(2) 日本における電気通信技術の動向

Telecommunications Trends in Japan

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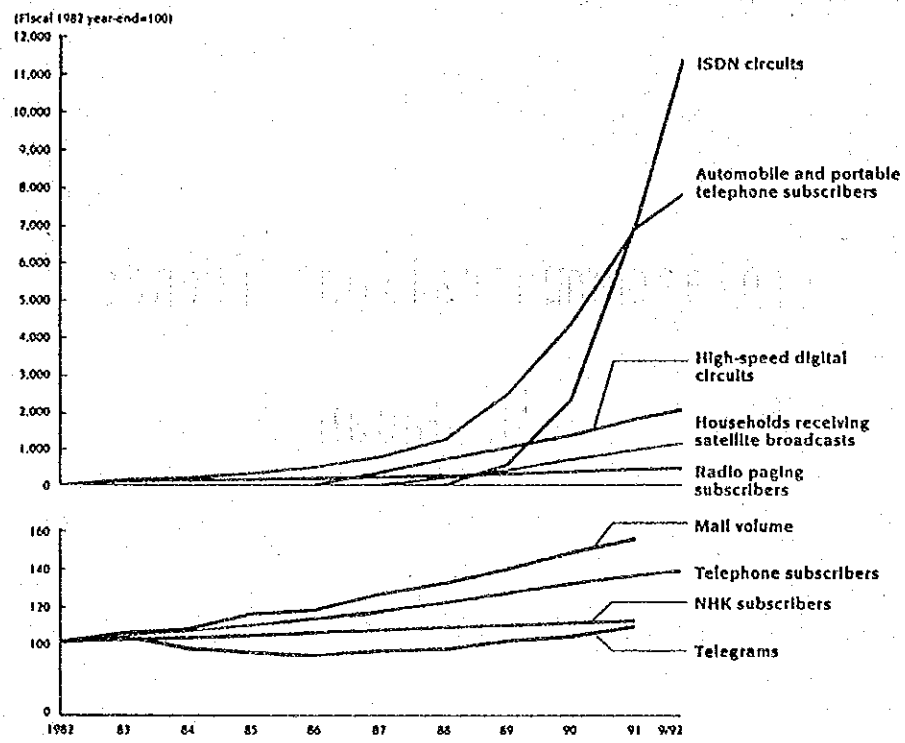
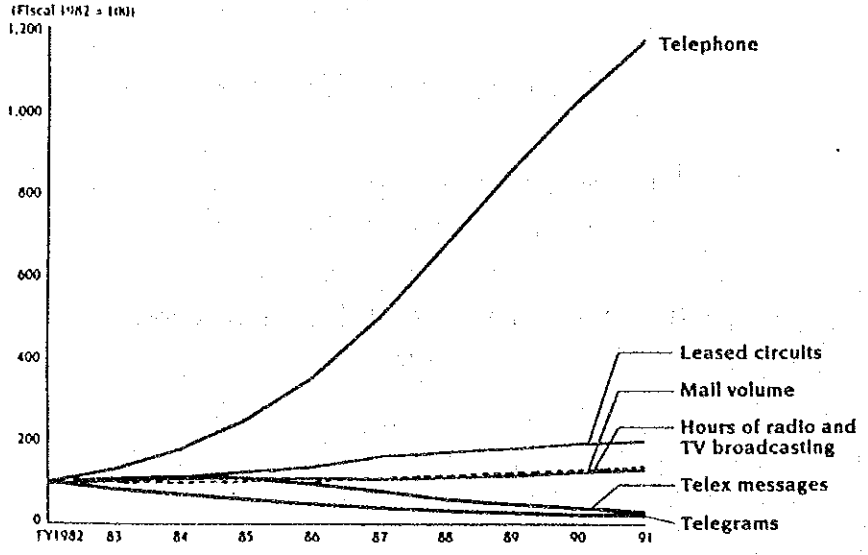
Domestic Communications Trends



Source: MPT
Notes: 1. The reference base of 100 is assigned to the following fiscal year-ends for the following services: number of high-speed digital circuits, 1985; number of households receiving satellite broadcasts, 1987; number of ISDN circuits, 1988.
2. The number of ISDN circuits is that of basic interface (INS Net 64) subscribers.

International Communications Trends



Source: MPT

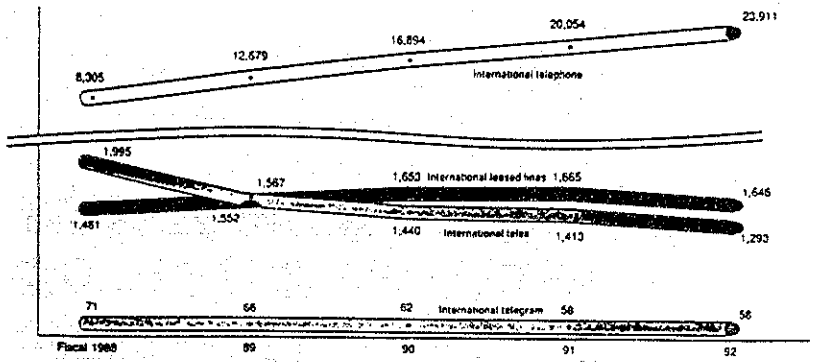
Telecommunications Service Trends

Number of international service circuits and their utilization

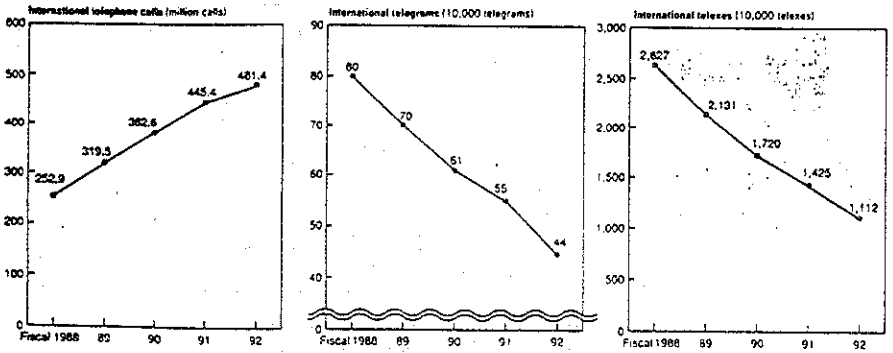
Number of international circuits grows with increasing socio-economic international interaction

International telephones are exhibiting rapid growth, with four times as many circuits in fiscal 1992 handling twice as many calls as four years earlier.

Number of international circuits



International telecommunications service utilization (number of connections handled)



Source: Information Management Division, Communications Policy Bureau

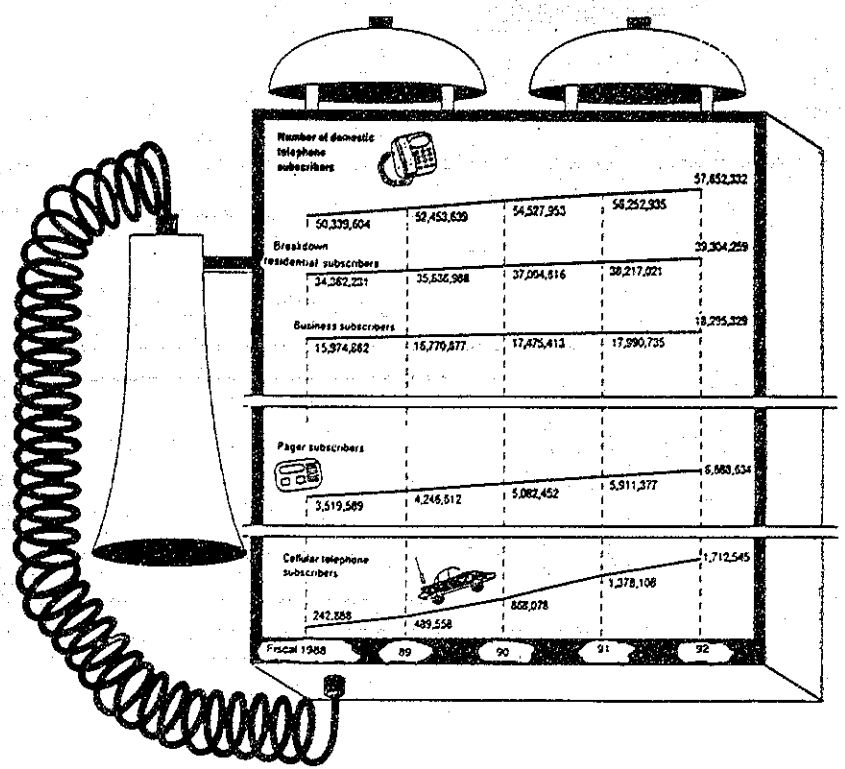
Telecommunications Service Trends

Number of domestic telephone subscribers, etc.

Rapid wide-spread use of cellular telephones

"A greater number of carriers; extended service area; lower charges and smaller and lighter telephones have resulted in a rapid increase in the number of cellular telephone subscribers."

Number of domestic telephone subscribers, etc.



Note "Number of telephone subscribers" shows both NTT and NCC subscribers. "Business subscribers" and "residential subscribers" show NTT subscribers only.

Source Information Management Division, Communications Policy Bureau

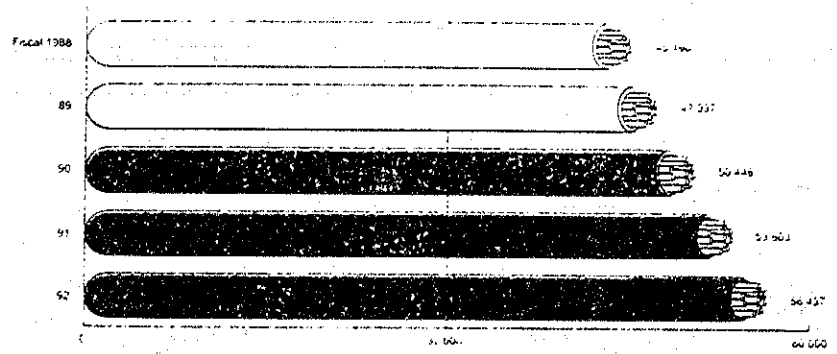
添付資料

Number of Cable TV broadcasting facilities and subscribers

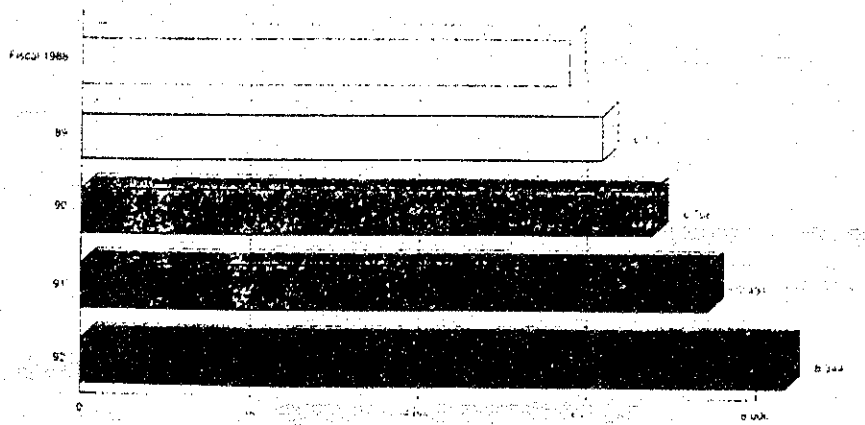
8,340,000 households subscribe to Cable TV

Compared to four years ago, the number of Cable TV broadcasting facilities has increased 1.3-fold and the number of subscribers has increased 1.4-fold.

Number of Cable TV broadcasting facilities



Number of Cable TV subscribers



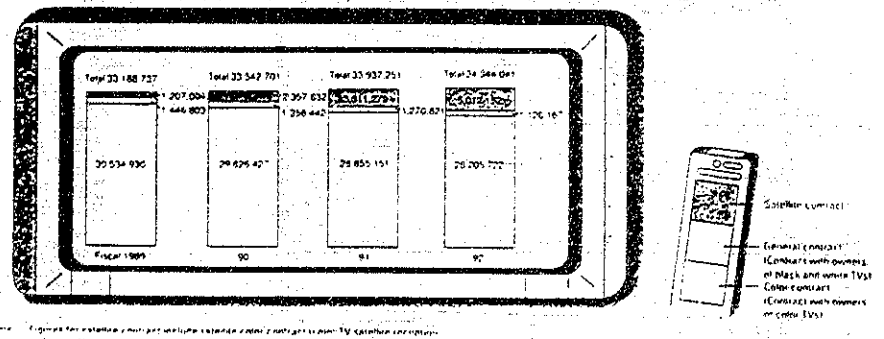
Source: Information Management Division, Communications Policy Bureau

Number of NHK television subscriber contracts

Diffusion of satellite broadcasting

Satellite contracts are increasingly steadily commensurate with the diffusion of satellite broadcasting. Fiscal 1992 recorded 5 million satellite contracts, a fourfold increase over three years prior.

