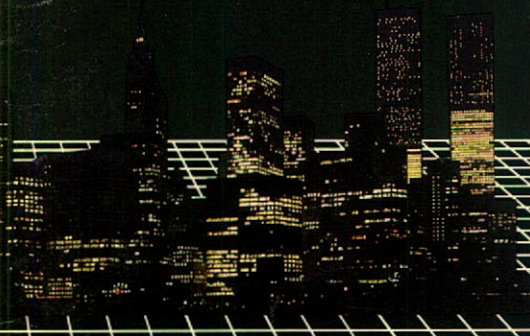


Annual Report  
1984

*C  
dup*



Innovating information  
networks



**nt** northern  
telecom

## **Northern Telecom Limited**

Northern Telecom Limited is the second largest designer and manufacturer of telecommunications equipment in North America. It is the world's largest supplier of fully digital telecommunications systems and is a significant supplier of integrated office systems. It operates 27 manufacturing plants in Canada, 15 in the United States, one each in the Republic of Ireland, Brazil, and the United Kingdom, and two in Malaysia. Research and development is conducted by 25 R&D centers located at these facilities and by Bell-Northern Research Ltd., a subsidiary, which operates six R&D facilities in Canada, and, together with affiliated companies, five in the United States and one in the United Kingdom.

## **Contents**

- 2 Letter to shareholders
- 5 Operations review
- 11 Officers and directors
- 12 Senior management of principal subsidiaries
- 14 Innovating information networks
- 25 Financial review
- 31 Financial statements
- 34 Notes to financial statements
- 42 Eleven-year review
- 44 Principal products

## **Form 10-K**

The Form 10-K annual report for 1984, as filed by the corporation with the Securities and Exchange Commission in Washington, D.C., is available to shareholders without charge upon request to Richard W. Wertheim, assistant vice-president, investor relations.

## **Investor information**

Investors desiring information about Northern Telecom's operations should write to the investor relations department at the corporation's executive offices, or telephone: (416) 275-0960.

## **Annual Meeting**

The annual meeting of shareholders will take place at 11:00 a.m., Thursday, April 25, 1985 in The Westin Hotel, Winnipeg, Manitoba.

## **Version française**

On peut obtenir la version française de ce rapport en écrivant à l'adresse suivante:  
Service des relations de l'entreprise  
Northern Telecom Limitée  
C.P. 458, succursale A  
Mississauga (Ontario)  
Canada L5A 3A2

## **Versión española**

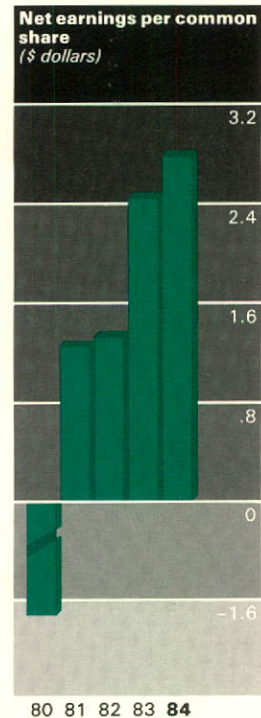
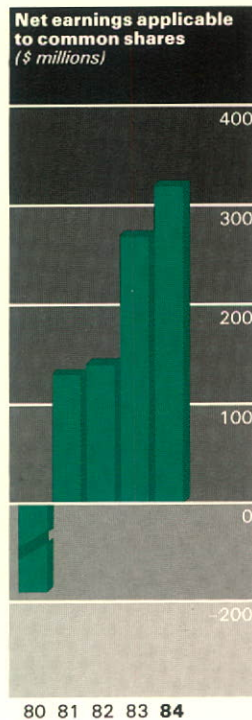
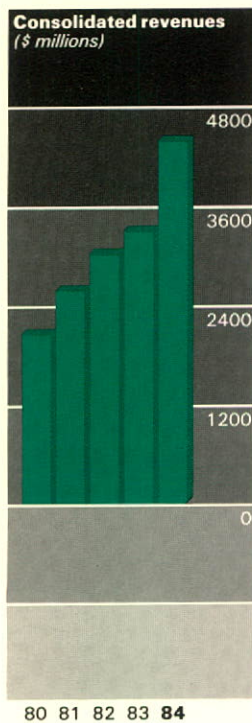
Puede obtenerse la versión española de este informe solicitándola al  
Corporate Relations Department  
Northern Telecom Limited  
P.O. Box 458, Station A  
Mississauga, Ontario  
Canada L5A 3A2

## **Cover**

*Northern Telecom designs, manufactures, and markets products and systems for private and public networks, facilitating communications of information within a building, across a city or continent, and around the world. "Innovating information networks," discusses Northern Telecom's OPEN World program for information management and communications.*

## Financial highlights

	1984	1983
Revenues	<b>\$4,378,606,000</b>	\$3,304,043,000
Net earnings applicable to common shares	<b>317,487,000</b>	268,410,000
Net earnings per common share	<b>2.76</b>	2.42
Dividends per common share	<b>0.40</b>	0.40
Common shareholders' equity	<b>1,822,040,000</b>	1,465,577,000
Working capital	<b>1,141,991,000</b>	701,480,000
Capital expenditures	<b>569,629,000</b>	376,905,000
Research and development expenditures (net)	<b>431,506,000</b>	324,824,000
Common shares outstanding (at December 31)	<b>115,560,532</b>	114,607,222
Common shares outstanding (average during year)	<b>115,000,454</b>	110,926,011
Common shareholders	<b>14,396</b>	13,536
Employees	<b>46,993</b>	39,318



## Letter to shareholders



*Custom very-large-scale integrated circuits (VLSIs) developed by Northern Telecom are key contributors to the cost-effectiveness and reliability of the corporation's fully digital DMS and SL families. New VLSIs have been developed as key components in evolving the DMS and SL families, and for the systems and terminals being introduced for the OPEN World. Bruce McCracken inspects the design for a new VLSI at a Bell-Northern Research laboratory near Ottawa.*

The past year, 1984, was marked by economic recovery in Northern Telecom's principal markets, particularly in North America.

It was a year when competition again increased in most of the corporation's product lines and markets. Nevertheless, Northern Telecom exceeded its growth targets and budgets, reporting record consolidated revenues, net earnings and earnings per common share, order input and yearend backlog. Our financing requirements exceeded expectations largely as a result of the higher than forecast growth in the business and increased level of investment needed to meet the demand for our products.

In the 1983 annual report, we stated: "our revenues growth target is to achieve a better than 25 percent increase to more than \$4 billion...Pre-tax earnings should grow somewhat faster than revenues, but earnings per share are expected to grow at a comparable rate, reflecting an anticipated increase in our corporate tax rate."

In fact, consolidated revenues in 1984 rose 32.5 percent to \$4.379 billion from \$3.304 billion in 1983. Pre-tax earnings rose 51 percent to \$491 million, compared with \$325.1 million in 1983. The corporate tax rate increased to 32 percent in 1984 compared with 30.1 percent in 1983, mainly reflecting increased earnings in the U.S. Net earnings (applicable to common shares) were \$317.5 million (\$2.76 per common share), up 39.8 percent from \$227.1 million (\$2.05 per common share) in 1983, before an extraordinary gain.

An extraordinary gain of \$41.3 million (\$0.37 per common share), brought 1983 net earnings to \$268.4 million (\$2.42 per common share). The extraordinary gain resulted from a reduction of income taxes arising from the use of a subsidiary company's prior years' tax losses, which were fully used in 1983.

Consolidated order input for the year amounted to \$4.903 billion, up 40.9 percent from the \$3.48 billion of orders received during 1983. The backlog of orders on hand at yearend was \$2.308 billion, 50.9 percent higher than the backlog of \$1.529 billion at yearend 1983. This level of orders to be filled gives us a solid start toward meeting our revenues and earnings targets for 1985, which we expect will be another record year for Northern Telecom.

### Digital leadership extended

Northern Telecom's leadership in developing, evolving, and marketing advanced digital telecommunications systems has been the single most significant factor in its growth since the corporation's announcement of the Digital World in 1976. Our leadership in digital telecommunications technology will continue to be the basis for our growth throughout this decade.

At yearend 1984, Northern Telecom had sold or on order fully digital DMS (Digital Multiplex Systems) switching and transmission equipment and SL PBXs (private branch exchanges) to serve the equivalent of 26.2 million lines in 67 countries. No company in the world can match this success and experience in developing and supplying fully digital telecommunications systems.

In November 1982, Northern Telecom announced its OPEN World program to address the need for improving the management of information. The corporation committed to the application of its expertise in digital communications, and the underlying key technologies of semiconductor integrated circuits and software, to evolve the DMS and SL families and to introduce new products and services for the OPEN (Open Protocol Enhanced Networks) World.

During 1984, Northern Telecom introduced many new capabilities for the DMS and SL families towards fulfilling commitments made for the OPEN World program. The corporation and its research and development subsidiary, Bell-Northern Research, made considerable progress in development programs for the introduction beginning in 1985 of major new products and services.

In February 1985, Northern Telecom hosted two major conferences for executives from organizations across North America and other countries. The corporation launched the Meridian line of products comprising the Meridian SL-1 and SL-100 Integrated Services Networks, including a local area network (LAN) capability, called LANSTAR, which will make it possible to transmit voice, data, graphics, and images within an organization over conventional telephone wires at the rate of 2.56 million bits of information per second. Previously installed SL PBXs can be upgraded to become Meridian SL-1 or SL-100 systems.

The corporation described the details of its plans to evolve and enrich the DMS Family to offer through the public telecommunications network equivalent capabil-

ities and services as those offered in private networks served by the Meridian SL-1 and SL-100 systems. Organizations can then choose the most attractive approach for them: their own private networks; using the public network capabilities provided by telecommunications companies; or a combination of both.

Northern Telecom also introduced the Meridian DV-1 Data Voice System, a data or integrated data and voice processing and communications system for organizations, departments, or branches of 5-to-100 people; families of digital integrated voice and data terminals; and a broad array of information services.

The corporation described its concept of a Dynamic Network Architecture for public telecommunications networks.

A Dynamic Network Architecture will increase the flexibility and capabilities of public communications networks to handle the new opportunities developing as a result of such trends as the growth in computing in homes, factories, offices, and other institutions. Implementation of a Dynamic Network Architecture will involve the further evolution of the DMS switching and transmission systems; new applications for fiber optics systems, and the development of other products and software.

A Dynamic Network Architecture will facilitate implementation of end-to-end digital communications, a concept that in the global telecommunications industry has been named the Integrated Services Digital Network (ISDN).

"Innovating information networks," beginning on page 14, describes the progress made in the OPEN World program during the past two years and the product introductions and commitments made at the conferences. This program represents a significant part of the corporation's business strategies.

Since Northern Telecom will be in an introductory phase for the new products in 1985, revenues from them will not be a significant factor in the year's performance. However, we expect they should favorably influence sales of the DMS and SL families. We expect that revenues from these new products and services will become increasingly significant in future years, contributing to Northern Telecom's achievement of its longer-term targets.

### Targets, strategies, outlook

In the 1983 annual report, we presented Northern Telecom's strategies and five-year growth targets. Reviewing the past year's performance against these, 1984 was a period of considerable progress.

As noted, the corporation exceeded its growth targets in revenues and earnings for the year. We are maintaining our target of achieving a 20 percent compound annual growth rate of revenues for the five-year period 1984-1988. We have set a target of 20-to-25 percent growth in revenues and net earnings per common share for 1985 and expect to well exceed the \$5 billion mark in revenues. Once again, pre-tax earnings should rise somewhat faster, but we expect a slightly higher tax rate due to higher earnings in the U.S. as a proportion of total results.

Consistent with the strategies disclosed, we maintained an approximately 10 percent rate of investment in research and development in 1984. The actual amount was \$431.5 million, (9.9 percent of consolidated revenues), up 32.9 percent from \$324.8 million in 1983. In 1985, we expect to invest about \$575 million in R&D, a 33.3 percent increase. In the five years 1985-1989, Northern Telecom expects to invest about \$4 billion in R&D, three times the \$1.32 billion invested in the past five years.

The level of capital investment for 1984 was increased from a planned \$500 million to \$569.6 million, up 51.1 percent from \$377 million invested in 1983. In part, this reflects a decision to pull forward some projects scheduled for 1985 to meet the higher than forecast demand for Northern Telecom's products. Capital spending in 1985 is expected to be about \$660 million.

The increased capital investment and higher than planned levels of working capital required to support the demand for Northern Telecom's products resulted in a requirement for additional funds during the year. The corporation for the first time issued preferred shares, comprising three separate issues amounting to a total of \$388 million.

The corporation's strong financial condition at yearend 1984 and earnings outlook for 1985 indicate reduced financing requirements. We will continue to consider favorable financing opportunities as they are identified. We do not expect at this time to issue common shares, except through employee savings plans and the Shareholder Dividend Reinvestment and Stock Purchase Plan.



*Meridian M3000 Touchphone offers a new concept in design and congeniality. The fully digital set provides control of all functions via a unique touch-sensitive liquid-crystal display and is programmed to guide people in the use of its integrated voice and data capabilities.*



Edmund B. Fitzgerald (left)  
and Walter F. Light

Including the preferred shares as debt (although they are legally regarded as equity), Northern Telecom maintained its total debt to total capitalization ratio at 25.4 percent, well below the 30 percent mark which we have stated is a comfortable level.

A highlight of 1984 was the first listing of the corporation's common shares on an exchange outside of North America. On June 4, Northern Telecom's shares began trading on The Stock Exchange in London, England. This listing was made as a further indication of our commitment to becoming a participant in, and contributor to, the U.K. telecommunications equipment market.

The dividend on common shares was maintained in 1984 at \$0.10 per common share each quarter, resulting in a decline in the payout ratio to 14.5 percent of trailing 12 months net earnings applicable to common shares. This was consistent with our stated intent to reinvest an increasing proportion of earnings to fund the growth in Northern Telecom's business. Nevertheless, the Board of Directors will continue to review the corporation's performance, outlook, and the dividend during 1985 to determine if an increase is desirable and appropriate.

In 1985, while we expect to achieve increases in the Canadian and international markets, the U.S. is likely to account for the most significant part of our growth.

Northern Telecom's performance in 1984 is reviewed in greater detail in the following "Operations review" and in the "Financial review" beginning on page 25.

While confident about the outlook for 1985, some concerns should be noted. First, by the end of February, most of our three-year labor agreements expire with 11 unions covering some 11,821 employees in Canada.

Second, we continue to watch closely the performance of the North American and international economies. So far, we see no signs in our business of a softening in demand.

Third, the level of competition continually increases. However, Northern Telecom is regarded as a leader in most of its product lines and major markets. We are committed to maintaining or extending that position. We believe the products and directions covered in the February conferences confirm this.

### Management and Board changes

During 1984, several changes occurred at senior executive and Board levels.

Walter F. Light, 61, who has served Northern Telecom, first as president from 1974 to 1979, then as president and chief executive officer (CEO), and since 1982 as CEO and chairman, announced he will take early retirement in 1985. Effective October 1, 1984, Edmund B. Fitzgerald, 59, president of Northern Telecom since 1982, assumed the additional position of CEO. Light remains chairman to help provide an effective transition of responsibilities until his retirement.

Effective February 15, 1985, Bruce H. Tavner, 47, was appointed managing director, Northern Telecom plc, London, England. Walter C. Benger, 58, formerly managing director, Northern Telecom plc, became its chairman while continuing as the corporation's executive vice-president, marketing. Tavner is responsible for all of the corporation's operations in the United Kingdom, the Near East, and Africa. As a vice-president of Northern Telecom Limited, Tavner is also responsible for the corporation's European subsidiary, Northern Telecom A.G., headquartered in Zurich, Switzerland, and Netas, a manufacturing and supply company in Turkey jointly owned with the Turkish Post, Telegraph and Telephone. Tavner was formerly chairman and CEO of Bell Canada International Inc., Ottawa, Ontario.

Three individuals joined Northern Telecom's Board of Directors: Owen B. Butler, 61, chairman of the Board of The Procter & Gamble Company, Cincinnati, Ohio; J.V. Raymond Cyr, 51, chairman, president and CEO of Bell Canada, Montreal, Quebec; and Robert J. Richardson, 56, president of Bell Canada Enterprises Inc., Montreal, Quebec.

Retiring from the Board of Directors in 1984, were: Clifford S. Malone, who served for seven years; William L. Naumann, a director for six years; and James C. Thackray, who served for 11 years. Their contributions are gratefully acknowledged.

Thanks are due to all 47,000 employees of Northern Telecom, who through their efforts brought success to the corporation in 1984, and a promising outlook for the future.

*Edmund B. Fitzgerald*

Edmund B. Fitzgerald  
President and Chief  
Executive Officer

*W. F. Light*

Walter F. Light  
Chairman

February 20, 1985

## Operations review

**C**ontinued growth in the U.S. led Northern Telecom's 32.5 percent increase in consolidated revenues in 1984. U.S. revenues rose 50.8 percent to \$2.799 billion (63.9 percent of total revenues), compared with \$1.856 billion in 1983 (56.2 percent of revenues). DMS switching revenues increased 77.3 percent in the U.S.; transmission was up 57.6 percent and SL PBXs (private branch exchanges) rose 43.2 percent.

In Canada, revenues rose 12.7 percent in 1984 to \$1.208 billion, or 27.6 percent of the total. This compares with Canadian revenues of \$1.072 billion the previous year (32.4 percent of consolidated revenues). This growth was, in part, attributable to improved capital spending by the telecommunications companies in Canada.

Due to the corporation's improved level of business in Canada and in international markets, supported by the Canadian and U.S. operating companies, employment rose 11.3 percent in Canada to 23,713 people.

The corporation's success in the U.S. results not only from market acceptance for its products, but from a commitment to, and investments made in, the country since the beginning of the 1970s. Northern Telecom is the second largest domestic manufacturer of telecommunications equipment in the U.S. with 15 manufacturing plants and 15 research and development laboratories in 11 states, and more than 100 major sales and service centers across the country. Employment in the U.S. at the end of 1984 had risen to 19,992 people, up 27.3 percent from the end of 1983.

The restructuring of the American Telephone and Telegraph Company (AT&T), effective at the start of 1984, was an event of profound historic significance not only in the United States; it potentially may influence telecommunications policies around the world. The restructuring created a period of turmoil and adjustment for telecommunications companies, their customers and suppliers, as well as significant opportunities. In an editorial near yearend, *Business Week* concluded that:

"Evidence on the breakup is still being presented, and it is adding up to a strong case that the overriding benefits of dismembering AT&T will soon start to outweigh the pain... Despite the ups and downs of the difficult transition, the invigorating climate of competition is speeding up fundamental technological innovation. This holds promise

not only of providing the American consumer with the world's most advanced telephone service but also of enabling U.S. industry to retain its world lead in the critically important telecommunications industry."

The 22 operating companies, divested by AT&T and grouped into seven publicly owned regional holding companies, moved swiftly with great enthusiasm, vigor, and aggressiveness to establish their independence and to broaden their businesses. True to their tradition of service and knowledge of their customers' needs, they accelerated capital spending for modernization of their networks, particularly through investments in digital switching and transmission systems.

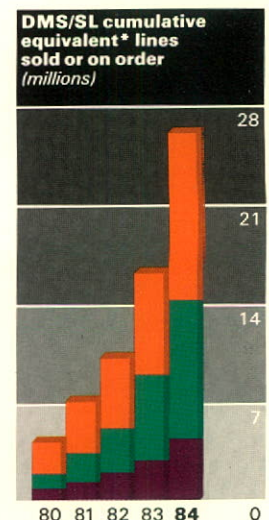
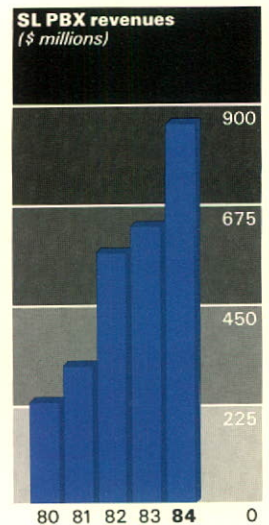
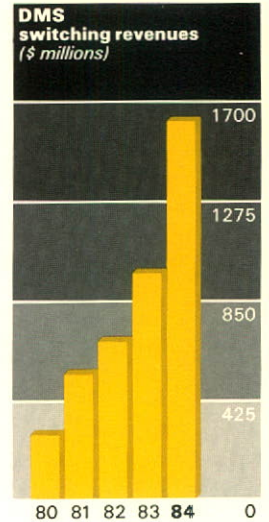
Following a strategy similar to that implemented in the U.S. nearly 15 years ago, Northern Telecom is increasing its investment in key international markets, taking a long-term and patient view towards achieving its goals. Northern Telecom increased its employment in international markets by 42.3 percent from the end of 1983 to 3,288 people.

International revenues in 1984 were flat with the 1983 level, although the level of orders exceeded the input received in 1983, indicating a stronger performance ahead for 1985. Revenues outside of North America were \$372.5 million (8.5 percent of consolidated revenues), compared with \$376.3 million (11.4 percent of the total) in 1983.

The operating specifications and standards for central office switches and other telecommunications equipment differ between countries and, in many cases, are different from those in North America.

In December 1984, the Turkish PTT (Post, Telegraph and Telephone) Administration put into service in Ankara its first digital central office, a transportable Northern Telecom DMS-10. In August 1983, Northern Telecom and the PTT signed a five-year \$300 million supply contract for digital switching systems and components.

In 1985, Northern Telecom and Netas, a manufacturing company near Istanbul jointly owned by Northern Telecom and the Turkish PTT, will supply DMS switches to serve an additional 165,000 telephone lines and 44,000 trunks (long-distance circuits).



\*Includes long-distance trunks multiplied by five

■ DMS lines  
■ DMS trunks\*  
■ SL

British Telecom, having stated its intent to purchase a portion of its requirements for digital central office switches from a source other than its current suppliers, evaluated systems from a number of companies. In late 1984, British Telecom announced it had narrowed the selection list to three companies and would make the final choice of a supplier in 1985. Northern Telecom was very pleased to make this "short list" and is continuing its efforts to expand its operations in the U.K. in a number of areas.

Northern Telecom installed DMS-10 and DMS-100 switches in its Bell-Northern Research (BNR) laboratories in Maidenhead where further international development work is being carried out. Mercury, a common carrier licensed by the U.K., installed a Northern Telecom DMS-250 long-distance switch for its network.

The first DMS switch for South America, a 2,000-line DMS-10, was put in service in Lima, Peru. The corporation also delivered its first DMS switch to China; the Shekou PTT placed a DMS-10 in service in December 1984.

#### **DMS and SL families lead growth**

Each of Northern Telecom's principal product lines contributed to the corporation's growth in 1984. Central office switching, led by demand for DMS, achieved the most significant growth and is expected to continue to be a significant factor in the corporation's financial performance in 1985.

Central office switching revenues rose 55.8 percent to \$1.886 billion in 1984, compared with \$1.211 billion in 1983, accounting for 43.1 percent of the corporation's total 1984 revenues (36.6 percent in 1983). DMS revenues rose 67.8 percent to \$1.615 billion from \$962.4 million in 1983. Other switching revenues consist of analog systems and certain peripheral equipment.

