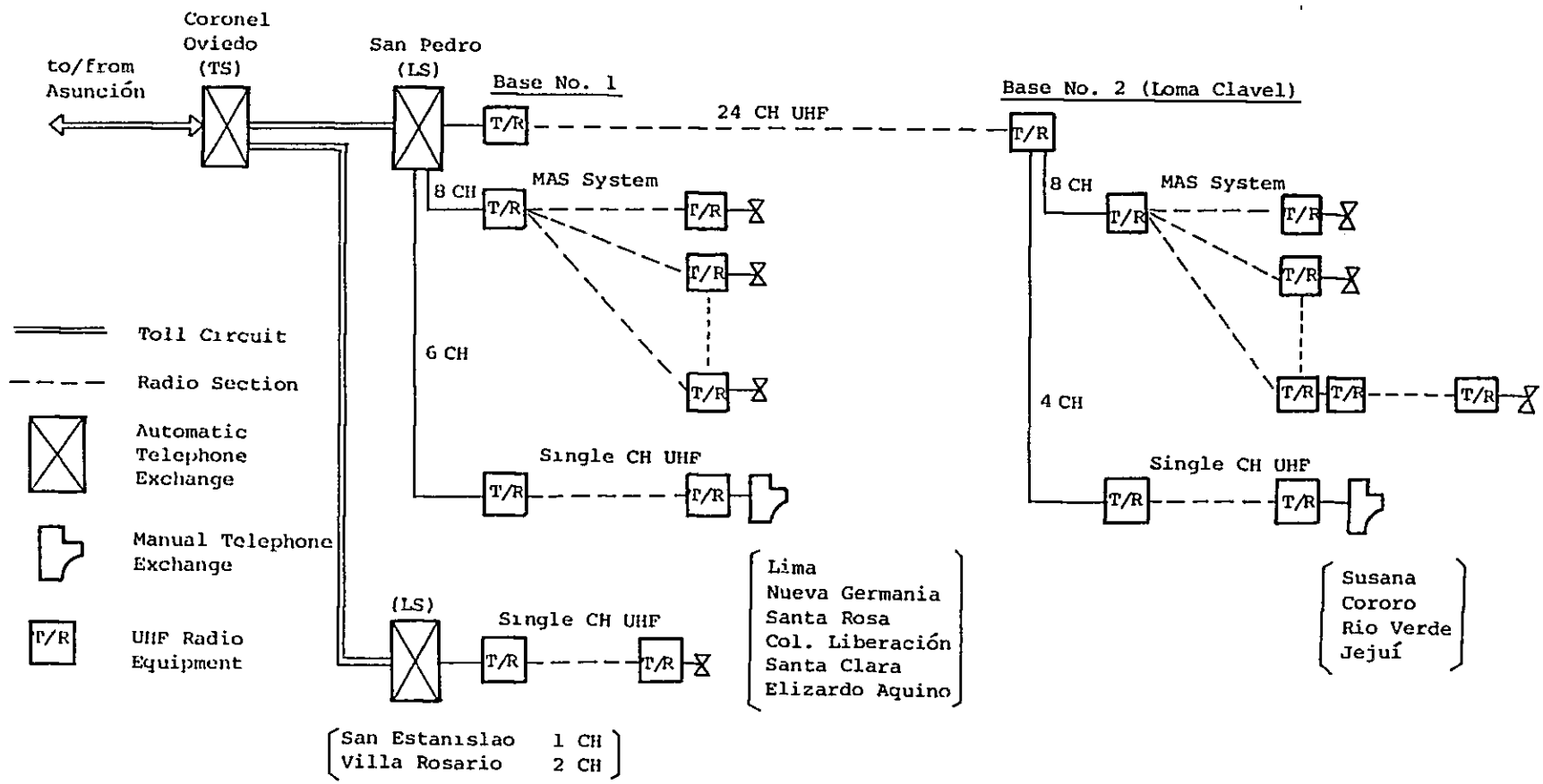


Fig. II-6a System Configuration (Villarrica)

