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**JETRO**  
**Japanese Market**  
**Report** — Regulations & Practices —

**Optical Communication Products**

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### Yen-Dollar Exchange Rates

<u>Year</u>	<u>Yen/US\$</u>
1992	127
1993	111
1994	102
1995	94
1996	109

Source : " International Financial Statistics " , IMF

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## Introduction

### Overview

The spread of the Internet, electronic data communication and cable television, and the open access to networks—these phenomena have been accelerating the need for high-speed processing and wide-area accessibility in on-line communication. Accordingly, the demand for optical products for communication is expected to rise.

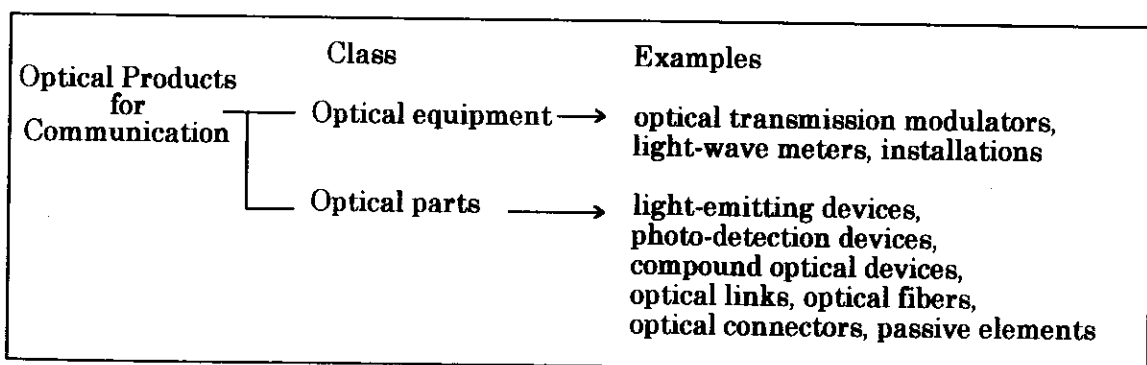
In Japan, a fiber-optic network has been rapidly developing over the past 20 years. Trunk lines--the major high-capacity lines of both domestic and international telephone companies--have nearly all been converted to fiberoptics. The fiber-optic network will start to penetrate other markets, such as leased lines for individual enterprises/homes and cable television lines. At the same time, intra-company networks (fiber-optic LAN) will develop as the volume of data communication increases.

Due to these circumstances, the field of optical communication, traditionally restricted to major telephone companies, will grow to include mobile communication, cable television, and PC-related.

### Definition of Optical Products for Communication

According to the Optical Industrial Technology Foundation, optical products for communication are classified as shown below.

Figure 1. Classification of Optical Products for Communication



Source: Optical Industrial Technology Foundation

This report covers products selected on the basis of the following criteria:

- Products that are designed to meet the increasing demand for high-capacity, wide-area, and high-speed optical communication
- Emerging products such as leased lines and fiber-optic LANs, which have promising markets in Japan

Table A. Optical Products for Communication Covered in this Report

	Applications
Optical transmission modulators	trunk lines, fiber-optic LANs, image transmission, optical modems, spatial light modulators, optical fiber amplifiers, etc.
Light meters	wavemeters, standard light sources, defect locators, power meters, wave-form meters, baseband frequency characteristics meters
Installation equipment	fusion splicers, connector-assembling tools
Semi-conductor laser diodes	longer wavelength regions (1.55 $\mu$ m band, 1.30 $\mu$ m band), shorter wavelength regions (0.85 $\mu$ m band), others (1.48 $\mu$ m band, 0.98 $\mu$ m band)
Light-emitting diodes	longer wavelength regions for communication (1.30 $\mu$ m band, 1.55 $\mu$ m band), shorter wavelength regions for communication (0.85 $\mu$ m band)
Photo diodes	longer wavelength regions for communication, shorter wavelength regions for communication
Optical links	low-speed and high-speed modes
Optical fiber cables	silica multi-mode optical fibers, silica single-mode optical fibers, multi-component glass optical fibers, polarization-maintaining optical fibers, dispersion-shifted optical fibers, plastic claddings
Optical connectors	optical connectors
Passive elements	optical switches, optical isolators, optical couplers, etc.

