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**MARKET STUDY ON TELECOMMUNICATIONS
EQUIPMENT AND SYSTEMS IN MEXICO**

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MARKET STUDY ON TELECOMMUNICATIONS

EQUIPMENT AND SYSTEMS IN MEXICO

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1. BACKGROUND

Mexico entered the age of telecommunications in 1851, with the inauguration of the first telegraph circuit. Local telephone service began in 1882 with the foundation of the Mexican Telephone Company. By the end of the 19th century, the first long distance telephone conference was held between Mexico and the United States, while submarine telegraphic cables reached Mexican coasts. The first Mexican radio station was inaugurated in 1923. In the 1930s, Mexico was linked to Europe, the Orient and South America through radio-telegraphic systems. For many years, telephone services were supplied by two private companies, subsidiaries of Ericsson (Sweden) and ITT (U.S.A.). Between 1963 and 1972, the Mexican government gradually purchased stock held by these two companies and became majority (51%) owner of the new Teléfonos de Mexico.

By the end of the Second World War, Mexico initiated a second phase in its telecommunications infrastructure with the installation of the microwave system. Spatial communications began in 1957. In 1963, the first microwave route was inaugurated between Mexico City, Monterrey and the U.S. border. The national system was completed in 1966 for the 1968 Olympic Games. Telex service began in 1957, using the existing long distance network, and by 1971 it was linked to the world network. The first television channel in Latin America was inaugurated in Mexico in 1950 by the company Televisión de México. The following year, Televisión de México was born, now the Televisa corporation.

Since then, Mexican telecommunications have come a long way and have grown significantly, to be among the world's most advanced. During the last decade, telegraphic channels have duplicated, ionospheric radiocommunications have grown 57%, satellite communications have boomed through the installation of the Morelos satellite System and its 237 local stations, telex lines have grown 150%, data communications systems grew over 500%, television stations multiplied by seven and 220 radio stations were concessioned, the number of telephone apparatus more than doubled, as well as the number of lines, telephone density increased from 6.7 to 11.4 per 100 inhabitants and the number of locations with telephone service grew from 4,200 to 7,200.

The Mexican telecommunications sector is undergoing fundamental changes. New policy initiatives are opening opportunities for Canadian and other foreign companies wishing to enter the market. As a result of Mexico's trade liberalization policies, tariffs have been lowered to a maximum 20%, down from 100% in 1982, and prior import licenses are no longer required to import telecommunications equipment. This enables foreign companies to export their products more easily to Mexico. Additionally, the Mexican government gradually has been changing its policies regarding the telecommunications sector, which has repeatedly been stressed as a crucial factor for Mexico's sustained economic development and growth. Deregulation and privatization are the

crucial factors changing the face of Mexico's telecommunications sector. The Mexican telephone company, Teléfonos de México was recently deincorporated and sold to private sector investors, and areas such as cellular telephones, construction and administration of microwave earth stations, fax, electronic mail, data transmission services, and other services deriving from the new technologies are now open to private investment and service.

2. ECONOMIC ENVIRONMENT

With the objective of reducing the inflation rate, the Mexican authorities implemented a stabilization program in 1988, called the Economic Solidarity Pact, which features traditional austerity measures, entailing tight fiscal and monetary policies and unorthodox measures, such as price, wage and exchange rate controls. This program has been the cornerstone of Mexico's economic policy over the past four years and has resulted in a drastic reduction of the inflation rate, from an annual rate of 159.2% in 1987 to 51.7% in 1988 and 19.7% in 1989. Inflation rebounded to 29.9% in 1990 but the Mexican government aims to achieve a 14% inflation rate in 1991, which seems a reasonable estimate based on an annual inflation rate of 13.3% as of October 1991. Along with the objective of consolidating the progress made in price stabilization, Mexico's macroeconomic policy in the short run aims to reaffirm gradual and sustained economic recuperation, basically by establishing the necessary conditions to encourage national and foreign investment and by stimulating local demand.

After the 1986 recession, Mexico's gross domestic product (GDP) increased a moderate 1.7% in 1987 and an additional 1.3% in 1988. Domestic economic activity recovered for the third consecutive year in 1989 with a growth rate of 3.1% and further 3.9% in 1990 to reach \$234 billion (1). With an 81.1 million population, per capita GDP was estimated at \$2,874 in 1990. Additionally, manufacturing output grew by 5.2% in 1990 in real terms, private investment and consumption expanded 13.6% and 5.2% respectively and public investment was up 12.8%. During the 1991-1994 period GDP is expected to maintain an average annual growth rate of 2.5%-3%. Preliminary figures for 1991 place GDP growth at 4.5%-5% for this year.

In an effort to revitalize and open the Mexican economy, the Mexican Government undertook a series of structural changes, including the accession to the General Agreement on Tariffs and Trade (GATT) on August 24, 1986 leading to an extensive trade liberalization process: import permits were eliminated on all but 198 of the total 11,812 tariff items based on the Harmonized

1. Note: All values in this report, unless otherwise stated (Mexican pesos, Mex\$, Canadian dollars, Cdn\$, etc) are quoted in United States dollar equivalents.

System adopted in 1988. Official import prices are no longer applicable, nor the 5% export development tax, and import duties were lowered from a maximum of 100% in 1982 to 20% since January 1988. The weighted average tariff rate is now 10.4%. The automotive and computer industries have also been liberalized, through the elimination of prior import permits, to allow free entry of products in these industries. The approval of the North American Free Trade Agreement will further strengthen trade between Canada, the United States and Mexico.

According to official data from the Mexican Secretariat of Commerce and Industrial Development (SECOFI), Mexico's trade balance in 1990 dropped once again to a \$3 billion deficit from -\$645 million in 1989. Exports increased by 17.5% in 1990, from \$22.8 billion to \$26.8 billion, while imports grew 27.3%, from \$23.4 billion to \$29.8 billion in 1990, having already increased 23.8% in 1989 and 54.9% in 1988. As of August 1991, total exports for the year amounted to \$18.3 billion and imports to \$23.6 billion.

Total Mexican imports from Canada increased 24% in 1989 and decreased 1.5% in 1990. Total Canadian exports to Mexico amounted to Cdn\$594 million, while total Canadian imports from Mexico were valued at Cdn\$1,730 million in 1990. According to Mexican figures, in 1989, 1.9% of Mexico's imports came from Canada, while 1.2% of its exports were to Canada. This makes Canada Mexico's fifth largest exporter and sixth largest importer.

3. TELECOMMUNICATIONS IN MEXICO

Mexico's telecommunications services are provided by two entities, the Secretariat for Communications and Transportation (Secretaría de Comunicaciones y Transportes-SCT), through the recently created Telecomunicaciones de México (TELECOMM) and the now privatized Teléfonos de México (TELMEX).

TELECOMM provides:

Telephone service to small towns (under 1,500 inhabitants)
Distribution of the following signals:

- Television
- Teleaudition
- Telegraph
- Voice and data

International telegraph

Telex

Data transmission

Facsimile and telephotography

Marine radio

Time sharing

Satellite communications

SCT also grants the concessions required for the provision by private firms of the following telecommunications services:

- Radio and television broadcasting
- Public telephone services
- Common radiotelephones
- Mobile radiotelephones (incl. cellular telephone services)
- Cable television
- Continuous music
- Paging systems

Additionally it grants permits for the following services:

- Studio links (plant for broadcasting stations)
- Remote mobile transmissions of radio and TV stations
- Private data communications system
- Private radio telephone
- Mobile aeronautic
- Mobile marine
- Civil band
- Amateur radio
- Private telephone line service with links to the national network and point to point with border crossing

TELMEX provides voice, sound, data and text transmission services and has the exclusive right to install, maintain and operate the public telephone network on a national basis, and to provide public local, national and long distance telephone service. TELMEX is also able to offer fax and other transmission services (including data).

3.1 SECRETARIAT OF COMMUNICATIONS AND TRANSPORTATION

The National Development Program for the 1989-1994 period stresses the importance of telecommunications for Mexico's sustained growth and development in all areas of the economy. SCT is looking to increase private investments in the telecommunications sector in order to expand and modernize the existing network and services. Quality and efficiency are being stressed, together with increased competition. Tariffs levied on different telecommunications services have and will continue to be brought into those charged in other countries. The regulatory framework will be reviewed to allow for increased private sector participation and to guarantee legal security to participants in this sector.

Among the most pressing problems identified by SCT that need to be resolved are the following:

- digitalizing the local trunk cable network by 65% and installing 4,000 kms. of optic fibres;
- expansion of the satellite communications network;
- overhauling of the present tariff schedule for services;

- modernization of telegraph services;
- expansion of access to private telephone lines for greater utilization of telex services;
- improved quality and greater access to data transmission services;
- increased facilities for computer networks;
- improvements to radio stations;
- diversification and expansion of television broadcasting;
- improvement of postal service;
- modernization of the legal framework for telecommunications in order to encourage new services and increased competition.