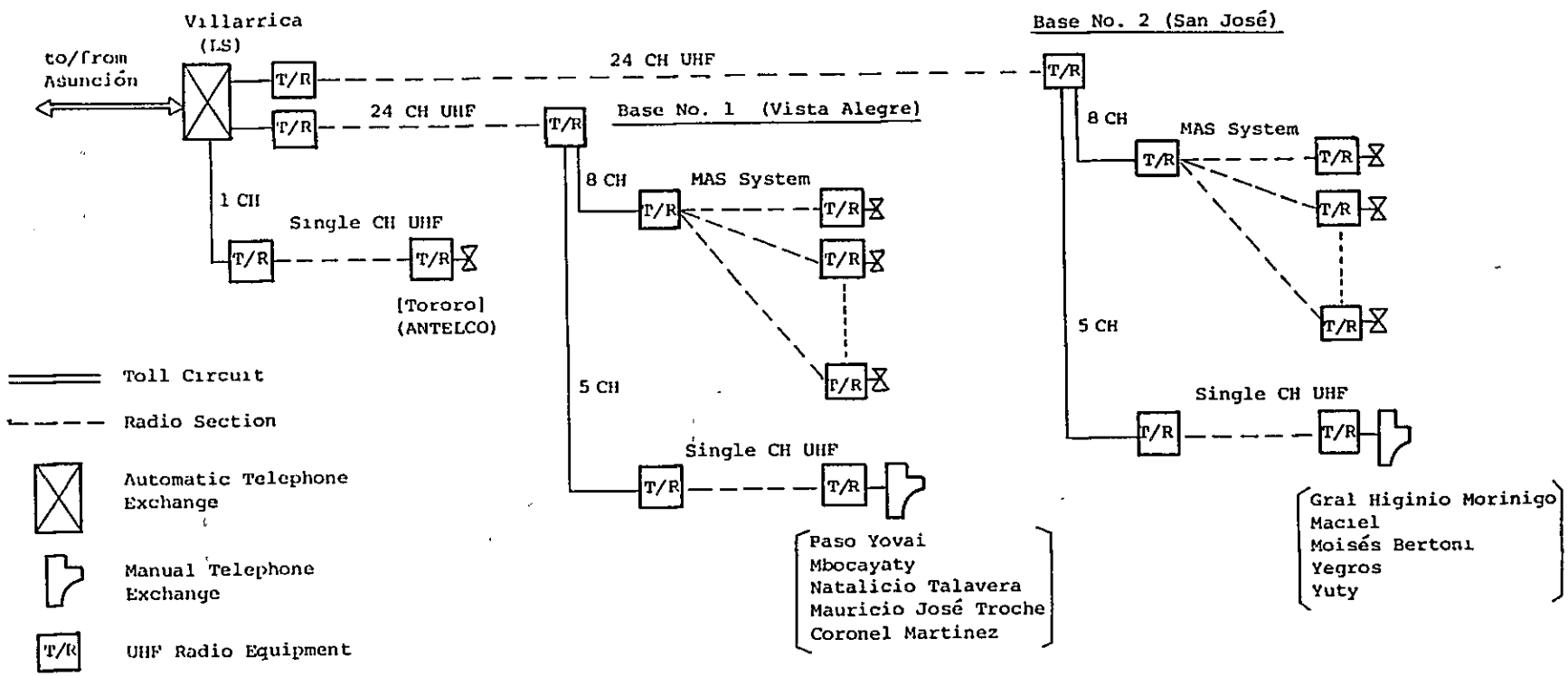


Fig. II-7a System Configuration (Carapeguá)