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## 1. Import Procedures and Regulations

### A. Import System

There are no particular regulations pertaining to the import of optical products for communication.

### B. Japan Industrial Standards (JIS)

The Japan Industrial Standards (JIS) are based upon the Industrial Standardization Law.

Since optical products for communication have only become popularized since 1980, many JIS were established to conform with international standards.

As of March 31 of 1997, the JIS designated 69 items as optical products for communication: 22 optical fibers, 14 optical connectors, 13 light active elements, 13 light passive elements, and 7 light meters (see Table B on next page).

At present, the Agency of Industrial Science and Technology is leading a project to bring the JIS for optical communication products more in line with international standards.

TableB-1. Japan Industrial Standards List of optical products for communication

as of March 31, 1997

Category	Name	Number
optical fibers	General rules of optical fibers	JIS C 6820
	Test methods for mechanical characteristics of optical fibers	JIS C 6821
	Test methods for structural parameters of multimode optical fibers	JIS C 6822
	Test methods for attenuation of multimode optical fibers	JIS C 6823
	Test methods for bandwidth of multimode optical fibers	JIS C 6824
	Test methods for structural parameters of single-mode optical fibers	JIS C 6825
	Test methods for attenuation of single-mode optical fibers	JIS C 6826
	Test methods for chromatic dispersion of single-mode optical fibers	JIS C 6827
	Optical fiber cords	JIS C 6830
	Jacketed optical fibers	JIS C 6831
	Silica glass multimode optical fibers	JIS C 6832
	Multicomponent glass multimode optical fibers	JIS C 6833
	Plastic cladding multimode optical fibers	JIS C 6834
	Silica glass single-mode optical fibers	JIS C 6835
	All plastic multimode optical fibers cords	JIS C 6836
	All plastic multimode optical fibers	JIS C 6837
	Optical fiber fusion splicing method	JIS C 6841
	Test methods for mechanical characteristics of all plastic multimode optical fibers	JIS C 6861
	Test methods for structural parameters of all plastic multimode optical fibers	JIS C 6862
	Test methods for attenuation of all plastic multimode optical fibers	JIS C 6863
Fiber ribbons	JIS C 6838	
Optical fiber ribbon cords	JIS C 6839	
optical connectors	General rules of connectors for optical fiber cables	JIS C 5962
	Test methods of connectors for optical fiber cables	JIS C 5961
	F01 Type connectors for optical fiber cables	JIS C 5970
	F02 Type connectors for optical fiber cables	JIS C 5971
	F03 Type connectors for optical fiber cables	JIS C 5972
	F04 Type connectors for optical fiber cables	JIS C 5973
	F05 Type connectors for optical fiber cables	JIS C 5974
	F06 Type connectors for optical fiber cables	JIS C 5975
	F07 Type connectors for optical fiber cables	JIS C 5976
	F08 Type connectors for optical fiber cables	JIS C 5977
	F09 Type connectors for optical fiber cables	JIS C 5978
	F10 Type connectors for optical fiber cables	JIS C 5979
F11 Type connectors for optical fiber cables	JIS C 5980	
F12 Type connectors for optical fiber ribbons	JIS C 5981	

TableB-2. Japan Industrial Standards List of optical products for communication

as of March 31, 1997

Category	Name	Number
active device	General rules of light emitting diodes for fiber optic transmission	JIS C 5950
	Test methods of light emitting diodes for fiber optic transmission	JIS C 5951
	General rules of photodiodes for fiber optic transmission	JIS C 5990
	Test methods of photodiodes for fiber optic transmission	JIS C 5991
	General rules of diodes for fiber optic transmission	JIS C 5940
	Test methods of laser diodes for fiber optic transmission	JIS C 5941
	General rules of diodes used for recording and playback	JIS C 5942
	Test methods of laser diodes used for recording and playback	JIS C 5943
	General rules of transmitting and/or receiving modules for low speed fiber optic transmission	JIS C 6110
	Test methods of transmitting and/or receiving modules for low speed fiber optic transmission	JIS C 6111
	General rules of transmitting and/or receiving modules for middle and high speed fiber optic transmission	JIS C 6112
	General rule of laser diode modules for fiber optic transmission	JIS C 5944
	Test methods of laser diode modules for fiber optic transmission	JIS C 5945
	passive element	General rules of passive devices for fiber optic transmission
Test methods of passive devices for fiber optic transmission		JIS C 5901
General rules of fiber optic branching devices		JIS C 5910
General rules of optical attenuator		JIS C 5920
General rules of optical switches		JIS C 5930
Test methods of optical switches		JIS C 5931
General rules of passive for light beam transmission		JIS C 5860
General rules of interference filters		JIS C 5870
Test methods of interference filter		JIS C 5871
General rules of optical isolators for light beam transmission		JIS C 5872
Test methods of optical isolators for light beam transmission		JIS C 5873
General rules of optical isolators for fiber optic transmission		JIS C 5932
Test methods of optical isolators for fiber optic transmission		JIS C 5933
Light meters	Measuring methods for laser output power	JIS C 6180
	Power and energy measuring detectors, instruments and equipment for laser radiation	JIS C 6181
	Test methods of optical power meters for laser beam	JIS C 6182
	Test methods of fiber-optic spectrum analyzer	JIS C 6183
	Test method of optical power meters for optical fiber	JIS C 6184
	Test method of optical time domain reflectometer	JIS C 6185
	Test method for fiber optic test sources	JIS C 6190