Number of NHK television subscriber contracts



Source: Figures for satellite contract include satellite contract in color TV satellite reception contracts, Satellite general contract (black and white TV satellite reception contracts) and satellite general contract (contract with owners of TVs in place, reception is not and owner and place, other fees)

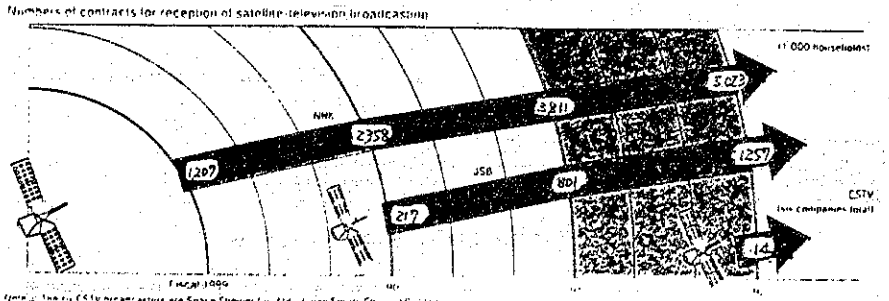
Source: Information Management Division, Communications Policy Bureau

Number of contracts for reception of satellite-television broadcasting

The number of satellite broadcast contracts (NHK) quadruples over last four years

NHK began satellite broadcasting in June 1989. Japan Satellite Broadcasting Co., Ltd. (JSB) began broadcasting as Japan's first private satellite broadcaster in November 1990, and in April 1992, CSTV broadcasters started its operations.

Numbers of contracts for reception of satellite-television broadcasting



Note: The six CS broadcasters are Space Shower Co., Ltd., Japan Sports Channel Co., Ltd., Satellite Movie Theater Broadcasting Co., Ltd., Tokyo Cable TV Co., Ltd., Star Channel Co., Ltd., and Music Channel Co., Ltd.

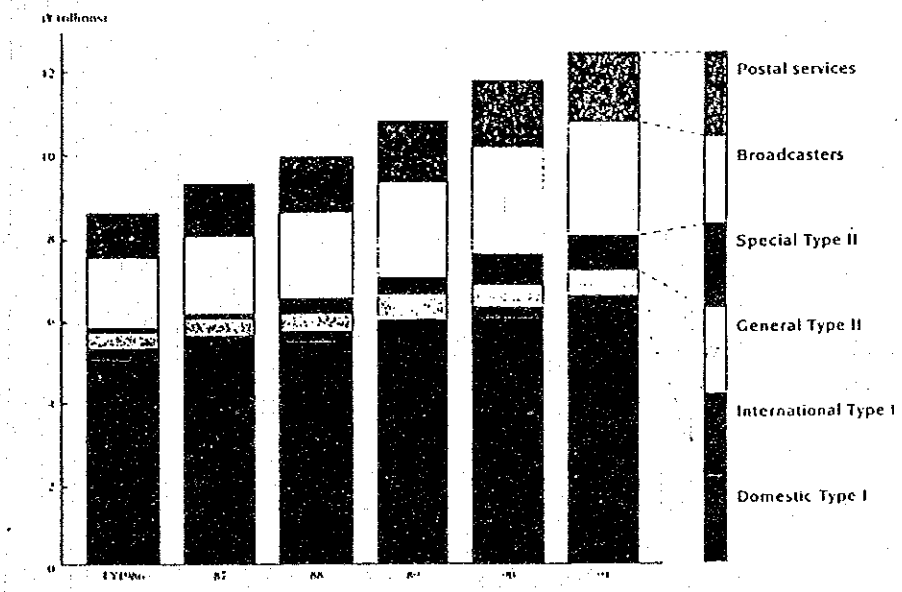
Source: Information Management Division, Communications Policy Bureau

■Broadcasters and Types of Broadcasting in Japan

	NHK	University of the Air Foundation	Commercial Broadcasters (Number of companies)
TELEVISION			
Terrestrial Broadcasting			
General broadcasting	●		● (117)
Educational broadcasting	●	●	
Standard TV teletext multiplex broadcasting	●		● (24)
Satellite Broadcasting			
BS: Improved reception	●		
BS: General broadcasting	●		● (1)
BS: HDTV test broadcasting			● (1)
CS: Standard TV broadcasting			● (6)
RADIO			
Terrestrial Broadcasting			
Medium-wave general broadcasting	●		● (47)
Medium-wave educational broadcasting	●		
FM broadcasting	●	●	● (41)
Community broadcasting			● (2)
Shortwave broadcasting	● (Overseas broadcasting)		● (1)
Satellite Broadcasting			
CS: PCM sound broadcasting			● (4)
Number of broadcasters	1	1	195
Urban-type cable TV	151 facilities, 143 broadcasters		

[As of August 1, 1993]

Trends in the Communications Market



Source: MPT

Notes: 1. Values in the chart were determined as follows. Type I telecommunications carriers, aggregate total of their telecommunications operating revenues; Type II telecommunications carriers, responses to a questionnaire (no values for Type II carriers in 1985); broadcasters, aggregate total sales of NHK and the private sector; postal services, postal service income as shown on the Postal Service Special Account.

2. Values for domestic Type I telecommunications carriers do not include JR Communications.

The Situation after the Telecommunications Reform

A. Market Entry

Japan has one of the most liberalized telecommunications markets in the world, comparable with that of the U.S.A.

Number of Telecommunications Carriers

	85.4.1	86.4.1	87.4.1	88.4.1	89.4.1	90.4.1	91.4.1	92.4.1	93.4.1	94.1.1
Type I Carriers	2	7	13	37	45	62	68	70	80	84
NTT	1	1	1	1	1	1	1	1	1	1
KDD	1	1	1	1	1	1	1	1	1	1
NTT Mobile Communications Network, Inc., etc.	-	-	-	-	-	-	-	-	1	9
New Type I Carriers	-	5	11	35	43	60	66	68	77	73
Long-Distance Carriers	-	3	3	3	3	3	3	3	3	3
Regional Carriers	-	-	3	4	4	7	7	7	8	9
International Carriers	-	-	-	2	2	2	2	2	2	2
Satellite Carriers	-	2	2	2	2	2	2	3	3	2
Mobile Communications	-	-	2	23	31	46	52	53	61	57
Mobile Phone	-	-	-	2	4	8	8	9	15	16
Radio Paging	-	-	2	20	26	33	36	36	36	31
Convenience Radio Phone	-	-	-	-	-	2	4	4	7	7
Ship Telephone	-	-	-	1	1	2	3	3	2	2
Data Communications	-	-	-	-	-	1	1	1	1	1
Others	-	-	1	1	1	-	-	-	-	-
Type II Carriers	85	209	356	530	693	841	943	1,036	1,179	1,497
Special Type II Carriers	-	9	10	18	25	28	31	36	36	38
General Type II Carriers	85	200	346	512	668	813	912	1,000	1,143	1,459
Total	87	216	369	567	738	903	1,011	1,106	1,259	1,581

Note: *Type I Carriers* offer services by establishing their own telecommunications circuit facilities.
Type II Carriers offer services by leasing telecommunications circuit facilities.

I. Main Points of the 1985 Telecommunications Reform

A. Establishment of the Constitution Which Makes Entry into All Fields Possible

1. Introduction of the Principle of Competition to Carriers Which Establish Their Own Telecommunications Circuit Facilities (Classified as Type I carriers)
2. Liberalization of Circuit Usage (Classified as Type II carriers)
3. Deregulation of Terminal Equipment (Liberalization of telephone sets)

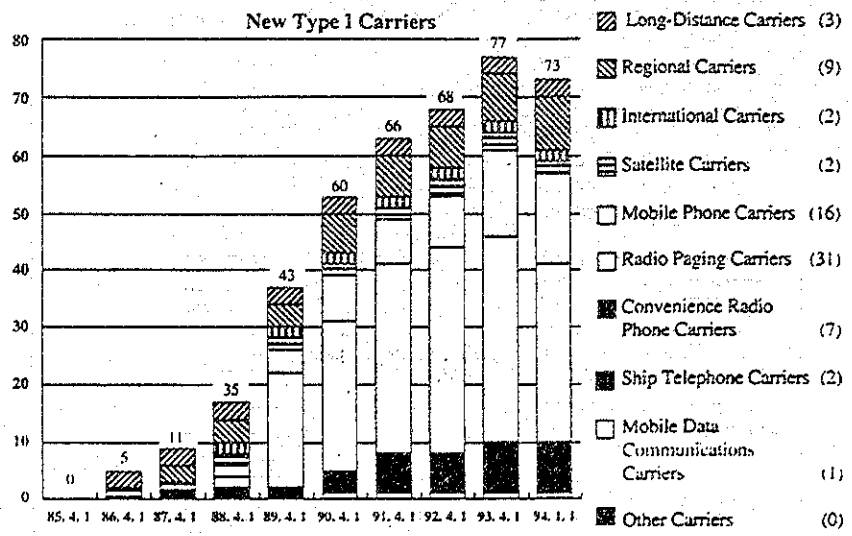
B. Improvement of Business Efficiency by the Privatization of NTT

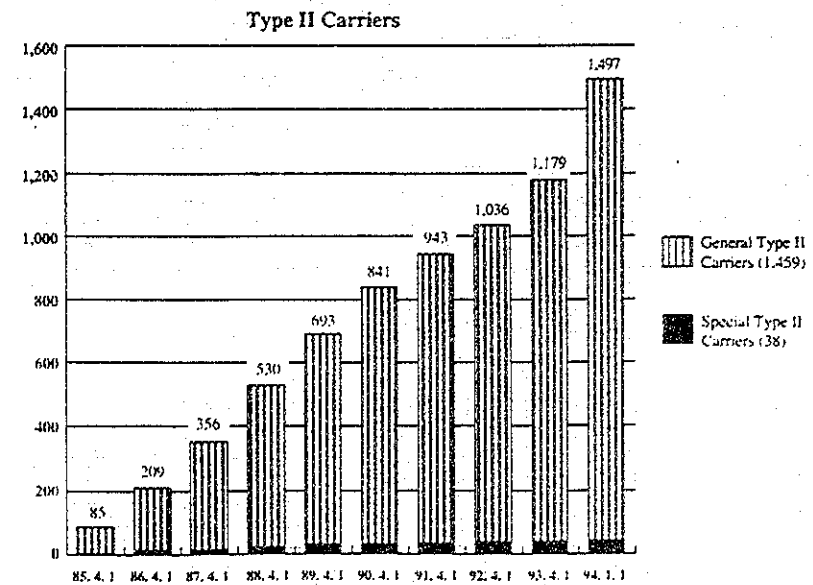
1. Change of the Regulations on Tariffs (Decision of the Diet ⟹ Approval by the Minister)
2. Abolition of Approval by the Minister for NTT's Budget
3. Elimination of the Regulation on NTT's Investment

Type I Telecommunications Carriers (as of January 1, 1994)

	Company	Types of Service	Service Areas
Long-Distance Carriers	Nippon Telegraph and Telephone Corp. (From April 1, 1985)	Telephone, Leased Circuit, Telegraph, Telegram, ISDN	Nationwide
	DDI Corp.	Telephone, Leased Circuit	Leased Circuit: 46 prefs. Telephone: 47 prefs.
	Japan Telecom Co., Ltd.	Telephone, Leased Circuit	Leased Circuit: 46 prefs. Telephone: 47 prefs. JRs: 45 prefs.
	Teleway Japan Corp.	Telephone, Leased Circuit	Leased Circuit: 27 prefs. Telephone: 33 prefs.
Satellite Carriers	Japan Satellite Systems Inc.	Leased Circuit	Nationwide
	Space Communications Corp.	Leased Circuit	Nationwide
Regional Carriers	Tokyo Telecommunication Network Co., Inc.	Telephone, Leased Circuit	Tokyo, Kanagawa, Chiba, Saitama, Gunma, Tochigi, Ibaraki, Yamanashi and Shizuoka Prefectures
	Osaka Media Port Corp.	Leased Circuit	Osaka, Kyoto, Hyogo, Shiga, Nara, Wakayama and Fukui Prefectures
	Chubu Telecommunications Co., Inc.	Leased Circuit, Digital Data Transmission	Aichi, Gifu, Mie, Shizuoka and Nagano Prefectures
	Shikoku Information and Telecommunication Network Co., Inc.	Leased Circuit, Data Communications	Kagawa, Tokushima, Kochi and Ehime Prefectures
	Kyushu Telecommunication Network Co., Inc.	Leased Circuit	Fukuoka, Saga, Nagasaki, Kumamoto, Oita, Miyazaki and Kagoshima Prefectures
	Hokkaido Telecommunication Network Co., Inc.	Leased Circuit	Hokkaido Prefecture
	Chugoku Telecommunication Network Co., Inc. (CTnet)	Leased Circuit	Hiroshima, Okayama and Yamaguchi Prefectures
	Tohoku Intelligent Telecommunication Co., Inc. (TOHKnet)	Leased Circuit	Aomori, Iwate, Akita, Miyagi, Yamagata, Fukushima, and Niigata Prefectures (from June 1, 1994)
	LCV Corp.	Leased Circuit	7 cities and towns, including Suwa City and Okaya City

Market Entry





Note: Parentheses indicate number of each type of carriers, as of January 1, 1994.