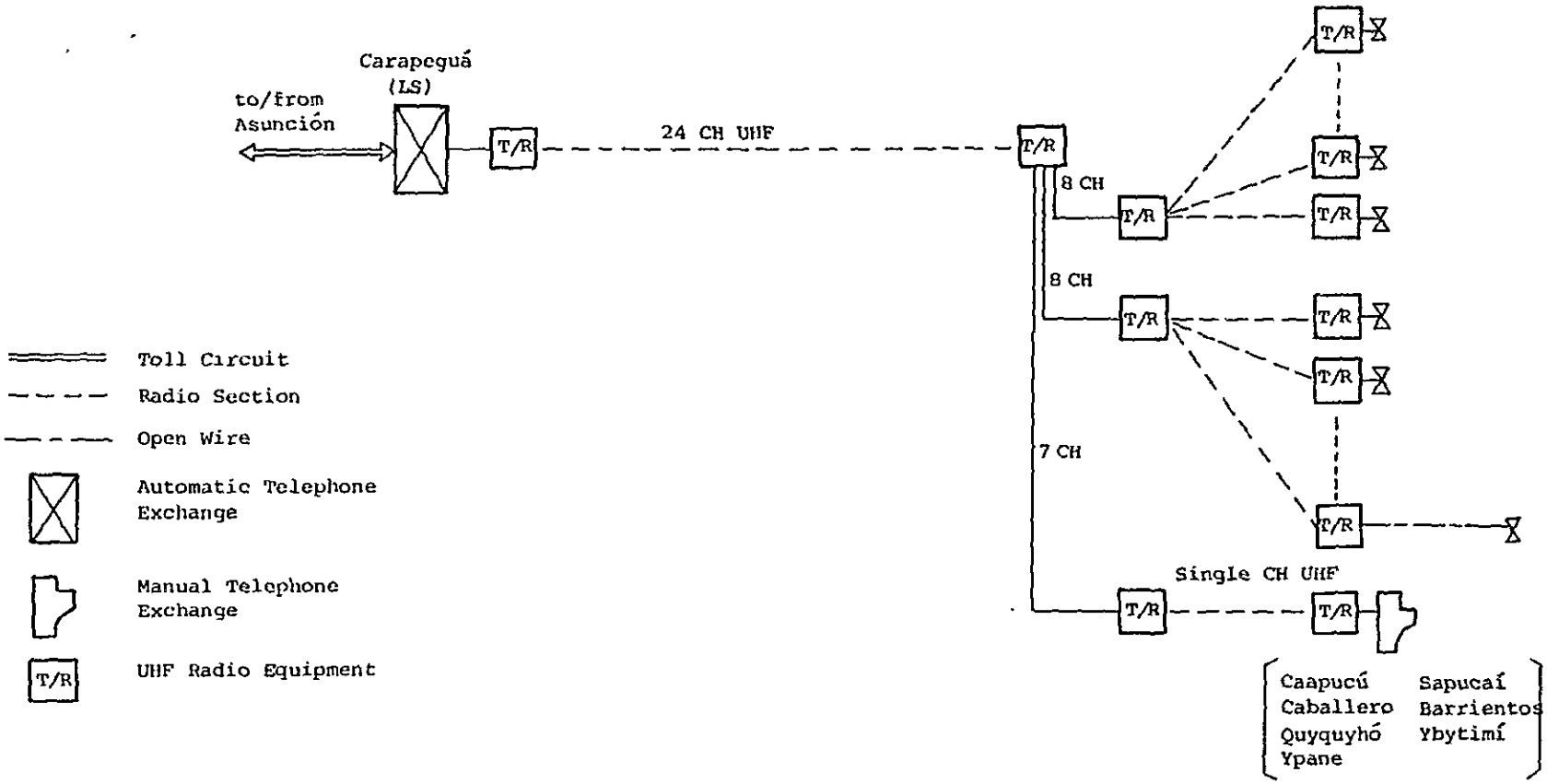


Fig. II-8a System Configuration (Hohenau)