The Program for the Modernization of Telecommunications published at the end of 1989 sets six basic objectives:

1. Improving the quality of telecommunications services in order to be internationally competitive;
2. Increasing service coverage in rural and urban areas to link Mexico's population both internally and internationally;
3. Diversifying and modernizing services;
4. Setting competitive tariffs and attaining financial selfsufficiency and reducing telephone taxes;
5. Fostering increased private investment participation and competitiveness and reducing state participation in order to attract new investments and reduce government spending in this sector;
6. Modernizing the regulatory framework in order to allow for increased competition by allowing private companies to provide telecommunications services, while the federal government retains planning, regulation and supervision functions.

This program calls for a one billion dollar investment during the 1989-1994 period. This amount is to be directed toward the satellite network (30%), data communications (8%), telegraph, the federal microwave and optic fiber network (54%) and special services. Private investors will have an increasing participation in telecommunications, particularly in areas such as private networks for data transmission, installation and operation of earth stations, cellular telephone services, paging systems, fax and electronic mail. Foreign and national private investors are expected to invest approximately \$30 billion in the telecommunications sector in the next ten years.

The government continues to operate the basic telecommunications network through a new decentralized office called Telecomunicaciones Nacionales de México. It operates the basic network, satellite earth stations, data communications and telegraph systems. In the area of radio, new concessions are expected to be granted and old ones reviewed. New concessions are also expected to be granted for television stations, UHF channels and side-band frequencies for music, teletext and cable TV.

SCT has stressed the importance of developing a solid infrastructure for satellite communications. Priority will be

given to the integrated use of the system and facilitating the installation and operation of earth stations by the private sector. SCT plans to continue adding new ground stations to the ones now operating in the Morelos Satellite System; expand coverage and increase the number of users of MSS by increasing the capacity of the existing ground stations, in particular those to operate on the KU band for rural and private applications; and to install 500 earth stations for the educational system. In 1990, SCT issued a call for bids for the supply of the new Solidaridad satellite system, consisting of two basically identical satellites, to be launched between 1993 and 1994. The bid for construction was won by Hughes Communications International, and the French company Arianespace won the launching bid. Each satellite will basically have 18 active transponders on the C band and three times more power on the Ku band, and will also operate on the L band for rural communications, and an estimated lifespan of 14 years.

SCT has announced the renewal of 430 radio broadcasting and 67 TV broadcasting stations within the Secretariat's program to enhance radio and TV coverage. The program calls for the installation of 400 new stations under concession, 250 for TV and 150 for radio. However, these concessions are exclusively for Mexican citizen. The system will operate both through concessions and permits. It also contemplates incorporating new technology to update installations already functioning, improving the quality of operating programs and the development of human resources. A recent agreement assigned 100 kilocycles on the radio band to Latin American countries, extending the AM band to 1,750 kc. This expansion increases the capacity to permit 1,000 new radio stations in Mexico.

3.2 TELEFONOS DE MEXICO

TELMEX is one of the largest corporations in Mexico, with sales of \$4.5 billion in 1990, 44.3% above 1989 levels in real terms. It has nine subsidiaries and is involved in the whole range of telephone related services, such as construction, telephone equipment production and providing the telephone service itself.

On September 19, 1989, Carlos Salinas de Gortari, Mexico's President, ordered the state-run company Teléfonos de México privatized. In December 1990, the company's voting shares, equivalent to 20.4% of total capital, were sold to a group of investors led by Carlos Slim Halu of the Mexican Grupo Carso, that included Southwestern Bell and France Telecom. Grupo Carso is the operator of the company as per the concession granted to the investor group, that will expire in 2026 with an optional renewal period of 15 years after that. The two foreign partners play an important role as counselors on new technologies, networking, commercial policy, supervision, reference and support. The Mexican government received \$1,757.6 million dollars in January 1991 as a result of this sale. During the month of May

1991, the 1,500 so called "L", neutral or non voting shares, representing 14.1% of TELMEX's capital, were sold on international stock exchanges for an amount totalling over \$2 billion. Grupo Carso itself bought 5% of the firm's capital in "L" shares for distribution among its personnel. The Mexican government still holds 8.4% of TELMEX's capital and is expected to keep it for at least another 180 days.

The government has therefore become a minority partner, foreign investors are able to hold up to 49% of the company, although this maximum has not yet been reached, while Mexican private investors, with a marginal participation (4.4%) of the Telephone Workers Union, are majority owners of the company. This move is expected to attract new capital that is needed to improve services and delivery, to expand the present network and to invest in R&D.

The State will retain authority over the telecommunications sector, through the legal network standards and regulations. TELMEX will control local and long distance telephone service based on a new concession. Concessions in new technologies, such as fiber optics and cellular telephones, have been granted to private investors. Other services are open to competition, such as the construction and operation of complementary public telephone networks, radiotelephone service, installation and operation of telephone booths, high quality private networks, private satellite services and the manufacture and distribution of equipment, among others.

The privatization and concession of TELMEX was subject to the following conditions in 1989:

1. That the state retains authority over telecommunications through the definition of the regulatory framework for TELMEX and the supervision of the company's operations. The regulatory framework will be based on the existing General Communications Law. The new concession, valid for 30 years, will be reviewed every five years. SCT also will review and approve the tariffs for TELMEX's services to promote efficiency and international competitiveness. This integral telecommunications system will be open to competition in those areas not exclusively concessioned to TELMEX based on two criteria: efficient service and financial balance of TELMEX.

2. That TELMEX improves telephone service significantly through the expansion and modernization of the telephone network in order to provide both households and commercial establishments greater access to high quality telephone service. By 1994, TELMEX is required to: provide long distance telephone service to all towns with more than 500,000 inhabitants (10,000 locations have no phone at present); to increase to 100,000 the number of public telephones to reach 2 for every 100 inhabitants (vs 40,000 at present); to reduce the number of lines out of order; to speed up

repair service and to answer all operator-assisted calls within 10 seconds (now only 70% of calls are answered within that time).

3. That the firm continues to respect the worker's rights and improve their conditions as spelled out in the terms and conditions of the agreement for the modernization of TELMEX signed by the government, the workers union and TELMEX. This agreement specifically takes into account productivity and technological change. Workers also will participate on an equity basis in the company.

4. That it continues to expand and modernize the telephone system according to an annually published five year plan spelling out the minimum coverage and modernization goals. Starting in 1990, the public telephone network will increase from five to ten terminal lines per 100 inhabitants by 1994 and to 20 by 2000; during the first five years TELMEX will install four million new terminal lines, representing a 12% annual increase; starting in 1992, TELMEX will provide telephone service to small rural locations within six months of their request for service and will provide connection to all private and public telecommunications systems in any city with automatic service; the local urban telephone network will be expanded and modernized through the substitution of obsolete switching systems with digital systems (digital technology is expected to represent at least 60% of the telephone network and 100% of the new overlay network in 22 cities by 1994).

5. That it undertakes some technological and industrial research and development on telecommunications technology to foster the company's competitiveness and to increase the technological capacity of the country in the area of telecommunications.

6. That it be owned by majority Mexican citizens. Foreign investment in TELMEX will not be permitted to exceed 49% and no foreign partner will be permitted to hold more than 10% of the capital (foreign investment now represents approximately 25% and is held in the form of non-voting ADR's sold in the U.S. market). In addition to capital, new investors will be expected to provide access to state-of-the-art technology to contribute to TELMEX's expansion program in terms of service quality and efficiency. National private investors will be the majority owners. The analyses of the proposals by investors will take into account their contribution to the company's development, expansion and service quality and its workers security.

TELMEX needs an estimated 9.8 billion dollars within the next six years to revamp its infrastructure, expand and improve service as outlined above. Annual investments since the privatization already amount to \$2.5 billion. Telephone service in Mexico has been characterized by numerous inefficiencies. The new measures are aimed at removing them through modernization, expansion and more efficient utilization. The following are some of the most salient inefficiencies, some of which have already been removed:

- 20% of the population has no access to telephones;
- the demand backlog for phone service is estimated to be 1.5 million requests;
- Of the 5.5 million lines presently installed, 495,000 use over 30 years old electro-mechanical technology, and 3.7 million are still analog;
- 40% of the underground telephone network is composed of obsolete cable with over 15 years in operation;
- 45,000 phones are out of order every day;
- service quality is below international standards;
- international long distance calls are significantly more expensive than in other countries;
- data banks and other data transmission services are not yet available to the general public.

TELMEX published its 1991-1994 three year program, which contemplates a total investment during that period of \$7.2 billion, 35% of which will correspond to imports, an annual growth rate of 12%, the installation of 2.3 million new lines during that period. This represents almost half of all telephones installed within over 50 years. This is expected to increase telephone density to one out of every three families, presently of only 5.1%, one of the lowest in the world. Another 8,000 communities will receive telephone service. The fiber optic network will be increased by the construction of 13,500 kms. Additionally, 470,000 obsolete lines will be replaced by digital centers, and 1,400 computer operators will be installed in 33 new digital centers. Another 100,000 public telephones will be installed, in order to reach an objective of two public telephones per 1,000 inhabitants. Cellular telephone supply will increase from 35,000 to 200,000 users, incorporating 50 cities. Customer complaints will also be given priority, through a faster and more efficient attention in the company's 288 offices, which will be computerized. Additionally, a new training center will be opened to train the company's workers and improve efficiency and productivity. Within the first year, 8,700 public telephones were installed, 1,200 rural communities were provided with telephone service and total 11,300 communities now have telephones.