Source: OPT NEWS 1997 No.3 Optoelectronic Industry and Technology Development Association



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### C. In-house Quality Standards

Aside from the JIS, individual companies designate in-house quality standards, which are not official laws but play an important role in the buying of foreign products.

These private quality standards differ from company to company according to their business domains and strategies. The following section reports on several examples based on the data obtained by business interviews.

#### 1. Communication Operators

Most of the communication operators who possess research and development facilities for optical communication products have set their own quality standards higher than international standards and the JIS, or in other words, overspecified their standards. Judging from the result of research interviews, two factors lead to such overspecifications.

One is that these companies cooperate with the manufacturers in developing optical communication products. They participate from an early stage of materials procurement, including the development and designing of optical communication systems with the aim of constantly up-grading their communication services. The other is that these companies attach great importance to the construction and maintenance of high-grade communication infrastructure, and that the provision of infrastructure is their top priority.

Because of these factors, it is not easy to win the communication operators' materials procurement, if the manufacturers have not joined in their research and development of optical communication products from the beginning.

Nevertheless, there are some companies, such as Nippon Telegraph and Telephone Corporation (NTT), which have recently begun to procure materials from both domestic and overseas manufacturers after making public their in-house quality standards.

On the other hand, due to the liberalization of the communication sector, an increasing number of firms are making efforts to win market share by not possessing their own research and development facilities but by providing cheaper, high-quality communication services.

Among these firms are those who have traditionally established their in-house quality standards but stopped sticking to them rigidly. With cost reduction as the top priority, these firms have shifted their strategies to procuring materials for the minimum prices. These firms are willing to purchase foreign products that are less expensive than the indigenous products.

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## 2. Cable Television Operators

An increasing number of cable television operators are converting their trunk lines into fiberoptics.

Not many cable television companies have their own in-house quality standards, but many procure optical communication products from the manufacturers that are handling terminals for users and broadcasting equipment. There are two reasons for this.

The first is the advantage of procuring all the necessary equipment as a "cable television system" from a single manufacturer in terms of equipment maintenance. Most of the Japanese cable television operators try to minimize the cost of construction work such as attaching the equipment, and do not possess their own research and development facilities for equipment. These firms procure the "cable television system"—a comprehensive set of broadcasting equipment, telephone lines, and leased line terminals—from a single cable television equipment manufacturer, entrusting the installation and maintenance of the system to the same manufacturer.

The second is the advantage of procuring in consistency in terms of maintaining high-quality vision services. The subscribers' needs in metropolitan areas are for higher vision qualities. In the case of a firm which experimentally procured broadcasting equipment, telephone lines, and leased terminals from different manufacturers, the subscribers complained of the color balance, which they said was worse than that of satellite TV and VCRs, and therefore they decided to order all the products from the same manufacturer.

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## II . Distribution

### A. Market Structure

The main users of optical communication products are operators in these fields: 1) domestic cable communication such as telecommunication, 2) international communication, 3) mobile communication, and 4) cable television. The market structure of optical communication products will be discussed from the perspectives of the users and the manufacturers respectively.

#### 1. Market Held by Communication Operators

The largest market is held by wire communication operators for indigenous use, among which Nippon Telegraph and Telephone Corporation (NTT)—the biggest communication proprietor in Japan—is the largest user. NTT actually holds the approximate two-thirds of the domestic market for optical communication products.