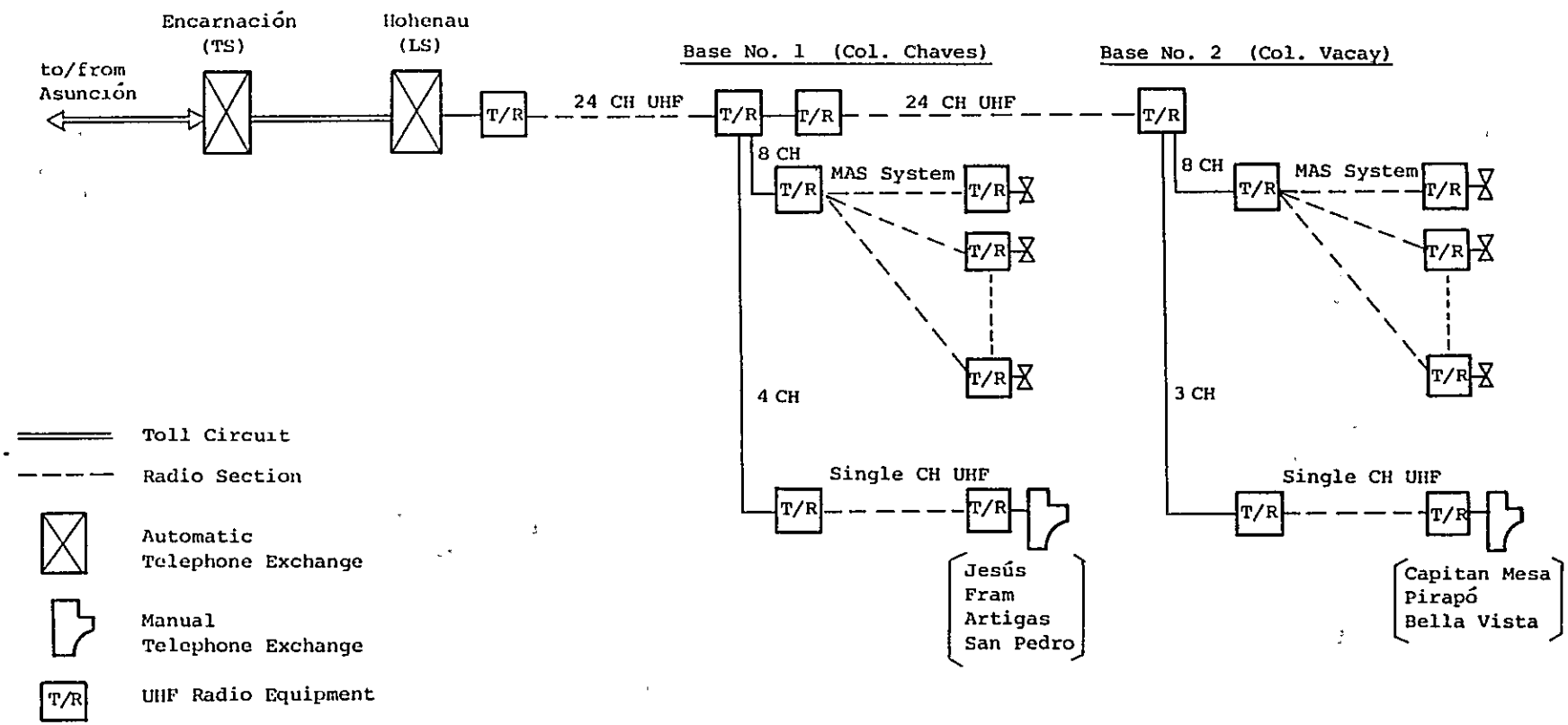


Table II-3a Principal Installation Schedule of Rural Telephone System

Item	Unit	Concepción	San Pedro	Villarrica	Carapeguá	Hohenau	Remarks
MAS system telephone office equipment	Set	1	1	1	1	1	
Radio equipment for MAS system base station	Set	2	2	2	2	2	
24CH UHF (VHF) multi-plex radio equipment	Sec-tion	2	1	2	1	2	For MAS system base station entrance circuit
Tower for MAS system base station	Unit	1	1	2	1	2	
DC power voltage convertor	Unit	1	3	1	1	1	For existing automatic telephone exchange
Commercial power receiving line	Km	-	-	1	5	0	
Power supply for MAS base station	Set	-	-	1	1	-	Commercial power/standby engine system
Ditto	Set	1	1	1	-	2	Dual prime engine system
Ditto	Set	-	-	-	-	-	Solar battery system
Building for MAS base station		1	1	2	1	2	Building size, 8 m x 8 m
Access road	Km	0.3	-	0.7	3	0	

Item	Unit	Concepción	San Pedro	Villarrica	Carapegua	Hohenau	Remarks
MAS terminal radio equipment	Set	90	90	90	90	90	Incl. telephone
Single channel radio link for MAS subscribers	Section	-	1	-	-	-	
Single channel radio link for independant subscriber	Section	-	3	-	-	-	Incl. telephone
Single channel radio link for manual telephone exchange	Section	3	10	10	7	7	
Single channel radio link for intra-office pay station	Section	-	-	1	-	-	
Antenna pole	Piece	93	106	101	97	97	
Power supply equipment for terminal station	Set	24	17	32	30	29	Solar battery system
Ditto	Set	69	87	69	67	68	Engine generator system
Portable engine generator	Set	8	15	16	12	12	Incl. five spare units each
Hut for radio equipment	Piece	-	1	-	1	-	
Open wire subscriber line	Section	-	-	-	1	-	