添付資料

	Company	Type of Service	Service Areas
International Telecom-munications Carriers	Kokusai Denshin Denwa Co., Ltd. (KDD)	Telephone, Leased Circuit, Telegraph, Telegram, Data Communications	Nationwide (Est. April 1, 1953)
	International Telecom Japan Inc.	Telephone, Leased Circuit	Nationwide
	International Digital Communications Inc.	Telephone, Leased Circuit, Other	Nationwide
Cellular Phone Carriers, etc.	NTT Mobile Communications Network, Inc. (NTT DoCoMo)	Telephone (Car, Portable), Radio Paging	Gunma, Ibaraki, Tochigi, Kanagawa, Saitama, Chiba, Tokyo, Yamanashi, Niigata and Nagano Prefectures
	NTT Hokkaido Mobile Communications Network, Inc.	Telephone (Car, Portable), Radio Paging	Hokkaido Prefecture
	NTT Tohoku Mobile Communications Network, Inc.	Telephone (Car, Portable), Radio Paging	Aomori, Iwate, Miyagi, Akita, Yamagata and Fukushima Prefectures
	NTT Tokai Mobile Communications Network, Inc.	Telephone (Car, Portable), Radio Paging	Aichi, Shizuoka, Mie and Gifu Prefectures
	NTT Hokuriku Mobile Communications Network, Inc.	Telephone (Car, Portable), Radio Paging	Toyama, Ishikawa and Fukui Prefectures
	NTT Kansai Mobile Communications Network, Inc.	Telephone (Car, Portable), Radio Paging	Osaka, Kyoto, Hyogo, Shiga, Nara and Wakayama Prefectures
	NTT Chugoku Mobile Communications Network, Inc.	Telephone (Car, Portable), Radio Paging	Hiroshima, Okayama, Yamaguchi Tottori and Shimane Prefectures
	NTT Shikoku Mobile Communications Network, Inc.	Telephone (Car, Portable), Radio Paging	Kagawa, Ehime, Tokushima and Kochi Prefectures
	NTT Kyushu Mobile Communications Network, Inc.	Telephone (Car, Portable), Radio Paging	Fukuoka, Saga, Nagasaki, Kumamoto, Oita, Miyazaki, Kagoshima and Okinawa Prefectures
	NIPPON IDOU TSUSHIN CORP.	Telephone (Car, Portable)	Tokyo, Kanagawa, Saitama, Chiba, Ibaraki, Tochigi, Gunma, Aichi, Mie, Gifu, Shizuoka, Yamanashi and Nagano Prefectures
	Kansai Cellular Telephone Co., Ltd.	Telephone (Car, Portable)	Osaka, Kyoto, Hyogo, Shiga, Nara, and Wakayama Prefectures
	Kyushu Cellular Telephone Co.	Telephone (Car, Portable)	Fukuoka, Saga, Kumamoto, Nagasaki, Oita, Miyazaki and Kagoshima Prefectures
	Chugoku Cellular Telephone Co., Ltd.	Telephone (Car, Portable)	Hiroshima, Okayama, Tottori, Shimane and Yamaguchi Prefs.

(Continued on next page.)

Cellular Phone Carriers, etc.	Tohoku Cellular Telephone Co.	Telephone (Car, Portable)	Miyagi, Yamagata, Fukushima, Niigata, Aomori, Akita and Iwate Prefectures
	Hokkaido Cellular Telephone Co.	Telephone (Car, Portable)	Hokkaido Prefecture
	Hokuriku Cellular Telephone Co.	Telephone (Car, Portable)	Toyama, Ishikawa and Fukui Prefectures
	Shikoku Cellular Telephone Co.	Telephone (Car, Portable)	Kagawa, Ehime, Tokushima and Kochi Prefectures
	Okinawa Cellular Telephone Co.	Telephone (Car, Portable)	Okinawa Prefecture
	Tokyo Digital Phone Co., Ltd.	Telephone (Portable)	Kanto Area (from July 1, 1994)
	TU-KA Cellular Tokyo Inc.	Telephone (Car, Portable)	Kanto Area (from April 1, 1995)
	Kansai Digital Phone Co., Ltd.	Telephone (Car, Portable)	Kansai Area (from December 1, 1994)
	TU-KA Cellular Kansai Inc.	Telephone (Car, Portable)	Kansai Area (from April 30, 1994)
	Central Japan Digital Phone Co., Ltd.	Telephone (Car, Portable)	Tokai Area (from December 20, 1994)
	TU-KA Cellular Tokai Inc.	Telephone (Car, Portable)	Tokai Area (from April 1, 1995)
	Avicom Japan Co., Ltd.	Telephone (Car, Portable)	Haneda Airport
	Tokachi Telephone Network Co., Ltd.	Telephone (Car, Portable)	Obihiro City (in Hokkaido Prefecture) and surrounding area
	Telecommunication Aomori K.K.	Telephone (Car, Portable)	Aomori City, Hirosaki City, Goshogawara City, Kuroishi City and surrounding area
	Kushiro Telecom Co.	Telephone (Car, Portable)	Kushiro City (in Hokkaido Prefecture) and surrounding area
	Yamaguchi New-Media Center Co.	Telephone (Car, Portable)	Five cities and three towns in Yamaguchi Prefecture, including Yamaguchi City and Hofu City
	Kansai Marinet Telecommunication Co., Ltd.	Telephone (Ship, Portable)	Osaka Bay, the Sea of Harima, and the coast of Osaka and Hyogo
	Setouchi Marinet Telecommunications, Inc.	Telephone (Ship, Portable)	Hiroshima Bay and surrounding area
	Japan City Media Inc.	Digital Data Transmission (Car, Portable)	Tokyo, Kanagawa, Chiba and Saitama Prefectures
	Telecom Hachinohe Co.	Telephone (Car, Portable)	Hachinohe City and surrounding area
	Nagaoka Mobilephone System Co.	Telephone (Car, Portable)	Nagaoka City and surrounding area
	Telenet Enshu Co., Ltd.	Telephone (Car, Portable)	Hamamatsu City and surrounding area
Radio Paging Carriers	31 companies, including Tokyo Telemessage Inc.		

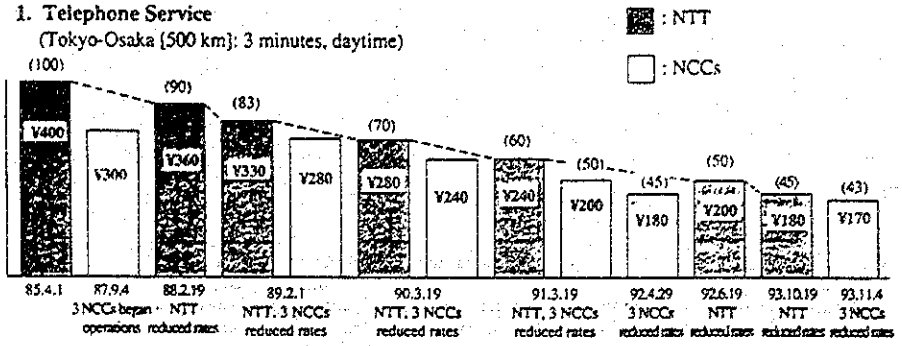
Note: Service areas include those prefectures where only part of the area is provided with service.

Rate Reductions

(Decreases in the rates for telecommunications services after the telecommunications reform. Parentheses indicate the index figures which have been calculated with the April 1, 1985 rate equal to 100 %.)

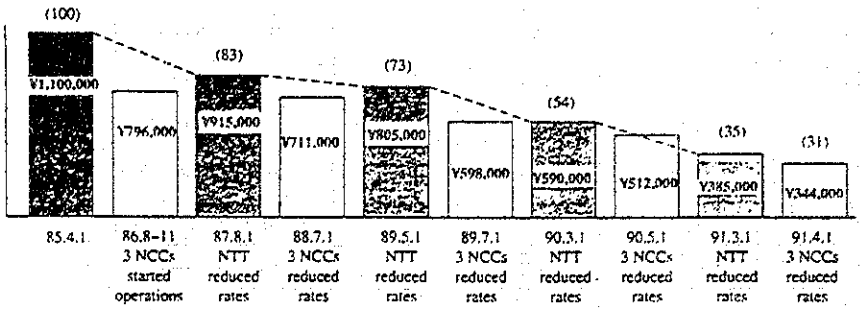
1. Telephone Service

(Tokyo-Osaka [500 km]: 3 minutes, daytime)



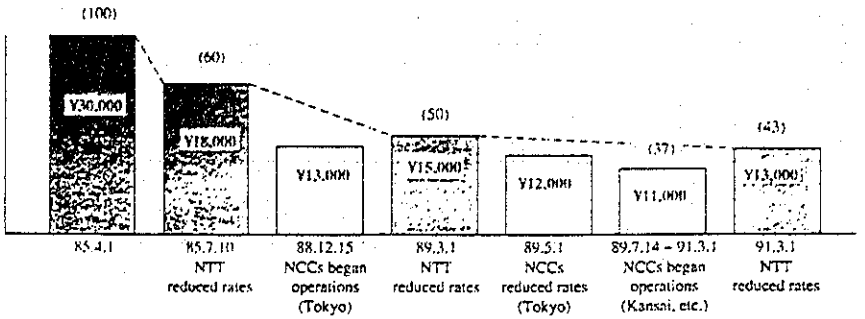
2. Leased Circuits Service

(Tokyo-Osaka [500 km]: 64 kb/s)



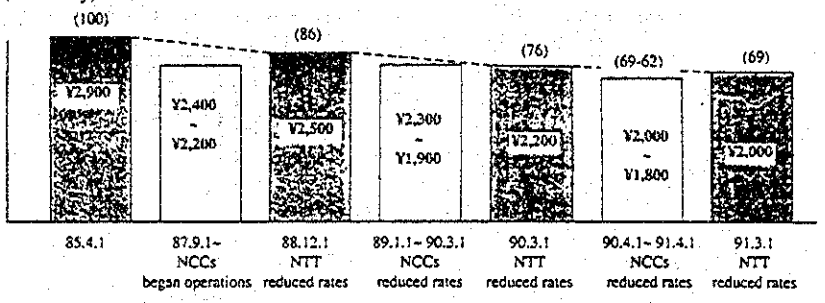
3. Cellular Phone Service

(Basic fee)



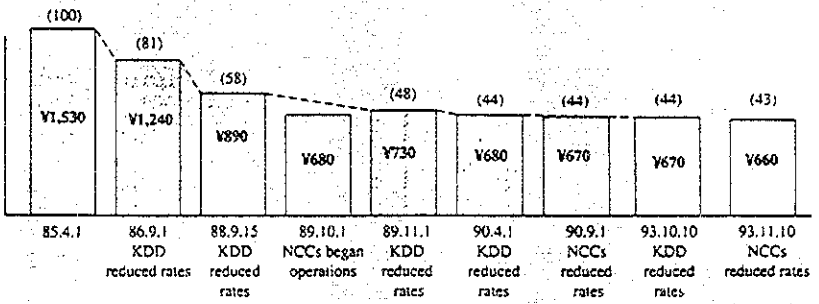
4. Paging Service

(Tone only)



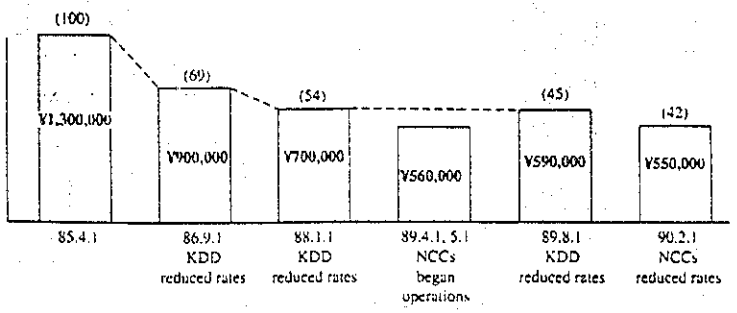
5. International Telephone Service

(Japan-U.S. 3 minutes daytime)

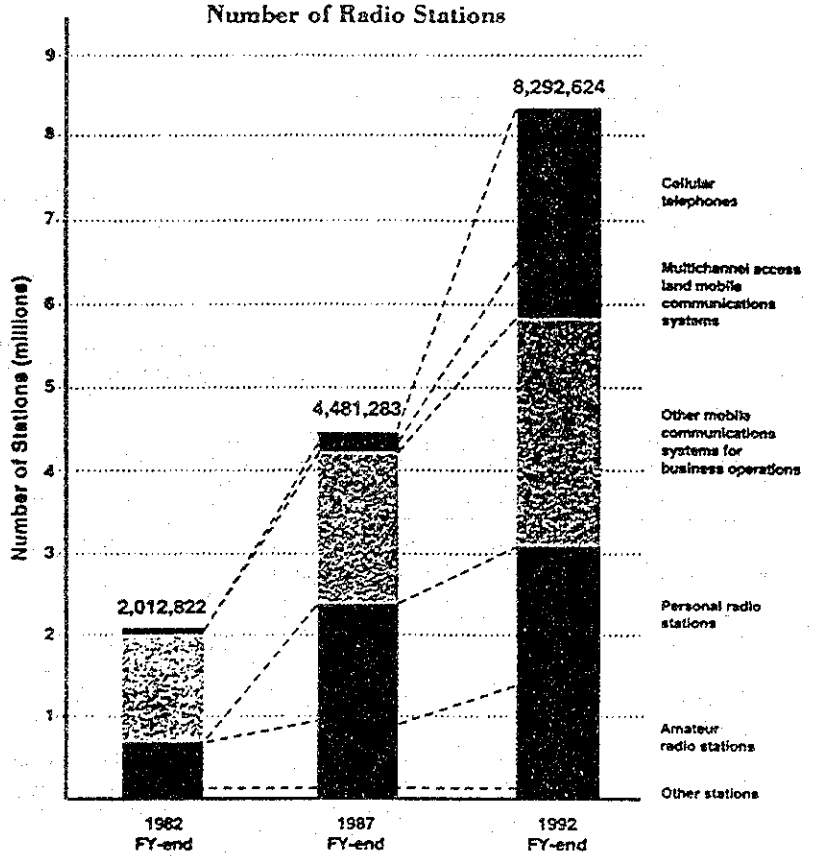


6. International Leased Circuit Service

(Japan–US: Voice-Grade Circuits)