A major reason for the growth in DMS revenues was purchases by the Bell operating companies (BOCs) in the U.S., amounting to US\$585 million in 1984, compared with US\$254 million in 1983. In total, Northern Telecom's revenues from the BOCs for switching, transmission systems, cable and outside plant products, and other equipment and services more than doubled in 1984 to US\$699.3 million from US\$340 million in 1983, which was more than double the 1982 level. These revenues exclude the sale of such equipment as SL PBXs through the distribution subsidiaries of these companies.

Larger digital switches are more complex and sophisticated than smaller ones. They must be capable of handling real-time (immediately responsive) computing for tens of thousands of calls, provide features, and billing information. Northern Telecom is one of few companies able to deliver proven, reliable large digital switches.

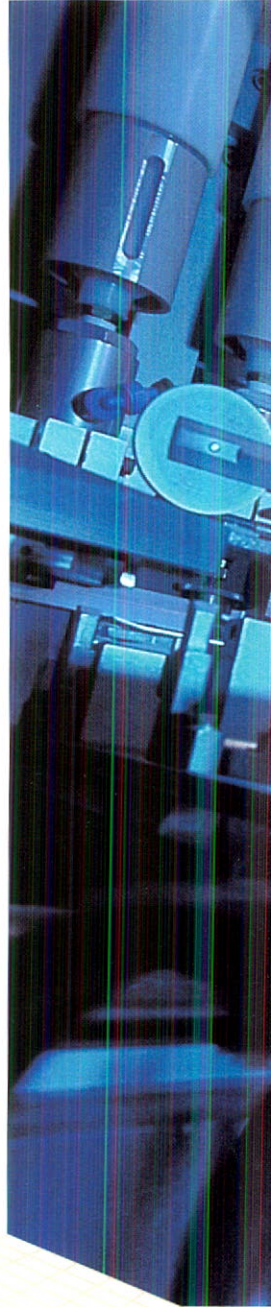
In December 1984, the New England Telephone Company, a part of the NYNEX regional holding company, placed in service a 59,000-line and 9,000-trunk DMS-100 switch in Newton, Massachusetts. This switch is the largest *fully* digital switching system handling local traffic in North America, and probably in the world. Another 14 DMS switches of more than 40,000 lines each have been ordered for delivery in the U.S. and Canada in 1985.

Ongoing feature development has allowed for further expansion of the DMS Family portfolio, enabling Northern Telecom to expand into new North American and international markets. The DMS-250, for example, was designed to meet the special requirements of the interexchange (long-distance) carriers and has had widespread acceptance. The corporation delivered 45 DMS-250s to customers in 1984.

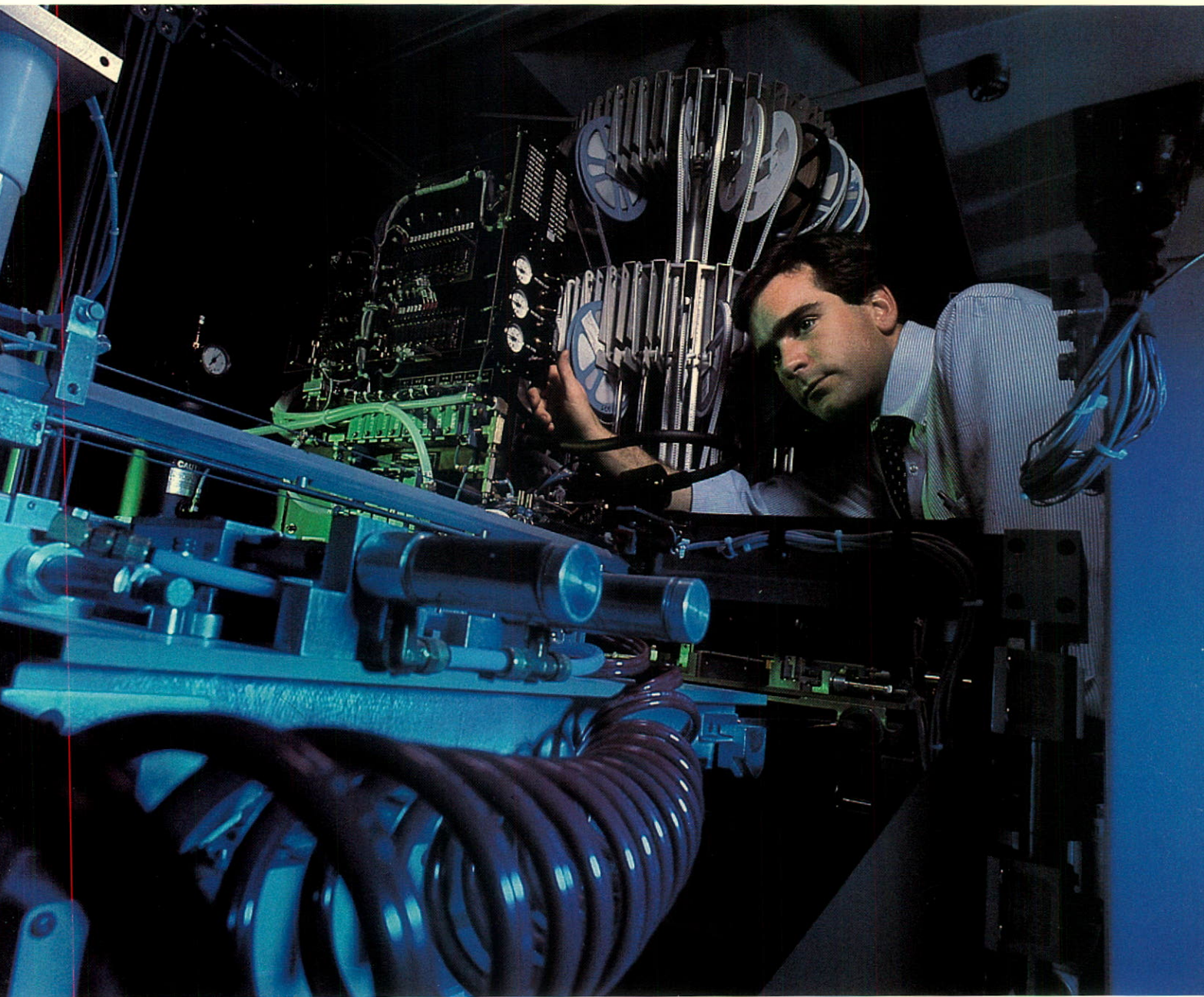
The flexibility of the DMS-100 system's design permitted its adaptation to provide cellular mobile-telephone switching capability. Five of these DMS-MTX switches were placed in service in four U.S. cities in 1984, including Minneapolis, Minnesota; Phoenix, Arizona; Seattle, Washington; and Denver, Colorado.

In the U.S., the divested BOCs are required by 1986 to provide what is called "equal access," offering connections with equivalent ease and quality to all interexchange carriers (IEC). Equal-access implementation requires new software features for the IEC and BOC switches. In July 1984, when the first equal-access tests were conducted by an IEC in Charleston, West Virginia, they were done by MCI on a Northern Telecom DMS-250. In December, Central Telephone-Nevada became the first major telephone company to introduce equal access on digital switches, adding this capability to 14 DMS-100s in the Las Vegas area.

The global telecommunications industry has adopted a term, Integrated Services Digital Network (ISDN), to describe the concept of an end-to-end digital telecommuni-



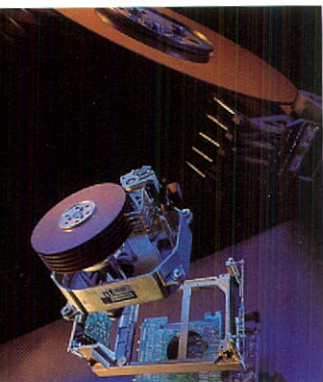




*Much of Northern Telecom's capital investment is made to increase productivity and quality.*

*For example, the corporation is increasing the use of surface-mounting (rather than*

*insertion) technologies for placing components on circuit boards. At the DMS switching plant near Durham, N.C., Mark Hudson prepares a universal surface mounting machine for use.*



*An exploded view of Northern Telecom's eight-inch Winchester Mercury disk drive manufactured by the Memory Systems Division in Ann Arbor, Michigan. The high-performance, high-capacity Mercury drives can store up to 234 million or 378 million bytes of information and will be used in various new Meridian line products.*

cations network that will make an array of new services available. In May 1984, the Bermuda Telephone Company and Northern Telecom announced plans for joint ISDN trials in 1985-86, employing DMS switching and transmission systems.

Sales to other telephone companies in the U.S., Canada, and international markets continued to be brisk.

An international highlight was the award of a US\$120 million agreement with Trinidad and Tobago, involving 193,000 lines of DMS switching, a fiber optics/digital radio transmission network, telephone sets, and outside plant equipment.

In 1982, Northern Telecom signed a US\$60 million contract, to supply the country with 60,000 DMS lines and other equipment to expand and modernize its network. Trinidad and Tobago is one of many examples where Northern Telecom's international efforts have been supported by Bell Canada International, which provides such services as training for a country's nationals to operate and maintain their networks.

In Canada, Northern Telecom signed its largest single contract for DMS-10, the corporation's small central office switch with a capacity currently being expanded to 10,000 lines. The contract, with Hydro-Québec, is for seven DMS-10s, valued at \$4.4 million. This will be the first application of the DMS-10 for a private network.

In 1984, Northern Telecom shipped the equivalent of about 10.5 million lines of DMS switching, nearly triple the 3.7 million equivalent lines shipped in 1983. In 1985, Northern Telecom believes a user somewhere in the world will be connected to a new DMS line about every four seconds.

According to several consulting firms, Northern Telecom became the number one supplier of digital PBXs in the U.S. and possibly in the world in 1984, shipping 1.165 million lines of the SL-1 and SL-100 systems, a 42.2 percent increase from 819,000 lines sold in 1983. While the SL PBXs have been sold in 61 countries, the largest market continues to be the U.S. (918,000 lines in 1984 compared with 589,000 in 1983). SL PBXs now serve more than four million telephone lines globally. SL PBX revenues in 1984 amounted to \$864.1 million, compared with \$627.2 million in 1983, up 37.8 percent.

The success of the SL PBXs and DMS switches is evidence of the market's acceptance of Northern Telecom's OPEN World program which features a commitment to evolve

these systems to provide new capabilities and services for improved information management. The highly modular hardware and software designs of these systems means that any SL or DMS switch installed since the first shipments can be upgraded to offer the same capabilities as future systems such as are described in "Innovating information networks," beginning on page 14.

The growth in SL PBX revenues in the U.S. was also attributable, in part, to the successful sales efforts of the four regional holding companies (Ameritech, Bell South, Pacific Telesis, and Southwestern) with which Northern Telecom signed distributor agreements in 1983 and 1984, as well as increased sales by other distributors and the corporation's own organization.

The cost of introducing four new SL-1 models in the first half of 1984 and increasing competition, depressed PBX profitability early in the year. However, profit margins, particularly in the U.S., significantly improved beginning in the second quarter as production increased and costs declined for the new models.

SL PBX revenues rose 19.3 percent in Canada in 1984, due, in particular, to the success of the new SL-1S and SL-1MS addressing the below-400-lines market.

The SL PBXs are Northern Telecom's largest-selling product internationally. Revenues outside North America exceeded \$80 million in 1984, up 24 percent from 1983.

More than \$11 million of SL-1s were ordered by several customers in Algeria, including Sonatrach, the Algerian national oil company, which purchased 17 systems; and Sonatite, a division of the Algerian PTT, which ordered 19 switches.

The New Zealand Post Office, the country's telecommunications authority, ordered 20 SL-1s. In China, the corporation won seven contracts to supply more than \$2.5 million of SL-1s for such customers as the Beijing and Garden hotels.

In April, Nippon Telegraph & Telephone Company of Japan announced that, following an international competition, Northern Telecom was one of two North American companies from which digital PBXs will be purchased.

The United States Information Agency (USIA) has chosen the SL-1 to supply the communications for the official U.S. national exhibition at Expo '85, a World's Fair to be

held in Tsukuba, Japan. The theme for the U.S. pavillion is "Artificial Intelligence and the Free Flow of Information," and exhibits will emphasize advances in the field of global telecommunications, especially the sharing of information among computers. The SL-1 will be an integral part of the networking display and will provide voice and data communications services for the pavillion, linking mainframe computers and distributed data processing systems throughout the exhibit. Via satellite transmission links, it will provide immediate communications access to information stored in data bases in the U.S.

### **Terminals: looking to the future**

In 1982, Northern Telecom undertook a development program for a new line of electronic residential and business telephones. The challenge was to design terminals that would be modern in appearance, meet the highest standards of reliability and quality, offer an array of features wanted by users, and that could be highly cost-effective to produce so they could be profitably sold at prices competitive with sets, often of lower quality, from other countries.

The forecast was that about one-quarter of a million sets of the first of these new sets, called the 8000 series, could be sold in the first full year of production. In fact, in 1984, Northern Telecom sold more than 1.2 million of the new Harmony residential 8000 series sets in Canada, the U.S., and 10 other countries.

In January 1985, Northern Telecom introduced two new 8000 series sets, Unity I and Unity II, designed for business use.

In international markets, Northern Telecom signed a contract with Nippon Telegraph & Telephone for 60,000 electronic push-button residential sets. This made Northern Telecom the first North American company to sell residential telephones to the Japanese telephone company.

Northern Telecom introduced in 1984 the Vienna Family of computers and office information systems for the European market. Vienna includes three shared-resource computers with compatible hardware and software, a multi-function terminal, and a range of peripherals. Vienna was developed by the corporation's U.K. laboratories.

Shipments of the Vienna terminals and the shared-resource computers began in May and August, respectively. Revenues for this product line are expected to increase significantly in 1985. Orders have been received from more than 100 customers in seven European countries, all among the largest 1,000 companies in Europe.

Reflecting the pending introduction of its new Meridian line of products, Northern Telecom in the latter part of 1984 wound down the production of the Model 500 series of distributed data processing systems. The corporation will continue to manufacture the 500 series to order and to sell systems from inventory or refurbished from the lease base. It will support systems in the field as it has continued to support data systems for which production was previously discontinued.

Cable and outside plant product revenues in 1984 increased 8.9 percent to \$308.8 million, compared with \$283.6 million in 1983. This resulted mainly from increased sales of cable to customers in the U.S. and the growth of outside plant product sales resulting, in part, from the introduction of some nine new products.

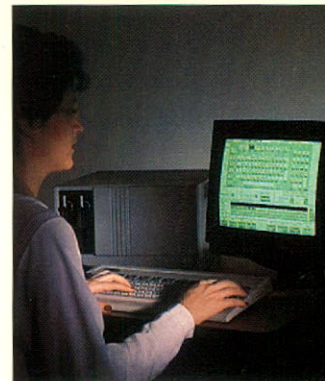
### **U.S. transmission up 58 percent**

Despite a weak Canadian market for transmission products and lower international sales following completion of a major contract in 1983 in South Korea, revenues for these products rose 15.4 percent in 1984 to \$599.6 million, owing to growth in the U.S.

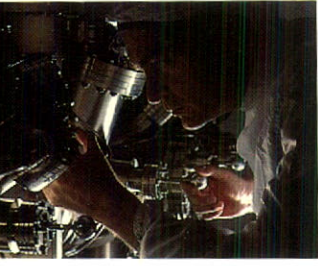
Transmission growth was led by such products as microwave radio, the DMS-1 Family, and optical systems. In June 1984, Northern Telecom signed a four-year agreement to supply transmission products and services to a subsidiary of the regional holding company, US West. In December, a similar contract was signed with a subsidiary of a second regional holding company, Ameritech, and others were being negotiated.

During the year, the corporation introduced a six gigahertz digital radio system, the RD-6A, joining the previously introduced RD-4A four gigahertz radio in this family, and announced that an 11 gigahertz system, the RD-11A, will be available in 1985. Each radio channel on these systems can carry the equivalent of 2,016 voice channels at a transmission rate of 135 megabits per second. The first RD-6A system was placed in service by QWest, a subsidiary of US West, between Houston and Beaumont, Texas.

In optical systems, Northern Telecom completed its first full year of production of advanced single-mode fiber and introduced the FD-135, a 135-megabits-per-second optical multiplex system. In 1985, Northern Telecom will begin shipments of the FD-565, a 565-megabits-per-second multiplex system.



*Shipments of the new Vienna multi-function terminal, designed in Northern Telecom's laboratories in England, began in May 1984.*



*A. J. Springthorpe uses the molecular beam epitaxy facility at BNR to grow layers of the semiconducting compound gallium arsenide. This ultra-high-vacuum facility provides the capability of fabricating high-purity materials required for devices used in high-speed integrated circuits and optical systems.*

Since its introduction in 1977, Northern Telecom has installed more than 2,500 DMS-1 subscriber carrier systems in 23 countries. The DMS-1 Family was designed to provide improved communications services cost-effectively to rural areas. In 1984, Northern Telecom introduced the DMS-1 Urban to offer similar economies in more densely populated areas such as metropolitan centers.

The introduction of these and other new products, expansion of manufacturing, and price competition in certain lines, resulted in somewhat lower profit margins for transmission systems in 1984. However, transmission systems are becoming increasingly sophisticated, making greater use of microelectronics and software, resulting in greater differentiation between suppliers' products. This and the success of Northern Telecom's new systems are expected to result in improving margins.

To meet the demand in the U.S. for transmission systems, Northern Telecom expanded its operations in Atlanta, including an investment of US\$42 million to more than double the manufacturing plant to 292,000 square feet. Also in Atlanta, BNR established a new laboratory to carry out R&D in telecommunications network technology.

### **Capital investments increased**

Northern Telecom's capital spending program was \$569.6 million in 1984, up 51.1 percent from \$376.9 million in 1983.

The largest part of Northern Telecom's investment is made not for buildings, but to increase production capacity, productivity, and quality. This includes investments in new manufacturing processes and systems, such as the increasing use of surface-mounting (rather than insertion) technologies for components on circuit boards, and the use of flexible manufacturing systems (robotics), and increasingly sophisticated test systems.

An example of such investments is the Bramalea, Ontario manufacturing plant for central office switching. While the size of the plant was unchanged in 1984, the corporation invested nearly \$22 million to increase production and in such areas as computerized systems for manufacturing and testing.

The DMS manufacturing plant in Calgary, Alberta was nearly doubled in size to 109,000 square feet with an investment of \$15 million.

In North Carolina, Northern Telecom announced an investment of nearly US\$100 million in plant and equipment to increase production of DMS switching. A new complex was nearly completed by yearend, featuring a 72,000-square-foot two-story office building; 193,000-square-foot manufacturing plant; and 175,000-square-foot warehouse. When completed, Northern Telecom's operations in the Raleigh/Durham area will total some 1.4 million square feet and will employ more than 5,400 people. In addition, a new BNR laboratory has been established to support the evolution of the DMS Family.

Construction began near Ottawa, Ontario of a 105,000-square-foot Advanced Technology Center. The center, when completed in early 1987, will represent an investment in plant and equipment of \$80 million. The facility, located beside Northern Telecom Electronics' (NTE) custom-semiconductor manufacturing plant in Nepean, is being established to create the technology and processes required to produce semiconductors with a line width of one micron or less (about one-fiftieth the width of a human hair). Current industry processes produce chips with a geometry between two-and-seven microns.

These new semiconductors will deliver significantly increased capability by containing more than 200,000 transistors on a quarter-inch-square chip, compared to 50,000 transistors which can now be mounted on chips of that size used in telecommunications. The new chips will be employed in future Northern Telecom switching and transmission systems, and terminals.

NTE's custom integrated-circuit manufacturing plant near San Diego is being doubled in size with a US\$4.3 million 57,000-square-foot expansion.

In sum, Northern Telecom's operating subsidiaries in Canada, the United States, and internationally set new performance benchmarks to exceed in 1985. They further developed their manufacturing, marketing, sales, and service organizations, and evolved their established and new product lines to a degree that supports the corporation's confidence that it can achieve its targets for continuing growth.

## Officers

**Chairman of the Board**  
Walter F. Light

**President and Chief Executive Officer**  
Edmund B. Fitzgerald

**Vice-chairman of the Board**  
Basil A. Beneteau

**Executive vice-presidents**  
Walter C. Benger  
*Marketing*

Donald A. Chisholm  
*Technology and innovation*

Charles G. Millar  
*Operations*

Donald A. Noble  
*Finance and administration*

**Senior vice-presidents**  
Clive V. Allen  
*General counsel*

Roy T. Cottier  
*Corporate relations*

J. Derek M. Davies  
*Business development*

C. Denis Hall  
*Technology*

**Vice-presidents**  
Philip T. Erickson  
*Patents and licenses*

John D. MacDonald  
*Operations, manufacturing*

R. Brian O'Regan  
*Public affairs*

Edward J. Pillman  
*Business systems*

John J. Rankin  
*Human resources*

Bruce H. Tavner

**Vice-president and treasurer**  
David W. Kendall, Jr.

**Controller**  
Stephen A. Holinski

**Secretary**  
Anthony J. Lafleur

## Directors

Ian A. Barclay<sup>3,5</sup>  
*Vice-chairman of the Board*  
*British Columbia Forest Products Limited*  
*Vancouver, British Columbia*

William O. Beers<sup>1,6</sup>  
*Former Chairman of the Board and Chief Executive Officer*  
*Kraft, Inc.*  
*Chicago, Illinois*

Basil A. Beneteau<sup>5</sup>  
*Vice-chairman of the Board*  
*Northern Telecom Limited*

O. Bradford Butler<sup>1,6</sup>  
*Chairman of the Board*  
*The Procter & Gamble Company*  
*Cincinnati, Ohio*

J. V. Raymond Cyr<sup>4,7</sup>  
*Chairman of the Board, President and Chief Executive Officer*  
*Bell Canada*  
*Montreal, Quebec*

A. Jean de Grandpré,  
O.C., Q.C.<sup>2,3,6</sup>  
*Chairman of the Board and Chief Executive Officer*  
*Bell Canada Enterprises Inc.*  
*Montreal, Quebec*

Edmund B. Fitzgerald<sup>2,4,5,6,7</sup>  
*President and Chief Executive Officer*  
*Northern Telecom Limited*

Donald S. Harvie, O.C.<sup>1,4</sup>  
*Chairman*  
*Devonian Foundation*  
*Calgary, Alberta*

Robert S. Hurlbut<sup>1,2,4</sup>  
*Chairman of the Board*  
*General Foods, Inc.*  
*Toronto, Ontario*

James W. Kerr<sup>3,5</sup>  
*Former Chairman of the Board and Chief Executive Officer*  
*TransCanada PipeLines Limited*  
*Toronto, Ontario*

Walter F. Light<sup>2</sup>  
*Chairman of the Board*  
*Northern Telecom Limited*

John H. Moore<sup>1,2,5</sup>  
*Former Chairman of the Board*  
*John Labatt Limited*  
*London, Ontario*

Paul F. Orefice<sup>6,7</sup>  
*President and Chief Executive Officer*  
*The Dow Chemical Company*  
*Midland, Illinois*

Charles Perrault<sup>3,5,7</sup>  
*President*  
*Perconsult Ltée.*  
*Montreal, Quebec*

Gérard Plourde, O.C.<sup>2,4</sup>  
*Chairman of the Board*  
*U A P Inc.*  
*Montreal, Quebec*

Robert J. Richardson<sup>2,3,4</sup>  
*President*  
*Bell Canada Enterprises Inc.*  
*Montreal, Quebec*

Walter M. Robinson, Jr.<sup>1,6</sup>  
*Partner*  
*Bass, Berry & Sims*  
*Nashville, Tennessee*

Donald J. Schuenke<sup>6,7</sup>  
*President and Chief Executive Officer*  
*The Northwestern Mutual Life Insurance Company*  
*Milwaukee, Wisconsin*

Robert C. Scrivener<sup>1,5,7</sup>  
*Former Chairman of the Board and Chief Executive Officer*  
*Northern Telecom Limited*

William M. Sobey<sup>4,7</sup>  
*Chairman of the Board*  
*Sobeys Stores Limited*  
*Stellarton, Nova Scotia*

Member of the:

<sup>1</sup> *Audit Committee*

<sup>2</sup> *Executive Committee*

<sup>3</sup> *Management Resources and Compensation Committee*

<sup>4</sup> *Operations Advisory Committee, Canada*

<sup>5</sup> *Operations Advisory Committee, International*

<sup>6</sup> *Operations Advisory Committee, United States*

<sup>7</sup> *Pension Fund Policy Committee*

The Board of Directors, which met 13 times in 1984, is responsible for the management of the corporation's business. Directors serve on one or more of the following Board committees:

– *The Audit Committee*, composed of directors who are neither officers nor employees of the corporation. It reviews the corporation's annual consolidated financial statements, registration statements, and prospectuses prior to Board approval. The committee reviews audit activities, and recommends changes in accounting policies for Board approval.