Item	Unit	Asunción	Cnel. Oviedo	Encarnación	Remarks
Spare equipment, spare panel and spare parts for maintenance	Set	1	-	-	
Instrument for maintenance	Set	1	1	1	
Test bench	Set	1	-	-	
Propagation testing instrument	Set	2	-	-	
Tool for construction work	Set	1	3	1	
Maintenance vehicle	Unit	1	3	1	

ANNEX III. AGREED SCOPE OF WORK

SCOPE OF WORK

FOR

THE STUDY

ON

NATIONAL TELECOMMUNICATIONS AND BROADCASTS DEVELOPMENT PROJECT

IN

THE REPUBLIC OF PARAGUAY

ANNEX III. AGREED SCOPE OF WORK

The Government of the Republic of Paraguay formulated the 20-year long National Telecommunications Development Project with the cooperation of International Telecommunication Union in 1966.

Since then, the Government of the Republic of Paraguay has continued the entiring efforts for the realization of the project, and brought the project to the successful completion.

Accordingly, the Government of the Republic of Paraguay finds it necessary to formulate a new national development project on telecommunications and broadcasts in order to meet the increasing demand for the new services in the field of telecommunications and broadcasts which are being created by the progress in different economic sectors.

Thus, the Government of the Republic of Paraguay made a request to the Government of Japan for technical cooperation in formulating the new National Telecommunications and Broadcasts Development Project.

In response to the request made by the Government of the Republic of Paraguay, the Government of Japan sent a Contact Mission in September, 1980 to identify and confirm the intension of Paraguay Government.

During its stay in Paraguay, the Contact Mission had a series of discussions and exchanged views with Paraguayan authorities concerned. As a result, the Contact Mission identified and confirmed that the Government of Paraguay has an intension of making a long-term National Telecommunications and Broadcasts Development Project in the following fields.

1. Domestic Telecommunications
2. International Telecommunications
3. Radio Regulation and Radio Monitoring
4. Broadcasting
5. Manpower Development

and in parallel to the long-term development project, the Government of Republic of Paraguay feels the urgent needs for making short-term development projects as follows:

1. International Subscriber Dialling System Introduction
2. Rural Telecommunication System Introduction
3. Digital Telephone Switching System Introduction
4. Radio Monitoring System Introduction
5. Expansion of Instituto Paraguayo de Telecomunicaciones (I.P.T.)
6. Satellite Communication System Development

(in priority order)

Based on the above-mentioned findings of the Contact Mission, the Government of Japan has decided to dispatch a Preliminary Mission for formulating Scope of Works of the below-mentioned two studies.

1. Master Plan Study on National Telecommunications and Broadcasts Development Project

This study is for the request of making the long-term project and the project life is to be fixed as 15 years with the segments of 5 years each as follows:

(1) The 1st 5 year development plan (1983_1987)
(2) The 2nd 5 year development plan (1988_1992)
(3) The 3rd 5 year development plan (1993_1997)

The study covers all fields that the Government of Paraguay requested as follows:

(1) Domestic Telecommunications
(2) International Telecommunications
(3) Radio Regulation and Radio Monitoring
(4) Broadcasting
(5) Manpower Development

The study will be completed by March 1983.

2. Feasibility Study on National Telecommunications Development Project

This study is for the request of making the short-term project and the study covers the following three fields which Paraguayan Government gives the highest priorities. (taking the future expansion to the whole country into consideration)

(1) The introduction of International Subscriber Dialling System to Asuncion

(2) The Introduction of Digital Telephone Switching System to Asuncion

(3) The Introduction of Rural Telephone System to Concepcion, Hohenau, San Pedro, Villarrica, Carapegua

The study will be completed by March 1982.

The scope of work of the above-mentioned two studies are confirmed as attached.

The Scope of Work

for

The Study

on

National Telecommunications and Broadcasts Development Project

is agreed by the following two authorities

Administración Nacional de Telecomunicaciones

and

Japan International Cooperation Agency,

the official agency responsible for implementation of technical cooperation programs of the Government of Japan

to confirm the aforementioned, the Scope of Work is herewith attached and signed by the representatives of the said authorities.