Fiber optic technology will continue to be used extensively in the future, due to its advantages over other types of transmission systems, in particular for the new overlay network and ISDN. A contract to create the second largest fiber optic cable network in the world, with 13,500 kms. of fiber optics, at an estimated cost of \$300 million, was awarded by the end of 1990 by TELMEX to a number of suppliers. The largest portion was granted to AT&T, followed by Alcatel-Indetel, Telettra, Fujitsu and Ericsson. This project is expected to be finalized within three years and incorporate Mexico's 53 largest cities to the network.

The new phone lines being installed are predominantly digital, so that by the year 2000 approximately 70% of the system will be

digital. These lines will increase both system capacity and transmission speed, and will allow for better and newer services. The new digital switching system manufactured by Indetel/Alcatel and Ericsson is expected to increase long distance capacity by 10% a year, raising the system's capacity from 700 million calls in 1986 to 2.8 billion calls by the year 2000. While 13% of the total network and 40% of the international long distance network were digital in 1988, in 1991, 57% of the long distance and 31% of the local network are digital. By 1994, 60% will be digitalized across the board. With 80% of the network digitalized by the end of the century, access to high capacity voice, data and image networks will be nearly universal.

TELMEX appears to be ready to allow additional companies to provide long distance carrier service from Mexico. Also, to improve communications with the United States, it is considering opening five "gateways" to the U.S. using R-1 signals instead of the currently used European R-2 signals.

TELMEX announced plans to modernize its home and commercial service, to increase telephone networks for banks and hotels, and to develop value added services, such as call waiting, speed dialing, touchtone dialing, call forwarding, automatic redialing, triplex system, automatic reminders and consulting calls, 800 toll free service and Ladatel (long distance public telephones and credit card telephones).

The firm has also increased local tariffs and reduced international long distance tariffs in order to assure international competitiveness and adequate financial resources, since tariffs applicable on local calls used to cover only about 40% of the cost, while charges on long distance calls were up to three times higher than those applicable in other countries.

Another priority for network expansion is providing service to the more than 1,800 maquiladora (in-bond) industry facilities in Mexico, by making long distance and data communications services more accessible. There is a large and growing need for advanced communications services between the U.S. and other foreign based parent companies and the assembly plants in Mexico. Many of these plants have had to resort to private communications channels.

TELMEX has created the Service Plan to supply the maquiladora industry with necessary telephone and telecommunications services through border crossing installations. An investment of \$350,000 was made to install five centers in Tijuana to service 15 maquiladora companies in that city. Other targeted cities under this program are Agua Prieta, Hermosillo, Nogales (Sonora), Cd. Acuña, Torreón (Coahuila), Cd. Juárez, Chihuahua (Chihuahua), Durango (Dgo), Matamoros, Reynosa, Nuevo Laredo (Tamps), Guadalajara (Jalisco), Mérida (Yucatán), Mexicali (BC). This is one of the areas which is expected to grow significantly in the future, representing major opportunities for foreign companies.

TELMEX and Fonatur, the National Fund for Tourism Development, have agreed to develop telecommunications infrastructure in Mexico's major tourism centers. The emphasis on developing the tourism industry in the National Development Plan and the attendant demand for access to internationally competitive telecommunications services should result in growing opportunities for sales of products aimed at this market segment.

SCT received 106 requests for concessions to operate cellular networks in Mexico's eight regions: I-Baja California (8), the II-Northwest (10), III-North (12), IV-Northeast (17), V-West (17), VI-Center (16), VII-Gulf and South (15) and VIII-Southeast (12). In March 1990, SCT announced the business groups awarded the cellular service franchises, which will involve a combined total of over \$250 million in addition to the \$55 million concession fee payable to the federal government. Foreign participation in these companies ranges from 40% to the maximum 49%.

The concessions were awarded to the following companies by region:

COMPANY	MEXICAN PARTNERS	FOREIGN PARTNERS
I. Baja Celular Mexicana	A.López Rocha E.Vázquez A. Telcemex	General Cellular
II. Movitel del Noroeste	TAMSA Bachoco	Mc.Caw Cellular Comm Contel Cellular
III. Telefonía Celular del Norte	J.Garza C.	Motorola Centel Cellular
IV. Celular de Telefonía	Protexa	Millicom
V. Comunicaciones Celulares de Occidente	Hermes Banamex	Bell South Racal Canadá
VI. Sistemas Telefónicos Portátiles Celulares	G.Alarcón	Bell Canada
VII. Telecomunicaciones del Golfo	Gpo.Mex.Des. Ind.Unidas	Bell Canada
VIII.Portatel del Sureste	L.Niño de R.	Associated Communications

Two Mexican firms, which hold fifty year concessions, that are good until 2006, to provide exclusively all land mobile radio communications services in Mexico, have been given permission to begin operating cellular telephone service in Mexico City. The two firms, IUSACELL, a subsidiary of Servicio Organizado Secretarial (S.O.S.), and DIPSA, a subsidiary of TELMEX will be the exclusive providers of this service in Mexico City. DIPSA is presently using Ericsson equipment, while IUSACELL uses Northern Telecom systems from Canada. DIPSA was also granted permission to begin offering cellular service in Tijuana. Nevertheless, these two firms are not guaranteed the exclusive rights to provide

service anywhere else. Northern Telecom will attempt to sell switching equipment to the concession holders in all regions.

In an effort to improve the quality and quantity of the telephone services available to the private sector, TELMEX has established its Center for Integrated Electronic Telephone Service (CITE). This assigns a representative to handle the relationship between high volume users and TELMEX. The representative can tailor the system to the customer's needs. The most important service provided to corporations requiring a private network is a Private Branch Exchange (PBX).

TELMEX recently began the overlay network project to supply its major users with a highly sophisticated and efficient network for data, voice, text and image transmission with high fidelity, security and speed. It will consist, in its first phase, of 950 kms of fiber optic cable and highly sophisticated technology. On August 23, 1989, the concession for this project was granted to Ericsson and Indetel-Alcatel, who will supply the equipment. The equipment used to assign circuits and channels electronically will be supplied by AT&T. The overlay network will provide the following advantages: high speed digital access and point to point connection for digital system users for voice and/or data communication; digital access to analog system users through multiplexors for the transmission of voice and data; security through the use of state-of-the-art technology to avoid errors; noise suppression for high fidelity communications through the use of a fully digital system; value added telephone services; private networks or temporary digital linkages for the configuration of semi-permanent networks; total digitalization of point to point communication, both local and national; and high quality service, immediate availability of services and safety through a backup system. In order to provide long distance service to the network users, it will be linked to the Automatic Long Distance Center (CALD) and, for local calls, to the Public Telephone Switched Network (RTPC). The first phase will link Mexico City with Monterrey and Guadalajara and will begin operating soon. In 1990, the northern part of the country will be serviced through Chihuahua, Ciudad Juárez, Nuevo Laredo, Matamoros and Reynosa. By 1993, it is expected to encompass 22 cities. Between 1989 and 1993, the \$450 million overlay network is expected to be fully installed. The first users of the network include Bancomer, Banamex, Banca Cremi, Bolsa Mexicana de Valores, The Secretariat of State (Gobernación), General Motors, Ford and Camino Real hotels.

The overlay network will eventually lead to ISDN. TELMEX is developing the Red Digital de Servicios Integrados (Integrated Services Digital Network ISDN) in conjunction with Ericsson. This will enable the user to transmit voice, data and text with only one line. ISDN will include carrier services for packet and circuit switching; teleservices, including telephone and data transmission with a capacity of 64 kbits, voice transmission, videotext, telex text transmission and high speed facsimile;

telex and fax combinations on one terminal; telemetering, videoconferences, etc. ISDN will permit handling of these services with one network in order for users to access all services. In its first phase, this project will be developed with a selected group of firms and utilize the existing fiber optic network. The integrated digital network (IDN) began operating in 1991, and provides companies and institutions with point to point and switching signals for voice, data, text and image.

4. MEXICO'S TELECOMMUNICATIONS INFRASTRUCTURE

The infrastructure supporting the National Telecommunications Network is comprised of the following networks:

- Federal Microwave Network
- Network of Stations for Spatial Communications
- Marine Radio-communication Network
- National Radio-monitoring and Measuring Network
- TELMEX Microwave Network

Cable and carrying circuits: In 1991, Mexico has 89,900 kms of carrying cable, 195 centers of carrying currents and 9044 installed telegraph channels. The fiber optic network, which consisted of 240 kms of cables in 1989, is being extended by 13,500 kms.