– *The Executive Committee*, which may exercise certain powers of the Board. It approves appropriations, in amounts exceeding the limits of officer authority, for capital investments, for R&D, and for lease expenditures, and approves the disposition of significant capital assets.

– *The Management Resources and Compensation Committee*, which recommends for Board approval the appointment and remuneration of

corporate officers, and reviews the appointment and remuneration of the officers of the principal subsidiaries. It also recommends new employee benefit plans and material changes to existing plans. It reviews recruitment and development programs and the plans for succession to senior management. It recommends appropriations under incentive plans. It recommends individuals for nomination to the Board.

– *Operations Advisory Committees*, established in 1983. Three committees serve respectively in a consultative role to Northern Telecom's Canadian, United States, and international principal operating subsidiaries.

– *The Pension Fund Policy Committee*, which approves the investment policies for, and reviews the performance of, the corporation's pension funds. It reviews the actuarial assumptions used to determine the funding requirements for the pension plans.

## Senior management of principal subsidiaries

### **Bell-Northern Research Ltd.**

**Chairman of the Board**  
Donald A. Chisholm

**President**  
John A. Roth

**Group vice-presidents**  
Howard M. Bender  
*Network products*

Klaus M. Buechner  
*Office products*

**Vice-presidents**  
John S. Buchan  
*Transmission products*

John Elliott  
*Corporate development*

Thomas M. Hennebury  
*Human resources and administration*

Owen W. McAleer  
*Networks technology division*

George C. Smyth  
*Digital switching systems development*

Anthony G. Stansby  
*Semiconductor applications*

Brian G. Watkinson  
*Access and services*

**Secretary and legal counsel**  
Roméo C. Champagne

**Treasurer and controller**  
Andrew F. Given

### **BNR Inc.**

**President**  
Klaus M. Buechner

**Vice-president**  
Rich Sevcik  
*Private switching systems*

### **Northern Telecom AG**

**Managing director**  
C. Roger Lawton

### **Northern Telecom (Asia) Limited**

**Managing director**  
Hal. G. Rosser

### **Northern Telecom Data Systems Limited**

**Managing director**  
Barry W. Eames

### **Northern Telecom (CALA) Corporation**

**President**  
Ewen B. Morrison

### **Northern Telecom Canada Limited**

**President**  
David G. Vice

**Executive vice-presidents**  
L. Ross Campbell  
*Administration*

H. Lloyd Webster  
*Marketing and technology*

**Group vice-presidents**  
André J. Boutin  
*Cable*

Ewart O. Bridges  
*Switching*

Gedas A. Sakus  
*Subscriber equipment*

Robert R. Watt  
*Transmission*

**Vice-presidents**  
David D. Archibald  
*Secretary and general counsel*

Michael K. Butler  
*Operations, Integrated Office Systems*

Richard A. Fortier  
*Human resources*

Robert Kenedi  
*Product line planning*

Roy McClean  
*Manufacturing*

John P. Strimas  
*Public relations*

David J. Thomas  
*Finance*

Elliott Turcot  
*Advanced switching*

S. Russ Woodland  
*Operations, transmission group*

### **Northern Telecom Electronics Limited**

**President**  
Charles G. Millar

**Vice-presidents**  
Ronald A. Hunter  
*Electronic components*  
A. Graham Sadler  
*Semiconductor components*

Anthony G. Stansby  
*Business development*

### **Northern Telecom Inc.**

**President**  
Desmond F. Hudson

**Executive vice-presidents**  
L. Colin Beaumont  
*Technology*

John W. Caffry  
*Finance and administration*

Thomas R. Worthy  
*Marketing*

Edward J. Mattiuz  
*Operations*

**Group vice-presidents**  
Bob G. Davis  
*Operations, Integrated Office Systems*

Andrew M. McMahon  
*Integrated Carrier Systems*

Roy Merrills  
*Integrated Network Systems*

Robert J. Potter  
*Integrated Office Systems*

**Vice-presidents**  
William C. Cawthon  
*Business development*

Jean-Paul Gagnon  
*Marketing, Integrated Office Systems*

Jerry L. Kreiger  
*Human resources*

Wayne R. Lasson  
*Digital switching systems*

Eugene B. Lotochinski  
*Market development*

John MacDonald  
*President, Northern Telecom Finance Corporation*

Edward B. Matthews  
*Strategic development*

Donald K. Peterson  
*Finance*

Richard R. Standel, Jr.  
*General counsel and secretary*

D. Wynn Walters  
*Public relations*

### **Northern Telecom Industries Sdn. Bhd.**

**Managing director**  
Ho Boon Theam

### **Northern Telecom International Limited**

**President**  
Robert A. Ferchat

**Vice-presidents**  
James W. Brown  
*Finance and administration*

Denis Mercier  
*Operations*

Charles M. H. Shiu  
*Business development*

### **Northern Telecom (Ireland) Limited**

**Chairman of the Board**  
Lord Killanin

**Managing director**  
Anthony B. Gorman

### **Northern Telecom Japan Inc.**

**President**  
Hugh A. Hamilton

### **Northern Telecom (NEA) Limited**

**Managing director**  
Brian Baynes

### **Northern Telecom plc**

**Chairman**  
Walter C. Bengier

**Managing director**  
Bruce H. Tavner

## Northern Telecom Limited and principal subsidiaries

Northern Telecom Limited sets the policies and long-term growth strategies for the corporation and its subsidiaries. It also carries out administrative and coordination functions for the global organization. R&D, manufacturing, marketing, sales, and service are carried out through the corporation's principal operating subsidiaries:

*Northern Telecom Canada Limited*, with headquarters near Toronto, Ontario, operates 27 manufacturing plants and 14 associated R&D laboratories. It is responsible for the Canadian telecommunications equipment market.

*Northern Telecom Inc.*, based in Nashville, Tennessee, serves the U.S. telecommunications markets with 15 manufacturing plants and 10 associated laboratories for R&D.

*Northern Telecom International Limited*, headquartered in Mississauga, Ontario, and its subsidiary Northern Telecom International Inc., with head office in Nashville, market and service the corporation's products outside of North America.

*Northern Telecom Electronics Limited*, based in Mississauga, manufactures and supplies electronic components for the corporation's other manufacturing operations.

*Bell-Northern Research Ltd.*, Ottawa, Ontario, is owned 70 percent by Northern Telecom and 30 percent by Bell Canada. It operates three laboratories in Ottawa, and one each in Toronto; Montreal, Que.; and Edmonton, Alta. BNR's affiliates operate laboratories in Mountain View, California; Ann Arbor, Michigan; Richardson, Texas; Durham, North Carolina; Atlanta, Georgia; and Maidenhead, England.

## Manufacturing operations

### Business communications systems

*Canada*  
Amherst, N.S.  
Belleville, Ont.  
Calgary, Alta.  
Saint John, N.B.  
*United States*  
Santa Clara, Cal.  
*Republic of Ireland*  
Galway

### Cable

*Canada*  
Amherst, N.S.  
Calgary, Alta.  
Kingston, Ont.  
Lachine, Que.  
Regina, Sask.

### Components

*Canada*  
Belleville, Ont.  
Ottawa, Ont.  
*United States*  
San Diego, Cal.  
West Palm Beach, Fla.  
*Malaysia*  
Kedah  
Penang

### Data Networks

*Canada*  
Belleville, Ont.  
*Republic of Ireland*  
Galway

### Information processing systems

*Canada*  
Scarborough, Ont.  
St. Laurent, Que.  
*United Kingdom*  
Hemel Hempstead  
*United States*  
Minnetonka, Minn.

### Outside plant

*Canada*  
St. Laurent, Que.  
*United States*  
Morton Grove, Ill.  
*Brazil*  
Rio de Janeiro

### Repair and overhaul

*Canada*  
Calgary, Alta.  
Montreal North, Que.  
North York, Ont.  
Saint John, N.B.

### Subscriber apparatus

*Canada*  
Amherst, N.S.  
London, Ont.  
*United States*  
Nashville, Tenn.  
*Republic of Ireland*  
Galway

### Switching

*Canada*  
Brampton, Ont.  
Calgary, Alta.  
Charlottetown, P.E.I.  
Montreal, Que.  
St. John's, Nfld.  
*United States*  
Creedmoor, N.C.  
Morrisville, N.C.  
Durham, N.C.  
Richardson, Tex.

### Test equipment

*United States*  
Concord, N.H.  
Moorestown, N.J.

### Transmission

*Canada*  
Aylmer, Que.  
Saskatoon, Sask.  
St. Laurent, Que.  
Winnipeg, Man.  
*United States*  
Atlanta, Ga.

## *Innovating information networks*

Once we get beyond face-to-face communications, we require networks to transmit information. These networks may comprise various transmission media, including wires of copper or glass, microwave radio, and satellites. Our communications may be guided to, and through, one or many networks by switching systems directing information from one or multiple sources to a multitude of destinations.

We need to have ways of entering, processing, and using the information, perhaps a place to store it, and ways to access it when we need it. The information may be sound (the human voice, music), statistics or text, graphics, or image, including video.

Information is as strategically vital to each of us as it is to small and large businesses, associations, and governments.

### **The Digital World**

In 1976, Northern Telecom announced the Digital World, starting a revolution that today continues to change the way people communicate information around the world.

In the Digital World, *all* information—voice, data, graphics, and image—is transmitted and handled in a *digital* mode (the format of computers) rather than in a mix of analog (electrical waves of varying amplitude and frequency analogous to sound) and digital signals. The promise of *fully* digital communications being fulfilled is the most efficient, cost-effective, fastest, and reliable means of handling information.

Northern Telecom became the first corporation in the world to commit to the introduction of a complete family of *fully* digital telecommunications switching and transmission systems.

Since its Digital World announcement, Northern Telecom has maintained its pioneering leadership in improving communications.

The corporation remains the leading supplier of fully digital telecommunications systems with its DMS (Digital Multiplex Systems) switching and transmission family and SL PBXs (private branch exchanges) handling the equivalent of more than 26.2 million telephone lines in 67 countries.

The proliferation of terminals, such as personal computers and workstations providing electronic mail, banking, shopping, word processing, spreadsheet analysis, and access to remote databases from offices and homes, is resulting in the rapid growth of data communications.

It is estimated that by 1990, a personal computer will be connected to the telecommunications network every five seconds. Today, while voice communications grow three-to-six percent annually, data commu-

nications increase 25-to-30 percent each year. This, and other factors affecting public networks, such as regulatory decisions, are placing new demands on telecommunications companies to provide greater flexibility and new capabilities in their networks.

In November 1982, Northern Telecom announced its OPEN World program for information management. Digital World and OPEN (Open Protocol Enhanced Networks) World are major steps towards what Northern Telecom calls the Intelligent Universe.

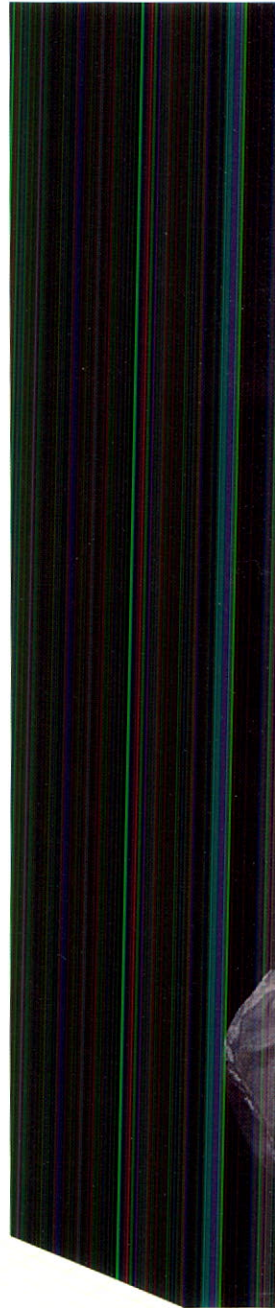
The Intelligent Universe is a view of the future when, through the application of digital and other technologies, people everywhere will be able to exchange, share, process, organize, store, and access information, using increasingly intelligent terminals linked by digital communications networks.

### **ISDN**

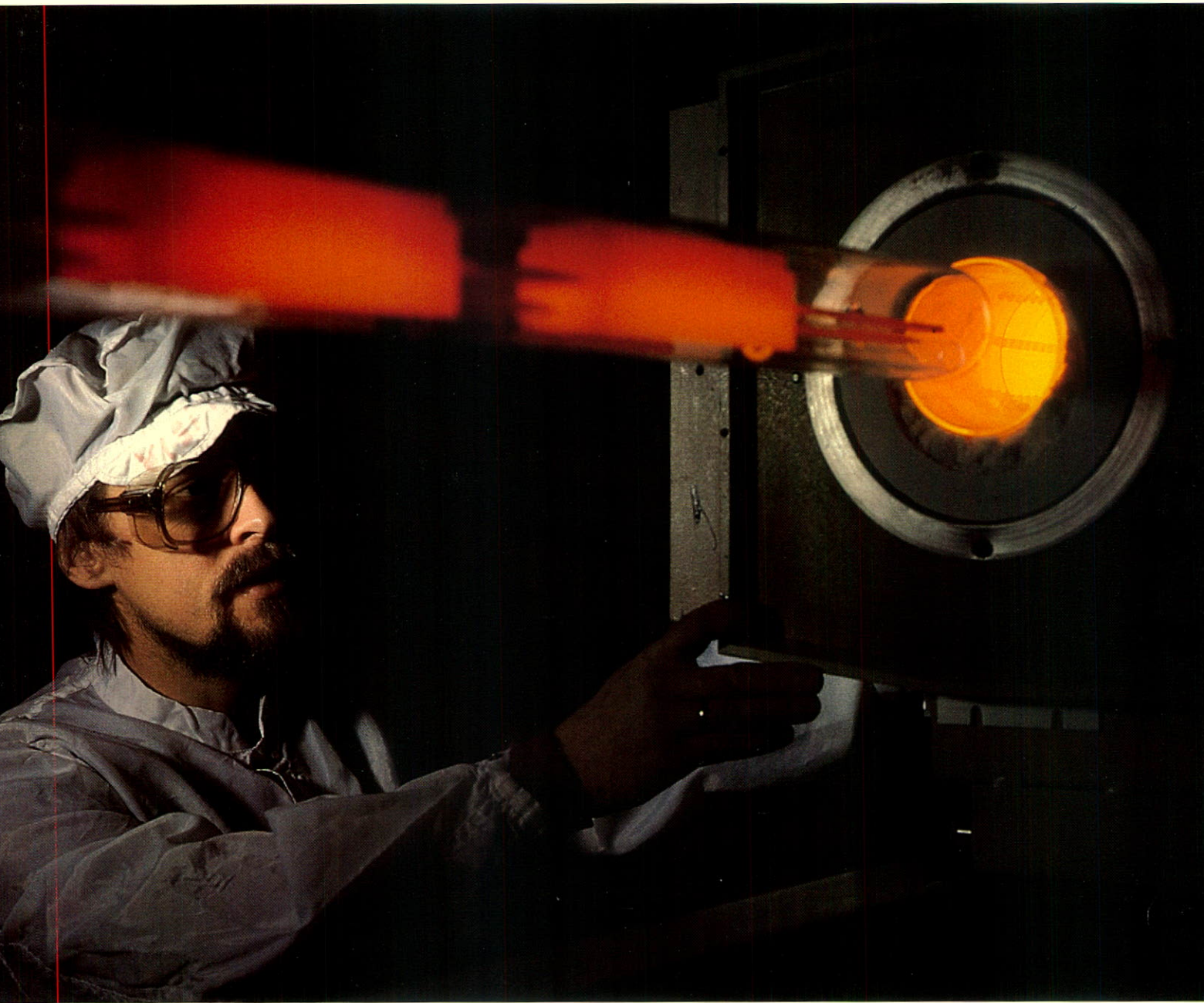
The concept of end-to-end digital telecommunications encompasses, what in the global telecommunications industry has come to be known as, the Integrated Services Digital Network (ISDN). Many recommendations for ISDN specifications were ratified in 1984 by the CCITT (International Telegraph and Telephone Consultative Committee); others are currently being considered. Northern Telecom and its research and development subsidiary, Bell-Northern Research (BNR), are actively involved in this process with the CCITT and are taking a leading role in the working groups developing the ISDN standards.

During the past three years, Northern Telecom has worked with a number of computer vendors to determine the optimal types of digital connections for today's requirements between computers and PBXs. The result was a multi-channel (transmission paths) computer-to-PBX interface (CPI) developed with Digital Equipment Corporation (DEC). We have pursued standardization of the CPI via the Electronics Industries Association and the Exchange Carrier Standards Association's Committee T1. The first CPI installation in 1984 was successful and commercial shipments are now underway. CPI specifications have been licensed to 105 PBX and computer manufacturers.

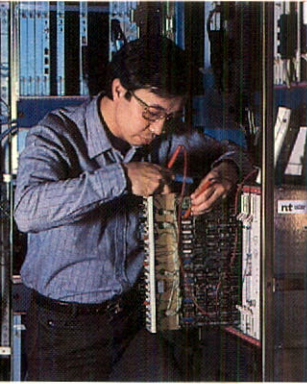
Northern Telecom and BNR played a leadership role in the CCITT's standards-setting programs that contributed to agreement on an electronic mail and messaging standard (called X.400). Other standardization activities include extensive work directed at defining the rules that will permit multiple vendors' equipment to be interconnected within the ISDN.







*Mikelis Svilans removes graphite crucibles from a furnace used for growing multi-layer semiconducting structures. The layers are later processed into lasers for fiber optics systems.*



*Kin Yu performs a voltage limit test on an SL-1XN manufactured in Belleville, Ontario. Northern Telecom has installed more than 13,000 SL PBXs to serve over four million telephone lines worldwide.*

The ISDN objective is to extend the full power of digital communications networks to the end user. Agreement has been reached on the rules for providing multiple channels on a link between switching systems. Northern Telecom will have these ISDN interfaces available on its DMS and SL switches by 1987.

The development by Northern Telecom of complex large-scale-integrated circuits has permitted us to introduce cost-effective means of transmitting voice and high-speed data over the conventional pair of wires that has been used to carry telephone calls only. The techniques employed are similar to those required for the ISDN interfaces proposed between terminals (voice and data) and the switching systems.

Northern Telecom's DMS-100 Data capability, announced in mid-1984, provides high-speed, circuit-switched data terminal access to a DMS-100 central office switch. This feature package on the DMS-100 currently offers data access to the public network via the existing two-wire telephone lines at speeds up to 56 kbps (thousands of bits per second) with an inherent capability for 64 kbps operation when needed. With the introduction of DMS-100 Data, Northern Telecom became the first corporation in the world to offer high-speed data-handling features on digital central office switches which may be made available to any user of the public telecommunications network.

Another application of this integrated voice and data distribution system provides bandwidth (information-handling capacity) that is consistent with ISDN proposals—two 64 kbps communications channels and associated signalling channels to the new digital terminals Northern Telecom is introducing beginning in 1985.

The introduction of DMS-100 Data and production of the integrated voice and data links for SL-1 and SL-100 beginning in 1985 are significant milestones in meeting Northern Telecom's ISDN program.

In May 1984, Northern Telecom announced with the Bermuda Telephone Company plans for joint ISDN trials in 1985-86. The corporation plans other ISDN trials and demonstration systems during this period.

### **The OPEN World**

In announcing its OPEN World program, Northern Telecom committed to applying its expertise in digital communications, and in the foundation technologies of semiconductors and software, to evolve the DMS and SL Families, and to introduce new products, systems, and services to improve the way we communicate and manage information.

OPEN World promises compatibility between systems from different vendors through the use of standard protocols (rules for how systems communicate) and the ability of users and their organizations to control their network and access to their systems.

Northern Telecom conceived the OPEN World program to address the requirements of networks: both the private networks within an organization's building or linking multiple locations, and the public telecommunications networks.

Services that can be provided by an organization's SL PBX, may also be provided by a telecommunications company's DMS central office switching system. An organization could choose either or both routes, weighing such factors as the relative costs or savings and the expertise needed and available to maintain and manage its own system.

In the two years that followed the November 1982 announcement of OPEN World, Northern Telecom introduced a steady stream of new features and services, evolving the capabilities of such established systems as the DMS switches, SL PBXs, and Displayphone terminal, which, introduced in 1981, was the world's first integrated voice and data unit.

In February 1985, Northern Telecom hosted conferences for executives from organizations across North America and other countries. At the conferences, Northern Telecom launched new integrated office systems and services for private networks; described its approach to evolving the capabilities of public networks, committing to enhancements to the DMS Family; and announced an array of other products and services for private and public networks.

Northern Telecom and BNR speakers also reviewed how the corporation has met its past commitments.

### **OPEN World: The first two years**

Northern Telecom has continually evolved its DMS central office switches. Employing advanced integrated-circuit technology, the corporation has increased the reliability and reduced by nearly one-half the size of a DMS-100 system for switching local calls. From about 300 features when Northern Telecom introduced the DMS-100 Family switches, the corporation has expanded the modular software to offer more than 1,400 features today.

In 1981, DMS-100 led the industry with the introduction of a digital remote switching capability (called a Remote Line Module), capable of handling more than 1,200 lines in a unit located away from the central switch. A new 640-line remote unit,

the RLCM, introduced in January 1984, accommodates advanced customer features such as circuit-switching (dedicated lines) of data. It can also accommodate fully featured business sets to meet any organization's business communications requirements. In 1984, Northern Telecom introduced such a featured set for the DMS-100 and SL-100 business user.