For the Japan International Cooperation Agency (JICA)

H. Teranishi

HIDEKI TERANISHI
Team Leader of Japanese Study Team

For Administración Nacional de Telecomunicaciones (ANTELCO)

MIGUEL C. GUANES
Cnel.(S.R.)Ing.Civ.Mil.
Presidente del Consejo

FRANCISCO F. DUARTE
Cnel.Transmisiones
Administrador General

Dated : March 10, 1981

Issued at: ANTELCO Headquarters

Attached Paper I

The Scope of Work for the Study
on National Telecommunications and Broadcasts Development Project

I Objectives of the Study

The objectives of the study on National Telecommunications and Broadcasts Development Project are to conduct a master plan study with a view to promoting a comprehensive approach to 15-year-long National Telecommunications and Broadcasts Development Project (Master Plan Study) and to conduct a feasibility study with a view to promoting an efficient approach to urgent National Telecommunications Development Projects (Feasibility Study).

II The Scope of the Study

1. Master Plan Study

Master Plan Study covers the whole area of the Republic of Paraguay and the following fields.

(1) Domestic Telecommunications

(A) Organizational and Managerial System

(B) Service Demand Forecast

a) Telephone
b) Telex
c) Telegraph
d) Leased Circuits
e) Data Communication
f) Television Transmission and Program Transmission
g) Visual Communication
h) Mobile Communication

(C) Fundamental Telecommunication Network Plan

a) Network Configuration
b) Routing

c) Numbering

(D) Rate System

(E) Charging System

(F) Technical Standard

(G) Demand Fulfillment Plan

a) Telephone

b) Telex

c) Telegraph

d) Trunk Circuits

e) Leased Cirduits

f) Data Communication

g) Television Transmission and Program Transmission

h) Visual Communication

i) Mobile Communication

(H) Facilities

a) Switching System

b) Transmission System

c) Outside Plant

d) Building

e) Power Supply

f) Others

(I) Operation and Management

(J) Maintenance

(K) Personnel Training

(L) Socio-Economic Analysis

(2) International Telecommunications

(A) Organizational and Managerial System

(B) Service Demand Forecast

a) Telephone

b) Telex

c) Telegraph

d) Leased Circuits

e) Data Communication

f) Television Transmission and Program Transmission

g) Visual Communication

h) Mobile Communication

(C) Fundamental Telecommunication Network Plan

a) Circuit

b) Routing

(D) Facilities

a) Switching System

b) Transmission System

c) Building

d) Power Supply

(E) Operation and Management

(F) Maintenance

(G) Personnel Training

(H) Socio-economic Analysis

(I) Communication-Satellite Earth Station and the Related Facilities

a) Circuit Number Forecast by each service

b) Destination Schedule

c) Satellite Communication System to a New Satellite

d) Propagation Problems

e) Building

f) Power Supply

g) Traffic Control for a New Satellite

h) Cost Estimate

i) Operation, Management and Personnel Training

(3) Radio Regulation and Monitoring

(A) Present State of Radio Regulation and Radio Monitoring

(B) Radio Regulation Guideline

a) Organization

b) Basic Laws and Regulations

c) Licensing and Supervision of Radio Stations

d) Radio Operators' System

e) Frequency Assignment Plan

f) Technical Standards and Operation Code of Radio Stations

g) Personnel Training

(C) Radio Monitoring Facilities Plan

a) Radio Monitoring Organization

b) The Placement of Radio Monitoring Facilities

c) Radio Monitoring Equipment

d) Radio Monitoring Standard

e) Operation and Management

f) Maintenance

g) Cost Estimate

h) Personnel Training

(D) Socio-economic Analysis

(4) Broadcasting

(A) National TV Broadcasting Network(generally Educational Broadcasting)

a) Organizational and Managerial System

b) Broadcasting Program

c) Frequency Plan

d) Site Selection and Estimation of Service Area

e) Facilities

f) Program Transmission

g) Program Production

h) Promotion of Viewers

i) Operation and Management

j) Maintenance

k) Personnel Training

l) Socio-economic Analysis

(5) Manpower Development

(A) Manpower Development Program for New Telecommunications and Broadcasts Services

(B) Manpower Development Program in the field of Electronic Industries

(C) I.P.T. Expansion Program

a) Curricula

b) Building Plan

c) Equipment Plan

d) Facilities Plan

e) Site

f) Infrastructure around the site

Id. 5

-2. Feasibility Study

Feasibility Study covers the following fields and areas.