In recent years, the Japanese communication operators have been actively merging/allying with one another in order to achieve consistent services for both international and domestic use. The competition will intensify among companies striving to provide cheaper, higher-speed, larger-capacity data communication services for both domestic and offshore markets. The demand will thus increase for optical communication products, which are indispensable for such services.

On the other hand, the main manufacturers are: 1) major cable makers that mainly produce fiber-optic cables, 2) major electric makers that mainly produce optical transmission devices, and 3) other manufacturers specializing in certain products.

The fiber-cable manufacturers produce a wide array of products from optical fibers to fiber-optic cables. Most of them also manufacture optical parts that are necessary in connecting optical fibers, including optical connectors, optical links, optical switches, optical isolators, and optical couplers. Furthermore, many develop/produce installation equipment (fusing equipment, etc.) that is essential for the connection between optical fibers and optical connectors and/or between optical fibers themselves.

The electric manufacturers that mainly produce optical transmission modulators also manufacture light-emitting devices (semiconductor lasers, light-emitting diodes) and photo-detection devices (photo diodes) in general. These companies possess their own semiconductor development/production section within themselves or their strategic allied firms, and thus in many cases, develop, produce, and sell optical transmission modulators that are composed of their own products.

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## 2. Market Held by Cable Television Operators

Presently, as of 1997, the Japanese cable television mainly utilizes copper coaxial cables. Only part of the metropolitan operators have begun to convert their trunk lines into fiberoptics.

Due to such competitive media as communication satellite digital broadcasting and rental video business, it is yet unclear whether cable television will be popularized. However, companies are expected to continue their efforts to shift their equipment to fiberoptics.

## B. Distribution by Type of User

This section reports on the distribution of optical communication products by type of user, based on the data obtained through business hearings.

### 1. Market Held by Communication Operators

Usually the communication operators, the users, present an article designed along their in-house quality standards, so that the manufacturers bid for the procurement.

There are two cases of purchasing the products. Case 1 is purchasing through the manufacturer-strategic allied outlets or specialized trading companies, and Case 2 is purchasing directly from the manufacturers (see Figure 2). The more common is the latter case according to the interviews.

In either case, the manufacturers provide the users with free maintenance and repair services. This is a common Japanese business practice, and the users, the communication operators, regard such support services included in the purchasing prices.

Also, some long-distance and international telephone companies designate their in-house quality standards in line with those of NTT, which has the largest networks of fiberoptics.

Moreover, NTT in-house quality standards have been announced prior to procurement since the late 1970 through the Kanpou (the government newsletters), the Commerce Business Daily, and the Official Journal of the European Communities. In recent years, most of the standards have been shown at NTT homepage "ON TIME" on the Internet before calling for bids.