The introduction of Integrated Business Network (IBN) features for the DMS-100, beginning in 1981, enabled telecommunications companies to provide special business services that previously only were available on PBXs like the SL-100. IBN includes Northern Telecom's Electronic Switched Network (ESN) capability (also offered with the SL PBXs), permitting a telecommunications company to offer virtual private networks by linking multiple locations across a continent.

Among other changes to the DMS-100 Family of local and long-distance switches have been: increased distribution of processing power (in a typical 40,000-line switch, for example, 95 percent of the telephone-call processing is done in distributed hardware and software modules rather than by the central control); increased memory density and capacity; and reduction of the network module (the part of the system that switches calls), providing the same function in one-half the space and using 25 percent less power.

Like the larger DMS-100 Family systems, DMS-10 has undergone significant enhancements to its capacity, doubling from a maximum size of 6,000 lines when it was introduced in 1977 to 12,000 lines in 1985. While processing power and memory have increased, power consumption has declined; a typical 4,000-line office today is less than half the size of those delivered in 1977. A feature package similar to IBN, called Integrated Business Services, was introduced in 1984 for the smaller DMS-10.

Northern Telecom introduced a number of digital transmission systems for the public network. These included a family of microwave radios, the RD series, initially comprising four and six gigahertz, and, in 1985, 11 gigahertz systems. The DMS-1 Urban joined the DMS-1 and DMS-1A subscriber carrier systems. The DMS-1 Family makes it more cost-effective to provide enhanced services in rural and urban areas by concentrating multiple calls coming into the system on to fewer lines for transmission to other switches.

In optical systems, the corporation moved from producing multi-mode glass fiber cable to more advanced single-mode fiber and introduced a 135-megabits optical transmission system, the FD-135. In 1985,

Northern Telecom will introduce the FD-565, a system capable of transmitting 565 million bits of information per second on a single fiber.

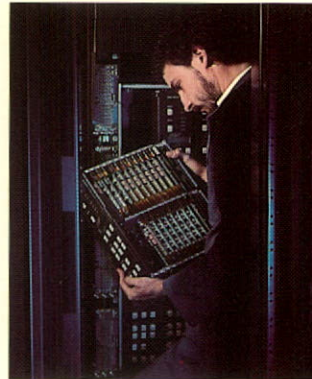
Northern Telecom introduced in 1983 and 1984 four new SL-1 models that evolved from the SL-1s previously offered and extended the cost-effective range of the family from 30-to-5,000 telephone lines. Consistent with the OPEN World commitment to product continuity, SL-1s installed since the first system was put in service in December 1975 can be upgraded to offer the same capabilities as the new models.

The four new models introduced were: the SL-1S serving 30-to-120 lines (with future expandability to 160 lines in the same cabinet); SL-1MS for 80-to-400 lines; SL-1N for requirements up to 1,200 lines; and SL-1XN, which can serve up to 3,000 lines in a non-blocking (all lines can be used simultaneously) configuration and to 5,000 lines overall.

The ability of Northern Telecom to evolve its DMS and SL digital systems, maintaining product continuity and enabling it to expand the base of proven reliable software, lies in the modular design of the systems' hardware and software. Since the SL-1 was introduced, its software base has increased 10 times in size to more than a million lines of code, representing some 500 person years of development work. The new models represent up to a 60 percent reduction in size from previous models with similar capacity, while consuming 20 percent less power.

The new capabilities introduced for the SL-1 PBXs make up a lengthy list. Among the most significant are:

- A series of devices and interfaces to facilitate communications by IBM and other personal computers and terminals with each other and with host computers through SL-1 PBXs at data transmission rates of from 110 bits per second to 56 kbps, depending on the application. One module, for example, permits IBM 3278 terminals to access mainframe computers over ordinary telephone wires rather than by coaxial cable.
- The SL-1/X.25 Gateway enabling asynchronous terminals to have direct, digital access to data packet switching networks through an SL-1.
- Voice messaging and text messaging, including compatibility with systems manufactured by other vendors by the licensing of the SL-1's messaging system interface specifications.
- Cooperative working agreements with several major data processing compa-



*Robert Mitchell completes testing of a DMT-300 digital multiplex system produced in St. Laurent, Quebec. The DMT-300 was introduced in December 1984.*

nies to develop effective interfaces between their systems and the SL PBXs. These included the Digital Equipment, Data General, Sperry, Wang, and Hewlett-Packard corporations.

–Enhanced Multitenant Service (EMS), a software package that extended the ability of office building owners to partition an SL-1 to serve a broader range of tenant organizations with new services.

Many of these capabilities were also introduced for the SL-100 PBX, which can serve up to 30,000 lines.

Each of these new capabilities for the SL PBXs enhanced the systems' networking capabilities and reduced the cost of voice and data communications.

Displayphone's capabilities expanded with a series of data communications enhancements, and the introduction of an SL-1 model, providing easy access to the PBX system's features. A new keyboard with full-sized keys enhanced Displayphone for a broader range of data users.

### **Introducing Meridian and a Dynamic Network Architecture**

The February 1985 conferences began an accelerated pace of market introduction by Northern Telecom of new products and enhancements to established systems. These will make available a vast array of new services to people in industry and other organizations, or in their homes.

For private networks, Northern Telecom launched the Meridian line of fully digital integrated voice and data systems. Products to be introduced beginning in 1985 include the Meridian SL-1 and SL-100 Integrated Services Networks; digital terminals; and the Meridian DV-1 Data Voice System.

For the public telecommunications network, Northern Telecom introduced the concept of a Dynamic Network Architecture. A Dynamic Network Architecture will increase the flexibility and capacity of the public network to respond to change and is necessary to implement the ISDN concept. It will enable telecommunications companies to provide quickly and cost-effectively new services through the public network such as those available with Northern Telecom's Meridian line of products. It will also permit telecommunications companies to provide enhanced local, national, and international communications between private networks.

Northern Telecom committed to the evolution of the DMS Family and the introduction of new systems and services to enable telecommunications companies to implement a Dynamic Network Architecture.

For end users and their organizations, the introduction of the Meridian line and a Dynamic Network Architecture will give them freedom to choose the most attractive and cost-effective means of accessing advanced communications and information services – through their own private systems, the public network, or a combination of both.

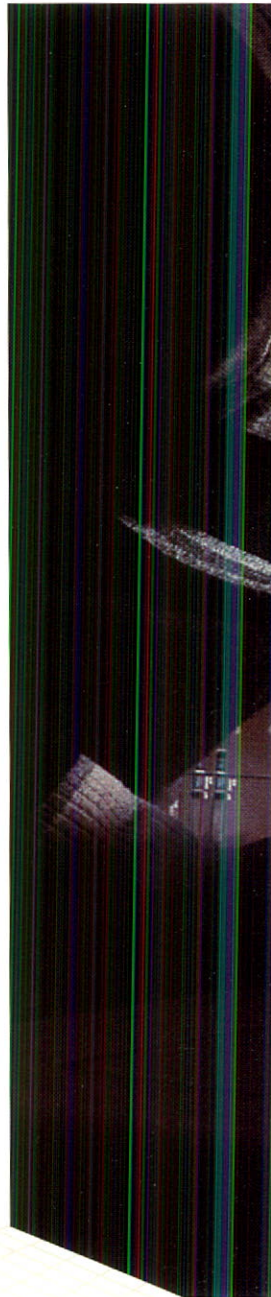
Meeting its commitments to continuity, Northern Telecom will be able to evolve and extend the architecture and capabilities of the nearly 13,000 SL PBXs installed to offer the same capabilities as the new Meridian SL-1 and SL-100 systems. This will be accomplished with the addition of *Packet Transport Equipment* and specially developed software and circuit packs.

In 1986, Northern Telecom will introduce a *Communications Service Module* for the DMS-100 switch, making it possible to enrich the Integrated Business Network features with services dedicated to a single customer organization equivalent to those to be offered on the Meridian SL-1 and SL-100 systems. In 1987, Northern Telecom will introduce enhanced capability on the module, allowing telecommunications companies to offer such services cost-effectively to multiple customers, small businesses, and the home.

The Packet Transport Equipment and Communications Service Module employ Northern Telecom's new Extended Multi-processor System (XMS) architecture. XMS provides computing capability for the various services and features provided. Simply stated, XMS means that, unlike other systems in which the processors have to be dedicated to specific tasks, the Meridian SL-1 and SL-100 functions can be easily transferred between processors. Additional processors can be added easily to increase the capacity for more functions and should any processor fail, its functions can instantly be re-allocated automatically to others.

### **LANSTAR**

Northern Telecom is introducing a local area network (LAN) capability, called LANSTAR, as an integral part of the Meridian SL-1 and SL-100 systems. The total bandwidth (information-handling capacity) available in the Packet Transport Equipment enables LANSTAR to carry up to 40 million bits of information per second (mbps). Other popular LANS now on the market have





*Northern Telecom's DMS-100 Family switches are evolving to offer new capabilities and services for public telecommunications*

*networks. Tony Cannata checks the print-out results of a test of DMS line circuits at the corporation's Bramalea, Ontario facility.*



*The Meridian DV-1 Data Voice System's computing capabilities are contained in easily expandable cabinets joined by a 20 mbps communications link for data and a 20 mbps line for voice.*

capacities of 10 mbps or less and can support only data communications. LANSTAR employs circuit (for voice) and packet (bundles of data sent in bursts) communications.

LANSTAR is the first LAN in the world capable of transmitting voice and data communications to the desk over conventional twisted-pair telephone wires at rates of 2.56 mbps. This capability will be available to those using Northern Telecom's new Meridian 4020 terminal. Equivalent capability using the Communications Service Module, will be offered for the DMS Family.

In 1985, Northern Telecom is also introducing *LANSTAR PC*, enabling IBM personal computers to be linked to the network for high-speed communications with each other, peripheral equipment such as printers and storage media, and other computers and services attached to the network.

Other manufacturers' terminals and computing systems can be linked to the DMS-100, or Meridian SL-1 or SL-100 systems. LANSTAR provides interfaces to other terminals and computers through the host of data modules and other devices previously introduced for the SL PBXs and DMS-100 Data to offer low-speed (up to 19.2 kbps) and medium-speed (up to 64 kbps) data communications.

### **New digital terminals**

The most powerful of Northern Telecom's new terminals are called the *Meridian M4000* series. The first of the series, the M4020, introduced in 1985, is designed to be an integral part of the Meridian SL-1 and SL-100. Similar terminals for public networks will be introduced for the DMS-100. The M4020 is capable of transmitting and receiving information over LANSTAR at rates of 2.56 mbps, giving the user excellent response time for functions such as sharing or accessing information files, financial spreadsheets, or text between terminals or from host computers.

The M4020 was designed as a compact terminal to fit comfortably on a desk. It consists of a high-resolution CRT (cathode ray tube) screen that can be swivelled, tilted, and raised for comfortable viewing; a base that contains the control logic and expandable memory; a telephone handset; and a moveable keyboard that can be stored under the terminal's base when not in use.

Devices such as a printer can be connected easily to an M4020. The M4020 is able to emulate data terminals made by other manufacturers (so it can communicate with them or with compatible host computers).

Through LANSTAR, the M4020 shares access to the Meridian SL-1 and SL-100 to use popular personal computing software. By accessing a rich variety of applications software programs developed by Northern Telecom and other vendors, the M4020 can offer such functions as word processing, financial spreadsheets (the screen provides up to 132 characters per line), database management, voice and text messaging and annotation, and appointments calendar management. The M4020 screen can be partitioned into multiple sections (windows) for concurrent tasks such as examining parts of several files at the same time.

The M4020 provides a broad array of calling features. A liquid-crystal display (LCD) located by the dialpad gives information on features being used (when the CRT is not in use), and such information as whether a message has been left for the user. Also included are a high-quality microphone and speaker for handsfree conversation.

Northern Telecom also announced the availability of several other digital terminals beginning in 1985 for Meridian SL-1 and SL-100. The corporation plans to introduce similar terminals for the DMS-100. The Meridian terminals include the:

- M3000 Touchphone*: a digital set providing control of communications functions via a unique touch-sensitive LCD. The LCD can access all of the Meridian calling features, and can explain how the features work. Touchphone includes an integrated handsfree conversation unit and a cost-effective option for transmitting data over the same pair of wires as the voice communications.

- M2000 series of digital terminals*: The first members of this series to be introduced are the M2112 and M2018 with 12 and 18 programmable keys, respectively, which can be assigned any combination of lines and features, and offer optional simultaneous data communications capability. The M2112 also features an integrated handsfree conversation unit.

In addition to these new digital terminals, the Meridian SL-1 and SL-100 will support Northern Telecom's SL PBX sets, as well as standard telephones.

### New information services

Northern Telecom is introducing an array of information services for the Meridian SL-1 and SL-100, and the DMS-100. Examples of the first services being introduced are:

- Messaging*: Voice and text messages can be annotated and sent to any other user within an organization served by the Meridian SL-1 or SL-100, or the DMS-100. Messaging is integrated with other services for such capabilities as annotating text files or documents and automatically routing busy or unanswered calls to the messaging system.
- Directory*: More than the electronic equivalent of a printed phone book, it can place calls and be used to automatically address and send messages.
- Forms*: This service makes it possible to automate many business procedures, including the composition and completion of business documents and electronic passwords for security. Complete a form and the system can automatically route it to others.
- Access*: Using this service, an individual can easily call up information from private or public databases from different computers. Access automatically provides the proper data transmission speed and necessary code or protocol conversions such as those for IBM 3278 or DEC VT100 terminals.
- Share*: Multi-media communications between two individuals using the system permits them to co-edit documents while simultaneously discussing the information on their terminals. Share automatically performs necessary speed and protocol conversions for the transfer and sharing of the information between the terminals.
- Resource Management*: This facilitates the use of other services by providing "Help" (instructions) to the user on the use of the system's capabilities. It also includes an electronic notation "clipboard," multi-media electronic filing, and printing of files.

### Meridian DV-1 Data Voice System

The Meridian DV-1 Data Voice System shares computing and architectural components with the Meridian SL-1 and SL-100, including the XMS architecture. Meridian DV-1 was designed to offer organizations, departments, or branches of from 5-to-100 people cost-effective data processing and communications, and the ability to expand to integrated data and voice capability.

Meridian DV-1's computing capabilities and digital switching are contained in easily expandable cabinets joined by a 20 mbps communications link for data and 20 mbps line for voice. Up to eight cabinets can be linked, occupying just 12 square feet of floor space in an office environment.

In addition to supporting conventional telephones, the DV-1 will also provide 2.56 mbps communications capability for IBM and IBM-compatible personal computers, Northern Telecom's M4020 terminal; a second member of the M4000 series, the M4010 for data-only services; and the Model 400 and 500 series of distributed data processing systems.

The DV-1 will include Northern Telecom proprietary software that provides call processing and data communication. The DV-1 supports applications software packages that function under the popular operating system based on UNIX, CP/M, and MS-DOS. The DV-1 provides extensive industry-standard languages, such as C, Cobol, Fortran, Basic, and Pascal, permitting users to develop their own specialized applications software. Northern Telecom will supply advanced software packages to provide such applications as word processing, financial spreadsheets, and database management.

Through a DV-1, users will be able to access host computers, public data networks, and their organization's PBX and Centrex (PBX-type features provided by a central office switch) services.

The Meridian SL-1 and SL-100, Meridian DV-1 Data Voice System, the new digital terminals, and enhanced DMS Family, represent data, and integrated data and voice products and capabilities unmatched in the world. Their introduction is but another step in Northern Telecom's OPEN World program. Additional innovative products and services will be introduced in future years.

### A Dynamic Network Architecture

The implementation of a Dynamic Network Architecture is based on the evolution of digital central office switches and much more. This includes the introduction of a number of new transmission systems, widespread use of optical systems with enhanced connectivity among and between switching and transmission systems, and new software that will permit the evolutionary restructuring of how the public telecommunications network functions.

This must be done without making obsolete the hundreds of billions of dollars invested in today's network. In the past, the network handled mainly voice communica-



*The M2000 series of digital terminals includes the M2112 and M2018 with 12 and 18 programmable keys, respectively.*

tions, using relatively small amounts of bandwidth allocated to specific circuits. Future networks must be capable of handling from a few bits to billions of bits of information at a time, transmitted at rates varying from hundreds to millions of bits per second.

The public telecommunications network of the future must be able to function as a single machine, although elements will be geographically dispersed and operated by different companies. It will have a multitude of access points including terminals connected directly to switches or through remote modules, or subscriber carrier systems such as DMS-1. These access points will be connected and interconnected by broad, ubiquitous transmission highways. The network must be able to make full and efficient use of its total capacity and capabilities by dynamically assigning them anywhere in the network where demand exists from users.

The objective is a high-performance, agile, cost-effective, end-to-end digital network for the implementation of ISDN.

To implement a Dynamic Network Architecture, Northern Telecom committed to the addition of new capabilities on its established systems and the introduction of new products and services.

In late 1984, Northern Telecom introduced the *DMT-300*, a system for digitally multiplexing (interweaving multiple communications signals on a single path). *DMT-300* also reduces the cost of interfaces between fiber optics systems transmitting at different rates. To facilitate the growth of a cost-effective synchronous fiber-optics transmission network, Northern Telecom will introduce the *DMT-400* in 1987.

Today's network offers various special services, including such capabilities as tie-lines (for point-to-point communications in private networks). These dedicated circuits are connected to, but are generally not switched by, the central office. Beginning in 1986, the DMS-100 will be able to automatically route such non-switched access lines.

To manage special-service circuits with the same flexibility as switched services are now handled, Northern Telecom will introduce a new family of products called digital cross-connect systems. The first of this Family, *DNX-100*, will be introduced in 1986.

The next member, *DNX-300*, to be introduced in 1987, will offer a more cost-effective interface between optical transmission systems operating at higher communications rates.

In 1987, Northern Telecom will provide direct synchronous fiber optics communications links to the DMS switching and transmission systems.

Northern Telecom will double the current per-hour call-handling capacity of the DMS-100 switch in 1987. The DMS-100's architecture—hardware and software—is open-ended, permitting further multiple increases of call-handling capacity. Previously installed switches will be upgradeable to the new capacity without the need to replace other modules in the system. Programs are already in place to accomplish this capacity increase. An extended network module for DMS-100 will follow to provide multiple 64 kbps channels for special services.

In 1986, the corporation will expand the extensive data-handling capabilities of the DMS-100 with the addition of a data access feature, permitting the transmission of data at rates up to 9.6 kbps simultaneously with voice communications over a single pair of telephone wires.

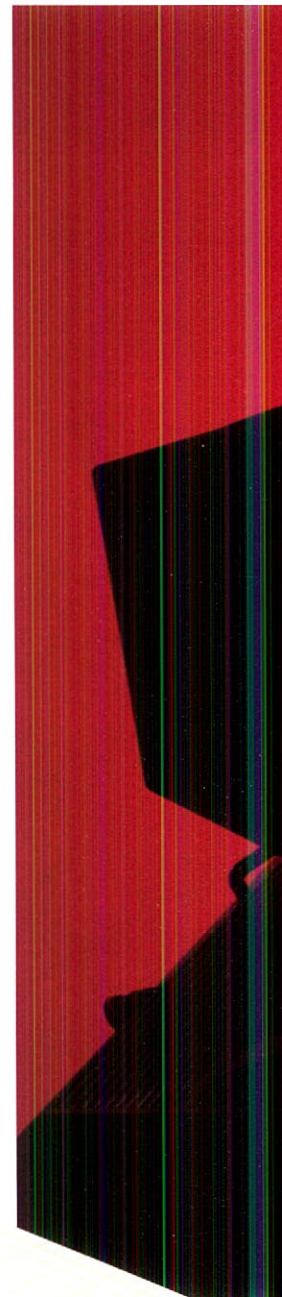
In 1987, the corporation will introduce for the DMS-100 a multi-channel interface for the agreed-upon ISDN standards for transmission rates between central office and PBX switches.

Protocols are the rules that dictate how systems communicate with each other. In 1986, Northern Telecom will begin the introduction of a protocol known as Common Channel Signalling 7 (CCS7), required to provide network-wide features availability. CCS7 is another key element for implementation of ISDN and will be supported on the DMS-10 and DMS-100 families.

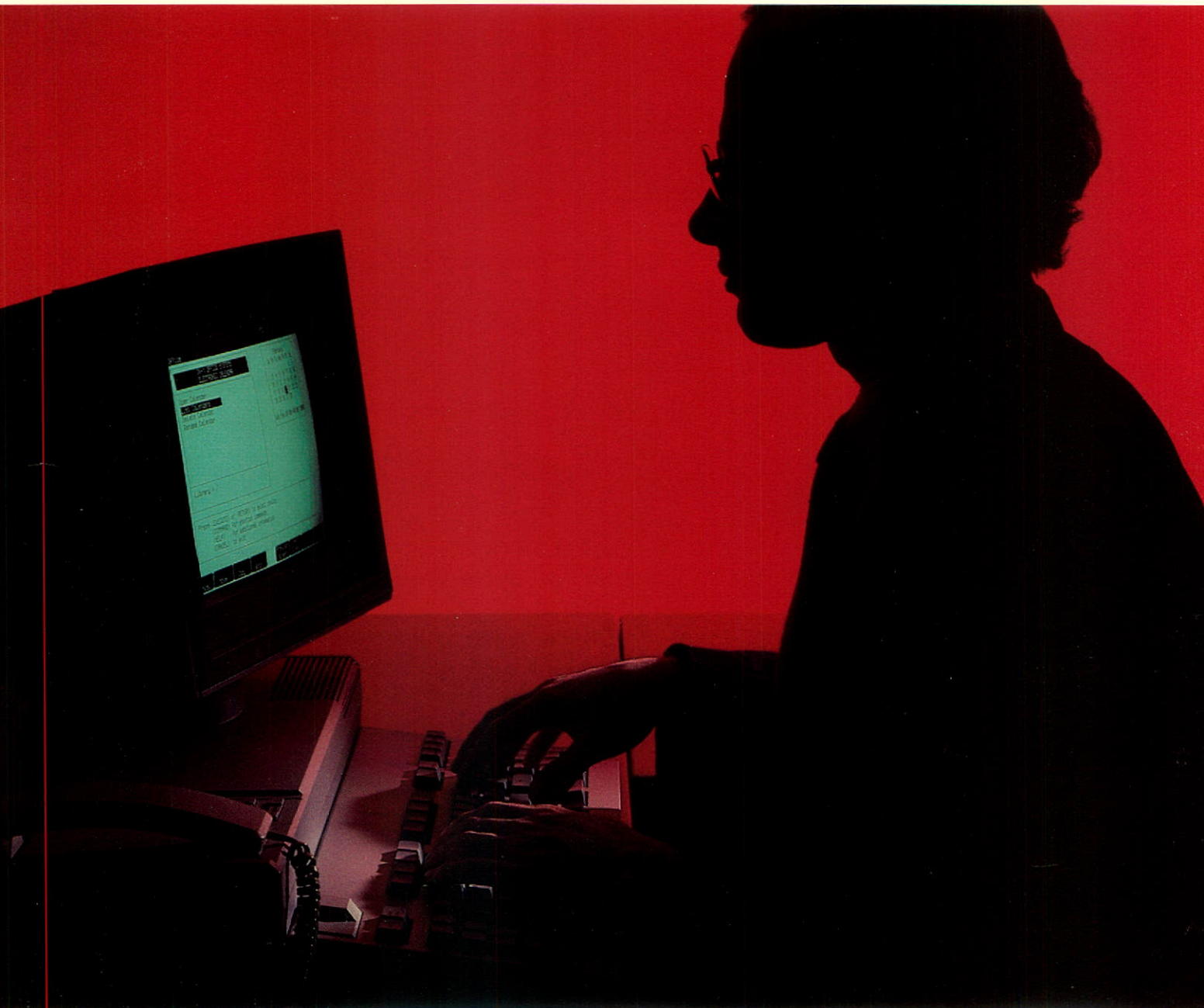
To provide cost-effective network access for data packet switching, Northern Telecom will introduce in 1986 a 1.54 mbps link between the DMS-100 and the corporation's SL-10 data packet switching system. In 1987, the corporation will extend the SL-10 Family with the introduction of a new high-capacity system called *DPN-100*, which will be able to handle up to 20,000 lines at each node.