Number of Radio Stations



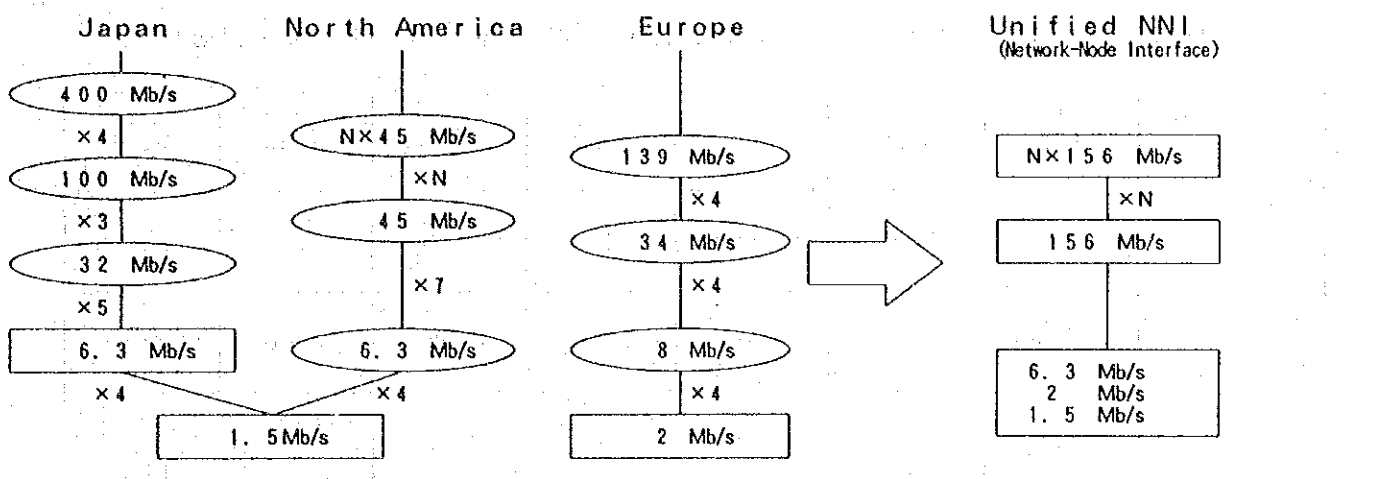
Fiscal Year-end	Cellular telephones	Multichannel access land mobile communications systems	Other mobile communications stations	Personal radio stations	Amateur radio stations	Other stations	Total
1982	19,804 (1.0%)	9,105 (0.5%)	1,344,674 (66.7%)	3,117 (0.2%)	550,338 (27.3%)	85,784 (4.3%)	2,012,822 (100%)
1987	150,800 (3.3%)	157,494 (3.5%)	1,799,320 (40.3%)	1,444,584 (32.2%)	825,153 (18.4%)	103,932 (2.3%)	4,481,283 (100%)
1992	1,712,500 (20.7%)	659,818 (8.0%)	2,801,534 (33.8%)	1,701,663 (20.5%)	1,283,185 (15.5%)	133,924 (1.6%)	8,292,624 (100%)

Present Status of Type I Telecommunications Carriers Constructing Communications Infrastructure

(as of the end of March 1993)

	Number of Companies	Number of Employees	Capital Investment FY '92 (¥100 million)	Revenues FY '92 (¥100 million)
Type I Carriers	80	252,970	25,753	69,155
NTT	1	232,198	18,833	55,738
KDD	1	5,881	620	2,352
NTT Mobile Communications Network, Inc.	1	1,938	1,336	3,280
New Type I Carriers	77	12,953	4,964	7,784
Long-Distance Carriers	3	6,100	1,888	4,105
Regional Carriers	8	1,871	543	373
Satellite Carriers	3	325	421	190
Mobile Carriers	61	3,729	1,835	2,433
International Carriers	2	928	277	681

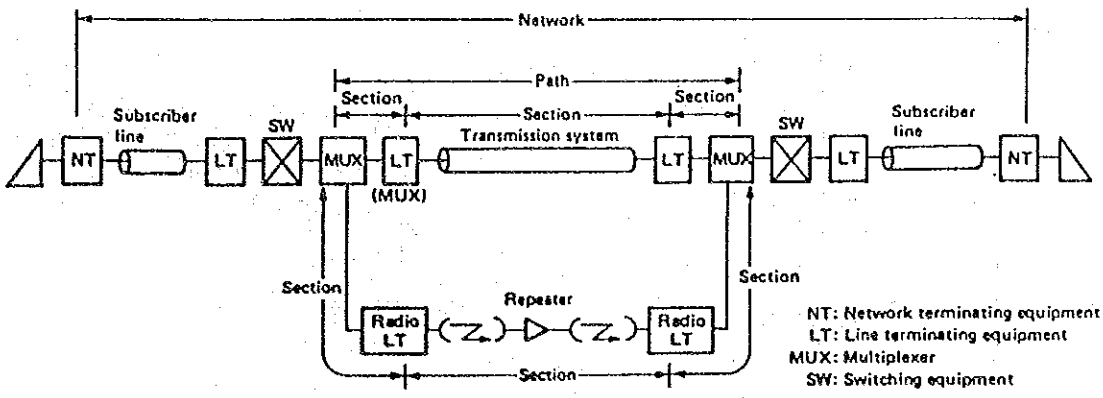
Notes: 1. Figures of the LCV Corp. are excluded.
2. Revenues of "Long-Distance Carriers" exclude revenues from telephone and leased circuit services for JR companies.
3. Revenues represent telecommunications services operating revenues. Figures in subtotals and totals are calculated in ¥1 million units, and after the calculation, yen portions less than ¥100 million are omitted.
4. Carriers in the preparation stage are included.



Conventional Digital Hierarchies

Synchronous Digital Hierarchies
(CCITT Standard)

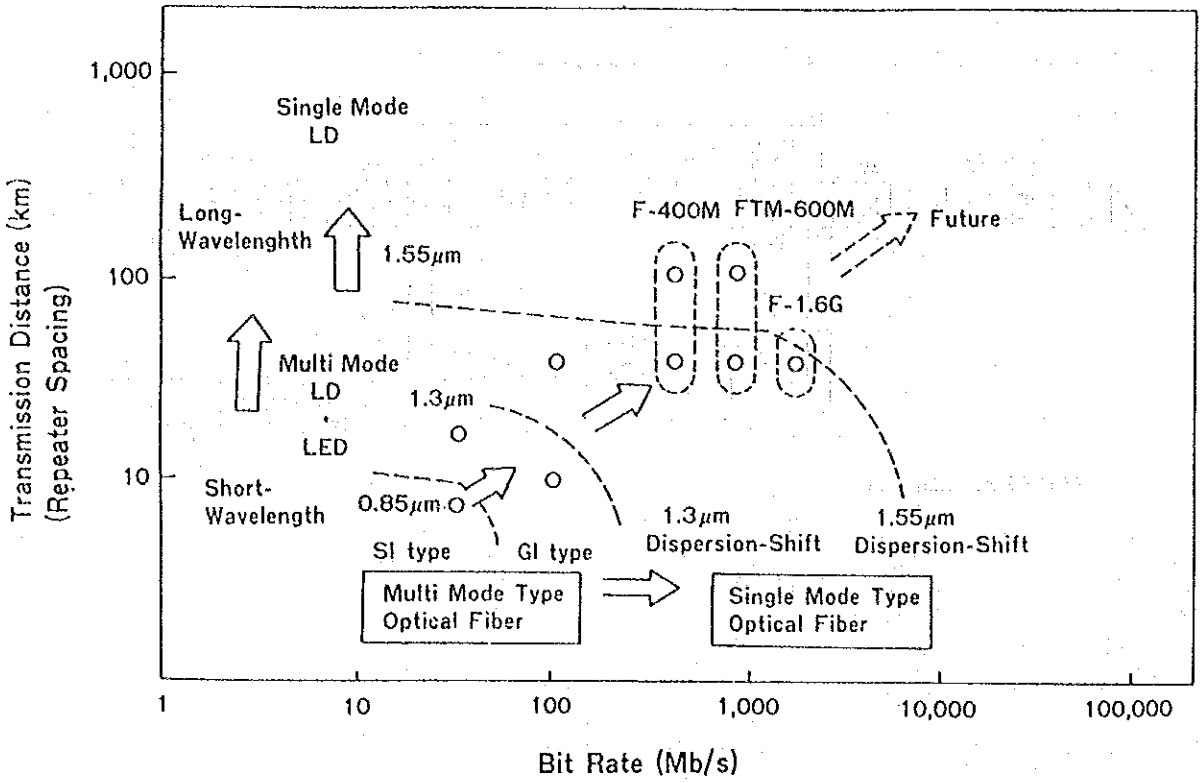
New Synchronous Digital Hierarchy



CCITT Section Concept

Outline of Optical Transmission System for Trunk Line

Items \ System	F-6M	F-32M	F-100M	F-400M	F-1.6G	FTM-150M	FTM-600M
Bit Rate	6,312Mb/s	3,2064Mb/s	97,728Mb/s	397,200Mb/s	397.2×4Mb/s	155.52Mb/s	622.08Mb/s
Channel (Telephone)	96×2ch	480ch	1,440ch	5,760ch	23,040ch	2,016ch	2,016×4ch
Wavelegth	1.2/1.3 μm	1.3 μm / 1.55μm			1.3 μm	1.3 μm / 1.55μm	
Fiber	Multimode / Single 1.3μm	Single 1.3μm / 1.55μm zero Dispersion Shift			Single 1.3μm	Single 1.3 μm or, 1.55μm Zero Dispersion Shift	
Light Source	InGaAsP/InP FP LD	InGaAsP/InP DFB LD				non-regulated	
Detector	Ge-APD	InGaAs-APD				non-regulated	
Repeater Spacing	20km / 40Km (1.3μm)	80Km (1.55μm)			40Km	40Km (1.3μm) / 80Km (1.55μm)	



Technical Trends of Trunk/Junction Transmission Systems

B. For public works

The following frequency bands are used for the flood control (dam control, etc.), police, maritime security, fire prevention, electricity, gas, railroad, and other public utilities.

Frequency Bands used for Public Works

Frequency band	System	Modulation method	Transmission capacity	Purpose
2 GHz (1,850-2,110)	Small-capacity TDM (P-P)	4 PSK	1.544 Mb/s (Note)	Short-haul small capacity
2 GHz (1,850-2,110)	Small-capacity TDM (P-MP)	4 PSK	1.544 Mb/s x 2	Same as the above, 3 to 8 substations
6.5 GHz (6,570-6,870)	Medium-capacity FDM	FM	600 ch or less	Medium-capacity trunk line
	Medium-capacity TDM	4 PSK 16 QAM	1.544 b/s x 4-12 1.544 b/s x 20-25	Medium-capacity trunk line
7.5 GHz (7,425-7,750)	Large-capacity FDM	FM	More than 600 ch	Large-capacity trunk line
	Medium-capacity TDM	4 PSK 16 QAM	1.544 b/s x 4-12 1.544 b/s x 20-25	Medium-capacity trunk line
12 GHz	FDM	FM	960 ch or less	Short- and long-haul small, medium, and large capacities
	TDM	4 PSK	6.3 Mb/s x 3 or less	Short- and long-haul small, medium, and large capacities
40 GHz	FDM	FM-TV	TV 1 ch	Short haul
	TDM	2 or 4 PSK 2 FSK	6.3 Mb/s x 5 or less	Short haul

Note: Maximum of 2 systems of 1.544 Mb/s is available using the cross polarization.
Other small capacity system in 7.5 GHz band and large capacity system in 12GHz band will be used in a few years.

Radio system for multiple line

A. Telecommunication business

The following are frequency bands used for the fixed station for common carriers, which had been exclusively used by NTT and KDD. Since the Telecommunication Business Law was enforced on April 1 in 1985, however, new enterprises have entered the business and are using these frequency bands.