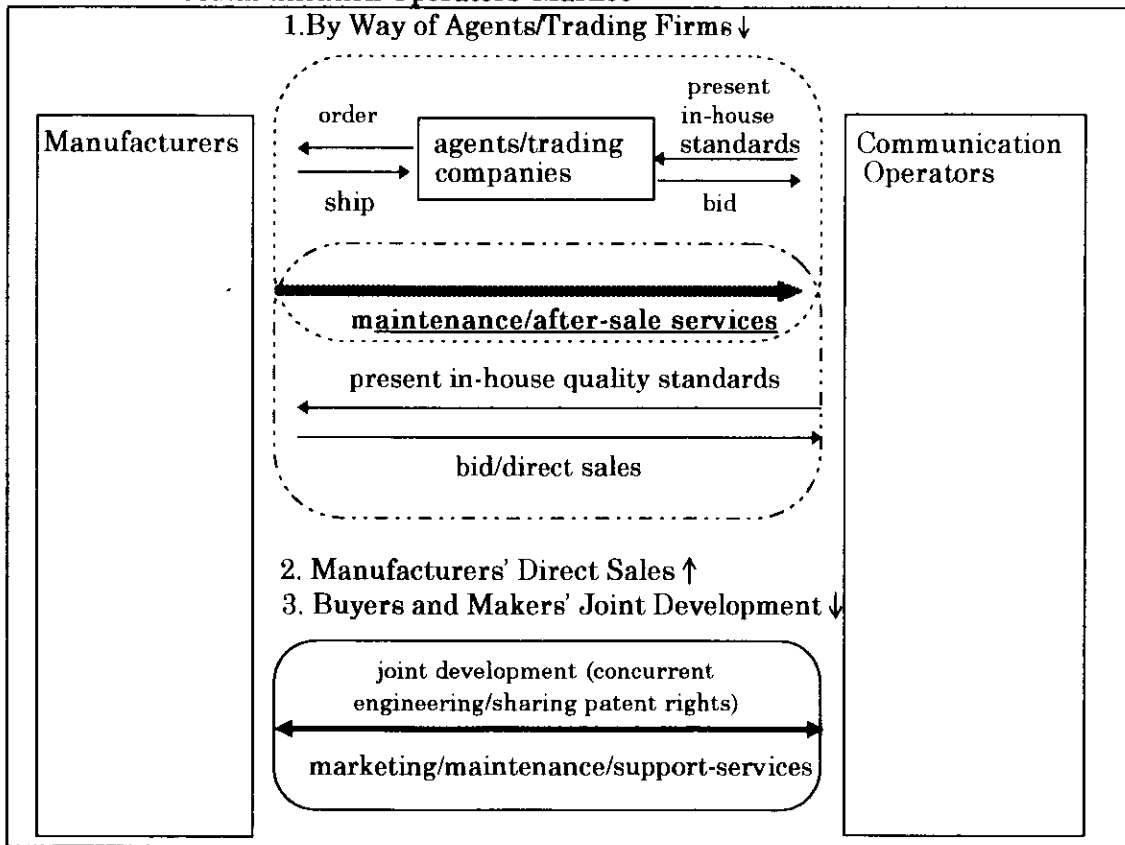
Furthermore, there is another case, Case 3, in which the users, communication operators, and the manufacturers jointly develop optical communication products.

With their staff going back and forth conducting concurrent engineering, they have close partnership, and often share the patent rights. Therefore, the access to this market is considered extremely difficult for other manufacturers that are not involved from the development stage.

In the communication market, therefore, the majority of the firms are taking the “just-in-time” strategy that only produce after accepting orders.

However, with the changing business surroundings, some companies have started to purchase finished products after carefully examining the designs and quality standards presented by the optical communication products makers or the trading companies.

Figure 2. Distribution of Optical Communication Products in the Market Held by Communication Operators’ Market



## 2. Market Held by Cable Television Operators

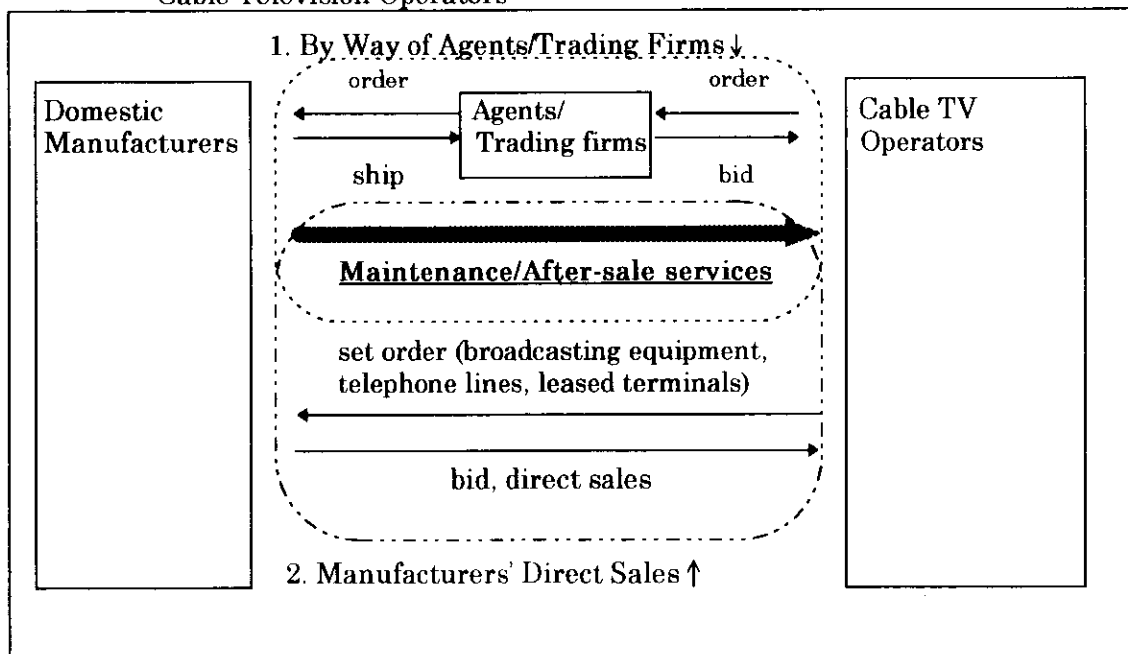
Similar to that of the communication operators, the distribution in the cable television market has two cases. In Case 1, the users, the cable television operators, purchase products by way of the maker-strategic allied agents or specialized trading firms, while in Case 2 they directly purchase from the manufacturers. However,