There are 17 ionospheric radio stations, through which 6,391 radio-telegraphic messages and 38,404 radiotelephonic messages were transmitted in 1991. This system is falling into disuse as telephone communications have become more widespread.

The Federal Microwave Network consists of 16,500 kms of simple length and 105,400 kms-R.F.channel of developed length, 111 terminal stations and 223 repeating stations. The microwave network provides channels between centers and national and international locations. The total network consists of two branches, one run by SCT and one by TELMEX. The latter covers 70% of the total telephone network. The present systems use RF semiconductor technology, however, the network is being modernized through installation of digital linkages.

In 1985, Mexico established the Morelos Satellite System (MSS), which has greatly expanded the telecommunications sector, enabling the provision of countrywide commercial and educational TV and radio broadcasting, an increase in data and voice traffic, the establishment of private networks and the introduction of several new products and services.

The MSS consists of two geosynchronous satellites, Morelos I and II, launched in June and November 1985 respectively. Both satellites are identical. They each have 22 transponders, and use two frequency bands (C or 6/4 GHZ and KU or 14/12 GHZ). In the C-band, each satellite has 12 transponders with a 36 MHz width and

six with 72 MHz; in the KU-band each has 4 transponders of 108 MHz. A 36 MHz transponder has the capacity for up to 900 telephone channels, two TV channels, or data transmissions of up to 60 million bits per second.

Morelos II began operating in 1989, and will operate in conjunction with Morelos I for six years and alone for another five years, expanding the system's service life to 1999. The major function of Morelos II will be to insure continuing TV, radio, telephone and data transmission services in case of a failure of Morelos I, until it eventually replaces Morelos I. In order to control the position and orientation of each satellite, SCT constructed the Contel Ixtapalapa, a tracking, telemetry and command station.

In 1988, the utilization of the Morelos Satellite System was estimated at 60%: 21% for television signal transmission, 15% for telephone transmission, 13% for special television program transmission, 8% for voice and data transmission and 3% for other uses. By 1994, the capacity used is expected to increase to 80-90% on Morelos I and 60% on Morelos II.

At the end of 1990, bids were opened for the construction of the new Mexican satellite system called Solidaridad, consisting of two satellites: Solidaridad I and II. This contract was won by Hughes Communications International and Arianespace from France won the bid for the installation of the system, which is to take place between 1993 and 1994. Additionally, an alternate control center is to be installed in Hermosillo, Sonora.

The Morelos Satellite System is presently operating with twelve international earth stations and 252 local earth stations. There is at present an installed capacity for 803 telephone circuits, 540 telex circuits and five video channels; 26 countries are telephonically linked and 17 linked through telex to Mexico through satellite communications.

There are also 490 private earth stations, of which 270 are transmitter-receivers for voice and data transmission on the KU band, used mainly for private networks; 150 for radio; 50 for one-directional data transmission and 20 for TV broadcasting. The number of public and private earth stations in Mexico is always growing. The Secretariat of Public Education alone plans to install 500 earth stations in rural areas for use in providing secondary school education classes through television broadcasting.

The rural telephony program of SCT operates with a network of 27 earth stations. Voice and data transmission services are given through SCT earth stations as well as through private stations authorized by SCT. Additionally, the INFOSAT service transmits data to various cities in Mexico using 55 earth stations. Radio broadcasting is also done through the MSS.

Among the most important users of the MSS are TELMEX, PEMEX, the Federal Electricity Commission, the public health and education institutions, banks and financial services institutions, the army and the navy.

National telex network: SCT provides telex service to 128 locations connected to the network by 79 telex centers. The network size in 1991 is of 24,185 telex user lines and has shown a gradual reduction, in particular due to the impressive growth of fax communications. The telex centers are electronic. The actual network configuration is centered around the cities of Mexico City, Monterrey, Hermosillo, Guadalajara and Coatzacoalcos.

Data Communications: The data communications network consists of 1,126 private systems with 35,600 terminals, 13,400 modems and 27 connected cities. The public network has eight public data communications systems with 1716 terminals and 1055 users. There are approximately 63,000 private lines in use, of which 50% are in Mexico City and 3,600 of which are interurban. Additionally, 4,200 lines are used exclusively for data transmission. Data transmission is done primarily using private lines and analog long distance circuits.

Since 1981, SCT has operated the National Data Transmission Network (TELEPAC), which employs packet switching technology introduced by GTE Telenet. At present, it covers 25 cities with a capacity of 1,152 installed ports. In its final stage it will cover 55 cities with 1,734 ports. Four links are presently used for data transmission in the country, all supported by voice circuits. Computer access is obtained by dialing a telephone number and establishing a physical connection for the time the communication is made. The public network offers 59 urban access lines; Infonet has 32 access lines to users switched to its concentrating office. PEMEX is the most important user of this system, which is connected to several computer networks throughout the world, including Tymnet and Telenet in the U.S. and Datatex-P, Transpac, Itapac and Iberopac in Europe. Increasingly the maquiladora industry is a major user of this system.

Development of a good data communications network will make it possible to organize vast amounts of information, store it in places other than where it is used, and provide it to a multitude of end users at a reasonable price. Services arising from the network include data consulting, teletext and videotext, access to computer networks, teleconferences, electronic mail and interactive games.

Telephone: Public telephone service is provided by TELMEX. There are almost eleven million apparatus in operation, of which 95% have automatic service, and over six million connected telephone lines. Telephone penetration has increased an average of 8% per year since 1980, when there were five million apparatus and 2.5

million lines. Over 13,000 towns and villages are linked by over 30 million kms of long distance lines in a microwave network covering most of the country. Additionally, 13,500 villages are serviced by rural telephones. The number of telephone calls made in 1991 is estimated at 5.5 billion urban calls, 1,049 million national long distance calls and 204 million international calls.

Telegraph services are provided by National Telegraphs (TELENALES), a state-owned corporation operated by SCT through TELECOMM. TELENALES operates out of 2,613 offices nationally and uses the installations of TELMEX and SCT, as well as its own lines. In 1991, 25 million domestic telegrams and 9.4 million domestic telegraphic payment orders were sent. The national telegraph service has 64.3 million beneficiaries in 2,343 towns. Internationally, 250,000 messages and 1.7 million payment orders were sent to 195 countries in 1991. In December 1987, TELENALES inaugurated facsimile and girofax services. The new fax service enables users to send copies of all types of documents to Mexico's major cities and should reduce the demand for telegraphic services.

In the area of television broadcasting, there are 575 TV channels (249 under concession, 297 under permit, 27 complementary and two owned by the government). Local TV stations are owned either by Televisa, some other private company, or by Imevisión, a state-owned company. Cable TV has increased significantly in the last five years. In Mexico City alone, where most of the broadcasting is concentrated, there are 16 TV stations, of which four belong to Televisa, four to Imevisión and eight to Cablevision (channels from the U.S).

In September 1989, a group of Mexican business people launched a new TV network called MVS-Multivisión, that offers eight channels to paying viewers and two channels to cable subscribers in rural areas. The network is transmitted on super-UHF, or microwave, and subscribers receive the signal via a special antenna fitted with a receiver and decoder. Two of the channels are transmitted through the Morelos Satellite System and distributed to some 400,000 cable subscribers in the country. Most cable TV is concentrated in only six cities: Mexico City, Toluca, León, Monclova, Uruapan and Zamora. On the other hand, Monterrey and Guadalajara, the two largest cities after Mexico, have less subscribers to cable TV because of the wide use of satellite dishes.

In 1991, there were 1033 radio stations in Mexico as follows:

	COMMERCIAL (under concession)	CULTURAL (under permit)
AM	684	45
FM	242	40
SHORTWAVE	11	11
TOTAL	937	96

Approximately 60% belong to the government.

Paging services are presently not very common in Mexico. Nevertheless, several Mexican companies are involved in this market, which has attracted the attention of new suppliers. There are three major providers of these services in Mexico: Servicios Modernos, which has been in the market 37 years and has some 10,000 subscribers in the Mexico City area; Radio Beep, which was established in 1974 and has some 6,000 subscribers; and Enlaces Radiofónicos, which services 18,000 subscribers through its six subsidiaries.

5. MARKET ASSESSMENT

The Mexican market for telecommunications related equipment, including telephone, telex, telegraph, radio, video and TV broadcasting, transmission and data communication equipment, was valued at \$557.5 million in 1989 and increased 48.5% to \$828.2 million in 1990 (see Table 1). Between 1990 and 1994, total apparent consumption is expected to increase at an average annual rate of twelve percent per year, rising to \$1,303.2 million the latter year.