Frequency Bands used for Telecommunication Business

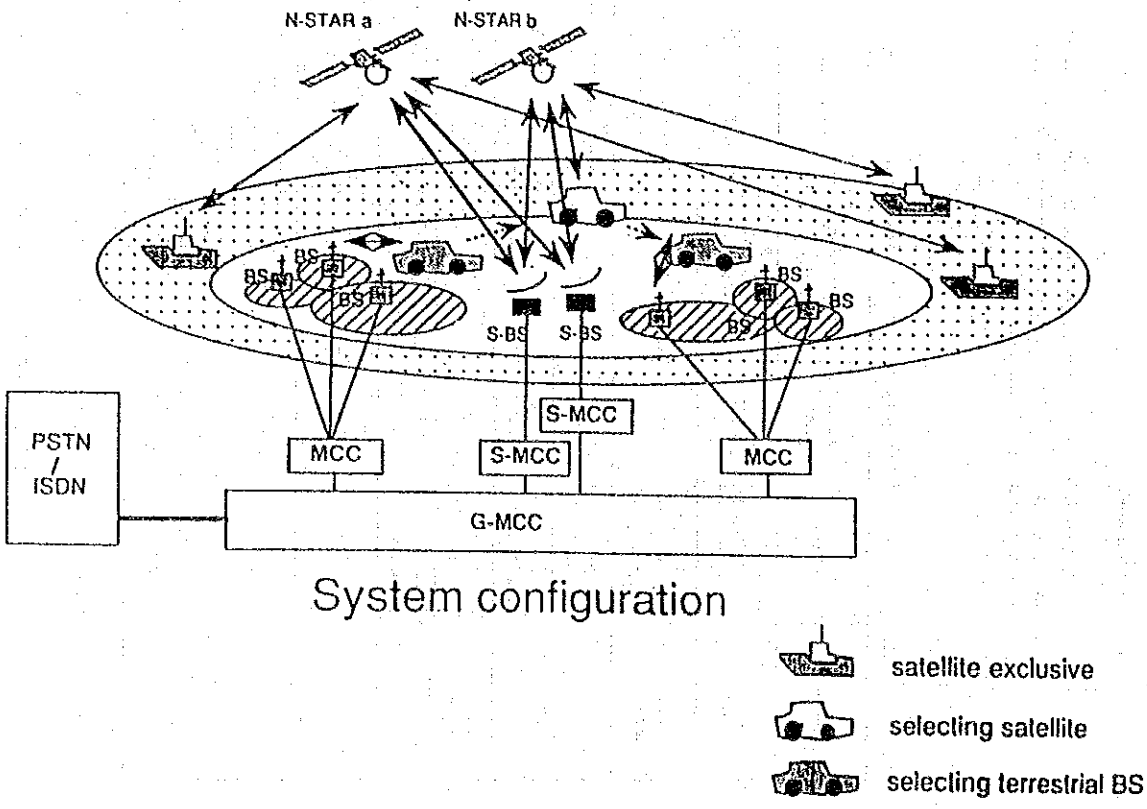
Frequency band	Modulation method	Transmission capacity/system	Purpose
2 GHz	4 PSK 16 QAM	3.2 Mbps/s 32Mbps/s	Short-haul small and medium capacity (Note 1)
4 GHz (3,600 - 4,200)	FM	TV1 ch	Long-haul TV
4, 5,6 GHz (3,600 - 4,200) (4,400 - 5,000) (5,925 - 6,425)	16 QAM 256 QAM	200 Mbps/s 156 Mbps/s 312 Mbps/s	Long-haul large capacity
11 GHz	4 PSK 4 PSK 8 PSK	100 Mbps/s 32 Mbps/s 6.3 Mbps/s 156 Mbps/s	Short-and long-haul large capacity Short-haul medium and small capacity Short-and long-haul lrage capacity
15 GHz	4 PSK	1440 ch (100 Mbps/s)	Short-haul large capacity
20 GHz	4 PSK	5760 ch (400 Mbps/s)	Short-and long-haul large capacity
21 GHz	FSK	8 Mbps/s	Subscriber's radio wave
26 GHz	FM FSK	TV 1ch Sound 2ch 14Mbps/s	Subscriber's radio wave

1) This frequency band is planned to be used for mobil stations in a few years.
2) Other transmission system is now planned.
3) New transmission system, which has the transmission capacity based on recomendation of CCITT about Network Node Interface, has been introduced.

公開資料

Main Features of N-STAR

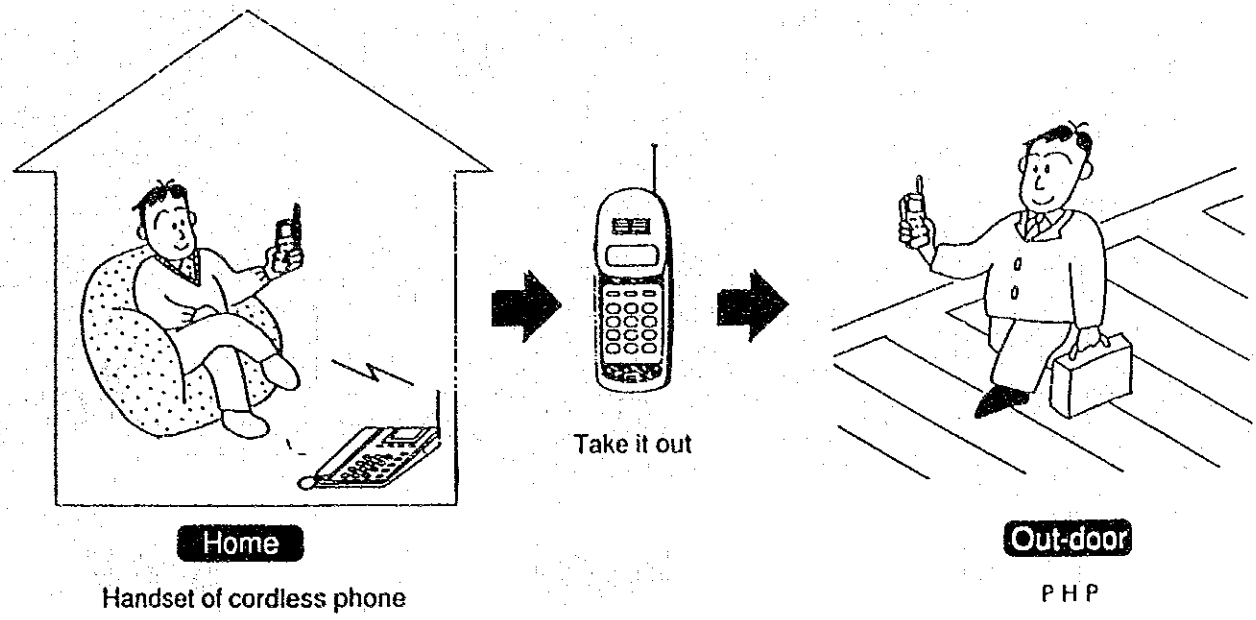
Item	Features
Weight	2000 kg
Span of Life	10 years
Stabilization	3-axis
Allocated Orbit	132 E 136 E
Transponder	・shaped-beam Ka-band 100MHz width 5 Ku-band 54MHz width 8 C-band 72MHz width 6 ・multi-beam Ka-band 200MHz width 6 S-band 18MHz width 1



System configuration

What's PHP(Personal Handy Phone) Service?

◆Take the handset of your home cordless phone to outside.
Then it works as your portable phone.



Basic Concept of PHP System

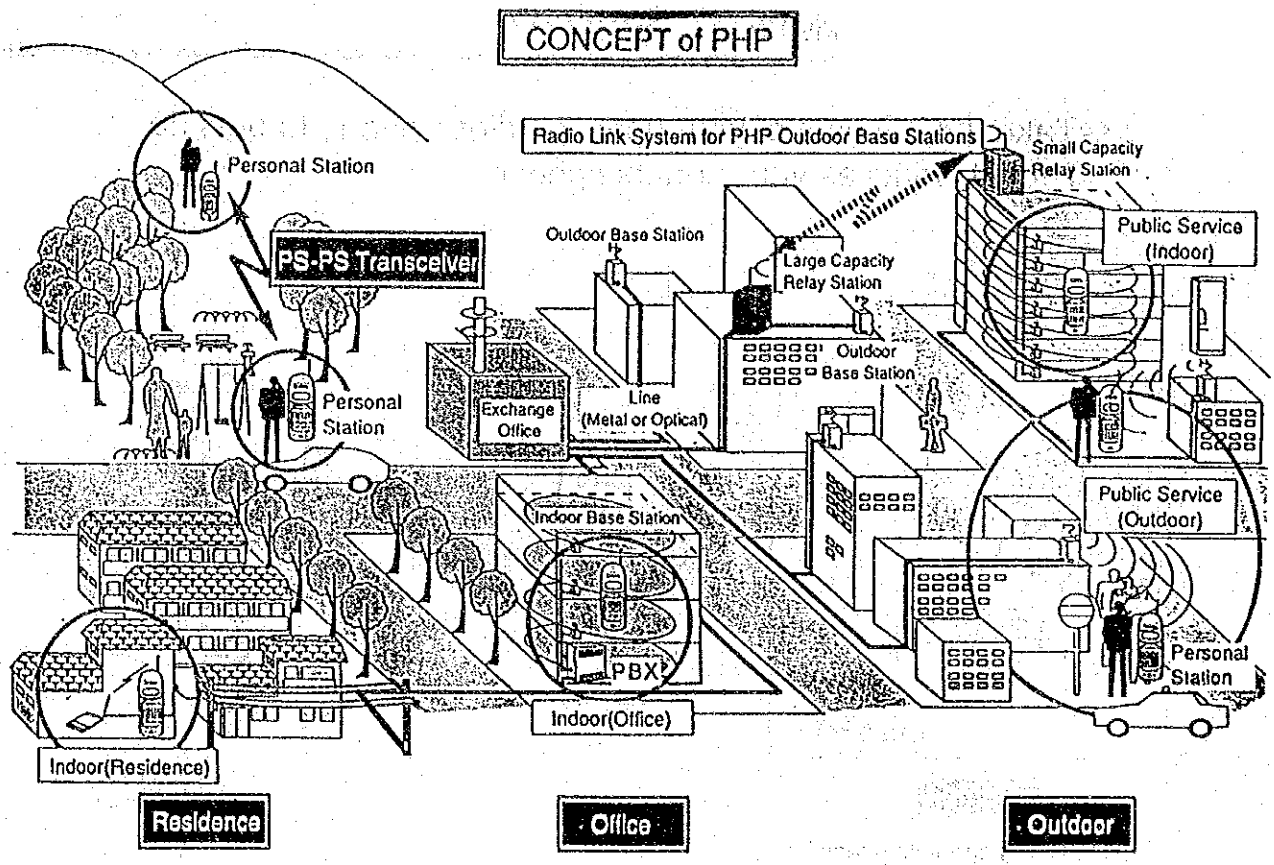
1) To Common Use Of PHP Terminal As A Cordless Telephone At Home And As a Portable Terminal For Outdoor PHP Service By Standardized Protcol

2) Digital Radio Transmission Scheme (TDMA / TDD)

3) Pocket-Sized Portable Terminal With Small Transmitting Power Less Than 10mW

4) Lowcost Outdoor Base-station With Microsized Service Area r≈100~200m

5) Utilization of 1.9GHz Band Frequency



Parameters for Personal Handy Phone

Item	Parameters
Transmission Band	1. 9GHz (1895~1916. 1MHz)
Carrier Spacing	300kHz
Access Method	Mobile station – TDMA/TDD Base station – TDM
Slots per carrier	4 slots
Transmission Rate	384kbps
Modulation	π/4 shifted QPSK
Coding Algorithm	ADPCM 32kbps
Transmitting Power	less than 10mW (Portable Station or indoor base station) less than 500mw (outdoor base station)

INTRODUCTION OF PERSONAL DIGITAL CELLULAR SYSTEM (PDC)

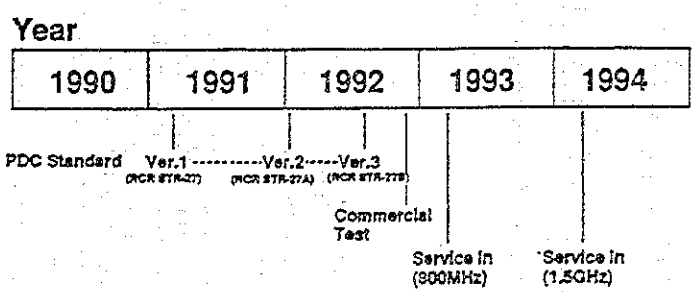
Features of the PDC Standard

Features	Applied Techniques
High Capacity	Diversity Reception (Option)
Macro / Micro Cell	Full Digital Call Control (Mobile Assisted Hand Over etc.)
Small Portable Phone	VOX
Providing New Services (Data,Fax,UDI etc.)	ISDN Signaling System
Security	Encryption / Authentication

Standard Specifications

	PDC	TIA (TDMA)	GSM
Frequency Band	800MHz &1.5GHz	800MHz	800MHz
Carrier Spacing	25 kHz Interleaving	30 kHz Interleaving	200kHz Interleaving
Modulation	π/4 Shifted QPSK		GMSK
Multiple Access	3(6)ch TDMA		8(16)ch TDMA
Carrier Bitrate (CODEC)	42 kbps (VSELP 11.2 kbps)	48.6 kbps (VSELP 13 kbps)	270 kbps (RPE-LTP 22.8kbps)
Equalizer	Option	Mandatory	Mandatory
Diversity	Option	Option	——
Control Channel	Dedicated to Digital System	Common Use with Analog System	Dedicated to Digital System

Development and Service Schedule



添付資料

Toward the Creation of a New Info-communications Industry

— Creating Demand and Employment through the Enhancement of Info-communications Systems —

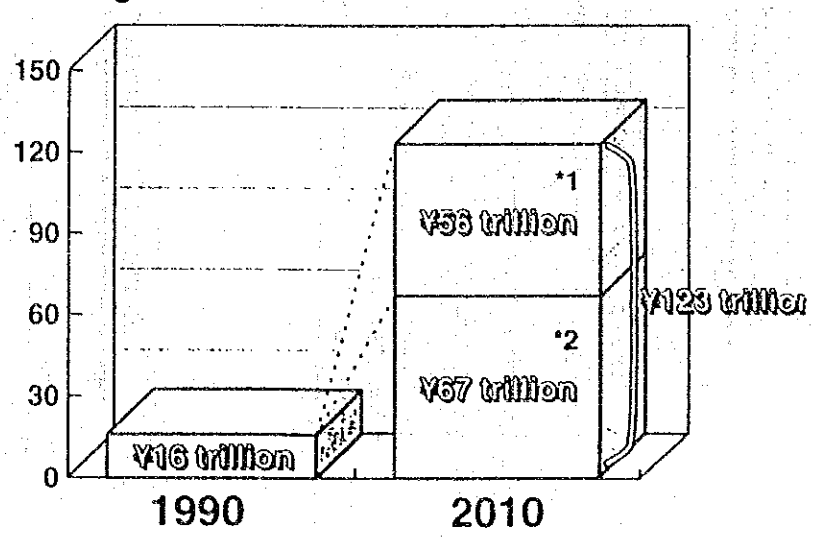
Main Points

1. The info-communications industry constitutes an important foundation block for the restructuring of Japan's economy as we approach the 21st century.