(1) The Introduction of International Subscriber Dialling System to Asuncion

(A) Existing Rate System
(B) Facilities
(C) Operation and Management
(D) Maintenance
(E) Personnel Training
(F) Financial Analysis
(G) Economic Analysis
(H) Social Appraisal

(2) Rural Telephone Introduction to Concepcion, Hohenau, San Pedro, Villarrica, Carapegua

(A) Organizational and Managerial System
(B) Service Demand Forecast
(C) Traffic Forecast
(D) Type of Systems
(E) Capacity by Area
(F) Facilities
(G) Operation and Management
(H) Maintenance
(I) Personnel Training
(J) Financial Analysis
(K) Economic Analysis
(L) Social Appraisal

(3) The Introduction of Digital Telephone Switching System to Asuncion

(A) Organizational and Managerial System
(B) Capacity
(C) Facilities
(D) Operation and Management
(E) Maintenance
(F) Personnel Training
(G) Outside Plant
(H) Financial Analysis
(I) Economic Analysis

(J) Social Appraisal

III Transfer of Knowledge Program

The JICA will provide on-the-job training for Paraguayan Counterparts in the course of the Master Plan Study and Feasibility Study in Paraguay and in Japan

IV Report

1. Master Plan Study

(1) Inception Report

The JICA will prepare and present to the Government of Paraguay 20 copies of Inception Reports (in English) in individual fields at the beginning of the main field studies.

(2) Comprehensive Draft Final Report which covers all the fields.

The JICA will prepare and present to the Government of Paraguay 20 copies of Comprehensive Draft Final Report after the comprehensive coordination among different fields in around October, 1982.

(3) Final Report

The JICA will prepare and present to the Government of Paraguay 20 copies of Final Report within 60 days after the receipt of the comments on Comprehensive Draft Final Report.

2. Feasibility Study

(1) Inception Report

The JICA will prepare and present to the Government of Paraguay 20 copies of Inception Report (in English) at the beginning of the field survey.

(2) Draft Final Report

The JICA will prepare and present to the Government of Paraguay 20 copies of Draft Final Report (in English) within 3.5 month after the completion

of the field survey.

(3) Final Report

The JICA will prepare and present to the Government of Paraguay 20 copies of Final Report (in English) within 2.5 month after the receipt of the comments on draft final report.

V Undertakings of the Government of the Republic of Paraguay

For the conduct of Master Plan Study and Feasibility Study, the Government of Paraguay through ANTELCO will undertake the following:

1. To be responsible for dealing with claims which may be brought by third parties against the Japanese study team members, and shall hold them harmless in respect of claims or liabilities arising in the course of or otherwise connected with the discharge of their duties in the implementation of the Study except when such claims or liabilities arise from the gross negligence of wilful misconduct of the above-mentioned individuals.

2. To provide the team with the data and information including topografic maps necessary for the study.

3. To provide the team with suitable office space and office quipment necessary for the study.

4. To provide the team with vehicles including drivers for the study.

5. To provide the team with other available facilities for the execution of the study.

6. To ensure the security of the team.

7. To exempt from taxes and duties on machinery, equipment and materials necessary for the study.

8. To assign counterpart personnel (officials/engineers) to the team during the study period.

9. Making Arangements for accommodations and field offices required for the study work, when necessary.

10. Allowing to take all data and materials concerned including photo films out of the Republic of Paraguay to Japan.

11. Carrying out such field works as Radio Wave Propagation Test and others.

VI Undertakings of the Government of Japan

The Government of Japan through JICA, for the conduct of Master Plan Study and Feasibility Study, will undertake the following;

1. To send the Japanese expert teams to conduct the study.

2. To transfer the knowledge to the Paraguay counterparts during the period of the Study.

VII Study Schedule

The Study will be carried out in accordance with the attached table.

(Table)

Tentative Study Schedule