TABLE 1
THE MEXICAN MARKET FOR TELECOMMUNICATIONS EQUIPMENT
(U.S. \$ million)

	1985	1986	1987	1988	1989	1990	1994 ^P
Production (1)	425.2	610.8	367.0	389.7	396.2	435.8	614.8
+ Imports (2)	110.8	146.9	85.1	129.7	167.2	397.7	695.6
- Exports (2)	3.4	5.1	5.4	5.8	5.9	5.3	7.2
=TOTAL	532.6	752.6	446.7	513.6	557.5	828.2	1,303.2

Source: (1) Based on data by CANIECE

(2) Import-Export data by Secretaría de Comercio y Fomento Industrial (SECOFI)

In 1985, total apparent consumption of telecommunications equipment was \$532.6 million. In 1986, demand increased 41% as a result of major one-time investments in conjunction with the launching of the Morelos Satellite System, the 1986 World Soccer Tournament and the major repairs to the telephone system after the 1985 earthquake. In 1987, the market decreased by 40%, to its normal level, and resumed a healthy growth rate of 12% in 1988 and 8.5% in 1989, reaching \$557.5 million. As a result of the privatization of TELMEX and major investments in radio and TV communications, apparent consumption grew 48.5% and reached an all time high of \$828.2 million. During the next four years, the telecommunications market is expected to grow rapidly as a result

of the ambitious investment program of TELMEX, the liberalization of the telecommunications sector, and the increased demand for access to the latest technology as Mexican firms become more internationally oriented, reaching a total of \$1.3 billion by 1994.

5.1 IMPORTS

The relative participation of imports in the apparent consumption of telecommunications equipment has increased gradually in the last few years. The import share of the market increased from 10% in 1984 to 20.8% in 1985 and 19.5% in 1986, as a result of increased investments in conjunction with the 1986 World Soccer Cup, the reconstruction of the telephone system, the digitalization of Mexico's telephone system and continuing investments that resulted from the increased capacity made available by the Morelos Satellite System.

In 1987 the import share of the market remained constant. However, it increased again to 25.3% in 1988, 30% in 1989 and 48% in 1990, as a result of the reduction in import duties and the elimination of the prior import permit requirements for telecommunications equipment, followed by the major investments made by TELMEX and TELECOMM which the domestic industry has not been able to supply. Imports will continue to play an important role in the Mexican market, within the new regulatory environment, particularly in telephone and high technology areas such as satellite communications, fiber optics, data communications, cellular telephones and TV and broadcasting equipment. By 1994, imports are expected to represent 53% of total demand, or \$695.6 million.

The following table shows imports by category between 1988 and 1990.

TABLE 2
MEXICAN IMPORTS OF TELECOMMUNICATIONS EQUIPMENT AND PARTS
(U.S. \$000)

CATEGORY	1988	1989	1990
TELEPHONE EQUIPMENT			
Telephone sets	8,611.6	14,959.7	93,921.9
Teleprinters	946.9	574.9	409.6
Switching apparatus	16,225.7	11,387.2	25,897.3
Fax	22,300.7	37,562.1	30,548.1
Answering machines	271.5	659.5	1,375.7
Other telephone eq.	6,309.1	8,899.4	24,184.5
Telegraph eq.	1,290.1	39.8	189.5
TOTAL TELEPHONE EQ.	55,955.6	74,082.6	176,526.6
COMMUNICATIONS EQUIPMENT			

AT&T (USA)	MCI
Bull (France)	NEC (Japan)
CGE (France)	Northern Telecom (Canada)
Ericsson (Sweden)	Philips (Holland)
Fujitsu (Japan)	Siemens (FRG)
Hitachi (Japan)	U.S. Sprint
IBM (USA)	

Best sales prospects for Canadian suppliers of telecommunications equipment include the following: telephone switching equipment, PBXs, data transmission equipment, customer premise equipment, private networks, fiber optics, satellite support services and equipment, cellular telephone systems, digital switches, TV and broadcasting equipment, new test and maintenance products, and possibly in the future value added services.

5.2 DOMESTIC PRODUCTION

As a result of economic pressures and political considerations, domestic production has played a very important role in this market. In 1986, domestic production, estimated at \$610 million, reached an all time high in response to a surge in demand, while at the same time imports were limited by import permit requirements and/or high import tariffs. After that, it decreased significantly to \$367 million and has kept growing at an average annual rate of 6%, reaching \$435.8 million in 1990.

The Mexican telecommunications industry employs approximately 11,000 people. For several years, domestic production accounted for an average 80% of the country's apparent consumption of telecommunications equipment. However, as a result of Mexico's trade liberalization policies and major new investments, its share decreased to 70% in 1989 and further to 52% in 1990. This trend is expected to continue in the coming years, and it is expected that the participation of local production in total apparent consumption will drop to approximately 48% by 1994.

The predominance of locally manufactured products is particularly noticeable in the area of telephone equipment, which accounts for 65% of total production of telecommunications equipment in Mexico. Mexico has a well developed telecommunications equipment manufacturing industry, mostly based on multinational firms, such as Ericsson and Indetel/Alcatel. These firms have done well in the past and established a major presence in Mexico by installing production facilities in the country. This has been viewed favorably by Mexican authorities.

Telephone

Until recently, all single line telephones in Mexico were produced by Indetel or Ericsson and then distributed by TELMEX. These two companies still dominate the market for central switching systems, but PBX and other telephones are now supplied

by local as well as foreign firms. Conmutel, General de Telecomunicaciones (GTE), Grupo Setel, Industria de Telecomunicaciones (Indetel), Industrias Retsa, Manufactura de Telecomunicaciones, Materiales de Telecomunicación, Mitel, Nacional de Telecomunicaciones, Phone System, Rolm, Standard Eléctrica, Tele-Team de México, Telecomunicaciones y Sistemas Profesionales, Telettra, Telefonía y Conmutación Digital and Teleindustrias Ericsson produce telephone and switching equipment in Mexico, and install and service the apparatus.

Presently installed central office switches are roughly 60% Ericsson, and 40% Indetel. AT&T, a recent arrival on the market, recently won a contract to provide central office switches. The inventory of central office switches is still heavily analog, but new installations are mostly digital.

Ericsson is 70% owned the Swedish corporation and 30% by Mexican investors through the stock exchange. Ericsson plans to invest \$25 million between 1989 and 1990 in order to increase its annual production capacity to one million lines, mostly to supply equipment needed for the overlay network. During 1989 and 1990 Ericsson is expecting to supply 400,000 new lines to TELMEX.

Indetel-Alcatel, a joint venture with ITT and Alcatel of France, has been in Mexico for 30 years and employs some 3,000 people. It is the principal public network supplier, having supplied over two million lines, and is a major supplier of fiber optics and digital equipment.

Between 1990 and 1994, the demand generated by TELMEX is expected to increase by 12%. Private sector demand for switching equipment is also expected to increase 10-15%, as a result of a need to substitute old and obsolete equipment as well as to expand their technological capacity.

Telex and Facsimile

In the area of telex equipment, a relatively recent change in government policy has allowed end users to buy or lease teleprinting equipment directly from approved suppliers instead of having to lease it from the Government. This has broken the monopoly previously held by Siemens (West Germany) and allowed the entry of other suppliers, such as the Mexican manufacturers Comutex, Telectra and Termidata Mexicana. This offers increased opportunities for Canadian companies. However, facsimiles are rapidly substituting telexes and the Mexican telex market is expected to decrease in size in the years to come. Fax sales have increased dramatically, from only \$1.2 million in 1986 to roughly \$50 million in 1990. Among the largest suppliers of fax equipment in Mexico are Canon, Xerox, Toshiba, Murata, NEC and Sharp.

Transmission equipment

Total demand for transmission equipment for microwave, optic fiber, multiplexors and satellite transmission is expected to increase eight percent annually between 1990 and 1995 as a result of increased investments in the telephone and data communications sectors, as well as in heavy end user sectors.

The domestic production of transmission equipment covers approximately 70% of total demand. Mexico is practically self-sufficient in the area of coaxial cable, presently supplied by Conductores Monterrey, Conductores Guadalajara, Latincasa and Condumex.

Latincasa was established in 1949 and currently produces and distributes telephone cable (56% of total sales), fiber optic cable (3%), electric commercial cables (21%), power cable (14%), magnetic cable (6%) and other related products.

Condumex also produces fiber optic cables for domestic consumption. Condumex has the capacity to produce 60 kilometers (kms) of fiber optic cable a month. Approximately half of this capacity is utilized. 85% of Condumex cable is sold to TELMEX. According to a market research study prepared by Condumex, there are some 450 private companies in Mexico that are potential buyers of light guides for data transmission. The high purity glass filament, which is the core of the optic fiber, representing 60% of the cable's cost, is imported. The remainder is made of locally produced materials.

Video and broadcasting equipment

Local production of video and broadcasting equipment accounts for 20% of total apparent consumption. In the area of mobile radio, local production has grown significantly in the last few years. Companies registered for the production of broadcasting equipment in Mexico include: Enlaces Radiofónicos, General de Radio, Industrias Sintronic, Intec de México, K.G. Comunicación, Macromex, MBO Especialidades Electromecánicas, Motorola, NEC, Tecnología Eléctrica y en Comunicaciones, Tele Electrónica Japonesa, Telectra and Teleitra.