unlike the communication operators, Case 1 is the more common, due to the fact that many of the cable TV operators do not possess research and development facilities for the equipment (see Figure 3). For this reason, the maintenance and support services for the products are the even more important requirement on the side of the manufacturers.

In either Case 1 or Case 2, the access to this market is again not easy once the supplier has been decided on. This is because the cable television operators usually buy the whole equipment—from broadcasting equipment, telephone lines, to leased terminals—from one cable TV equipment manufacturer.

When purchasing optical communication products at the start of business, cable TV companies generally present their in-house standards before inviting bids or making a private tender. However, there are also many cable TV companies which do not have detailed in-house quality standards and just select the most suitable products judging from the standards presented by the strategic allied agencies, trading firms, or manufacturers.

Figure 3. Distribution of Optical Communication Products in the Market Held by Cable Television Operators



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### III . Market Entry

#### A. Demand Trend by Type of User

##### 1. Market Held by Communication Operators

##### a. Access to the Long-distance and International Telephone Companies

The competition among the communication operators have become more and more drastic over the recent years. Due to their relatively short history in the communication business, the long-distance and international telephone companies have begun to dismiss their in-house standards and procure finished products in order to increase their competitiveness in the market. This strategy is expected to become more popular in the future among long-distance and international telephone companies that are placed in less advantageous positions than NTT, which has possessed leased lines from long ago.

From this perspective, the chances are better to enter the market held by the long-distance and international telephone companies than to enter NTT's in exporting optical communication products to Japan.

##### b. Access to the Communication Operators Using Different Multi-Signal Transmission Modes

Optical communication utilizes the multi-transmission mode which sends several signals at the same time with the aim of improving the efficiency of the telephone lines.

Today as of 1997, NTT, which holds the largest market share, uses the Time Division Multi-Transmission Mode\*1 for optical signal. Other communication operators that set their in-house standards along with NTT's utilizes the same mode in order to maintain compatibility.

However, some long-distance and international telephone firms are testing the Wavelength Division Multi-Transmission Mode\*2 for the trunk lines, which is mainly used in America. These companies are trying to differentiate themselves from NTT in order to prepare for even more drastic competition projected in the future market.

At present, an easy majority of the Japanese optical communication products are designed to suit the Time Division Multi-Transmission mode adopted by NTT. Only a

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limited number of manufacturers are producing products to suit the WDM mode.

The WDM mode is yet to be popularized, but should be watched closely from this point. The WDM products rely highly on the imports. Because of these factors, the opportunities are relatively high for the foreign manufacturers to get access to the communication operators considering to adopt the WDM mode.

Note:

**Time Division Multi-Transmission Mode\* 1**

A multi-transmission mode which aligns on the time axis the time-dispersion information (sampling analogue or digital signals) from different communication lines as one frame, and transmits by repeating this frame of data against the next-incoming information.

**Wavelength Division Multi-Transmission Mode\* 2**

A multi-transmission mode which utilizes several wavelengths with a single optical fiber. Because it is capable of multiplexing and demultiplexing optical signals of different wavelengths, it is considered to be superior to the time-division mode in selectively delivering particular optical signals to particular users.

c. Gathering Data in the Japanese Market

As mentioned earlier, the largest user of optical communication products in Japan is NTT. Presently NTT is increasing the proportion of bidding for procurement through its international announcements. The opportunities for international procurement are projected to grow in the future. Therefore, on entering the market held by communication operators, it is important to gather sufficient information about the Japanese market and take advantage of the opportunities given by way of such international announcements on the Internet.