Beginning in 1986, Northern Telecom will introduce a family of new products for network operating systems. Network operating systems, or digital network controllers (DNC), will manage the capacity and capability resources available throughout the network to automatically assign bandwidth on demand from users.

These systems will be able to initiate reconfiguration of local networks to handle fluctuating traffic patterns and can alert operators to congestion or failures within the







*The Meridian M4020 terminal is designed to be an integral part of the Meridian SL-1, SL-100, and DV-1 systems. Simi-*

*lar terminals will be introduced with the DMS-100 for public communications networks.*

network. If necessary, a network operating system will quickly solve or recommend solutions that may arise from congestion or failure in part of the network.

The first of these digital network controllers, called *DNC-500*, will be available in 1986. DNC-500 will meet users' needs to control their Centrex services. The DNC-500 will also be able to support special services, managing the links between cross-connect systems and multiplexers.

In 1987, Northern Telecom will introduce the *DNC-1000*, providing control of fiber optics communications and network-wide management capability. In 1987, the corporation will also introduce a network operating protocol to be supported on all Digital World products, based on the CCITT's X.400 message-handling specifications.

### **OPEN World: The Vision**

Imagine this scenario among many that are possible. You are at your desk in your office, or perhaps a bank, insurance company, or industrial organization. Maybe you are a hospital administrator, factory manager, university professor, or government official. Before you is a Northern Telecom Meridian M4020, and:

Your M4020 informs you there is a message waiting. With the stroke of a key, you call up the message (text or voice), which tells you that your organization's chief financial officer (CFO) would like to discuss your annual budget. Two more keystrokes call up the Directory service and you are quickly able to call the CFO, who, of course, has an M4020 on the desk. The CFO suggests that you look at the budget together and, using the Share service, places the same data on the screens of both terminals.

You begin to discuss the budget, but need more information. Using the Access service, you call up on your screen, creating one or more windows, information previously electronically filed on your organization's host computer. But you need some additional information. Continuing the call with the CFO, you add on as a conference call the department's financial controller, who provides the information needed, verbally or perhaps in another window on your screen.

Now you and the CFO discuss the budget, each making changes on the screen, which immediately appear on the other's terminal. Then, the CFO's M4020 indicates a call is coming in. The CFO places you on hold and takes the call from a manager of one of your organization's plants. The plant man-

ager has a question concerning inventory and production levels. Although both people are in different cities, and even have different host computers, the plant manager can call up the data and share the information on both M4020 terminals for discussion.

While waiting for the CFO to come back on your line, you are calling up your electronic mail and responding by text or voice message, and your secretary is printing out a revised copy of the budget. When the CFO comes back on the line, you conclude your conversation and agree to call a staff meeting to discuss the details.

Using the electronic calendar capability, you or your secretary can use the M4020 to poll the electronic calendars of the other employees involved to find an open date. Finding one, the information about the time, place, and reason for the meeting are entered into everyone's calendar.

We live in a constantly changing environment. We have a seemingly unquenchable need to communicate information of all kinds. We want to be able to do this quickly and easily at minimal cost. The ability to do so may affect our standard of living, health, and the future of institutions, including business and government, on which we depend.

Advances in technologies such as microelectronics, software, and fiber optics are making possible opportunities and services that science fiction writers dreamed of for the past century or more. Barriers to communications of time, space, or systems incompatibility are disappearing. The only limits left may be those of imagination.

A communications revolution began with Northern Telecom's announcement of the Digital World. In the five years, 1985-1989, Northern Telecom expects to invest more than \$4 billion in research and development for information and communications systems, more than three times the level of R&D spending for the past five years.

These systems will meet the criteria established for the OPEN World, providing: *control* by users of their information systems and networks, whether they are at home, at work, or at work at home; *cost-effective* access and use of information services; *congenial* communications of information in all forms; *continuous* evolution of the systems, networks, and capabilities; and *compatibility* between systems and networks to facilitate communications. Northern Telecom continues to lead the way to an Intelligent Universe.

## Financial review

**N**orthern Telecom reported record financial results for 1984 consolidated revenues, net earnings (applicable to common shares) and earnings per common share, and order input and yearend backlog.

Consolidated revenues in 1984 were \$4.379 billion, up 32.5 percent from \$3.304 billion in 1983, and compared with \$3.036 billion in 1982. These increases were attributable principally to volume growth rather than price changes.

### U.S. continued to lead growth

The United States continued to represent the largest part of Northern Telecom's growth in 1984, while the Canadian market recovered following a decline in 1983, and revenues in international markets were little changed from the prior year.

On a geographic basis (the location of the selling organization), U.S. revenues were \$2.826 billion (64.5 percent of consolidated revenues), up 49.8 percent from \$1.887 billion (57.1 percent of total) in 1983; 1982 revenues were \$1.473 billion (48.5 percent of the total).

Canadian revenues increased to \$1.379 billion (31.5 percent of the total) in 1984, a 10.1 percent increase from \$1.252 billion (37.9 percent of the total) in 1983, which represented a 10.1 percent decline from the 1982 level of \$1.392 billion (45.9 percent of the total).

Outside of North America, revenues in 1984 were \$174.1 million (four percent of the total), up 5.4 percent from \$165.2 million (five percent of the total) in 1983, and compared with \$169.8 million (5.6 percent of the total) in 1982.

### Revenues by destination

The preceding numbers and note 18 to the financial statements report revenues by the location of the selling organization which invoiced the sale of the product. Measured by destination (the markets where the customers are located), international revenues were \$372.5 million (8.5 percent of the total), compared with the 1983 level of \$376.3 million (11.4 percent of the total), and compared with \$325.2 million (10.7 percent of the total) in 1982.

In 1984, sales of SL PBXs (private branch exchanges) to international customers rose 24 percent. Despite a substantial increase in optical systems revenues, transmission revenues in 1984 declined 41.9 percent, reflecting completion in 1983 of a major contract in South Korea for digital transmis-

sion equipment. In 1984, DMS central office switching and SL-10 revenues were flat with the 1983 levels, while analog switching sales rose mainly due to a contract in Turkey. Increased revenues in 1983 compared with 1982 reflected gains in sales of digital and analog central office switching, and SL-10 data packet switches.

In Canada, revenues by destination increased 12.7 percent to \$1.208 billion (27.6 percent of the total) from \$1.072 billion (32.4 percent of revenues) in 1983; in 1982 revenues were \$1.248 billion (41.1 percent of the total).

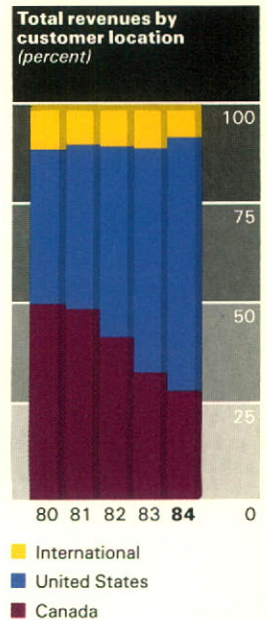
This growth was, in part, due to a recovery in spending by telecommunications companies, the corporation's major customers in Canada. As well, during the past several years, new markets for information systems have developed in Canada, such as interconnect sales by distributors.

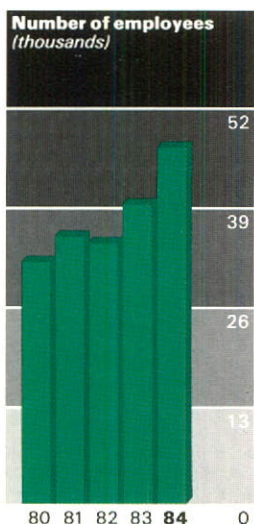
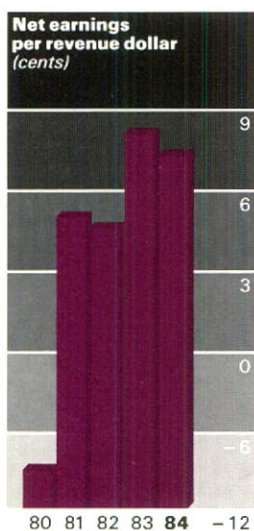
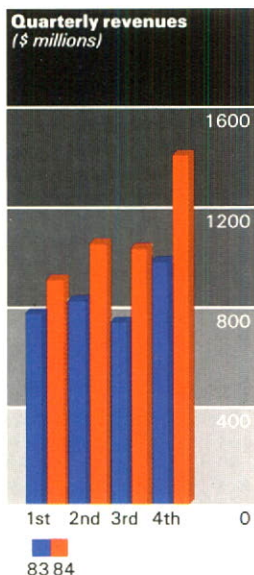
Contributing to increased Canadian revenues in 1984 were DMS switching, up 47.7 percent; SL PBXs, up 19.3 percent; and telephone apparatus such as the new Harmony electronic telephone sets, up 34.9 percent. Transmission revenues declined 18.2 percent in 1984 reflecting an overall weak market for these products.

Bell Canada and other subsidiary and associated companies of Bell Canada Enterprises Inc. (BCE) accounted for \$903.9 million, or 20.7 percent of Northern Telecom's 1984 consolidated revenues, up 13.1 percent from \$798.9 million (24.2 percent of the total) in 1983; in 1982 revenues were \$913.8 million (30.1 percent of the total). The amounts reflect the fluctuating levels of spending by those companies as the economy weakened and then recovered.

U.S. revenues rose 50.8 percent in 1984 to \$2.799 billion, compared with \$1.856 billion in 1983 (63.9 percent and 56.2 percent of the total, respectively), and \$1.462 billion (48.2 percent of the total) in 1982. The increase in 1984 was led by DMS switching revenues, up 77.3 percent; transmission systems, 57.6 percent; and SL PBXs, which rose 43.2 percent.

Sales to the various Bell operating companies (BOCs), divested by American Telephone and Telegraph Company in 1984, more than doubled to US\$699.3 million from US\$340 million in 1983 (excluding sales of PBXs and other equipment made through the BOCs' distribution companies). Revenues also rose from sales of various products to other telecommunications companies, inter-





exchange carriers, government and military customers, and in other markets such as industrial, education, and health and hospitality organizations.

### Product line revenues rose

While revenues for each of the five reported product lines increased in 1984, the most significant rise was recorded by central office switching, up 55.8 percent.

Central office switching revenues in 1984 were \$1.886 billion, compared with \$1.211 billion in 1983, and \$1.004 billion in 1982. Central office switching revenues increased as a proportion of the total business to 43.1 percent in 1984, compared with 36.6 percent in 1983 and 33.1 percent in 1982. The principal reason for the increased revenues was the success of DMS digital switches in the U.S. and Canada. DMS revenues rose 67.8 percent to \$1.615 billion in 1984, compared with \$962.4 million in 1983 and \$672.5 million in 1982.

Revenues for analog switching, and peripheral and other equipment rose 9.2 percent in 1984 from 1983; the 1983 level was down 25.2 percent from the 1982 amount.

An adjustment in the previously reported revenues for the central office switching and transmission product lines has been made to reflect the consolidation with switching of certain peripheral systems, previously reported as transmission revenues.

Northern Telecom has stated that its business strategy includes an intent to develop and market products, systems, and networks that effectively integrate voice and data communications. The corporation has made considerable progress in implementing this strategy and in 1985 is launching new integrated voice and data systems for private and public networks. For example, increasingly, combined voice and data digital terminals are being designed and marketed as integral elements in information systems. Reflecting this integration, effective with this report, the product lines previously known as business communications systems and terminal equipment have been combined into a single line called integrated business systems and terminals.

Integrated business systems and terminals revenues rose 24.1 percent to \$1.508 billion in 1984 compared with \$1.215 billion in 1983, and \$1.190 billion in 1982. SL PBX revenues led the increase, rising 37.8 percent to \$864.1 million in 1984 from \$627.2 million in 1983; in 1982 SL PBX revenues were \$570.3 million. Other significant gains in 1984 included sales of key telephone sys-

tems, mainly the Vantage line, up 56.7 percent; SL-10 data packet switching revenues, up 25.7 percent; and telephone apparatus, up 21.9 percent.

In 1984, Northern Telecom began phasing out production of the Model 500 series of distributed data processing systems, continuing to manufacture for orders and to sell systems from inventories or the lease base. Revenues for data systems declined 13.7 percent during the year. In Europe, the corporation introduced the Vienna Family of shared resource computers and terminals, with initial shipments of terminals in May and computers in August. In February 1985, the corporation launched a new line of integrated voice and data products, called Meridian.

Transmission revenues were \$599.6 million in 1984, up 15.4 percent from \$519.8 million in 1983, and compared with \$487.8 million in 1982. Particularly strong areas included microwave radio, the DMS-1 Family, and optical systems. Fiber optics revenues rose 78.4 percent in 1984 to \$99.9 million from \$56 million in 1983, and \$39.6 million in 1982.

Revenues from cable and outside plant products were \$308.8 million in 1984, up 8.9 percent from \$283.6 million in 1983, and \$291.5 million in 1982. The gain in 1984 was mainly due to the increase in outside plant products which rose 12.3 percent to \$134.9 million from \$120.1 million in 1983, and \$122.3 million in 1982, and higher sales of cable to customers in the U.S. The decline in 1983 reflected reduced demand for cable in Canada and lower prices during the year due to a drop in copper prices.

Other telecommunications mainly comprises research and development done for Bell Canada and other customers, and some sales of integrated circuits and memory systems. Revenues rose 2.3 percent to \$76.5 million in 1984 from \$74.8 million in 1983, and \$62 million in 1982.

### Higher gross margin

The profitability of the DMS switching family and the increasing proportion of consolidated revenues attributable to them contributed to further improvement in the corporation's gross profit margin in 1984.

The gross margin in 1984 was 38.5 percent, resulting in gross profit of \$1.688 billion. In 1983, the gross margin was 36.1 percent with gross profit of \$1.192 billion; in 1982 the margin was 30 percent and gross profit was \$911.3 million.

Transmission systems experienced lower profit margins due to the costs of introducing new products and price competition in certain product lines and markets. New products included the DMS-1 Urban, RD-4A and RD-6A four and six gigahertz digital microwave radios, single-mode optical fiber and FD-135 optical multiplex systems.

The consolidated gross margin improvements also reflected the continuing success of the corporation's cost-reduction and productivity programs.

### SG&A

Selling, general and administrative expenses (SG&A) amounted to \$781.6 million in 1984 (17.9 percent of revenues), up 39.4 percent from \$560.7 million in 1983, and \$461.9 million in 1982 (17 percent and 15.2 percent of revenues, respectively).

The increases in SG&A are due mainly to the expansion of the U.S. marketing, sales, and services forces, reflecting continuing growth in revenues. These forces were also increased in the international business to support the corporation's efforts to achieve in the future significantly higher business outside of North America. Higher salaries and employee-related expenses also affected SG&A. Northern Telecom has significantly increased its expenditures in marketing and promotion of the corporation and its products.

### R&D investment rose 32.9 percent

The net investment in R&D in 1984 was increased 32.9 percent to \$431.5 million (9.9 percent of consolidated revenues), compared with \$324.8 million (9.8 percent of revenues) in 1983; the 1982 level was \$241.4 million (eight percent of revenues).

In 1985, Northern Telecom expects to invest in R&D at a similar rate. Major investments will continue to be made to enhance established systems such as the DMS Family, and in new products such as the Meridian line, transmission systems, and others.

### Operating earnings

Operating earnings rose 54.8 percent in 1984 to \$474.4 million compared with \$306.5 million in 1983 (operating margins of 10.8 percent and 9.3 percent, respectively); the 1982 operating earnings were \$208 million (6.9 percent of revenues).

On a geographic basis (location of the selling organization), operating earnings do not include general corporate or R&D expenses. Operating earnings in Canada increased 16.8 percent to \$453.6 million from \$388.3 million in 1983, and compared with \$357.1 million in 1982.

U.S. operating earnings were up 72 percent to \$633.7 million, compared with \$368.5 million in 1983, and up from \$182.1 million in 1982.

International operating earnings were \$23.1 million in 1984, compared with \$26.9 million in 1983, and \$36.5 million in 1982. The decline reflected higher expenses mainly due to growth in the marketing, sales, and service operations.

### Equity earnings

Equity in earnings from operations of non-consolidated finance subsidiaries amounted to \$61.5 million in 1984, compared with \$54.2 million in 1983 and \$69 million in 1982. The decrease from 1982 to 1984 is primarily because of reduced loans to Northern Telecom subsidiaries and reduced interest on such loans. Amounts due to non-consolidated finance subsidiaries outstanding at yearend 1984, 1983, and 1982, were \$297.2 million, \$315.2 million, and \$374.6 million, respectively.

### Interest charges

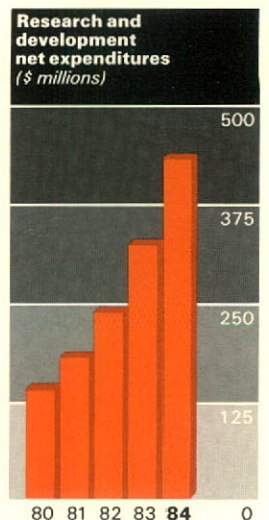
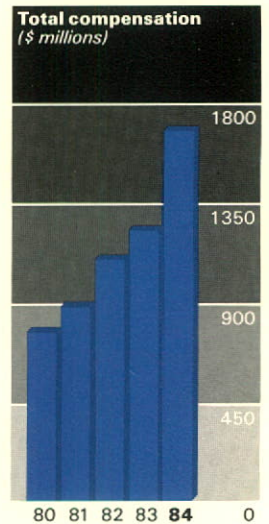
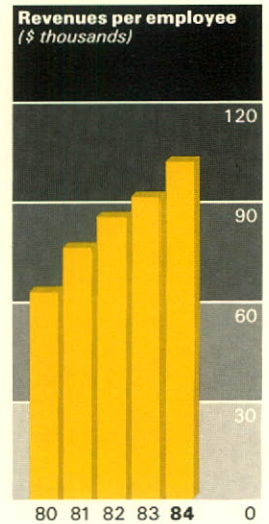
Total interest charges were \$66.8 million in 1984, \$64.8 million in 1983, and \$108.6 million in 1982. The increase in 1984 interest expense is partly attributable to higher average short-term borrowings and generally higher short-term rates in 1984 compared with 1983.

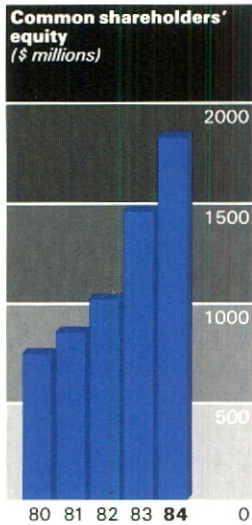
Including the current portion, total long-term debt and Scientific Research Investment Contracts (SRICs), outstanding at yearend 1984, 1983, and 1982 were \$172.9 million, \$190.8 million, and \$340.3 million, respectively. Short-term debt outstanding at the end of the respective years was \$117.9 million, \$1.6 million, and \$1.3 million. The average combined rate on long-term and short-term debt at yearend 1984 was 9.2 percent, compared with 7.9 percent at yearend 1983, and 8.8 percent at yearend 1982.

If the SRIC financing were eliminated from the yearend interest calculations for 1983 and 1984, the yearend average interest rate would have declined in 1984 reflecting a higher use of short-term debt at a favorable rate compared with the prior year.

### Taxes and extraordinary items

The 1984 provision for income taxes was \$157.1 million (32 percent of pre-tax earnings), compared with \$98 million (30.1 percent of pre-tax earnings) in 1983, and





\$60.4 million (31.3 percent of pre-tax earnings) in 1982. The increase in the tax rate was mainly the result of higher earnings in the U.S. where the effective tax rate is higher than in Canada.

In 1983 and 1982, the corporation fully used all its available accounting tax loss carryforwards. This resulted in extraordinary gains of \$41.3 million, or \$0.37 per common share, in 1983, and \$7 million, or \$0.06 per common share, in 1982.

### Record net earnings

Earnings, before extraordinary gains and preferred-share dividends, rose 47 percent to \$333.9 million from the previous record level in 1983 of \$227.1 million; 1982 net earnings were \$132.4 million. Net earnings applicable to common shares (including extraordinary gains in 1983 and 1982, and preferred-share dividends in 1984) were \$317.5 million in 1984 (\$2.76 per common share), compared with \$268.4 million (\$2.42 per common share) in 1983, an 18.3 percent increase, and \$139.4 million (\$1.32 per common share) in 1982.

Preferred dividends were \$16.4 million for the year. The corporation does not view preferred shares as permanent equity because of their retraction terms. The return on average common shareholders' equity, before extraordinary items and after preferred-share dividends, was 19.3 percent in 1984, 18.4 percent in 1983, and 14.3 percent in 1982.

Net return on average invested capital, before extraordinary items, increased in 1984 to 14.2 percent from 12.3 percent in 1983 and 9.3 percent in 1982. This ratio is calculated by adding after-tax earnings before extraordinary items to interest charges on long-term debt (after tax), and dividing by invested capital. Invested capital comprises the long-term portion of long-term debt, amounts due to non-consolidated finance subsidiaries, SRICs, deferred credits, deferred income taxes, minority interest, preferred shares, and shareholders' equity.

Book value of the corporation's common shares rose to \$15.77 at yearend 1984, compared with \$12.79 and \$9.45 at yearend 1983 and 1982, respectively.