There were some 20 producers of parabolic antennae in Mexico, located in Mexico City, Monterrey, Guadalajara, San Luis Potosí and Mérida, producing an estimated 3,000 antennae annually. Those registered with Secofi are Diseños Electromecánicos, Empresas JL and Lehmex. They all need imported electronics.

Data communications services

This area is considered one of the most important potential growth areas in the telecommunications market, involving simultaneously the computer market and the telecommunications market. This sector is expected to experience the highest growth

rate in the telecommunications industry over next five years; it is expected to grow at a rate of 15% annually. At present, most of the technology in this area is imported, except for some modems, which are made in Mexico. The maquiladora industry has the greatest need and is an excellent market for data communications equipment and services.

6. END USERS

The most important users of telecommunications equipment are two Mexican government agencies: TELMEX, the national telephone company, and Telecomunicaciones de México (TELECOMM), which is part of SCT. These two entities dominate the purchases of telephone, telex and telegraph equipment. It is estimated that approximately 60% of total sales in the telecommunications market are to private companies, now including TELMEX and reprivatized banks, while the rest is sold to state-owned companies.

Other major end users are PEMEX, the state-owned oil company; the Federal Electricity Commission (CFE), the state-owned electric power company; the banking system; the maquiladora industry; the Social Security System; the Secretariat of Defense; Televisa and Imevisión, the two major TV networks; radio broadcasting companies; CONASUPO, the government-owned food purchasing and distributing company; the national railway; Metro and air traffic control systems; and educational institutions.

Some of the most promising applications for telecommunications are in the following areas:

Petroleum industry: PEMEX controls exploration, production, distribution and commercialization of oil, gas, petroleum products and petrochemicals. It has offices and plants throughout Mexico. Telecommunications provide increased efficiency through voice and data circuits which link the central administration with rigs, wells, exploration teams, as well as with all potential buyers in the world.

Electricity: The Federal Electricity Commission (CFE) is responsible for generating and distributing energy to all of Mexico. CFE uses the MSS to monitor and control the operation of its generators and its distribution stations, to synchronize generating power units with its distribution network, and to cover countrywide management, engineering and operation requirements.

Banking and Financial Institutions: Mexico's banking system, now in the process of being resold to private investors, includes six banks operating on a national basis, eight on a multiregional basis and six on a regional basis. The most important ones are Bancomer, Banamex, Banca Serfín, Banca Confía, Banco del Atlántico, Multibanco Comermex, Banca Cremi, Multibanco Mercantil de México, in addition to the government owned development banks.

Banks require telecommunications to operate transactions between the main office and its branches; maintain security, precision and confidentiality requirements; to operate private networks within one bank and to link up to other institutions; to utilize integrated services such as fax, teleconferencing, electronic mail, electronic funds transfer, etc.; access to networks to link up users to the bank network; and automatic cashiers. Banks basically use five telecommunications services for data transmission: private lines, the switched telephone network, private long distance circuits, the public packet switching network Telepac and the Morelos Satellite System.

Maquiladora Industry: This industry, together with industrial parks, are priorities for network expansion. There is a great demand for telecommunications services in order to communicate between the U.S. and foreign-based parents and the assembly plants located in Mexico. These include regular telephone service, private lines for transmission of digital data and voice, facilities for high speed digital and special applications.

Social Security: The Mexican Institute for Social Security (IMSS) operates over 2,200 rural clinics without communications. The MSS enables this and other health organizations to operate more effectively by providing voice and data networks. These are greatly needed to keep track of patients, order medicines, consult specialists, and to check availability of beds and facilities.

Food Distribution: CONASUPO is the most important purchaser and distributor of agricultural and other food products. It operates an extensive chain of stores, of which some 2,500 are located in rural areas with no communications. Voice and data circuits are needed to coordinate acquisitions and sales, to ascertain what and when products are purchased and at what prices, and in general, to supervise inventories throughout the country through a central office. Even though CONASUPO already coordinates this information through mainframe computers, it needs telecommunications circuits to access the computer from all locations. The National Consumer Institute handles updated information on prices and quality of a great variety of products and uses this to provide support to individual buyers.

Education: Schools and universities could be linked for library and bibliographical information, research projects, student exchanges and administrative controls, among others, not to mention video programs on the Morelos Satellite.

Listed below are the present users of private networks through the MSS by sector:

Education: Monterrey Technological Institute and UNAM;
Corporations and Services: Black & Decker, Cementos Cruz Azul, Cemex, Chrysler, Industrias Axa, Industrias Resistol, Mexhon,

Pyosa, Redsat, S. Comerciales Benavides, Sersa, Stars, Tamsa, Telenales and Televisa;

Banks: Banamex, Banca Serfín, Banco del Atlántico, Banco Internacional and Bancomer;

Financial services: Casa de Bolsa Abaco, Casa de Bolsa Arka, Casa de Bolsa Invermex, Casa de Bolsa Multivalores, Casa de Bolsa Vector, Inverlat, Operadora de Bolsa, Probursa, Seguros América and Valores Finamex;

News: Editora El Sol, El Financiero and El Nacional.

Additionally, companies using the SCT satellite infrastructure include Notimex, Banco de México, Associated Press and the following radio chains: OIR, RASA, Radio Impulsora de la Provincia, El Heraldó, Radio Centro, Radio Programas de México, Estereo Rey, Núcleo Radio Mil and Grupo ACIR.

7. MARKET ACCESS

As a result of Mexico's accession to GATT, the Mexican government has gradually opened the economy to international markets. Tariffs have been lowered from a maximum 100% in 1983, to 20% since December, 1988. The official price system has been totally eliminated and import permits are required on only 198 of the total 11,812 items in the Mexican Harmonized Tariff System.

The import climate for telecommunications equipment has improved significantly as a result of this commercial liberalization. Maximum duty rates have been reduced to 20% and prior import permits are only required on imports of parts for switchboards and modems. Therefore, imports of telecommunications equipment are subject to an ad valorem duty of maximum 20% assessed on the invoice value. In addition, a customs processing fee of 0.8% is assessed on the invoice value. A 10% value added tax (recently reduced from 15%) is then assessed on the cumulative value of both taxes in addition to the invoice value. Some manufacturers who use imported inputs for their products under a Mexican Government approved manufacturing plan may have the duty and/or VAT waived or rebated. Raw materials, intermediates and machinery for use in manufacturing or assembling products for export are generally eligible to be imported either duty free or under bond. Telecommunications equipment imported into Mexico needs to follow international standards and often requires a special homologation permit from SCT to be sold in Mexico. Mexico has employed predominantly European telecommunication standards (CCITT). Further information can be obtained from Mexican customs brokers or directly from Mexican Customs.

Formerly, in order to bid on tenders and sell to a government agency or decentralized company, foreign manufacturers required having a local resident agent and to have the foreign supplier registered and accepted by the Secretariat of Planning and Budgeting (Secretaría de Programación y Presupuesto - SPP). As of July 1991, the above requirement for prior registration with SPP has been eliminated.

APPENDIX II

The new procedures now in force require the foreign supplier to have a local agent or representative and it has to be registered through his local representative as an accepted supplier with each government ministry and/or decentralized agency according to the international tender requirements under review.

International tenders financed by the World Bank or the International Development Bank are open to all member countries of these institutions. More recently, the World Bank, where its credits are involved, has required that bid documents should also include an affidavit confirming that the Canadian company is a bona fide Canadian company with an official residence in Canada and that Canada is recognized as a contributing member to the World Bank.

There are no official metric requirements applicable to imports into Mexico. However, since the metric system of units is, by law, the official standard of weights and measures in Mexico, importers will usually require metric labeling for packaged goods, although the English system is also used. Dual labeling is acceptable. Imported products should be labeled in Spanish containing the following information: name of the product, trade name and address of the manufacturer, net contents, serial number of equipment, date of manufacture, electrical specifications, precautionary information on dangerous products, instructions for use, handling and/or product conservation and mandatory standards. Mexico adheres to the International System of Units (SI). Electric power is 60 cycles with normal voltage being 110, 220 and 400. Three phase and single phase 230 volt current is also available.