2. Cable Television Market

a. Access to the Cable Television Companies in the Metropolitan Areas

When entering the Japanese cable television market, a good knowledge of what services the cable TV companies provide is essential in getting access to the metropolitan cable TV stations, for which higher-grade services are in demand.

One reason for this is the fact that the Japanese cable TV operators are divided into two types: 1) the companies providing services in the metropolitan areas, such as



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Tokyo and Osaka, and 2) the companies building regional networks in the farming/rural areas. In general, the subscribers' needs vary, depending on the different areas.

The cable TV subscribers in the urban areas demand more than what the regular TV broadcasting conventionally provides. Their demand is high for wide-area and high-speed communication services, such as "pay-per-view" and "video-on-demand."

In the rural areas, on the other hand, cable television business is part of the regional network development. Therefore, the programs it provides are mainly re-broadcasting of regular TV programs and the original municipal programs. There is less demand for "pay-per-view" and "video-on-demand."

## 2. Taking Advantage of Trading Companies

Most cable TV companies purchase equipment through trading firms when starting the business. Some trading companies even manage the cable TV stations by themselves. At any rate, trading companies interfere in the materials procurement of cable TV companies, so it is advantageous to affiliate with the trading companies in order to get access to the cable TV market.

### B. Dealing with the Japanese Business Practice

According to those concerned with the optical communication business, the Japanese and foreign manufacturers think quite differently of how responsible they are for the maintenance and repair services after sales.

The Japanese manufacturers attach great importance to the after-sale services in general. At the same time, the users, communication and cable TV operators, decide on which manufacturer to order from, assuming that the maintenance and support services be included in the sales prices.

Therefore, to enter the Japanese market, foreign manufacturers must understand such Japanese business practice that the maintenance and repair services are the manufacturers' responsibility. With this premise in mind, the foreign manufacturers need to decide on whether they follow the Japanese style or not. If not, they should indicate how much their after-sales maintenance and repair would cost aside from the sales prices. The product must be of the same value as the "service-included value" of the Japanese products.

The following are the two strategies of the foreign manufacturers which have

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successfully entered the Japanese market.

a. Establishing a Corporate Body in Japan

Many foreign manufacturers have successfully gained access to the Japanese market including NTT's share, by setting up their corporate bodies in Japan and providing the maintenance and repair services in the same Japanese style.

Among the communication operators, many comment that there is not much difference between Japanese and foreign products in terms of quality, so that the difference lies in how sufficiently the after-sale services are provided. In this respect, one big drawback of the foreign manufacturers selling their products through Japanese trading firms is that they can't respond quickly to their customers when the necessity for maintenance and repair arises.

For this reason, it will be most effective for foreign manufacturers to establish their corporate bodies in Japan, to be able to provide the same maintenance and support services as the Japanese manufacturers.

b. Tie-up with Japanese Manufactures/Joint Development

Also successful are the foreign manufacturers that have tied up with large Japanese cable manufacturers and/or electric makers in order to overcome service-management and/or for joint development.

This strategy is largely taken by the American and European venture enterprises. In this way, they can entrust their strategic allied Japanese makers with the maintenance and after-sale services of their products. A North American company A, for example, has tied up with a large Japanese cable maker and an electric manufacturer that are jointly developing products with Japanese communication operators. This enables them to join in the early stage of the product development and make it easier for their products to penetrate the Japanese market.

# **Appendix**

## Appendix 1. Market Overview

Table 1. Domestic Production

Unit: ¥million

Class	Products	1993	1994	1995
Optical equipment	Optical transmission modulators	268,367	287,957	325,597
	Light meters	24,875	26,401	28,515
	Installations	10,688	10,344	10,355
	Total	303,930	315,702	364,467
Optical parts	Light-emitting devices (semiconductor lasers, LED)	127,238	139,257	155,576
	Photo-detection devices	109,871	117,093	117,825
	Compound optical devices	52,155	58,016	69,187
	Optical links	12,307	16,065	23,573
	Optical fibers	141,867	131,086	134,471
	Optical connectors	11,554	13,242	16,744
	Passive elements	5,737	6,625	8,589
	Total	460,729	481,384	525,965

Source: Optical industry market research by Optoelectronic Industry and Technology Development Association