2. To create jobs and to realize greater affluence in the lives of the people in Japan, efforts will be made to promote new businesses in the info-communications fields.
   Specifically involved will be both market and job creation:
   Through the establishment of a nationwide fiber-optic network, a new ¥56 trillion market will be created by the year 2010. Overall, the multimedia market, which will include existing related markets, will be worth ¥123 trillion by that year. In establishing this network, 2.4 million jobs will be created by 2010 as well.

New markets stemming directly from the fiber-optic network will be worth at least ¥56 trillion in the year 2010. Overall, the multimedia market, which will include existing related markets, will be worth ¥123 trillion in that year.

Changes in the size of the multimedia market



***1. Fiber-optic network markets:**
New markets that will be created directly by high-speed, large-capacity, two-way communications, which are made possible through building the proposed fiber-optic network, include services such as imaging program distribution and tele-shopping, and hardware such as new terminals.

***2. Conventional multimedia markets:**
The growth of markets stemming from the conventional multimedia industry, bringing together the present terminal equipment and software, will be accelerated through building the fiber-optic network.

IMPORTANT MEASURES

1. Setting up a 'Program for the Establishment of Info-communications Infrastructure'
2. Addressing issues associated with the integration of telecommunications and broadcasting
   1) Encouraging experiments on integrated telecommunications and broadcasting services
   2) Application of FM multiplex for telecommunications services
3. Policies for promoting new business
   1) Promoting the commercialization of PHP
   2) Vitalizing regional info-communications markets
   3) Developing portable business radio and community broadcasting systems
   4) Vitalizing BS/CS business operations
   5) Diversification of FM broadcasting

Use of Visual Media In and Out of the Home

Use	Examples
Viewing for pleasure	Watching programs on TV (ordinary broadcasts, satellite broadcasts, cable TV) Viewing pictures at exhibitions Pay-TV broadcasts in hotels TV and VCR broadcasts on planes HDTV broadcasts in the open air and at special events
Practical uses	TV shopping, using ordinary and cable TV broadcasts Stock information and ordering using TV game equipment
Communication	TV phones Video letters (making a videotape to describe to relatives or friends how one is getting along) Intercom systems with monitor cameras attached
Education	Study, viewing of lectures by video Magazines and conversational-English materials on CD-ROM Magazines on videotape
Hobbies and entertainment	Three-dimensional image games, bodily-sensation simulation games, interactive games Flight simulation Karaoke, animated karaoke on compact discs Concerts from distant places
Creative production	Making videotapes with a camera and editing the result with a VCR

Use of Advanced Visual Media In Business

Industry	Examples
Broadcasting	Satellite news-gathering Program distribution
Information services	Public information services Information services to franchising members
Education	Lectures to schools in remote locations
Surveillance	Surveillance of facilities where dangerous materials are stored, unmanned business points, factories and other places of production Surveillance for safety and crime and disaster prevention Weather and environmental surveillance
Publishing	Electronic publishing, image databases
Planning and development	Urban planning, architecture and construction Airplane, automobile, and ship design Chemicals and pharmaceuticals
Sales	Promotional videos, presentation visuals, office-use electronic photographs, on-site insurance claims processing, used-car auctions
Other	Teleconferencing, in-house TV broadcasting, personnel training

(3) 光ファイバーケーブル伝送技術の展開

Evolution of Optical Fiber Cable Technology in Japan

Masao OHBA

Telecommunications Engineering Training Group
NTT Suzuka Training Institute

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   3.2 Optical Fiber Fusion Splicing

   3.3 Connectors for Outside Plant

   3.4 Cable Sheath Joint and Spare Optical Fiber Treatment

   3.5 Maintenance Operation Supporting System

4. Conclusion

1. Introduction

Evolution toward an advanced information society is spurring demand for more convenient and diversified telecommunication services. The integrated services digital network —ISDN— is being developed in countries around the globe to meet this demand by providing more advanced and higher quality services efficiently and at reasonable cost. To realize ISDN, outside plant facilities play an extreamly important role as the infrastructure on which it is based, and optical fiber cable is a key technology supporting the ISDN concept.

After a successful field trial of an optical cable transmission system in 1978, NTT began to introduce optical fiber cables for trunk transmission lines in 1981. Deployment of optical fiber cables into trunk networks prior to subscriber loops made sense because optical fiber could be particularly more effective than existing transmission systems for its long repeater spacing and large-capacity. In addition, starting around 1984, optical fiber cables began to be introduced into subscriber loops. Initially subscriber optical fiber cables were overlayed on existing copper cables to provide digital and video transmission services in urban business areas. Now, NTT has decided to proceed with full-scale implementation of fiber optic subscriber loops as the infrastructure to support coming digital service as well as ISDN.

NTT has gone to considerable effort to integrate various fiber optic technologies and develop the best fiber optic hardware for application to both trunk transmission lines and subscriber loops. Of course, the hardware is still important, but recently more emphasis has been put on operational and maintenance aspects. Now, these operations and maintenance support systems have been introduced in the field.

Most of the equipment and facilities used by NTT to support telecommunications services have been developed internally by our own research and development department.

In the area of outside plant facilities, the usual situation is that hardware suppliers carry out research and development of new technologies, and operating companies, who are the users of the hardware, merely select the most appropriate one. However, to maximize operational efficiency and to facilitate integration with other hardware, the user's operational know-how should be fully reflected in the hardware. Of course, this can be said for equipment inside the telephone office as well, but it is particularly true for outside plant facilities because they are assembled in the field. Ease of construction and maintenance, therefore, is as an important parameter as the other characteristics of the facilities. Operational know-how should be fully integrated in the hardware, such as the cross-sectional structure of cable.

Fiber optic technology itself is relatively new; it is about 12 years since optical fiber cables were first introduced in Japan for commercial use. During these years, the progress has been remarkable. This success can be attributed to the numerous trials we conducted in the process of development. Of course, we made a few blunders along the way. But even failuers are valuable learning experiences and have contributed to our store of know-how.

This presentation describes the changes in fiber optic and its related technologies that stand behind present level services.

2. Optical Fiber Cable System Technology Development

2.1 Optical Fiber Fabrication

VAD, standing for Vapor-phase Axial Deposition, that was one of the optical fiber fabrication methods, was developed by NTT Laboratory in 1977. Since then, optical fiber preform has been produced by the VAD method. VAD is not only a simple process, it also enables fabrication of

large-size preform. With our initial version of the VAD method, only the core and cladding close to the core were made by the VAD method. The first preform was jacketed with a silica tube called a jacket tube to make a large preform. With this method, a certain amount of eccentricity occurs between core and cladding due to the unequal thickness of the jacket tube. Another drawback of the first method is that an attenuation peak occurs owing to OH^- ions which permeate the jacket tube into the core during the fiber drawing. The former method also yielded limited geometrical performance and potential for cost reduction. Considerable effort was expanded to overcome these problems of the conventional VAD method. As a result, the completely synthesized VAD method was developed in 1987, which made it possible to fabricate all parts of the preform maintaining precise parameter control. Large-size preforms can be produced ranging from 100 km to 500 km in fiber length. Coupled with a high-speed fiber drawing technique, optical fiber can now be mass produced, which has resulted in a sharp reduction in its cost. These progress have also eliminated some of the other problems of the former fabrication method. For example, core eccentricity has been cut to a third of the conventional fiber. This advance has had a great impact on fiber connecting techniques which I review shortly, and has greatly accelerated the development of single-mode (SM) optical fiber.

In 1987, NTT was first to introduce 1.5 μm dispersion-shifted optical fiber for commercial use. This optical fiber is designed to realize its best dispersion characteristics at the 1.5 μm wavelength region where optical loss of silica optical fiber is the lowest. 1.5 μm dispersion-shifted optical fiber cable has been introduced to economize long-haul trunk transmission lines, and is now occupying center place in the trunk transmission network. The profile of the optical fiber core adopts a stepped configuration. This profile design was adopted giving consideration to the shift in zero-dispersion wavelength from 1.3 μm to 1.5 μm, improved bending loss characteristics, and ease of splicing as well as conventional 1.3 μm optical fiber.

2.2 Optical Fiber Cable Design

Along with the evolution of optical fiber itself, considerable progress has also been made in optical fiber cable techniques. Optical fiber cable technology has progressed in conjunction with several related factors such as economy, ease of construction as well as stability of transmission characteristics. The evolution of optical fiber cable can be roughly divided into three stages; the initial stage from the first introduction of optical fiber cable in 1981 to 1985: the second stage from 1985 to 1987: and the third stage from 1987 up to the present.

In the initial stage, NTT adopted GI optical fiber unit type cable. In this cable, an optical fiber is covered by a 3-layer silicone/nylon coating to protect its transmission and mechanical characteristics against lateral pressure. The outer diameter was made 0.9 mm to ease handling as easy as existing copper wires. This fiber constitutes 6-optical fiber unit. The 6-optical fiber unit is composed of six coated optical fibers stranded around a center steel wire and wrapped plastic tapes. Then several units and some metallic qauds are also stranded tightly around a steel tension member into making a cable core. The maximum number of the fibers were 48. This cable adopts Laminated Aluminum Polyethelene (LAP) sheath to keep dry air pressure in the cable to protect against water panetration equally to existing copper cables. This cable structure had also employed for SM optical fiber cable with 24 of the maximum fiber number for first introduction in 1983.

In the second stage, NTT employed a new type of GI optical fiber cable into subscriber loops to satisfy increase demand of subscriber use. In 1985, NTT employed UV coated optical fiber with a 0.25 mm coated diameter instead of silicone/nylon 3-layer coated fiber, and a UV coated optical fiber unit called a 5-optical fiber ribbon composed of five mono-coated optical fibers. The structure of this optical fiber ribbon is most effective for mass-connecting as several optical fibers are arranged at once. A fiber ribbon is also more effective structure for grouping optical fibers into an

optical fiber cable. However, this cable technology was not enough mature for SM optical fiber cable for trunk transmission use, because mass-fusion splicing technique for SM optical fiber was not established in those days.

NTT have been employed a plastic spacer with multiple slots to accommodate the optical fiber ribbons. A plastic spacer, called a slotted rod, is formed around a tension member with slots along the cable. This structure enables a tight and compact optical fiber cable called a optical fiber ribbon slot cable, having stable transmission characeristics.

A 5-GI optical fiber ribbon slot cable containing two hundreds of optical fibers was introduced in 1985, and the number of fibers increased to six hundreds with six slotted rods in 1987. These high-density subscriber optical fiber ribbon slot cables have been fully ultilized especially in urban areas.

The third stage began deployment of SM optical fiber ribbon for the use of trunk transmission lines due to the realization of SM optical fiber mass-fusion splicing technique. The optical fiber ribbon slot cable technique was naturally employed for trunk transmission 4-SM optical fiber ribbon slot cable as it causes small cable diameter, light weight and low price. Employing this cable has sharply reduced construction and cable costs of trunk transmission lines due to ease of construction and deployment of a mass-fusion splicing machine for 4-SM optical fiber ribbon. This cable has become the basic optical fiber cable of NTT, and several variations of SM optical fiber cable were dirived.

An induction free optical fiber cable, called IF optical fiber cable, was introduced in the electromagnetic induction section of trunk transmission lines in 1987. Any metallic materials such as interstitial wires, aluminum tape or steel strand are not used in this cable, making the best use of characteristics that optical fiber is free from electromagnetic induction. IF optical fiber cables cannot employ the gas pressure cable maintenance method because they do not have interstitial wires connecting pressure-sensors installed in the cable joining points with electric signal, and aluminum tape which composes LAP sheath keeping dry air pressure inside of the cable. So IF optical fiber cable has "water-blocking" resinous ribbons to prevent water penetration when cable is injured.

For subscriber loops use, optical fiber water-blocking cable, called optical fiber WB cable, was introduced into the section of pulling to user's buildings. First, these water-blocking cables were introduced for limited uses. However, recently these cables have been generally introduced into all sections because of the deployment of new maintenence operation systems for optical fiber cable network, instead of conventional gas-pressure maintenance system. Details of these operational systems including water-blocking cable are given later.

Optical fiber cable for subscriber loops has a maximum fiber count of 1,000, compared to 300 for trunk lines. The basic unit of optical fiber is a 4-optical fiber ribbon, as already described. 800- or 1,000-fiber subscriber cables have been developed based on 8-optical fiber ribbon which can be divided into two 4-optical fiber ribbons to realize an outer cable diameter of 40 mm. Cable that is basically designed the same for both trunks and subscriber loops with less than three hundred optical fibers.