Prepared by:
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**APPENDIX I:
INDUSTRIAL CHAMBERS AND ASSOCIATIONS**

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**APPENDIX II:
USEFUL MEXICAN GOVERNMENT MINISTRIES**

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Director General de Fomento de las
Telecomunicaciones e Informática
Av. San Francisco 1626 - Piso 7
Col. del Valle
03100 México D.F.
Phone: 534-19-79 534-19-44

Dr. Alejandro López Toledo
Director General de Políticas
y Normas de Comunicaciones
Av. Eje Central Lázaro Cárdenas 567
Torre Central de Telecomunicaciones
Anexo B - Piso 2
Col. Narvarte
03028 México D.F.
Phone: 519-22-56 519-19-93

Lic. Héctor Ruiz Bouchot
Director General de Recursos Financieros
Dr. José María Vértiz 800 - Piso 6
Col. Narvarte
03020 México D.F.
Phone: 579-60-66 590-27-89

Col. Polanco - Reforma
11550 México D.F.
Phone: 522-22-21 519-5210-052
Fax: 545-55-67
Contact: Sr. María del Carmen Martínez
Presidenta

CAMARA NACIONAL DE LA INDUSTRIA
DE TELEVISION POR CABLE (CANICAT)
KESMACH Y TVINDUSTRI CHAMBER
Monte Albalá 192
Col. Narvarte
03020 México D.F.
Phone: 682-01-73 519-0825-282
Fax: 682-08-81
Contact: Lic. Miguel Villaseñor Mirasol y otros
Directores de Recursos Materiales

Ing. Virgilio Suelo Martínez
Director General de Construcción y
Conservación de Obras Públicas
Av. Cuauhtémoc 814 - Piso 5
Col. Narvarte
03020 México D.F.
Phone: 520-62-70 520-51-52

Ing. Francisco J. Jaulfred Mercado
Director General de Fomento de las
Telecomunicaciones e Informáticas
Av. San Francisco 1526 - Piso 7
Col. del Valle
03100 México D.F.
Phone: 524-19-75 524-19-44

**APPENDIX III:
MAJOR BUYERS AND DECENTRALIZED AGENCIES**

TELECOMUNICACIONES DE MEXICO (SCT)
Eje Central Av. Lázaro Cárdenas 567
Col. Narvarte
03020 México D.F.
Phone: 519-91-61 519-09-08
Fax: 559-98-12

C.P. Carlos Lara Sumano
Director General
Ala Norte Piso 11
Phone: 519-40-49 530-34-92

Ing. Juan Manuel Zamudio
Subdirector de Sistemas
Satelitales
Ala Norte - Piso 9
Phone: 519-63-43 530-30-60

Ing. Carlos Hernández Ojeda
Subdirector de Sistemas de
Microondas
Ala Norte - Piso 6
Phone: 530-24-31

TELEFONOS DE MEXICO S.A. DE C.V..
Parque Vía 198
Col. Cuauhtémoc
06599 México D.F.
Phone: 222-12-12

Lic. Juan Antonio Simón
Director General
Phone: 222-12-12

Arq. Pedro Cerisola
Director de Operaciones
Phone: 222-14-96

MITEL DE MEXICO, S.A. DE C.V. (MITEL) (SCT)
Av. Oleoducto 2810
Col. Parque Industrial El Alamo
44490 Guadalajara, Jal.
Apdo. Postal: 91081
Phone: 39-75-20
Fax: 35-56-11

Sr. Peter Conlon
Director General
Phone: 39-75-20 39-74-41

Ing. Miguel Angel Romera Herrera
Director de Operaciones
Phone: 39-75-20

PETROLEOS MEXICANOS (PEMEX) (SEMIP)

Av. Marina Nacional 329
Col. Huasteca
11311 México D.F.
Phone: 250-26-11 254-20-44
Fax: 254-45-29

C.P. Francisco Rojas Gutiérrez
Director General
Torre Ejecutiva - Piso 44
Phone: 250-34-57 250-10-55

Lic. Víctor M. Montañez Morfín
Secretario Particular
Torre Ejecutiva - Piso 44
Phone: 250-34-57 250-10-55

Lic. Adrián Lajous Vargas
Subdirector de Planeación y
Coordinación
Torre Ejecutiva - Piso 36
Phone: 203-47-43 254-33-34

Ing. Alfonso Nava Jaimes
Gerente de Ingeniería de Telecomunicaciones
Phone: 531-61-90

COMISION FEDERAL DE ELECTRICIDAD (SEMIP)

Río Ródano 14
Col. Cuauhtémoc
06598 México D.F.
Phone: 553-71-33 536-64-00
Fax: 553-6424

Ing. Guillermo Guerrero Villalobos
Director General
Piso 7
Phone: 553-65-00

Ing. Andrés Moreno Fernández
Subdirector de Construcción
Piso 5
Phone: 286-69-43

Lic. José Luis García
Gerente de Abastecimientos
(Responsable de Adquisiciones)
Piso 7
Phone: 286-95-36 286-9556

COMPañIA DE LUZ Y FUERZA DEL CENTRO, S.A. (CFE) (SEMIP)
Melchor Ocampo 171
Col. Tlaxpana
11379 México D.F.
Phone: 518-00-80 hasta el 99
Fax: 591-10-11

Ing. Guillermo Guerrero Villalobos
Director General
Río Ródano 14 Piso 7
Col. Cuauhtémoc
06598 México D.F.
Phone: 553-64-00 553-65-00

Ing. Jorge Gutiérrez Vera
Subdirector General - Piso 8
Melchor Ocampo 171
Col. Tlaxpana
11379 México D.F.
Phone: 546-77-70 592-42-73

Ing. Celestino Cázares Lazcano
Gerente Administrativo
(Responsable de Adquisiciones)
Melchor Ocampo 171 - Piso 8
Col. Tlaxpana
11379 México D.F.
Phone: 546-79-58

BANCO NACIONAL DE MEXICO S.A. (BANAMEX)
Isabel la Católica 44
Col. Centro
06089 México D.F.
Phone: 709-09-20

Sr. Alfredo Harphelu
Presidente
Piso 1
Phone: 709-09-20 ext. 74623

Dr. Sergio Olivera Díaz
Comité de Dirección
Piso 1
Phone: 709-09-20 ext. 74492

Lic. Jaime Moreno Valle
Director de Productos Internacionales
Piso 1
Phone: 720-60-23 709-09-20

Ing. Mario Quijada Mendivil
Director de Sistemas
Barranca del Muerto 24 - Piso 10
Col. Guadalupe Inn
01020 México D.F.
Phone: 725-11-85 725-16-04

Ing. José Covarrubias Bravo
Director de Ingeniería de
Comunicaciones
Barranca del Muerto 24 - Piso 10 Sur
Col. Guadalupe Inn
01020 Mexico D.F.
Phone: 725-16-01 725-12-78

BANCOMER, S.A.
Av. Universidad 1200
Col. Xoco
03339 México D.F.
Phone: 534-00-34
Fax: 604-19-11
Telex: 1777629630 BCSAME

Lic. Héctor Hernández Cervantes
Director General
Piso 2
Phone: 621-33-01 621-33-02

C.P. Carlos Aguilar Villalobos
Director General Adjunto de
Finanzas y Apoyos Bancarios
Piso 2
Phone: 534-00-34 ext: 3388

Departamento de Telecomunicaciones
Phone: 621-65-20

NACIONAL FINANCIERA S.N.C. (SHCP)
Av. Insurgentes Sur 1971
Col. Guadalupe Inn
01020 México D.F.
Phone: 550-69-11

Lic. Oscar Espinosa Villareal

Director General

Torre 4r - Piso 13

Phone: 550-16-16

550-17-16

325-67-01

Fax: 550-31-32

Lic. Guillermo Guzmán González

Secretario Particular

Torre 4 - Piso 13

Phone: 550-37-66

550-59-70

Lic. Héctor Arangua Moral

Director Adjunto de Promoción y

Financiamiento

Torre 4 - Piso 13

Phone: 550-48-30

325-67-22

Lic. Gustavo Valdés Rojas

Jefe de la Unidad de Telecomunicaciones

Torre 3 - Piso 4

Phone: 325-62-00

COMPAÑIA NACIONAL DE SUBSISTENCIAS POPULARES (CONASUPO) (SCFI)

Av. Insurgentes Sur 489

Col. Hipódromo Condesa

06100 México D.F.

Phone: 271-10-00

271-11-31

Lic. Javier Bonilla García

Director General

Piso 4

Phone: 272-26-14

272-04-72

Lic. Agustín Vargas Durán

Director de Operaciones

Piso 9

Phone: 271-66-31

516-70-64

Sr. Juan Aguilera Aguilar

Jefe de Prensa y Difusión

Phone: 584-23-75

CONSEJO NACIONAL DE CIENCIA Y TECNOLOGIA (CONACYT) (SPP)

Circuito Cultural Universitario

Edificio Conacyt

Col. Cd. Universitaria

04515 México D.F.

Apdo. Postal: 20-003

Phone: 665-11-77

655-32-77

Fax: 655-39-06

Telex: 017-74-521

Dr. Fausto Alzati Araiza
Director General
Edificio A - Piso 3
Phone: 665-40-43 665-47-93

Lic. Luis F. Basteris Canton
Director Adjunto de Modernización Tecnológica
Edificio B - Piso 1
Phone: 665-11-77 ext. 3461

Act. Alfredo Phillips Grenne
Director de Asuntos Internacionales
Edificio A - Piso 2
Phone: 665-24-11 ext 2621

Ing. Sergio Flores Flores
Director del Centro de Cómputo
y Telecomunicaciones
Edificio A - Piso 1
Phone: 665-11-77 ext 1681

CANAL ONCE XEIPN TELEVISION (SEP)
Prolongación de Carpio 475
Col. Santo Tomás
11340 México D.F.
Phone: 396-81-77 341-34-09
Fax: 341-23-73