### Liquidity and capital resources

In 1984, funds provided from earnings and depreciation of \$567.1 million exceeded by significant amounts the 1983 and 1982 levels, which were \$388.9 million and \$309.5 million, respectively. Effectively, these funds were reinvested in working capital, which increased by \$551.9 million, with

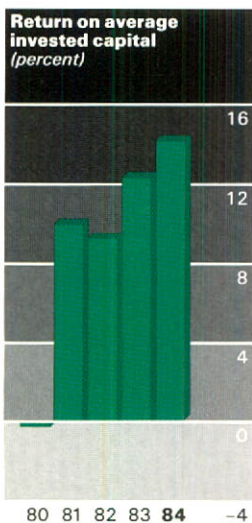
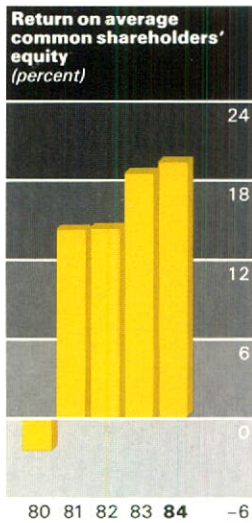
other elements of operating cash flow offsetting each other. The amount of current assets less current liabilities increased by \$440.4 million in 1984 compared with increases of \$65.4 million in 1983 and \$138 million in 1982. This resulted in an increase in the current ratio to 1.92:1 for 1984, from 1.80:1 in 1983; the current ratio in 1982 was 1.94:1.

The primary use of increased working capital funds was for higher levels of inventory (up \$471.7 million from 1983) and accounts receivable (up \$369.6 million from 1983). These were built-up commensurate with increasing revenues levels in 1984 and to meet the anticipated demand in 1985 as indicated by the record yearend backlog.

The increased revenues growth experienced by the corporation and the higher-than-expected level of orders in 1984 required higher levels of working capital and investment in plant and equipment. Some capital programs planned for 1985 were advanced and the 1984 spending was increased from an expected \$500 million to \$569.6 million. Capital expenditures in 1984 were up 51.1 percent from \$376.9 million in 1983, and compared with \$252.6 million in 1982. The increases in 1984 capital spending were, in particular, to provide for production capacity for new and established products and systems, and for systems such as computers and computerized manufacturing, test, and design systems to increase productivity and quality. Major investments were made in DMS and SL switching, transmission systems, and integrated circuits manufacturing, and in R&D equipment and facilities.

Capital expenditures for 1985 are expected to be about \$660 million, reflecting the continuing demand for production capacity expansion, the introduction of new systems and cost-reduction efforts.

Funds provided from operations of \$56.7 million were insufficient to meet investment needs of \$549.8 million, resulting in significant external financing. After reducing cash and short-term investments by \$13.4 million from yearend 1983 levels, it was necessary to increase short-term borrowings by \$116.3 million principally through commercial paper issued by the corporation's U.S. subsidiary. In 1984, the corporation issued preferred shares for the first time, making three public offerings in Canada of its Cumulative Redeemable Retractable Class A Preferred Shares as



follows: 4,400,000 shares of \$2.1875 Series 1 issued in April for \$110 million; 3,120,000 shares of \$2.22 Series 2 issued in June for \$78 million; and 8,000,000 shares floating rate Series 3 issued in August for \$200 million.

Continued growth of the business will require further investment in 1985. These investments will be met principally from internally generated funds and will be supplemented by external financing as required. While having no immediate need for funds at yearend 1984, the corporation will continue to take advantage of attractive financing opportunities it identifies.

In March 1983, a wholly owned non-consolidated finance subsidiary of the corporation, Northern Telecom International Finance B.V. (NTIF) of the Netherlands, completed a public offering in Europe of US\$50 million (\$61.8 million) of seven percent convertible subordinated debentures due March 1, 1998. The debentures are unconditionally guaranteed on a subordinated basis by the corporation and are convertible into common shares of Northern Telecom at US\$29.6666 per share. At December 31, 1984, US\$5,985,000 principal amount of the debentures had been converted, resulting in the issuance of 201,737 common shares.

The holders of the remaining outstanding debentures have the right to require NTIF to redeem their debentures at 100 percent of the principal amount on March 1, 1985 or March 1, 1986 provided they tender their securities at any time during the month of December of the respective preceding year. No such debentures so were tendered for redemption on March 1, 1985. Prior to March 1, 1986, NTIF has the right to call for redemption the outstanding 1998 debentures if the market price of Northern Telecom's common shares is at least 120 percent of the conversion price for a specified period.

Through the Shareholder Dividend Reinvestment and Stock Purchase Plan, \$27.9 million of dividends and additional cash were invested in 1984, \$26.9 million in 1983, and \$20.4 million in 1982. These amounts included \$23.9 million, \$23.6 million, and \$19.4 million, respectively, from BCE, the corporation's majority shareholder. Investment plans for employees raised \$14.2 million in 1984, \$8.8 million in 1983, and \$7.3 million in 1982.

Total debt as a percentage of total capitalization was 25.4 percent at the end of 1984, compared with 11 percent at yearend 1983, and 23.8 percent at yearend 1982

(total debt comprises notes payable, SRICs, total long-term debt, and preferred shares; total capitalization consists of total debt, deferred taxes, minority interest, and common shareholders' equity).

### Backlog up 51 percent

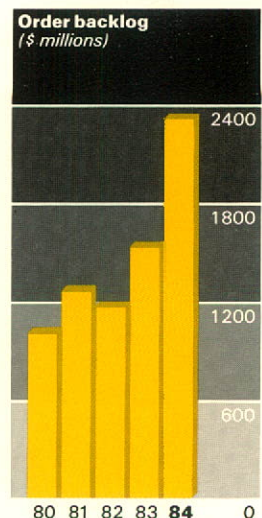
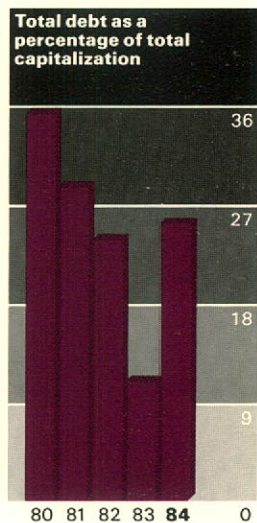
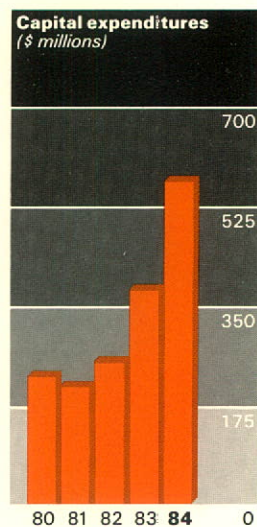
Reflecting mainly demand for DMS and SL switches, order input in 1984 was \$4.903 billion, 40.9 percent higher than the \$3.48 billion of orders received in 1983, and compared with \$2.744 billion of orders in 1982.

At yearend 1984, the backlog of orders on hand was \$2.308 billion, up 50.9 percent from the year earlier level of \$1.529 billion; the backlog at yearend 1982 was \$1.173 billion. Virtually all the backlog is for delivery in 1985.

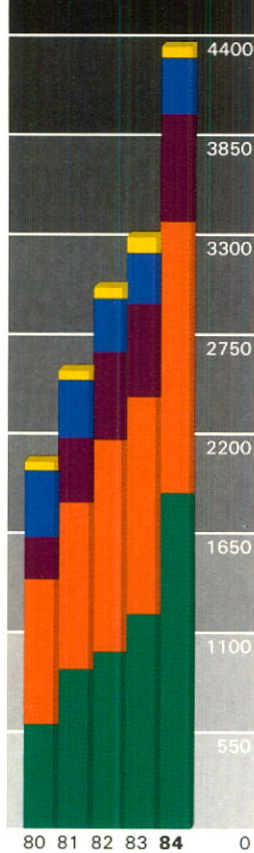
Historically, orders for central office switches have accounted for the largest part of the backlog, reflecting the time needed to produce these systems. DMS switching represented \$1.38 billion, or 59.8 percent of the order backlog at yearend 1984 compared with \$856.9 million, or 56 percent of the yearend 1983 backlog. Integrated business systems and terminals orders on hand was the next most important product line at 22.6 percent of the backlog compared with 21.8 percent of the yearend 1983 total.

It is the corporation's policy to include in the backlog only firm orders for specific systems. Accordingly, while Northern Telecom signed a number of significant supply agreements with major customers during the past several years, only a portion of an agreement's expected value is included in the order backlog at any given date.

Orders from customers in the U.S. represent a growing amount of the backlog. At yearend 1984, orders on hand from U.S. customers were 60.9 percent higher than a year earlier, and at \$1.736 billion, represented 75.2 percent of the total backlog. This compared with 71 percent (\$1.079 billion) of the order backlog at yearend 1983. Orders on hand from Canadian customers at yearend 1984 were \$381 million, up 14.9 percent from a year earlier (\$331.6 million), representing 16.5 and 21.7 percent, respectively, of the yearend backlogs. International customers accounted for the balance, amounting to 8.3 percent of the 1984 yearend backlog (\$191 million), compared with 7.8 percent (\$118.6 million) a year earlier.



**Revenues by principal product lines**  
(\$ millions)



■ Other telecommunications  
■ Cable and outside plant  
■ Transmission  
■ Integrated business systems and terminals  
■ Central office switching

### Performance of common shares

Northern Telecom's common shares are listed on the Montreal, Toronto, Vancouver, New York, and London stock exchanges. The following table shows the high and low sale prices of the shares on the Montreal and Toronto exchanges (taken together), and as reported on the composite tape in the United States, which includes trading on the New York Stock Exchange (NYSE). At January 31, 1985, the last sale price on the NYSE was US\$39.50, and on the Toronto Stock Exchange was \$52.50.

	Montreal/Toronto (C\$)		NYSE Composite Tape (US\$)	
	High	Low	High	Low
<b>1983</b>				
First quarter	33 <sup>5</sup> / <sub>8</sub>	27 <sup>1</sup> / <sub>4</sub>	27 <sup>5</sup> / <sub>8</sub>	22 <sup>1</sup> / <sub>8</sub>
Second quarter	50 <sup>1</sup> / <sub>4</sub>	31	41	25
Third quarter	60 <sup>5</sup> / <sub>8</sub>	44	49 <sup>1</sup> / <sub>8</sub>	35 <sup>1</sup> / <sub>2</sub>
Fourth quarter	58 <sup>1</sup> / <sub>8</sub>	46 <sup>7</sup> / <sub>8</sub>	47 <sup>1</sup> / <sub>4</sub>	37 <sup>3</sup> / <sub>8</sub>
<b>1984</b>				
First quarter	52 <sup>1</sup> / <sub>2</sub>	41 <sup>1</sup> / <sub>8</sub>	42	32 <sup>1</sup> / <sub>4</sub>
Second quarter	45 <sup>1</sup> / <sub>2</sub>	38 <sup>3</sup> / <sub>4</sub>	35 <sup>1</sup> / <sub>8</sub>	29 <sup>7</sup> / <sub>8</sub>
Third quarter	55 <sup>1</sup> / <sub>8</sub>	43 <sup>5</sup> / <sub>8</sub>	42 <sup>1</sup> / <sub>4</sub>	33
Fourth quarter	53	44	40 <sup>1</sup> / <sub>4</sub>	32 <sup>1</sup> / <sub>8</sub>

At December 31, 1984, BCE owned 51.9 percent of Northern Telecom's common shares. The remaining 48.1 percent were owned by 14,395 registered shareholders.

### Dividends

In 1984 and 1983, Northern Telecom paid a cash dividend on common shares each quarter of \$0.10 per common share, for a total of \$0.40 each year. The total amounts paid out as dividends in 1984 and 1983 were \$46 million and \$44.7 million, respectively. The corporation's dividends are declared in Canadian funds; shareholders may choose to receive payment in U.S. funds (based on a

conversion rate). Shareholders may invest common-share dividends and optional cash payments under the Shareholder Dividend Reinvestment and Stock Purchase Plan.

Northern Telecom intends to continue paying quarterly dividends. The level of payments will be determined by the Board of Directors based on such considerations as the earnings from operations, capital requirements, and the corporation's financial condition.

Under the Income Tax Act (Canada), cash dividends paid on Northern Telecom common shares to non-residents of Canada are subject to withholding tax, unless the non-resident person carries on business in Canada and the dividends may reasonably be attributed to that business. The rate of withholding tax is 25 percent or such lower rate as provided for under an applicable tax treaty. Under the terms of the Canada-United States Income Tax Convention, the rate of non-resident withholding tax will not exceed 15 percent in the case of cash dividends paid to a resident of the U.S., within the meaning of the Convention, who is the beneficial owner of such dividends.

Shareholders who are neither residents nor deemed to be residents of Canada, and who do not use or hold and are not deemed to use or hold the corporation's common shares in carrying on business in Canada, are generally not subject to tax under the Income Tax Act (Canada) on the disposition of the common shares. Capital gains on the disposition of the common shares are subject to tax if at any time during the period of five years immediately preceding the disposition, not less than 25 percent of the issued shares of any series or class of the capital stock of Northern Telecom belonged to the non-resident holder and/or persons with whom the holder did not deal at arm's length. Under the Convention, gains from the disposition of the common shares by residents of the U.S. are generally exempt from taxation in Canada.

### Revenues by principal product lines

	1984	1983	1982	1981	1980
Central office switching	\$1,885.5	\$1,210.5	\$1,004.4	\$ 897.4	\$ 591.2
Integrated business systems and terminals	1,508.2	1,215.3	1,189.8	937.3	816.8
Transmission	599.6	519.8	487.8	363.8	240.6
Cable and outside plant	308.8	283.6	291.5	323.6	361.6
Other telecommunications	76.5	74.8	62.0	48.8	44.4
<b>Total</b>	<b>\$4,378.6</b>	<b>\$3,304.0</b>	<b>\$3,035.5</b>	<b>\$2,570.9</b>	<b>\$2,054.6</b>

Note: Revenues have been reclassified for 1983 and prior years to conform with the presentation adopted in 1984.



**Consolidated statement of operations**

Northern Telecom Limited and subsidiary companies  
Year ended December 31  
(millions of dollars except per share figures)

	1984	1983	1982
Revenues (note 18)	\$4,378.6	\$3,304.0	\$3,035.5
Cost of revenues	2,691.1	2,112.0	2,124.2
Gross profit	1,687.5	1,192.0	911.3
Selling, general and administrative expense	781.6	560.7	461.9
Research and development expense (note 2)	431.5	324.8	241.4
Operating earnings	474.4	306.5	208.0
Equity in earnings from operations of non-consolidated finance subsidiaries (note 3)	61.5	54.2	69.0
Investment and other income (net)	21.3	24.4	25.6
Interest charges			
– amounts due to non-consolidated finance subsidiaries (note 3)	(37.9)	(44.0)	(61.2)
– long-term debt	(13.2)	(16.4)	(34.6)
– other	(15.7)	(4.4)	(12.8)
Foreign currency gains (losses) (note 3)	.6	4.8	(1.2)
Earnings before income taxes and extraordinary item	491.0	325.1	192.8
Provision for income taxes (notes 3 and 4)	(157.1)	(98.0)	(60.4)
Earnings before extraordinary item	333.9	227.1	132.4
Extraordinary item (note 5)	–	41.3	7.0
Net earnings	333.9	268.4	139.4
Dividends on preferred shares	(16.4)	–	–
Net earnings applicable to common shares	\$ 317.5	\$ 268.4	\$ 139.4
Earnings per common share (note 6)			
– before extraordinary item	\$ 2.76	\$ 2.05	\$ 1.26
– after extraordinary item	\$ 2.76	\$ 2.42	\$ 1.32
Dividends declared per common share	\$ 0.40	\$ 0.40	\$ 0.333
Weighted average number of common shares outstanding (thousands)	115,000	110,926	105,492

**Consolidated statement of retained earnings**

Northern Telecom Limited and subsidiary companies  
Year ended December 31  
(millions of dollars)

	1984	1983	1982
Balance at beginning of year	\$ 667.4	\$ 443.7	\$ 339.4
Net earnings	333.9	268.4	139.4
	1,001.3	712.1	478.8
Dividends—preferred shares	(16.4)	–	–
– common shares	(46.0)	(44.7)	(35.1)
Expenses of issue of preferred shares, net of related income taxes	(5.9)	–	–
Balance at end of year	\$ 933.0	\$ 667.4	\$ 443.7


## Consolidated balance sheet

Northern Telecom Limited and subsidiary companies  
As at December 31  
(millions of dollars)

<b>Assets</b>		<b>1984</b>	<b>1983</b>
Current	Cash and short-term investments at cost (approximates market value)	\$ 94.9	\$ 108.3
	Accounts receivable		
	Affiliated companies	83.3	98.8
	Trade (less provision for uncollectibles \$49.6 for 1984, \$31.3 for 1983)	1,035.9	650.8
	Inventories (note 7)	1,144.5	672.8
	Prepaid expenses	20.8	11.8
	Deferred income taxes	—	31.2
		<b>2,379.4</b>	<b>1,573.7</b>
Long-term receivables	34.3	36.1	
Investments	Non-consolidated finance subsidiaries (note 3)	478.1	420.6
	Other	15.8	12.4
	<b>493.9</b>	<b>433.0</b>	
Other	Plant and equipment—net (note 8)	1,145.3	803.6
	Goodwill and other assets (note 1)	6.8	26.6
	<b>Total assets</b>	<b>\$4,059.7</b>	<b>\$2,873.0</b>
<b>Liabilities and shareholders' equity</b>			
Current liabilities	Notes payable	\$ 117.9	\$ 1.6
	Accounts payable and accrued liabilities		
	Affiliated companies	4.9	7.5
	Payroll accrued	78.5	63.6
	Trade and other	915.7	678.5
	Taxes payable	77.5	59.8
	Due to non-consolidated finance subsidiaries (note 3)	13.8	33.4
	Scientific research investment contracts due within one year (note 9)	24.3	24.5
	Long-term debt due within one year (note 10)	4.9	3.3
		<b>1,237.5</b>	<b>872.2</b>
Long-term liabilities	Due to non-consolidated finance subsidiaries (note 3)	283.4	281.8
	Scientific research investment contracts (note 9)	11.2	35.7
	Long-term debt (note 10)	132.5	127.3
	<b>427.1</b>	<b>444.8</b>	
Deferred credits	Income taxes	155.2	73.9
	Other	11.8	3.1
	<b>167.0</b>	<b>77.0</b>	
Minority interest in subsidiary company		18.1	13.5
Preferred shares (redeemable) (note 12)		388.0	—
Common shareholders' equity	Stated capital of common shares (note 13)	797.8	755.7
	Retained earnings	933.0	667.4
	Foreign exchange adjustment (note 14)	91.2	42.4
	<b>1,822.0</b>	<b>1,465.5</b>	
Commitments and contingencies (note 17)			
	<b>Total liabilities and shareholders' equity</b>	<b>\$4,059.7</b>	<b>\$2,873.0</b>

On behalf of the  
Board of Directors

  
John H. Moore  
Director

  
William O. Beers  
Director

**Consolidated statement of  
changes in financial position**

 Northern Telecom Limited and subsidiary companies  
 Year ended December 31  
 (millions of dollars)

		1984	1983	1982
Cash and short-term investments	Provided by (applied to):			
	Operations	\$ 56.7	\$ 271.9	\$ 355.9
	Investment	(549.8)	(357.5)	(234.3)
	Financing	525.7	89.0	37.0
	Dividends on common shares	(46.0)	(44.7)	(35.1)
	Increase (decrease) in cash and short-term investments	(13.4)	(41.3)	123.5
	Cash and short-term investments at beginning of year	108.3	149.6	26.1
	Cash and short-term investments at end of year	\$ 94.9	\$ 108.3	\$ 149.6
Cash provided by operations	Earnings before extraordinary item	\$ 333.9	\$ 227.1	\$ 132.4
	Items not requiring cash			
	Depreciation and amortization	233.2	161.8	177.1
	Equity in net earnings of non-consolidated finance subsidiaries (note 3)	(55.9)	(49.8)	(57.0)
	Deferred income taxes	81.3	.9	(1.1)
	Other	32.5	14.3	7.9
	Extraordinary item	—	41.3	7.0
	Dividends on preferred shares	(16.4)	—	—
	(Increase) decrease in working capital (note 15)	(551.9)	(123.7)	89.6
	Total	\$ 56.7	\$ 271.9	\$ 355.9
Cash invested	Expenditures for plant and equipment	\$(569.6)	\$(376.9)	\$(252.6)
	Disposals of plant and equipment	25.6	24.8	25.6
	Other	(5.8)	(5.4)	(7.3)
	Total	\$(549.8)	\$(357.5)	\$(234.3)
Financing	(Increase) decrease in long-term receivables	\$ 1.8	\$ 15.4	\$ (22.5)
	Increase (decrease) in			
	Notes payable	116.3	.3	(58.1)
	Amount due to non-consolidated finance subsidiaries	(18.0)	(59.4)	67.7
	Proceeds from scientific research investment contracts	—	—	70.0
	Payments of scientific research investment royalties	(24.7)	(22.0)	(2.8)
	Additions to long-term debt	11.0	11.5	32.3
	Reductions of long-term debt	(11.1)	(78.9)	(77.3)
	Conversion of long-term debt	—	(61.1)	—
	Issue of preferred shares	382.1	—	—
	Issue of common shares	42.1	231.3	27.7
	Investment in non-consolidated finance subsidiaries	—	(.5)	—
	Dividends from non-consolidated finance subsidiary	23.5	54.0	—
	Other	2.7	(1.6)	—
	Total	\$ 525.7	\$ 89.0	\$ 37.0

## Notes to consolidated financial statements

Northern Telecom Limited and subsidiary companies  
(millions of dollars except per share figures)

### 1 Accounting policies

The accompanying financial statements have been prepared on the historical cost basis in accordance with accounting principles generally accepted in Canada and conform in all material respects with International Accounting Standards. With respect to the consolidated financial statements of Northern Telecom Limited (NTL) and its subsidiary companies (collectively, the corporation), there are no material differences between Canadian and United States generally accepted accounting principles.

#### *a) Principles of consolidation*

The consolidated financial statements include the accounts of NTL and all subsidiary companies, except the finance subsidiary companies which are accounted for by the equity method. The finance subsidiaries are not consolidated as their business is fundamentally different from that of the consolidated group.

#### *b) Translation of foreign currencies*

Foreign subsidiaries are classified as either integrated or self-sustaining.

Integrated foreign subsidiaries are those whose economic activities have a direct effect on the cash flows and operations of the parent company. Current assets (excluding inventories and prepaid expenses), current liabilities, and long-term monetary assets and liabilities are translated at the exchange rates in effect at the balance sheet date; other assets and other liabilities are translated at the actual rates in effect when the originating transactions took place. Revenues and expenses are translated at approximately average rates for the year except for cost of revenues, depreciation, and amortization, which are translated at the actual rates in effect when the related assets were manufactured or acquired. Translation gains and losses are reflected in consolidated net earnings.

Self-sustaining foreign subsidiaries are those whose economic activities are largely independent of those of the parent company. Assets and liabilities are translated at the exchange rates in effect at the balance sheet date. Revenues and expenses, including gains and losses on foreign exchange transactions excluding long-term intercompany advances, are translated at approximately average rates for the year. The unrealized translation gains and losses on the parent company's net investment in these subsidiaries are accumulated in a separate component of shareholders' equity, described in the consolidated balance sheet as foreign exchange adjustment. These gains or losses may become realized on the payment of dividends by, or a change in the equity capital of, a subsidiary, in which event an appropriate portion of foreign exchange adjustment is transferred and reflected in consolidated net earnings.