NTT has deployed 1.3 μm zero-dispersion optical fiber in both subscriber loops and short medium-haul trunks. Parameters of the fiber are in full compliance with CCITT recommendations that NTT also has contributed to establish. The attenuation is less than 0.5 db/km for all types of cable. For long-haul trunks, 1.5 μm dispersion-shifted optical fiber is installed. While the mode-field diameter of this fiber is slightly smaller than that of 1.3 μm optical fiber, cladding diameter and concentricity error is the same. Cable attenuation is less than 0.26 dB/km.

3. Construction and Operation Technologies Development

3.1 Optical Fiber Cable Installation

The optical fiber cable can be installed over longer spans than the conventional metallic cable because of its light weight and small diameter. However, an optical fiber tends to be destroyed when the optical fiber cable was suffered from an excessive stretch of tension and forced to be bend in smaller diameter than its acceptable limits. The installation of optical fiber cables must therefore be handled very carefully.

When optical fiber cables were introduced, NTT developed an optical fiber cable pulling truck and an intermediate puller designed to maintain the cable tension at no more than 200 kgf. Tools for installation in manholes to prevent excess bending of the cable and to relieve tension buildup were also developed and applied. Initially, the average installation span was about 1 km, because of the limitation of personnel and construction time on the road.

In 1987, the installation system of the optical fiber cable was re-evaluated for deployment of SM optical fiber ribbon slot cable for trunk transmission lines. A microprocessor has been applied to the intermediate puller, making it possible to precisely control the pulling force and velocity automatically. The microprocessor also made it possible to synchronize multiple intermediate pullers. So the machine can be stopped in the event of emergency without many operators. Therefore, the long span installation was realized based on a high-reliable dispersed pulling system and lighter weight optical fiber cable. Today, the average installation span is over 2 km (the longest installation is 11 km), and the costs of the installation per unit span has fallen dramatically. In 1993, this system has been upgraded which has no limitation of the number of synchronized machines.

3.2 Optical Fiber Fusion Splicing

Fusion splicing of optical fibers has been used to make permanent joints ever since the first introduction of optical fibers, and its role in the construction of today's optical fiber cable networks is as important as ever. The present fusion splicing techniques are highly sophisticated and have evolved along with all optical fiber cables.

In the case of GI optical fiber, comparatively thick diameter core of 50 μm, low splice loss could be realized by merely aligning the outer cladding. Here, a fusion splicing machine with a fixed V-groove to align the fibers served very well without any need to align the core. This technique was further developed into a mass-fusion splicing method. A mass-fusion splicing is a method of splicing multi-fibers just in the form of optical fiber ribbon at once. There are two principal technical points of a mass-fusion splicing method. One is cutting multi-fiber uniformly, and the other is splicing multi-fiber equally. The mass-fusion splicing machine was applied to reduce joint operation time and operational costs, since the introduction of 5-GI optical fiber ribbon in 1985.

For splicing, the coatings must be removed and the optical fiber cut. When mono-coated fiber was first introduced, an existing coating remover was employed. For cutting, a stapler type tool was used which provided an optical fiber a crack by pushing an edge on, and cut by bending with rubber stand by hand. This method was sufficient for mono-coated fiber.

The introduction of mass-fusion splicing for multi-optical fiber ribbon, however, required a multi-fiber cutting technique. To conveniently manipulate optical fiber ribbon through the process of coat removal, cutting and positioning on a splicing machine, optical fiber ribbon holder was employed. In order to cut multi-fiber uniformly, a much improved fiber cutting method had to be

developed. A round edge is drawn across the optical fiber ribbon to score the optical fibers. Then a bar is applied along the scored seam and all optical fibers in a ribbon are vertically cut at precisely uniform length. Another advantage of this method is that it is not dependent on operator skill as was the conventional stapler cutting method.

Low-loss splicing of SM optical fibers is much more difficult than splicing GI optical fibers. This is because the core diameter of SM optical fiber is only about 10 μm. NTT has thus sought to develop a core alignment technique that enables low-loss splicing independent of the degree of core eccentricity. When NTT first began to deploy SM optical fiber, a power monitoring system for core alignment was implemented. More manpower was required for this system, however, because personnel must be required at three different locations of the light source, joint and optical detector site. To overcome this drawback, a direct core observation method was developed that requires personnel only at the joint. In this technique core is aligned automatically by the microprocessor according to the observation from two direction by a image processor. This was the mainstay splicing technique for SM optical fibers up until the realization of completely synthetic SM optical fiber.

By supressing the core eccentricity of SM optical fiber to less than 1 μm, low-loss splicing of SM optical fiber has made possible only with outer diameter alignment as well as GI optical fiber. Moreover, through the development of advanced image processing technique, optimum splicing conditions of the mutli-fiber end surfaces, intervals and misalignments of core can be visually verified. By combining these various techniques, mass-fusion splicing of 4-SM optical fiber ribbon has been realized at an average loss of only 0.11dB, as well as conventional core alignment method.

This technique was further developed for 8-SM optical fiber ribbons. Two types of splicing machines have been developed: a small-scale and light-weight model capable of performing basic functions, and a fully automatical model. The latter is full-automatic splicing machine makes full use of electronic detection and display technology. With the automatic splicing machine, all the operator action is to set the optical fiber ribbon in the holder. The machine does automatically coat removal, cutting, splicing and applying reinforcement after splicing. The total time required to splice one optical fiber ribbon is about two minutes.

3.3 Connectors for Outside Plants

Since the introduction of optical fiber cables, fusion splicing has been the main method of joining optical fibers. Connectors have been commonly employed, however, on maintenance section in telephone office, termination points at user premises, and at subscriber aerial line drop points.

Easy to optical fiber joining and re-joining is required to make the construction time shorten and network structure more flexible. In this context, then, use of connectors is a more suitable approach than fusion splicing. For some time, however, as was mentioned, the application contexts for connectors has been limited. This is because, although connectors are fast to join optical fibers, in terms of connection loss and cost, they suffer in comparison with fiber splicing.

As of 1986, however, a 5-optical fiber ribbon, high-density GI optical fiber cable began to be introduced, which created a need for an high-density connection part to join the new cable. Here, an acrylic plastic MF connector was developed to interconnect the 5-optical fiber ribbon. In the MF connector, the five optical fibers are positioned by two guide pins, and a clip applies pressure to the plug housing to maintain the optical fibers in alingment. Connectorized optical fiber cables are also introduced to prevent complex work in the field.

SM optical fiber, which began to be systematically introduced into subscriber loops in 1988, has much lower eccentricity as a result of the completely synthesized VAD process mentioned earlier. Multi-fiber connectors called MT connector have been developed for 4-optical fiber ribbon

and 8-optical fiber ribbon. Starting with a basic MF connector, extremely precise technology is called for to obtain the high alignment precision that is required. For the 8-optical fiber, the MT conector realizes a very low connecting loss of 0.35 dB on the average. Application of the MT connectors to subscriber loops will make it possible to configure more flexible cable network.

3.4 Cable Sheath Joint and Spare Optical Fiber Treatment

For the optical fiber cable sheath joints, a mechanical closure method was adopted from the very beginning. This method was adopted because its use does not involve open flame which can easily damage optical fiber. The first optical fiber cable sheath joint was made of metal tube, and air tightness was maintained by rubber tubes and O-rings.

Mid 1980' was a migration period from the lead sleeve method which required open flame (the "hot-joint" method) to a mechanical "cold-joint" method closure even for metallic cable sheath joints. At this same time, around 1985, unified "standard closure" sheath joints began to applied to both metallic and optical fiber cable. This standard closure, constructed with a plastic half-sleeve and rubber end plates, has greatly simplified maintenance work, especially the installation of optical fiber branching joints. The standard closure has been further enhanced since 1988: it was made even easier to install in the field, its parts were simplified and reduced in number, and various cost-cutting modifications were adopted.

In the design of optical fiber cable joint closure, spare optical fiber treatment is a very important issue. Storage of spare optical fiber for trunks and subscriber loops is based on different conceptions. The comparatively few fibers that are needed for trunks are stored independently in the form of fiber ribbons. This arrangement insures highly stability of optical transmission characteristics at the optical fiber joining point and facilitates maintennance work. In the case of subscriber loops, it is connection parts that correspond to the various branching configuration.

3.5 Maintenance Operation Supporting System

When optical fiber cables were first introduced, NTT employed a gas-pressurized system to supervise underground optical fiber cables. This system had already been employed with good results in exsiting metallic cables, and is effective for supervising the state of the cable sheath and also for locating gas leaks based on the dictribution of gas-pressure level in the cable.

Recent trends in optical fiber networks, however, are reducing the effectiveness of this system. The development of 1.5 μm dispersion-shifted optical fiber cable has made it possible to greatly extend the span between trunk line repeaters. This longer repearter spacing has made it impossible to supply adequate pressure level gas from the system equipments installed only in telephone office. Gas-pressure maintenance requires a gas-dam in the terminal of the cable gas section. The gas-dam is not only expensive but also takes a considerable time to manifacture. For subscriber loops with numerous cable branches, the gas-dam is a real bottleneck that hinders the construction of large-scale networks following the tight subscriber needs.

Even the optical fiber cable status would be supervised, the optical fiber transmission performance was not monitored. What was needed, therefore, was a method of checking the optical fiber transmission characteristics. As the optical fiber count in cables has gone up, so has the cost of final completion testing. Transmission characteristics of many optical fibers, even in service should be measured automatically. To meet these requirements, NTT has completely updated its maintenance operation supporting systems for application to optical fiber cable networks.

Redundant optical fibers are bent to be stored in the cable jointing closures. Owing to bending stresses, a bent optical fiber sharply reduces its breaking life in comparison with a straight optical

fiber when exposed to water. Optical cable jointing is the weak point against water penetration in optical fiber cable lines. For this reason, a water sensor is installed in every jointing point to monitor water penetration. The sensor is triggered by swelling pressure that occurs in the presence of water.

Optical couplers are installed at the terminal of optical fiber lines in telephone offices, functioning as a "window" to monitor the transmission performance of the optical fibers, even in service.

Testing units are installed in every cable terminating telephone office. Supervising terminals are installed in supervising center where maintenance crews are, and control the various maintenance operations such as fault location and automatic optical fiber testing. The data obtained from these operations are stored in the system database. The maintenance department is then able to check the state of optical fiber cables by analizing the collected data in the database.

This maintenance operation supporting system that implements these functions, have been introduced into both trunk transmission lines and subscriber loops since 1989 and 1990, respectively. The system for trunk lines is called FITAS and that for subscriber loops is called AURORA.

In the case of maintenance for outside cables, maintenance operation needs personel communication between intra-offices and manholes to carry out the testing. Optical talk tool is indispensable particularly for non-metallic optical cable which has no metallic interstitial wires. Since the initial introduction of optical fiber cable, optical talk tools that access to the fiber-end exists. However, fiber end access method is not convenient because this method needs fiber cutting and splicing at working point of outside. Then new optical talk system which enables non-destructive fiber access has been developed in 1993. This system realized easy operation for multi-point communication using unbroken optical talk line.

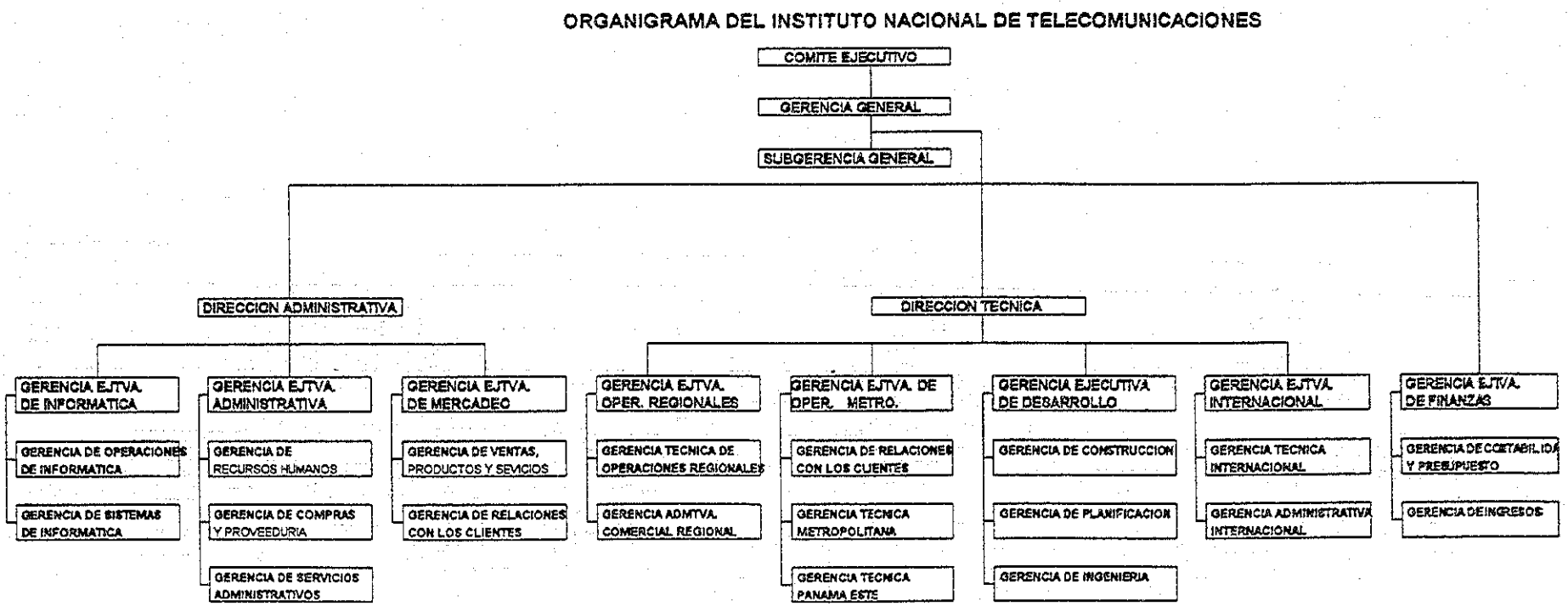
4. Conclusion

In this presentation, I have surveyed evolution of NTT's optical fiber cable and related technologies since the first introduction to the present. NTT keeps on challenging to deploy more valuable technologies centering around the fiber optic subscriber network. I hope this presentation makes a contribution to development of the telecommunication in Mexico.