Lic. Alejandra Lajous Vargas
Director General
Phone: 396-81-77

Srta. Reyna Hernández
Secretaria Particular
Phone: 396-81-77 347-21-06

Ing. Oscar Baldenebro Salle
Coordinador de Desarrollo y
Mantenimiento Técnico
Phone: 347-87-10

Srta. Silvia Garduño
Jefe del Departamento de Compras
(Responsable de Adquisiciones)
Phone: 396-81-77

INSTITUTO MEXICANO DE LA RADIO (IMER)
Mayorazgo 83
Col. Xoco
03330 México D.F.
Phone: 604-74-47 604-72-07
Fax: 604-77-41

Lic. Alejandro Montaña Martínez
Director General
Phone: 604-80-49 604-80-61

Lic. Jaime González
Secretario Particular
Phone: 604-80-49

Lic. Jesús Ordáz H.
Subdirector de Radiodifusora
Margaritas 18
Col. Florida
01030 México D.F.
Phone: 534-38-10 524-17-58

Lic. Manuel Miranda
Director del Sistema Nacional de Noticiario
Phone: 524-54-41

KEEP RADIO EDUCACION (SEP)
Angel Urraza 622
Col. del Valle
03100 México D.F.
Phone: 575-65-66 559-61-69
Fax: 559-23-01

Lic. Luis Ernesto Pi Orozco
Director General
Phone: 575-65-66 559-61-69 ext 101 y 103

Lic. Adolfo Benítez Beltrán
Secretario Particular
Phone: 559-61-69 575-65-66 ext 102 y 104

C.P. Evangelina Montesinos
Jefe del Departamento de
Recursos Financieros
Phone: ext 250

Sr. Hugo Salgado Alvear
Jefe del Departamento
de Recursos Materiales
(Responsable de Adquisiciones)
Phone: ext 255 y 256

Ing. Fernando Ceballos Betancourt
Sub-Director de Apoyo Técnico
Phone: ext.203 y 204

**APPENDIX IV:
DISTRIBUTORS OF TELECOMMUNICATIONS EQUIPMENT**

AEROELECTRONICA, S.A. DE C.V.
Terminal Aviación General, Hangar 2, Zona C
Col. Federal
15620 México D.F.
Phone: 558-11-77 558-19-20
Fax: 763-13-65
Contact: Ernesto Sánchez Amaya
Director General

ANDREW CORPORATION
Homero 1804 - Piso 9
Col. Polanco
11510 México D.F.
Phone: 580-32-92 580-00-16
Fax: 395-87-22
Contact: Ing. Ramón G. Zamora
Director General

RADIO PRO S.A.
Manuel Ma. Contreras 104, Desp. 203
Col. San Rafael
06470 México D.F.
Phone: 566-05-38 705-44-11
Fax: 566-08-24
Contact: Ing. Alejandro Zendejas
Director General

AT & T INTERNATIONAL
Campos Eliseos 345 - PH 2
Col. Polanco
11560 México D.F.
Phone: 202-33-22
Fax: 202-31-51
Contact: Lic. Santiago Gutiérrez Fernández
Director General

INGENIERIA BRAMEX, S.A.
M. Villalongín 20-3
Col. Cuauhtémoc
06500 México D.F.
Phone: 546-61-70 397-49-61
Fax: 546-61-70
Contact: Ing. José de Moraes
Director General

DIGITRON, S.A. DE C.V.

Mariano Escobedo 375-1403
Col. Chapultepec Morales
11570 México D.F.

Phone: 250-02-22
Fax: 250-02-22
Contact: Oscar Rodríguez Téllez
Director General

ENSAMBLADORA DE ACUÑA S.A. DE C.V.

Atilano Barrera Poniente 490
Col. Benito Juárez
26200 Ciudad Acuña, Coah.

Phone: 2-16-34
Contact: Mario L. Bosquez O.
Gerente General

GENERAL DE RADIO, S.A. de C.V.

López 34
Col. Centro
06070 México D.F.

Phone: 521-23-78 512-51-47 518-62-99
Fax: 512-64-46
Contact: Ing. Manuel Cota Benoit
Presidente

G.S. COMUNICACIONES, S.A. DE C.V.

Saltillo 19 - Desp. 804
Col. Condesa
06140 México D.F.

Phone: 211-73-07 286-36-42 286-37-63
Fax: 211-73-07
Contact: Ing. Alejandro Cárdenas Huerta
Director General

GRUPO CONDUMEX S.A. DE C.V.

Paseo del Río 186
Col. Chimalistac San Angel
01070 México D.F.

Phone: 664-03-42 550-81-77 326-51-00
Fax: 550-47-75
Contact: Ing. Julio Gutiérrez Trujillo
Presidente y Director General

GRUPO CORPORATIVO J.L., S.A. DE C.V.

Orizaba 43
Col. Roma
06700 México D.F.

Phone: 525-70-36 533-46-80
Fax: 525-72-45
Contact: Ing. José L. González
Director General

GRUPO SIT, S.A. DE C.V.
Av. Lomas de Sotelo 1112 - Piso 2
Col. Loma Hermosa
11200 México D.F.
Phone: 395-24-77 395-87-88
Fax: 395-83-06
Contact: Sr. José Aviña
Director General

**IMPORTACION, CONSULTORIA Y
PRODUCCION, S.A. (ICP)**
Av. Universidad 771, Desp. 401
Col. del Valle
03100 México D.F.
Phone: 688-67-61 688-64-54
Fax: 688-59-39
Contact: Ing. D.R. A. Hendersón
Director General

**INDUSTRIAL Y COMERCIAL
ELECTRONICA, S.A. DE C.V.**
Presa Salinillas 370, Piso 1
Col. Loma Hermosa
11200 México D.F.
Phone: 395-73-77 395-75-51
Fax: 395-38-23
Contact: Sergio Acevedo Mora
Director Comercial

INFORMATICA Y TELECOMUNICACIONES, S.A. DE C.V.
Inglaterra 85
Col. Parque San Andrés Coyoacán
04040 México D.F.
Phone: 689-83-77
Fax: 689-21-62
Contact: Jesús Sotomayor
Presidente

MACROMEX, S.A. DE C.V.
Calle 3 No. 1075
Agua Prieta, Son.
Phone: 338-06-67
Contact: Ana Elva Cornejo
Director General

MAQUILA 2000, S.A. DE C.V.
5 de Febrero 2255
Col. Guerrero
88240 Nuevo Laredo, Tamps.
Phone: 5-03-11
Fax:
Contact: Rubén W. Martínez
Gerente General

MOTOROLA DE MEXICO, S.A.

Tonalá 59
Col. Roma
06700 México D.F.
Phone: 208-55-38 208-43-92
Fax: 525-13-71
Contact: Ing. José Baviera
Director General

NUCLEOELECTRONICA, S.A.

Calzada Las Aguilas 101
Col. Las Aguilas
01710 México D.F.
Phone: 593-63-22 593-60-43 593-60-22
Fax: 593-60-21
Contact: Ing. Manuel Diego
Director General

PLAMEX, S.A. de C.V.

Blvd. Agua Caliente 1601-19
Col. Centro Industrial Barranquitas
22400 Tijuana, B.C.N.
Phone: 81-71-44
Fax:
Contact: Salvador Pérez Ramos
Gerente General

PREFORMADOS DE MEXICO, S.A. DE C.V.

Poniente 140
Col. Industrial Vallejo
07720 México D.F.
Phone: 587-42-19
Fax: 587-43-08
Contact: Ing. José Monetti Calanche
Gerente General

PRODUCTOS LORAIN DE MEXICO, S.A. DE C.V.

Av. San Andrés Atoto 165-D
Col. San Esteban
53500 Naucalpan, Méx.
Apdo. Postal 77001.
Phone: 576-82-77
Fax: 576-86-57
Contact: Ing. Rafael Díez Gutiérrez
Director General

ROLM TELECOMUNICACIONES, S.A. DE C.V.

Bosque de Ciruelos 162
Col. Bosques de las Lomas
11700 México D.F.
Phone: 251-81-11 596-22-44
Fax: 251-80-08
Contact: C.P. Carlos A. Humphrey
Director General



**SISTEMAS DE INGENIERIA EN
ELECTRONICA DE MEXICO, S.A. DE C.V.**

Pichucalco 115
Col. Héroes de Padierna
14200 México D.F.
Phone: 645-45-16
Fax: 645-69-24
Contact: Ing. Antonio López Angeles
Presidente

**SISTEMAS Y SERVICIOS DE TELECOMUNICACIONES Y
ELECTRONICA, S.A. DE C.V.**

Miguel Serrano 21-Piso 8
Col. del Valle
03100 México D.F.
Phone: 559-36-66 575-52-57
Fax: 575-55-04
Contact: Ing. José R. Aguirre M.
Director General

DOCS

CA1 EA953 91M21 ENG

Verut, Caroline

Market study on telecommunications
equipment and systems in Mexico

43265833