NTL's U.S. dollar-denominated long-term debt is regarded as a partial hedge of NTL's net investment in its U.S.-based self-sustaining subsidiaries. Accordingly, unrealized exchange gains and losses on this debt are allocated to foreign exchange adjustment.

#### *c) Rental revenue*

For operating leases, rental revenue is recognized when billed to customers. For leases which qualify as sales-type leases, the present value of future rental payments is recorded as sales revenue at the inception of the lease.

#### *d) Depreciation*

Depreciation is calculated generally on the straight-line method using rates based on the expected useful lives of the respective assets as follows:

Buildings 20-to-40 years; machinery and equipment 3-to-16 years; and equipment for lease to customers three-to-four years.

#### *e) Research and development*

Research and development costs are charged to earnings in the periods in which they are incurred, except for costs incurred pursuant to specific contracts with third parties for the manufacture of telecommunications equipment, which are charged to earnings in the same period as the related revenue is recognized.

#### *f) Income taxes*

The corporation follows the practice of providing for income taxes based on accounting income for tax purposes included in the financial statements regardless of when such income is subject to taxes under the tax laws. The corporation accounts for investment tax credits by the flow-through method.

#### *g) Inventories*

Inventories are valued at the lower of cost (calculated generally on a first-in, first-out basis) and net realizable value. The costs of finished goods and work in process comprise material, labor, and manufacturing overhead.

#### *h) Goodwill*

Goodwill represents the unamortized excess of the acquisition costs over the net assets of subsidiary companies at the dates of their acquisition and is amortized over its estimated life. Amortization charged to operations, based on estimated lives up to 20 years, for the years ended December 31, 1984, 1983, and 1982 was \$21.2, \$0.7, and \$0.7, respectively.

## 2 Research and development

Research and development costs for the years ended December 31, 1984, 1983, and 1982 amounted to \$496.4, \$390.3, and \$306.8, respectively. These costs include research and development charged to customers of Bell-Northern Research Ltd., principally Bell Canada, and costs expended pursuant to specific contracts for the manufacture of telecommunications equipment which are accounted for as contract costs. The net expense of research and development to the corporation for the years ended December 31, 1984, 1983, and 1982 amounted to \$431.5, \$324.8, and \$241.4, respectively.

## 3 Investments in non-consolidated finance subsidiaries

The finance subsidiaries provide funds to some of NTL's subsidiaries and finance certain equipment sales.

In the consolidated statement of operations, foreign currency gains or losses and income taxes of the finance subsidiaries are included in the respective captions.

Following is a summary of the combined operations of the finance subsidiaries for the year ended December 31:

	1984	1983	1982
Interest income			
–NTL subsidiaries	\$ 37.9	\$ 44.0	\$ 61.2
–other	38.1	27.7	15.3
Rental and other income	10.2	6.7	3.6
Interest charges	(8.6)	(11.9)	(4.0)
Administrative expenses	(16.1)	(12.3)	(7.1)
Earnings from operations	61.5	54.2	69.0
Foreign currency gains	2.9	4.2	—
Provision for income taxes	(8.5)	(8.6)	(12.0)
Net earnings	\$ 55.9	\$ 49.8	\$ 57.0

Following is a summary of the combined assets and liabilities of the finance subsidiaries at December 31:

	1984	1983
<b>Assets</b>		
Cash and short-term investments	\$ 40.2	\$ .3
Receivables	389.7	240.8
Loans to NTL subsidiaries	297.2	315.2
Other assets	23.1	11.3
	\$ 750.2	\$ 567.6

### Liabilities and shareholders' equity

Variable rate bank loans bearing interest at an average rate of 10.6%	\$ 80.4	\$ 7.6
Promissory notes bearing interest at an average rate of 8.2%	65.6	—
7% Convertible subordinated debentures (U.S. dollars) due March 1, 1998	58.2	54.8
Other liabilities	67.9	84.6
Shareholders' equity (including foreign exchange adjustment of \$43.2 in 1984, \$18.1 in 1983)	478.1	420.6
	\$ 750.2	\$ 567.6

On December 1, 1982, Northern Telecom International Finance B.V. (NTIF) issued US\$80 of seven percent convertible subordinated debentures due December 1, 1997. The debentures were convertible into common shares of NTL at US\$24.3333 per share. Effective November 23, 1983, NTIF called for redemption all of the outstanding 1997 debentures at a price of US\$1,073.44 per US\$1,000 principal, which included accrued interest and a four percent premium. During the year ended December 31, 1983, virtually all debentures were converted (note 13).

On March 1, 1983, NTIF issued US\$50 of seven percent convertible subordinated debentures due March 1, 1998, which are unconditionally guaranteed on a subordinated basis by NTL. The debentures are convertible into common shares of NTL at US\$29.6666 per share. At December 31, 1984, US\$6 principal amount of debentures had been converted (note 13). The holders of the remaining outstanding debentures have the right to require NTIF to redeem their debentures at 100 percent of the principal amount on March 1, 1985 or March 1, 1986 provided they tender their securities at any time during the month of December of the respective preceding year. No such debentures were so tendered for redemption on March 1, 1985. Prior to March 1, 1986, NTIF has the right to call for redemption the outstanding 1998 debentures if the market price of NTL common shares is at least 120 percent of the conversion price for a specified period.

At December 31, 1984, receivables of \$389.7 included \$130.9 of notes and accounts receivable and the following amounts due to finance subsidiaries under non-cancellable leases:

	Direct financing leases
Year ended December 31	
1985	\$ 75.3
1986	68.5
1987	65.6
1988	59.2
1989	38.1
Thereafter	41.5
	348.2
Less: unearned income	(89.4)
	\$ 258.8

## 4 Provision for income taxes

Following is a reconciliation of income taxes calculated at the Canadian statutory rate to the provision for income taxes included in the consolidated statement of operations:

	1984	1983	1982
Income taxes at Canadian statutory rate including provincial income taxes	\$ 232.7	\$ 155.4	\$ 94.5
Reduction of Canadian taxes applicable to:			
Manufacturing profits	(13.6)	(1.4)	(2.6)
Research and development incentives	(37.4)	(34.4)	(7.4)
Inventory allowance	(4.4)	(3.9)	(3.3)
Difference between Canadian statutory rate and rates applicable to foreign subsidiaries	(13.8)	(12.2)	(11.4)
Other	(6.4)	(5.5)	(9.4)
Provision for income taxes	\$ 157.1	\$ 98.0	\$ 60.4

Details of the corporation's income taxes are:

	1984	1983	1982
Earnings before income taxes and extraordinary item			
Canadian	\$ 229.9	\$ 122.1	\$ 61.4
Foreign	261.1	203.0	131.4
	<b>\$ 491.0</b>	<b>\$ 325.1</b>	<b>\$ 192.8</b>
Provision for income taxes			
Canadian	\$ 75.9	\$ 43.8	\$ 24.2
Foreign	81.2	54.2	36.2
	<b>\$ 157.1</b>	<b>\$ 98.0</b>	<b>\$ 60.4</b>
Provision for income taxes			
Current	\$ 42.8	\$ 64.7	\$ 79.5
Deferred	114.3	33.3	(19.1)
	<b>\$ 157.1</b>	<b>\$ 98.0</b>	<b>\$ 60.4</b>

Deferred income taxes result principally from deductions for tax purposes in respect of plant and equipment being in excess of amounts currently charged to operations.

#### 5 Extraordinary item

The extraordinary item for the year ended December 31 was:

	1984	1983	1982
Reduction of income taxes arising from the use of prior years' tax losses of a subsidiary company	\$ —	\$ 41.3	\$ 7.0

#### 6 Earnings per common share

Earnings per common share are calculated after deducting dividends on preferred shares from net earnings and are based on the weighted average number of shares outstanding during the year.

#### 7 Inventories

At December 31, inventories consisted of:

	1984	1983
Raw materials	\$ 394.8	\$ 256.1
Work in process	421.4	263.1
Finished goods	328.3	153.6
	<b>\$ 1,144.5</b>	<b>\$ 672.8</b>

#### 8 Plant and equipment

At December 31, plant and equipment consisted of:

	1984	1983
Cost		
Land	\$ 29.7	\$ 28.8
Buildings	378.0	276.7
Machinery and equipment	1,380.1	975.0
Equipment for lease to customers	110.4	125.7
Property under capital leases	28.8	26.1
	<b>1,927.0</b>	<b>1,432.3</b>

Less: Accumulated depreciation

and amortization		
Buildings	83.5	64.4
Machinery and equipment	600.5	458.5
Equipment for lease to customers	88.0	96.7
Property under capital leases	9.7	9.1
	<b>781.7</b>	<b>628.7</b>
	<b>\$ 1,145.3</b>	<b>\$ 803.6</b>

#### 9 Scientific Research Investment Contracts

In January 1982, NTL and a subsidiary concluded arrangements with investors to fund a portion of 1982 research and development expenditures. The subsidiary received \$70 in cash in exchange for an obligation to make eight semi-annual and variable royalty payments, commencing June 30, 1983, based on the corporation's revenues from certain products. The arrangements provided for the investors to treat their investment as research and development for tax purposes and thus research and development income tax incentives in respect of the expenditure were available to the investors and not to the corporation. In 1981, \$20 was received under similar arrangements.

At December 31, 1984, estimated payments under these contracts for the years 1985 and 1986 amounted to \$24.3, and \$11.2, respectively.

#### 10 Long-term debt

At December 31, long-term debt consisted of:

	1984	1983
Sinking fund debentures		
7¼% Series C due April 15, 1986	\$ 1.2	\$ 1.2
10½% Series D due April 30, 1990	12.6	12.6
	<b>13.8</b>	<b>13.8</b>
Fixed rate bank loans of a U.S. subsidiary (U.S. dollars) bearing interest at an average rate of 10.6%	7.9	7.6
Variable rate revolving bank loans of European subsidiaries (various currencies) bearing interest at an average rate of 12.6%	12.4	10.1
12¼% Notes (U.S. dollars) due October 1, 1990	77.9	73.3
Obligations under capital leases	22.7	21.7
Other	2.7	4.1
	<b>137.4</b>	<b>130.6</b>
Less: amount included in current liabilities	(4.9)	(3.3)
	<b>\$ 132.5</b>	<b>\$ 127.3</b>

On June 30, 1982, NTL sold privately US\$25 of 9¼ percent subordinated notes maturing June 30, 1989 with warrants to purchase common shares at US\$15.42 per share. On February 17, 1983, against surrender of these notes, the holder exercised warrants attached thereto and purchased 1,500,000 common shares (note 13) and received a cash payment of US\$1.875.

On March 7, 1983, holders converted US\$50 of 12¼ percent subordinated convertible notes due December 1, 1993 into 2,439,021 common shares at the conversion price of US\$20.50 per share (note 13).

At December 31, 1984, the amounts of long-term debt payable, including net sinking fund requirements, for the years 1985 through 1989 were \$4.9, \$9, \$8, \$1.8, and \$1.9, respectively.

### 11 Unused bank lines of credit

At December 31, 1984, NTL and certain subsidiary companies had unused bank lines of credit, generally available at the prime bank rate of interest, of approximately \$544.

### 12 Preferred shares

NTL is authorized to issue an unlimited number of Class A Preferred Shares and Class B Preferred Shares, without nominal or par value, issuable in series.

At December 31, outstanding preferred shares and stated capital were:

	<b>1984</b>	
	Number of shares	Stated capital
Cumulative Redeemable Retractable		
Class A Preferred Shares		
\$2.1875 Series 1, issued April 25, 1984	<b>4,400,000</b>	<b>\$110.0</b>
\$2.22 Series 2, issued June 12, 1984	<b>3,120,000</b>	<b>78.0</b>
Floating rate Series 3, issued August 29, 1984	<b>8,000,000</b>	<b>200.0</b>
		<b>\$388.0</b>

The dividend rate on the series 3 preferred shares is calculated each quarter. The quarterly dividend rate is one-quarter of 70 percent of the average of the prime rate established by two major Canadian chartered banks for stated periods.

The series 1 preferred shares are not redeemable before April 25, 1987 but will be redeemable on or after that date at the option of the corporation at prices declining annually from \$26.50 per share at April 25, 1987 to \$25 per share at April 25, 1993 and at \$25 per share thereafter, plus accrued and unpaid dividends in each case. The holders of series 1 preferred shares may require the corporation to redeem any or all of their series 1 preferred shares on April 25, 1989 or on April 25, 1994 at \$25 per share plus accrued and unpaid dividends or, in the alternative, they may convert their series 1 preferred shares on either of the two aforementioned dates into shares of a further series of Class A Preferred Shares on a share-for-share basis if the corporation elects to create any such further series for the purpose of such conversion. In the event that not more than 440,000 series 1 preferred shares remain outstanding at any time after April 25, 1989, the corporation may redeem all, but not part, of such shares at \$25 per share plus accrued and unpaid dividends.

The series 2 preferred shares are not redeemable before June 12, 1987 but will be redeemable on or after that date at the option of the corporation at prices declining annually from \$26.50 per share at June 12, 1987 to \$25 per share at June 12, 1993 and at \$25 per

share thereafter, plus accrued and unpaid dividends in each case. The holders of series 2 preferred shares may require the corporation to redeem any or all of their series 2 preferred shares on June 12, 1989 or on June 12, 1994 at \$25 per share plus accrued and unpaid dividends or, in the alternative, they may convert their series 2 preferred shares on either of the two aforementioned dates into shares of a further series of Class A Preferred Shares on a share-for-share basis if the corporation elects to create any such further series for the purpose of such conversion. In the event that not more than 300,000 series 2 preferred shares remain outstanding at any time after June 12, 1989, the corporation may redeem all, but not part, of such shares at \$25 per share plus accrued and unpaid dividends.

The series 3 preferred shares are not redeemable before August 29, 1987 but will be redeemable on or after that date at the option of the corporation at \$25 per share plus accrued and unpaid dividends. The holders of series 3 preferred shares may require the corporation to redeem any or all of their series 3 preferred shares on October 25, 1990 or on October 25, 1992 at \$25 per share plus accrued and unpaid dividends or, in the alternative, they may convert their series 3 preferred shares on either of the two aforementioned dates into shares of a further series of Class A Preferred Shares on a share-for-share basis if the corporation elects to create any such further series for the purpose of such conversion.

With respect to each of the series 1 and series 2 preferred shares outstanding, the corporation will make all reasonable efforts to purchase for cancellation on the open market at a price not exceeding \$25 per share plus costs of purchase, (i) in each calendar quarter in the period from July 1, 1989 to June 30, 1994, 0.5 percent of the number of shares outstanding at June 30, 1989, and (ii) in each calendar quarter after June 30, 1994, 0.75 percent of the number of shares outstanding at June 30, 1994. To the extent that the corporation is unable to purchase such shares, the undertaking will carry over only to the succeeding calendar quarters of the same calendar year, after which it will be extinguished. The maximum aggregate stated capital of shares that the corporation may be required to purchase under these purchase obligations in 1989 is \$1.9.

### 13 Common shares

NTL is authorized to issue an unlimited number of common shares without nominal or par value.

At December 31, outstanding common shares and stated capital were:

	<b>1984</b>		<b>1983</b>	
	Shares	Stated capital	Shares	Stated capital
January 1	<b>114,607,222</b>	<b>\$755.7</b>	106,352,286	\$524.4
Issued during the year	<b>953,310</b>	<b>42.1</b>	8,254,936	231.3
December 31	<b>115,560,532</b>	<b>\$797.8</b>	114,607,222	\$755.7

At December 31, 1984, Bell Canada Enterprises Inc. (BCE) owned 51.9 percent of the outstanding common shares.

Common shares issued and reserved for issuance were:

	1984	1983	Issued 1982	Reserved at December 31, 1984 for issuance
Shareholder Dividend Reinvestment and Stock Purchase Plan	643,861	630,671	1,117,647	1,958,481
Investment Plan for Employees - Canada	209,860	176,155	372,921	1,026,475
Employee Thrift/Savings Plan - U.S.	99,589	20,703	19,086	610,622
Warrants expiring June 30, 1989 (note 10)	-	1,500,000	-	-
12 1/4% Subordinated convertible notes due December 1, 1993 (note 10)	-	2,439,021	-	-
7% Convertible subordinated debentures issued by NTIF (note 3) due December 1, 1997	-	3,286,649	-	-
due March 1, 1998	-	201,737	-	1,483,654
	<b>953,310</b>	<b>8,254,936</b>	<b>1,509,654</b>	<b>5,079,232</b>

#### 14 Foreign exchange adjustment

Following is an analysis of foreign exchange adjustment included in shareholders' equity at December 31:

	1984	1983	1982
Balance at beginning of year	\$42.4	\$37.4	\$15.7
Translation adjustments	53.3	5.6	27.8
Losses on hedges	(4.5)	(.6)	(6.1)
Balance at end of year	\$91.2	\$42.4	\$37.4

#### 15 Cash provided by changes in working capital

Changes in the components of working capital excluding cash and short-term investments for the year ended December 31 were:

	1984	1983	1982
(Increase) decrease in			
Accounts receivable	\$(369.6)	\$(199.1)	\$(44.3)
Inventories	(471.7)	(95.2)	33.9
Prepaid expenses	(9.0)	.5	(1.6)
Deferred income taxes	31.2	(7.0)	(12.2)
Increase (decrease) in			
Accounts payable and accrued liabilities	249.5	181.2	91.1
Taxes payable	17.7	(4.1)	22.7
Cash provided by (applied to) changes in working capital	\$ (551.9)	\$(123.7)	\$ 89.6

#### 16 Plans for employees' pensions

NTL and most of its subsidiary companies have non-contributory defined benefit plans which provide for service pensions based on length of service and rates of pay for substantially all their employees.

The policy is to fund pension costs based on various actuarial cost methods as permitted by pension regulatory bodies. Such costs are funded as accrued and reflect actuarial assumptions regarding salary projections. Pension costs charged to earnings for the years ended December 31, 1984, 1983, and 1982 were \$66.5, \$67.6, and \$64.7, respectively, which included costs associated with voluntary payments for retired employees.

In compliance with the United States Financial Accounting Standards Board's Statement No. 36, the disclosure of the following information is required to exclude actuarial assumptions regarding salary projections. A comparison of accumulated plan benefits and plan net assets follows:

	1984	1983
January 1		
Actuarial present value of accumulated plan benefits		
-vested	\$611.0	\$559.4
-non-vested	33.9	27.3
	\$644.9	\$586.7
Net assets available for benefits, at market value	\$910.6	\$768.0

The weighted average assumed rate of return used in determining the actuarial present value of accumulated plan benefits was 7.8 percent for 1984 and eight percent for 1983.

As stated above, in addition to pension benefits, NTL and most of its subsidiary companies provide certain health care and life insurance benefits for retired employees. The costs of retiree health care benefits are recognized as claims are paid. Life insurance benefits for retirees are expensed as funded, during the post-employment period. For the years ended December 31, 1984, 1983, and 1982 these costs amounted to \$2.9, \$2.3, and \$1.7, respectively.

#### 17 Leased property and commitments

At December 31, 1984, future minimum lease payments under capital leases, net of estimated executory costs and imputed interest, amounted to \$22.7 and future minimum payments under operating leases were \$157.2.

Rental expense on operating leases for the years ended December 31, 1984, 1983, and 1982 amounted to \$65.6, \$50.4, and \$45, respectively.



## 18 Information on business segment by geographic areas

### Business segment

NTL operates in one business segment—telecommunications equipment, which consists of the design, development, manufacture, and marketing of central office switching equipment, integrated business systems and terminals, transmission equipment, cable and outside plant products, and other telecommunications products and services.

### Geographic areas

The following table sets forth information by geographic area for the year ended December 31:

	1984	1983	1982
<b>Total revenues</b>			
<i>Canada</i>			
Customers	\$1,378.5	\$1,252.2	\$1,392.3
Transfers between geographic areas	828.1	520.2	249.9
	<b>2,206.6</b>	1,772.4	1,642.2
<i>United States</i>			
Customers	2,826.0	1,886.6	1,473.4
Transfers between geographic areas	121.4	65.9	93.8
	<b>2,947.4</b>	1,952.5	1,567.2
<i>Other</i>			
Customers	174.1	165.2	169.8
Transfers between geographic areas	33.1	19.7	17.1
	<b>207.2</b>	184.9	186.9
Elimination of transfers between geographic areas	(982.6)	(605.8)	(360.8)
Total customer revenues	<b>\$4,378.6</b>	\$3,304.0	\$3,035.5
<b>Operating earnings</b>			
Canada	\$ 453.6	\$ 388.3	\$ 357.1
United States	633.7	368.5	182.1
Other	23.1	26.9	36.5
Operating earnings before research and development expense	1,110.4	783.7	575.7
Research and development expense	(431.5)	(324.8)	(241.4)
Segment operating earnings	678.9	458.9	334.3
General corporate expenses	(204.5)	(152.4)	(126.3)
Operating earnings	474.4	306.5	208.0
Other income less non-operating expenses	16.6	18.6	(15.2)
Earnings before income taxes and extraordinary item	\$ 491.0	\$ 325.1	\$ 192.8
<b>Identifiable assets</b>			
Canada	\$1,900.5	\$1,206.5	\$ 952.9
United States	2,167.6	1,273.9	1,084.9
Other	200.9	192.0	175.2
Adjustments and eliminations	(913.2)	(459.2)	(416.0)

Identifiable assets	<b>3,355.8</b>	2,213.2	1,797.0
Investments	493.9	433.0	433.1
Corporate assets	210.0	226.8	213.3
Total assets as at December 31	<b>\$4,059.7</b>	\$2,873.0	\$2,443.4

Transfers between geographic areas are made at prices based on total cost of the product to the supplying segment.

The point of origin (the location of the selling organization) of revenues and the location of the assets determine the geographic areas.

Of the total customer revenues, including research and development, revenues from Bell Canada and other subsidiaries and associated companies of BCE accounted for \$903.9, \$798.9, and \$913.8 for 1984, 1983, and 1982, respectively. Total revenues also included rental and service revenue of \$165, \$181.4, and \$186.8 for 1984, 1983, and 1982, respectively.

Operating earnings represent total revenues less operating expenses. Research and development costs cannot be allocated on a geographic basis. In computing operating earnings, none of the following items has been added or deducted: investment and other income (net), interest charges, currency gains (losses), general corporate expenses, income taxes, and extraordinary items.

Identifiable assets are those assets of the corporation that are identified with the operations in the geographic area. Corporate assets are principally cash and short-term investments, and corporate plant and equipment.

Finance subsidiaries are not consolidated (see notes 1 and 3).

### Auditors' Report

The Shareholders  
Northern Telecom Limited

We have examined the consolidated balance sheets of Northern Telecom Limited as at December 31, 1984 and 1983 and the consolidated statements of operations, retained earnings and changes in financial position for each of the three years in the period ended December 31, 1984. Our examinations were made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as we considered necessary in the circumstances.

In our opinion, these consolidated financial statements present fairly the financial position of the corporation as at December 31, 1984 and 1983 and the results of its operations and the changes in its financial position for each of the three years in the period ended December 31, 1984 in accordance with Canadian generally accepted accounting principles applied on a consistent basis.