Table 2. Import Trend

Unit: ¥million

Names of Products	HS Codes	1994	1995	1996
Optical fiber cables	8544.70-010	5,950	8,077	11,481
	9001.10-010	1,395	1,308	2,188
	9001.10-090	105	175	418
Sub total		7,450	9,560	14,087
Light-emitting devices (photoelectric semiconductor devices)	8541.40-090	1,518	1,540	1,542
Light-emitting devices (light-emitting diodes)	8541.40-010	10,824	13,844	14,710
Sub total		12,342	15,384	16,252
Total value of major optical communication products		19,792	24,944	30,339

Source: Japan Tariff Association, *Japan Imports & Exports*

Note: The imported optical communication products have not been completely given the HS codes.  
This table only shows the import trend of a few representative optical communication products.

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## Appendix 2. Trade Fair and Exhibitions

### **INTER OPT**

<b>Name of Trade Fair</b>	<b>INTER OPT</b>
<b>The Next Trade Fair</b>	<b>September, 1998</b>
<b>Place of the Next Fair</b>	<b>Japan Convention Center, Makuhari Messe (Chiba Pref.)</b>
<b>Intervals</b>	<b>A Year</b>
<b>Number of Participants (previous fair)</b>	<b>193 companies</b>
<b>Number of Visitors (previous fair)</b>	<b>79,398 people</b>
<b>Application Requirement</b>	<b>Engaged in the optical industry Both domestic and foreign</b>
<b>Cost of Participation</b>	<b>Exhibiting space: 1 unit (3m × 3m) 1~3 units    ¥340,000 per unit 4~9 units    ¥330,000 per unit 10~19 units    ¥320,000 per unit 20 units or more    ¥305,000 per unit</b>
<b>Application Period</b>	<b>The brochure will be issued in December, 1997</b>
<b>For Further Information:</b>	<b>Optoelectronic Industry and Technology Development Association ML Plaza 6F, 7-5-8 Toyo, Koto-ku, Tokyo 135-0016 TEL. 03-5632-7721, FAX: 03-5632-7725</b>

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### Appendix3. Organizations

#### <Government Agency>

**Basic Industries Bureau, The Ministry of International Trade and Industry (MITI)**

1-3-1, Kasumigaseki, Chiyada-ku, Tokyo 100-0013

TEL. 03-3501-1511 ex. 3191

FAX. 03-3501-0129

#### <Related Organization>

**Optoelectronic Industry and Technology Development Association**

ML Plaza 6F, 7-5-8 Toyo, Koto-ku, Tokyo 135-0016

TEL. 03-5632-7721

FAX. 03-5632-7725

#### <Trading Companies>

**C. Itoh & Co., Ltd.**

4-1-3 Kyutaromachi, Chuo-ku, Osaka 541-0056

TEL. 06-241-2121

**Mitsui & Co., Ltd.**

Mitsui & Co., Ltd. Bldg., 1-2-1 Otemachi, Chiyoda-ku, Tokyo 100-0004

TEL. 03-3285-1111

**Sumitomo Corporation**

Sumitomo Bldg., 4-5-33, Kitahama, Chuo-ku, Osaka 541-0041

TEL. 06-220-6000

**Marubeni Corporation**

1-4-2 Otemachi, Chiyoda-ku, Tokyo 100-0004

TEL. 03-3282-2111

**Mitsubishi Corporation**

2-6-3 Marunouchi, Chiyoda-ku, Tokyo 100-0005

TEL. 03-3210-2121

**Nissho Iwai Corporation**

2-5-8 Imabashi, Chuo-ku, Osaka 541-0042

TEL. 06-209-2111

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**Toyo Menka Kaisha, Ltd.**

1-6-7 Kawaramachi, Chuo-ku, Osaka 541-0048

TEL. 06-208-2211

**Nichimen Corporation**

Mita NN Bldg., 4-1-23 Shiba, Minato-ku, Tokyo 108-0014

TEL. 03-5446-1111

**Kanematsu Corporation**

Seavance N Bldg., 1-2-1 Shibaura, Minato-ku, Tokyo 105-0023

TEL. 03-5440-8111

<Cable Manufacturers>

**The Furukawa Electric Co., Ltd.**

2-6-1 Marunouchi, Chiyoda-ku, Tokyo 110-0005

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**Mitsubishi Cable Industries, Ltd.**

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<Electric Manufacturers>

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