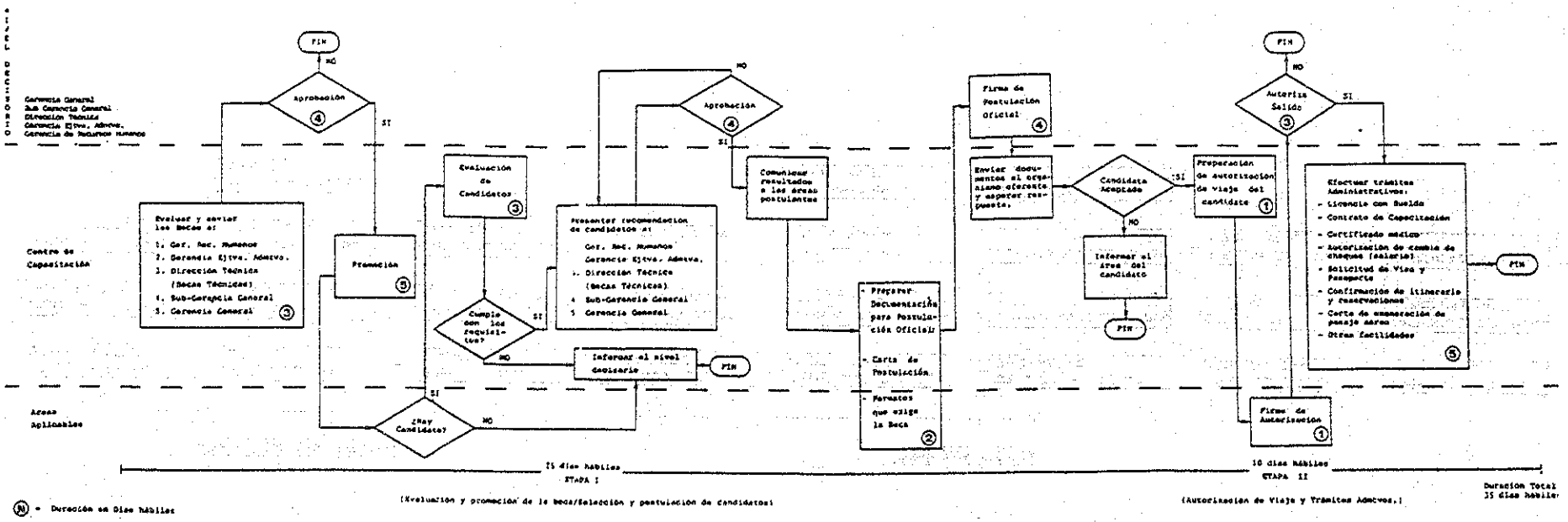
3．持ち帰り資料

(1) 研修員所属先組織図等

① 電気通信庁 (INTEL) 組織図（パナマ）



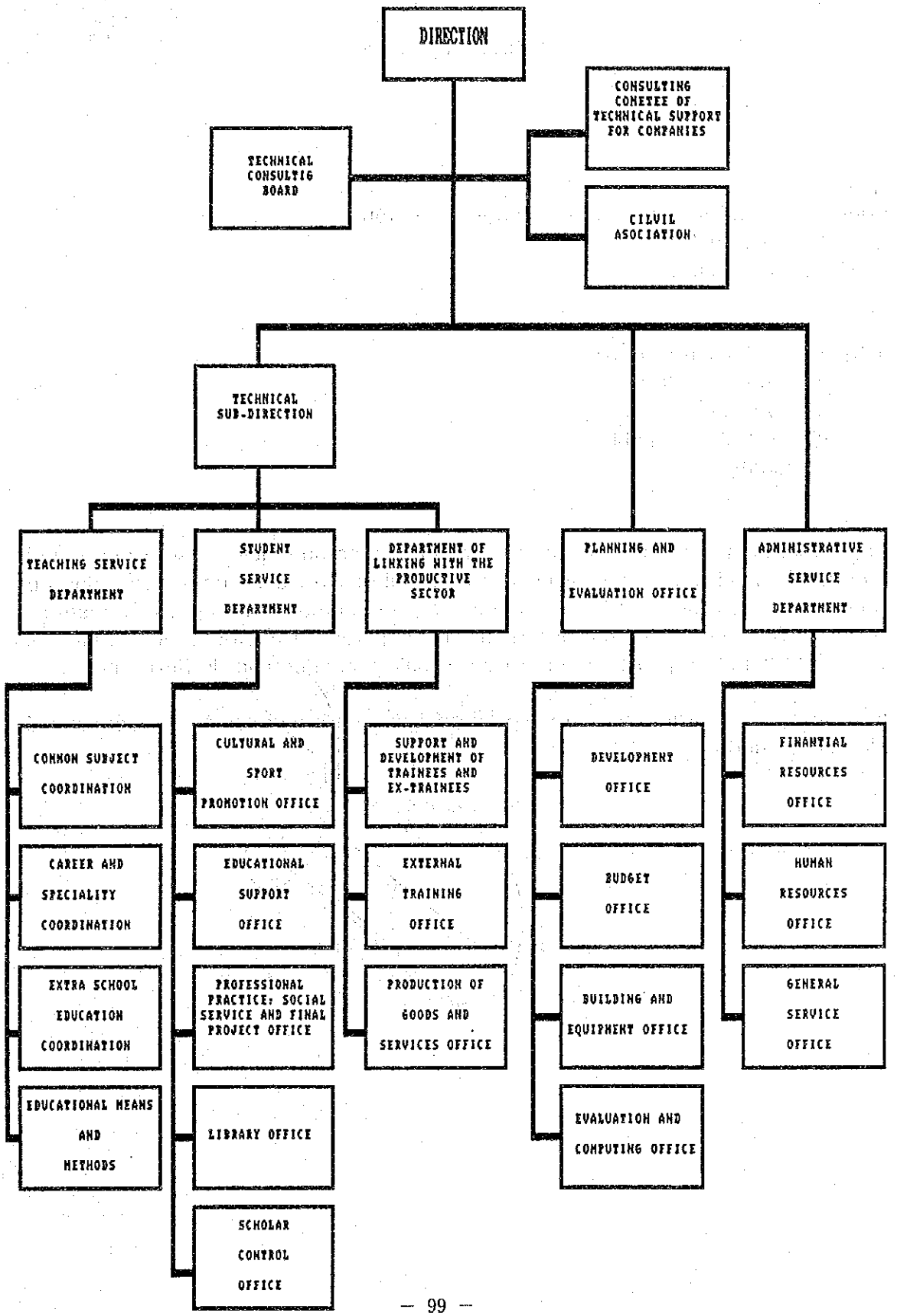
② INTELにおいてG.I.入手後、候補者選出までのプロセス（パナマ）



③　教育省　工業サービス技術教育学校組織図（メキシコ）

S.E.P.　　S.E.I.T.　　D.G.E.T.I.

C.E.T.i.s. No. 30



(2) INTTELMEX からの研修コースに対する提言（手紙文）

① 原稿

Inttelmex
Instituto Tecnológico de Teléfonos de México

Febrero 17, 1994

JICA
Agencia de Cooperación Internacional del Japón
Aristóteles No. 77
11560 México, D.F.

At'n: Sr. Hidekazu Shiraishi
Sr. Hiroyuki Chida
Sr. Masao Oba
Srita. Yuki Hayashi
Presente

Adjunto al presente encontrarán las observaciones que hicimos sobre el temario y contenido del curso que ofrecen sobre "Fibra Optica". Incluimos hojas que hacen referencia al temario y contenido de dos cursos que imparte el Instituto: el primero es para personal que hace la recepción de equipo y el segundo, es para el personal de planta exterior que trabaja con el equipo de fibra óptica.

Agradecemos su atención y en espera de mantener una relación académica más estrecha, quedo.

Atentamente,

Lic. Gustavo Serrano Ochoa

Tepepan 31, Col. Tlalpan Guerra
México, D.F. 14050
Tel. 665-0700 Fax 665 6296

OBSERVACIONES:

1.- El temario para el curso de fibra óptica es muy amplio tomando en cuenta que trata temas de las áreas de Planta Exterios, Centrales y Transmisión. Por tal motivo los candidatos al curso deben tener un cierto conocimiento sobre la planta telefónica.

2.- Para ser un curso de fibra óptica, el tiempo del curso dedicado exclusivamente a fibra óptica abarca un 35% del total del tiempo del curso.

3.- El curso en cuanto a ejercicios prácticos ocupa un 10% del total del tiempo del curso, aunque las prácticas que se mencionan son las recomendadas para un curso de fibra óptica.

4.- Por el contenido de los temas el curso se recomienda a personal gerencial de nivel medio, instructores, jefe de línea de primer nivel con ciertos conocimientos de la planta telefónica.

5.- Al terminar el curso los participantes tendrían un amplio conocimiento sobre una red telefónica de modernas tecnologías, aunque no conocimientos muy profundos de cada uno de los temas, por el corto tiempo dedicado a ellos.

6.- En general el temario abarca temas de tecnologías actuales tendientes a usar la fibra óptica como medio de transmisión, y los servicios diferentes a la telefonía que se pueden satisfacer con estas redes tales como video, datos, etc. (servicios tendientes a RDSI).

7.- En relación a nuestros cursos, todos los temas de este curso a excepción de las visitas, los tenemos contemplados aunque en diferentes cursos, ya que como se observa, los capitulos 1, 3, 5, 6 y 9 no son temas propios de un curso de fibra óptica en particular.

CURSO: INGENIERIA DE PLANTA EXTERIOR CON FIBRA OPTICA

OBSERVACIONES:

Tema 1: Si el curso es de Planta Externa este tema es de mucho tiempo, la obra civil se puede dar al final.

Tema 2: Se debería dar más tiempo al aspecto práctico subtemas 8 y 9 de 6 días y 3.5 a la teoría.

Temas 3 y 4: Sería para personal de Transmisión.

Tema 5: Mucho tiempo para aplicaciones fuera de TEL-MEX 1 ó más 1.5 días bueno.

Tema 6: Adecuado.

Temas 7, 8 y 9: Mucho tiempo para saber lo de otra administración
2 días adecuado.

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Fibra óptica, monomodo índice, escalonado y dispersión corrida. .....
Seguridad. .....

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CAPITULO 8 NORMATIVIDAD DE REDES OPTICAS FLEXIBLES. .....

duracion 5 dias

FIBRAS OPTICAS PARA PLANTA EXTERNA

I. Principios Básicos de las Fibras Opticas.

II. Cables Opticos, Descripción y Aplicaciones.

III. Empalmes, fusión y mecánico.

IV. Caja de empalme, características físicas.

V. Distribuidor Optico, características físicas.

VI. Instalación de Cable Optico.

VII. Protocolo de prueba y aceptación.

VIII. Redes Opticas Flexibles.

Duración: 10 días.

② INTTELMEXからの手紙文（主要部分要訳）

『光ファイバーケーブル伝送技術集団研修コース』のテーマ及び内容について、我々の見解と分析をまとめました。また、当学院が実施している２つのコースのテーマと内容について記したものをご参考のため添付致しました。なお、上記２コースは対象者を①設備受け入れ担当者対象　②局外プラントの光ファイバー設備に携わる者対象として設定してあります。

今後とも、学術交流、相互理解を一層深めたいと考えておりますので、何卒よろしくお願い致します。

ｉ）光ファイバーケーブル伝送技術コースに対する見解

・光ファイバーケーブル伝送技術コースには、広範囲のテーマ（局外設備、中枢部、伝送分野）を盛り込んでいるため、コース参加者は中堅管理者、インストラクター線路担当部長など、ある程度電話設備の知識を有する者に望ましいと思われる。

・光ファイバーケーブル伝送技術コースでありながら、光ファイバーそのものに関する研修が全体の比率から見ると若干少ないのではないかと思われる。光ファイバーに関する実習を増やすと良いのではないか。

・コース終了時には、参加者は電話に関する最新技術を幅広く習得できるであろう。ただ、時間的制約により、各項目に関し深く学ぶことは難しいのではないか。

・光ファイバーの実用技術、電話通信網を活用しての映像、データサービスへの応用技術は、非常に興味深い。

・光線路技術の実習に関し、特に接続部検査、接続実習、パルス測定、ＩＤ試験機処理実習　には最低６日間程度の十分な時間を割いて学びたい。本技術の理論は３～５日間程度にまとめると良いのではないか。

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