*Tanche Ross & Co.*

Chartered Accountants

Toronto, Ontario  
Canada  
February 1, 1985

## Consolidated supplementary information on the effects of changing prices

(unaudited)

Northern Telecom's financial statements are prepared on the historical cost basis in accordance with accounting principles generally accepted in Canada. Inflation erodes the value of capital, increasing the costs of maintaining current levels of business activity and, especially, of replacing plant and equipment. The effects of changes in the value of money, whether measured in terms of general price levels or in terms of costs specific to a particular enterprise, are not apparent in historical cost accounts. In an attempt to separate those effects from the economic impact of changes in levels of business activity, The Canadian Institute of Chartered Accountants (CICA) has recommended the presentation of certain supplementary financial data based on current costs.

*The CICA current cost recommendations are essentially experimental. Generally, current costs are based on estimates; there are many different asset valuation methods and the selection of appropriate methods by individual companies is a subjective process. Consequently, the reader is advised to exercise caution in interpreting the information presented. In particular, it is not recommended that the data be used in isolation for purposes of valuing the corporation in terms of its assets or traditional financial ratios. In addition, because of the subjectivity inherent in the formulation of the data, intercompany comparisons of current cost results, even within an industry, may not be reliable.*

### Current cost information presented

The supplementary data focus principally on the representation of operating costs and asset values based on current reproduction or replacement costs. Generally, the accounting policies outlined in the historical cost financial statements are followed in the preparation of the current cost data. Only inventories and plant and equipment are revalued as these are the significant assets by reference to which the corporation's operating capability may be assessed. The revaluation has two purposes: to provide an estimate of the costs of reproducing or replacing assets in such a way that the present level of activity is unchanged and to reflect an adjusted cost of revenues and depreciation expense based on the revalued amounts as if the assets had actually been reproduced or replaced at these values.

## Consolidated statement of operations on a current cost basis

Year ended December 31  
(millions of dollars)

	1984	1983*
Earnings before income taxes and extraordinary item (historical cost)	<b>\$491.0</b>	\$339.3
Less: current cost adjustments		
Cost of revenues (note A)	<b>(27.5)</b>	(6.0)
Depreciation expense (note B)	<b>21.0</b>	20.3
Loss on disposal of plant and equipment (note C)	<b>(15.9)</b>	(11.3)
	<b>(22.4)</b>	3.0
Current cost earnings before income taxes and extraordinary item	<b>513.4</b>	336.3
Provision for income taxes (note D)		
Current	<b>42.8</b>	67.5
Deferred	<b>114.3</b>	34.8
	<b>157.1</b>	102.3
Current cost net earnings before extraordinary item	<b>\$356.3</b>	\$234.0

\*The 1983 comparative amounts have been restated in (approximately) 1984 average dollar values.

## Schedule of significant items on a current cost basis

As at December 31  
(millions of dollars)

	1984	1983**
Inventories (note A)	<b>\$1,152.0</b>	\$ 697.0
Plant and equipment (note B)	<b>\$1,318.2</b>	\$1,007.1
Common shareholders' equity (net assets) (note E)	<b>\$2,000.0</b>	\$1,688.0

\*\*The 1983 comparative amounts have been restated in 1984 yearend dollars.



*Pete Owens monitors a robotic assembly system for DMS production at Northern Telecom's manufacturing plant near Durham, N.C. Northern Telecom is increasing the use of flexible manufacturing systems such as these to improve productivity and reduce costs.*

### Notes to the current cost information

A. The cost of revenues adjustment reflects the general movement in the costs of manufacturing inputs between the dates of their purchase or application to manufacturing processes and the dates of sale of the related finished products. Inventories on hand at the yearend are revalued at the costs of manufacturing inputs prevailing at that date. The calculations are based on indices generated as part of the ongoing management control process.

B. The depreciation expense adjustment represents the excess of depreciation based on current costs over depreciation based on historical costs. Plant and equipment are revalued at their costs of reproduction or replacement at the yearend, based on appraisals or industry indices prepared specially for the purpose.

C. Losses on disposal of plant and equipment, deducted in arriving at historical cost earnings, do not arise in current cost accounting because the current values of assets disposed of are adjusted at the disposal dates to equal the disposal proceeds.

D. No adjustment is made to income tax expense. This is in conformity with the CICA recommendations, although it should be recognized that additional tax deductions would be available if the estimated current costs were in fact actual costs.

E. Common shareholders' equity has been adjusted by \$2.4 (\$4.6 for 1983) in respect of the minority interest in the increase in the current cost of assets.

### Other supplementary information

The following information includes a restatement of selected items to reflect the effects of general inflation as measured by the Consumer Price Index. This is designed to provide an indication of the relationship of price level changes specific to the corporation's assets to price level changes in the economy as a whole.

	1984	1983*
Decrease in the current cost of inventories and plant and equipment held during the year	\$ (7.2)	\$ (9.4)
Effect of general inflation	71.3	63.4
Excess of effect of general inflation over the change in current cost	<b>\$78.5</b>	<b>\$72.8</b>

During periods of inflation, a corporation with a net monetary liability position benefits from a gain in its purchasing power. As the value of money decreases, so too does the real amount of the net monetary liabilities.

	1984	1983*
Gain in general purchasing power from holding net monetary liabilities during the year	<b>\$3.7</b>	\$3.2

The financing adjustment is calculated under the assumption that at each yearend the corporation would have financed, or realized the benefit of, the changes in the current cost of its non-monetary operating assets held during the year. As the corporation is capitalized partially by common shareholders' equity and partially by net monetary liabilities, it is reasonable to assume that in the long run the cash provided by the reproduction or replacement of the operating assets would be for the account of the common shareholders and lenders in their existing proportions. The financing adjustment represents the amount of the decrease in the current costs for the year which would be apportioned to lenders and amounted to \$0.5 (\$0.4 for 1983\*).

The financing adjustment based on the current cost adjustments in the consolidated statement of operations on a current cost basis amounted to \$1.7 (\$0.1 for 1983\*).

\*The 1983 comparative amounts have been restated in (approximately) 1984 average dollar values.



*Bernice Sams performs quality inspection of DMS telephone line cards after surface mounting of components has been completed.*

## Consolidated 11-year review

Northern Telecom Limited and subsidiary companies  
(millions of dollars)

		1984	1983	1982
Earnings and related data	Revenues	\$4,378.6	\$3,304.0	\$3,035.5
	Cost of revenues	2,691.1	2,112.0	2,124.2
	Depreciation on plant and equipment	211.0	156.0	175.0
	Selling, general and administrative expenses	781.6	560.7	461.9
	Research and development expense	431.5	324.8	241.4
	Interest charges*	5.3	10.6	39.6
	Provision for income taxes**	157.1	56.7	53.4
	Earnings (loss) before extraordinary items	333.9	227.1	132.4
	Net earnings (loss) applicable to common shares	317.5	268.4	139.4
	Earnings (loss) per revenue dollar (cents)	7.3	8.1	4.6
	Earnings (loss) per common share (dollars)			
	— before extraordinary items	2.76	2.05	1.26
	— after extraordinary items	2.76	2.42	1.32
Dividends per share (dollars)	0.40	0.40	0.33	
Financial position at December 31	Working capital	1,141.9	701.5	636.1
	Plant and equipment (at cost)	1,927.0	1,432.3	1,159.5
	Accumulated depreciation	781.7	628.7	543.1
	Total assets	4,059.7	2,873.0	2,443.4
	Long-term debt***	132.5	127.3	244.6
	Redeemable retractable preferred shares	388.0	—	—
	Common shareholders' equity	1,822.0	1,465.5	1,005.5
Capital expenditures	569.6	376.9	252.6	
Compensation	Payroll	1,505.6	1,155.9	1,033.9
	Benefits	263.9	218.6	192.3
	Total	\$1,769.5	\$1,374.5	\$1,226.2

Employees at December 31 **46,993 +** 39,318 + 34,449 +

+ Excludes employees of associated Turkish company, NETAS—Northern Electric Telekomünikasyon A.S.

\* Net of equity earnings from operations of non-consolidated finance subsidiaries.

\*\* Includes income tax effects of extraordinary items.

\*\*\* Excludes long-term debt of non-consolidated finance subsidiaries incorporated in 1978 and 1979.

## Quarterly financial data (unaudited)

(millions of dollars except per share figures)

Summarized consolidated quarterly financial data for 1984 and 1983 are as follows:

	4th Quarter		3rd Quarter		2nd Quarter		1st Quarter	
	1984	1983	1984	1983	1984	1983	1984	1983
Revenues	\$1,404.4	\$974.2	\$1,026.9	\$739.5	\$1,048.2	\$816.3	\$899.1	\$774.0
Gross profit	\$ 542.2	\$352.8	\$ 395.6	\$278.3	\$ 407.3	\$302.6	\$342.4	\$258.3
Earnings before extraordinary item	\$ 123.1	\$ 67.8	\$ 75.0	\$ 49.5	\$ 78.7	\$ 62.4	\$ 57.1	\$ 47.4
Net earnings	\$ 123.1	\$ 84.5	\$ 75.0	\$ 57.9	\$ 78.7	\$ 71.0	\$ 57.1	\$ 55.0
Net earnings applicable to common shares	\$ 114.6	\$ 84.5	\$ 69.2	\$ 57.9	\$ 76.6	\$ 71.0	\$ 57.1	\$ 55.0
Earnings per common share								
— before extraordinary item	\$ 0.99	\$ 0.60	\$ 0.60	\$ 0.44	\$ 0.67	\$ 0.56	\$ 0.50	\$ 0.44
— after extraordinary item	\$ 0.99	\$ 0.74	\$ 0.60	\$ 0.52	\$ 0.67	\$ 0.64	\$ 0.50	\$ 0.51
Weighted average number of common shares outstanding (thousands)	115,349	113,446	115,132	111,743	114,882	110,669	114,634	107,775

1981	1980	1979	1978	1977	1976	1975	1974
\$2,570.9	\$2,054.6	\$1,900.5	\$1,504.6	\$1,221.9	\$1,083.5	\$ 996.8	\$ 957.7
1,847.2	1,553.7	1,303.4	1,032.1	873.2	781.4	725.5	716.3
120.7	113.9	91.1	53.4	30.9	24.1	23.3	25.4
359.3	341.5	280.0	229.0	159.2	122.4	100.4	92.6
181.6	140.9	132.6	97.8	68.2	61.4	49.0	44.0
64.2	44.9	38.2	17.1	6.6	6.8	8.3	7.7
55.7	4.3	35.5	36.7	44.9	48.0	44.7	49.6
113.2	(21.3)	111.2	87.7	80.9	73.9	70.2	53.8
129.2	(185.1)	111.2	94.0	84.4	77.1	67.5	53.8
5.0	(9.0)	5.9	6.2	7.0	7.1	6.8	5.6
1.09	(0.21)	1.21	1.03	1.02	0.93	0.88	0.68
1.24	(1.83)	1.21	1.11	1.06	0.97	0.85	0.68
0.33	0.33	0.28	0.25	0.22	0.20	0.20	0.18
498.1	456.2	557.1	370.4	337.1	307.6	284.9	281.4
983.7	852.2	702.8	615.9	393.0	360.1	287.2	273.4
420.8	345.9	277.2	234.5	204.3	189.2	164.2	156.6
2,145.8	1,998.9	1,889.5	1,356.4	764.2	674.8	570.4	555.2
246.0	321.7	192.0	190.5	52.6	58.3	67.8	104.5
-	-	-	-	-	-	-	-
851.8	740.7	922.1	643.3	472.4	400.8	339.9	285.2
209.6	225.6	173.5	127.2	44.7	38.2	31.7	33.2
847.7	730.2	651.8	482.9	395.3	347.2	325.0	301.2
144.2	131.5	108.1	93.3	75.0	58.0	45.0	41.2
\$ 991.9	\$ 861.7	\$ 759.9	\$ 576.2	\$ 470.3	\$ 405.2	\$ 370.0	\$ 342.4
35,444+	31,915+	33,301+	31,756+	24,962	25,277	23,751	26,147

### Management's report

The accompanying consolidated financial statements of Northern Telecom Limited and its subsidiaries and all information in this annual report are the responsibility of management and have been approved by the Board of Directors.

The financial statements have been prepared by management in conformity with Canadian generally accepted accounting principles. The financial statements include some amounts that are based on best estimates and judgments. Financial information used elsewhere in the annual report is consistent with that in the financial statements.

Management of the corporation and its subsidiaries, in furtherance of the integrity and objectivity of data in the financial statements, has developed, and maintains, a system of internal accounting controls, and supports an extensive program of internal audits. Management believes that this system of internal accounting controls provides reasonable assurance that financial

records are reliable and form a proper basis for preparation of financial statements, and that assets are properly accounted for and safeguarded. The internal accounting control process includes management's communication to employees of policies which govern ethical business conduct.

The Board of Directors carries out its responsibility for the financial statements in this annual report principally through its Audit Committee, which consists of directors who are not officers or employees of the corporation or any of its affiliates. The Audit Committee reviews the corporation's annual consolidated financial statements and recommends their approval to the Board of Directors. The shareholders' auditors have full access to the Audit Committee, with and without management being present.

These financial statements have been examined by the shareholders' auditors, Touche Ross & Co., chartered accountants.

## Principal products



Unity II

### Integrated business systems and terminals

Data packet switching networks  
 Basic and featured electronic key telephone systems  
 Electronic and digital PBX systems (combined voice and data)  
 Private and carrier network switching systems  
 On-line terminal systems  
 Data entry terminal systems  
 Distributed data processing systems  
 Remote batch terminal systems  
 Integrated voice and data terminals  
 Rotary dial, push-button and key telephones  
 Electronic and featured telephones  
 Style, decorator, and novelty telephones  
 Coin telephones  
 Hands-free speaker units  
 Repertory dialers  
 Modular hardware  
 Headsets  
 Specialty and accessory terminals  
 Hard disk drives  
 Streaming-cartridge tape drive



Displayphone PLUS

### Cable

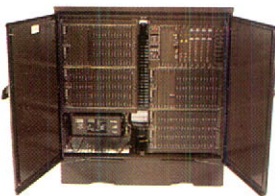
Telephone wires  
 Composite coaxial cables  
 Switchboard wires and cables  
 Pulp insulated telephone cables  
 Optical fiber cables  
 Polyolefin insulated telephone cables  
 Frame wires  
 PVC insulated inside wiring cables



Digital Voice Announcer

### Outside plant

Customer premises distribution systems  
 Central office protectors and connectors  
 Subscriber protection devices  
 Terminals and closures  
 Splicing connectors  
 Loading devices  
 Outdoor cross-connect systems  
 Optical splicing and installation products



DMS-1 Urban

### Central office switching

Digital switching and related data service systems  
 Traffic Operator Position Systems  
 Network Operation Management Systems  
 Centralized Automated Loop Reporting Systems  
 Electronic switching systems  
 Crossbar switching systems  
 Step-by-step systems

### Transmission

Digital Subscriber Access Products  
 Optical fiber transmission systems  
 Digital microwave radio systems  
 Analog and digital multiplex systems  
 Analog and digital carrier systems  
 Digital cross-connect systems  
 Digital line transmission systems  
 Private network transmission systems  
 Voice frequency equipment and systems

### Data networking

Packet switching systems  
 Network access concentrators  
 Protocol converters

### Test equipment

Transmission test equipment  
 Signaling and supervision test equipment  
 Service observation test equipment  
 Service analysis equipment  
 PCM carrier test equipment  
 Loop test equipment  
 Trunk test equipment  
 Data communications diagnostic test equipment  
 Data communications patching and switching equipment  
 Data communications remote access switching and patching equipment  
 Network management systems

### Power equipment

Power plants  
 Ringing and tone equipment

### Trademarks

The names *Digital World*, *Displayphone*, *DMS*, *DMT*, *DNC*, *DNX*, *DPN*, *DV-1 Data Voice System*, *Harmony*, *Intelligent Universe*, *Lanstar*, *Meridian*, *OPEN World*, *RD*, *SL*, *Touchphone*, *Unity*, and *Vienna*, used in this report, are trademarks of Northern Telecom. *MS-DOS* is a trademark of Microsoft Corporation. *CP/M* is a trademark of Digital Research, Inc. *UNIX* is a trademark of Bell Laboratories. *IBM* is a trademark of International Business Machines Corporation. *DEC* and *VT* are trademarks of Digital Equipment Corporation.

**Corporate offices**

*Northern Telecom Limited*  
Corporate Executive Offices  
33 City Centre Drive  
Mississauga, Ontario  
L5B 3A2  
Telephone:  
(416) 275-0960  
Telex: 06-960348

*Bell-Northern Research Ltd.*  
3500 Carling Avenue  
Ottawa, Ontario  
K1Y 4H7  
Telephone:  
(613) 727-2000  
Telex: 0533175

*BNR Inc.*  
685A East  
Middlefield Road  
Mountain View,  
California 94043  
Telephone:  
(415) 969-9170  
Telex: 334414

*Netas-Northern Electric Telekomunikasyon A.S.*  
Alemdag Caddesi  
Ümraniye, Üsküdar  
Istanbul, Turkey  
Telephone: (90) (1)  
3351100  
Telex: 22413

*Northern Telecom AG*  
Drahtzugstrasse 18  
8008 Zurich,  
Switzerland  
Telephone:  
(41) (1) 55 70 20  
Telex: 59640

*Northern Telecom (Asia) Limited*  
Keck Seng Tower  
133 Cecil Street  
#15-01  
Singapore 0106  
Telephone:  
(65) 2255151  
Telex: 23369

*Northern Telecom (CALA) Corporation*  
14701 N.W.  
77th Avenue  
Miami Lakes, Florida  
33014  
Telephone:  
(305) 558-4858  
Telex: 44132

*Northern Telecom Canada Limited*  
304 The East Mall  
Islington, Ontario  
M9B 6E4  
Telephone:  
(416) 232-2000  
Telex: 06-984607

*Northern Telecom Data Systems Limited*  
Maylands Avenue  
Hemel Hempstead,  
Hertfordshire  
England  
HP2 7LD  
Telephone:  
(44) (442) 41141  
Telex: 826151

*Northern Telecom (Dublin) Limited*  
25 St. Stephen's  
Green  
Dublin 2, Republic of  
Ireland  
Telephone:  
(353) (1) 609488  
Telex: 31673

*Northern Telecom Electronics Limited*  
33 City Centre Drive  
Mississauga, Ontario  
L5B 3A2  
Telephone:  
(416) 275-0960  
Telex: 06-960298

*Northern Telecom Finance Corporation*  
MetroCenter,  
Nashville House  
One Vantage Way  
Nashville, Tennessee  
37228  
Telephone:  
(615) 251-4440  
Telex: 554368

*Northern Telecom France S.A.*  
185, avenue  
Charles-de-Gaulle  
F-92200  
Neuilly-sur-Seine,  
France  
Telephone:  
(33) (1) 722-5151  
Telex: 611819

*Northern Telecom Inc.*  
259 Cumberland Bend  
Nashville, Tennessee  
37228  
Telephone:  
(615) 256-5900  
Telex: 554368

*Northern Telecom Industries Sdn. Bhd.*  
Bayan Lepas  
Free Trade Zone,  
Penang,  
West Malaysia  
Telephone:  
(60) (4) 831-211  
Telex: 40056

*Northern Telecom International Finance B.V.*  
Daalmeerstraat 4  
2131 HC Hoofddorp  
Hoofddorp,  
The Netherlands  
Telephone:  
31-2503-33297  
Telex: 74585

*Northern Telecom International Inc.*  
259 Cumberland Bend  
Nashville, Tennessee  
37228  
Telephone:  
(615) 256-5900  
Telex: 554368

*Northern Telecom International Limited*  
33 City Centre Drive  
Mississauga, Ontario  
L5B 3A2  
Telephone:  
(416) 275-0960  
Telex: 06-960348

*Northern Telecom (Ireland) Limited*  
Industrial Estate  
Galway  
Republic of Ireland  
Telephone:  
(353) (91) 57671  
Telex: 28343

*Northern Telecom Japan Inc.*  
Akasaka Twin Tower  
East Wing, 13F  
17-22, Akasaka  
2-Chome  
Minato-ku  
Tokyo-107 Japan  
Telephone:  
(81) (3) 582-3137

*Northern Telecom (NEA) Limited*  
Kidwells Park House  
Kidwells Park Drive  
Maidenhead,  
Berkshire  
England SL6 8BE  
Telephone:  
(44) (628) 35031  
Telex: 849846

*Northern Telecom plc*  
Berkeley Square  
House  
Berkeley Square  
London W1X 5LE  
England  
Telephone:  
(44) (1) 491 4599  
Telex: 27433

*Northern Telecom (U.K.) Limited*  
Langton House  
Market Street  
Maidenhead,  
Berkshire  
England SL6 8BE  
Telephone:  
(44) (628) 72921  
Telex: 849725

**Listing of stock**

The Stock Exchange  
London, England  
Montreal Exchange  
New York Stock  
Exchange  
The Toronto Stock  
Exchange  
Vancouver Stock  
Exchange  
*Stock symbols*  
NT on NYSE  
NTL on Montreal,  
Toronto, and  
Vancouver exchanges

**Dividend****Reinvestment and Stock Purchase Plan**

Common shareholders wanting to purchase additional common shares of Northern Telecom Limited can take advantage of a convenient and cost-free investment plan. Quarterly dividends may be invested automatically to purchase additional common shares at a discount from the average market price (calculated during a fixed period each quarter). Common shares may also be purchased at the average market price by voluntary cash payments of as little as \$50 to a maximum of \$5,000 during a quarter. In either case, there are no brokerage fees or other service charges. Additional information may be obtained from: The Treasurer Northern Telecom Limited P.O. Box 830, Tour de la Bourse Montreal, Quebec Canada H4Z 1K1

**U.S. dividends**

Registered U.S. shareholders are entitled to receive their dividends in U.S. or Canadian dollars, subject to Canadian withholding tax. Requests to change the currency in which dividends are currently being received should be directed to: Northern Telecom Limited Stock Transfer Office P.O. Box 830 Tour de la Bourse Montreal, Quebec Canada H4Z 1K1

**Transfer offices**

Corporate offices  
800 Place Victoria  
Suite 250  
Montreal, Quebec  
H4Z 1A2

483 Bay Street  
Floor 2, South Tower  
Toronto, Ontario  
M5G 2E1

*Montreal Trust Company*  
Halifax, Winnipeg,  
Regina, Calgary,  
Vancouver  
*Manufacturers Hanover Trust Company*  
New York, New York  
*Continental Illinois National Bank and Trust Company of Chicago*  
Chicago, Illinois  
*The Royal Trust Company*  
London, England

**Registrars**

*Montreal Trust Company*  
Halifax, Montreal,  
Toronto, Winnipeg,  
Regina, Calgary,  
Vancouver  
*Manufacturers Hanover Trust Company*  
New York, New York  
*Continental Illinois National Bank and Trust Company of Chicago*  
Chicago, Illinois  
*The Royal Trust Company*  
London, England

Northern Telecom Limited  
Corporate executive offices  
33 City Centre Drive  
Mississauga, Ontario L5B 3A2

