Modems: Market Overview

In this report:

Synopsis

Editor's Note
This report explores the modem market. For an overview of modem technology, see Report 570-201. For detailed information on approximately 500 modems designed to work with microcomputers, see Report 570-301.

Market Highlights
ISDN has been characterized as the modem killer, but is the Goliath ISDN bearing down mightily on the David-sized modem? Apparently not yet. The modem companies, meanwhile, have been busily assembling new arsenals of innovative products that will help keep the giant at bay. Eventually, digital will replace analog, but predictions vary, and industry analysts are not setting a firm date for the interment of the modem.

The responses to our survey indicate that the modem industry is alive and well. Microcomputer modems detailed in the comparison columns total approximately 500 from over 60 vendors, covering modems in the following categories: low, medium, high, fiber optics, modem eliminators, radio frequency, and line drivers. Vendors are incorporating the latest MNP error correcting protocols and the latest CCITT recommendations into their products. Speeds are going higher without sacrificing clarity or reliability. Many features that were once high-priced options are now standard.

In 1989, users welcomed price reductions on some very sophisticated devices. Companies teamed up to combine resources and curb research and development expenditures. U.S. vendors looked for markets across the seas, both Atlantic and Pacific, and adjusted their products for use in the global village. The facsimile revolution has hit the modem industry, and modem vendors are gearing up to meet the challenge.

Yet, it is much too early to bid the modem goodbye. This report also profiles leading vendors who are doing their best to keep the industry fresh and profitable.

Market Leaders

AT&T Paradyne

In March 1989, AT&T acquired Paradyne, a data communications equipment supplier. Paradyne attracted AT&T's interest chiefly because of its strong presence in the international marketplace. After AT&T received the go-ahead to compete in the data communications arena, the company began scouting for opportunities to increase its visibility on the world scene. Paradyne, now AT&T Paradyne, filled that need. It had distributorships in 47 countries and sales offices in the United States, United Kingdom, Japan, Hong Kong, and Canada.

AT&T Paradyne's modem line-up includes the Paradyne 3400 Series and the AT&T Dataphone II modems, both marketed under the AT&T Paradyne name. Although the 3400 Series and Dataphone II are complementary product lines, migration capabilities have not been worked out.

One of the most sophisticated modems on the market, the 3400 Series of network-managed modems transcends the ordinary by working with the ANALYSIS System and with Personality Modules, so named because they allow users to adjust modem characteristics to suit their applications.

Codex

Codex anticipated the demand for V.32 devices, beating competitors to market by shipping V.32 modems in 1986. In January 1989, the company upgraded its V.32 product line by introducing the 2264 for the U.S. and the 2266 for international networks. A world leader in V.32 technology, Codex has installed over 20,000 such devices internationally.

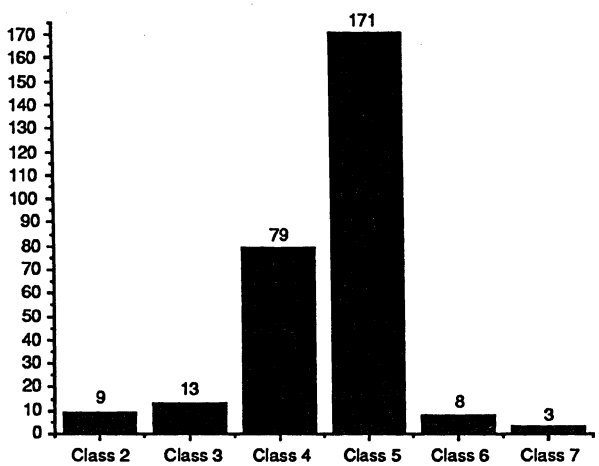
A member of the committee that drafted the V.32 recommendation in 1984, Codex has not wavered from its commitment to the standard. Foreseeing a strong demand into the 1990s for products incorporating high-speed dial modem technology, Codex proposes V.32 as the solution for cutting dial line costs while retaining reliability in sensitive applications such as leased-line backup, off-hour polling, and transmitting CAD/CAM graphics.

In 1989, Codex enhanced its modem and network management lines by adding direct interfaces to IBM's NetView. The DualVIEW Management Option enables the 2600 Series to be managed by two independent systems. Users can manage the 2600 Series from a Codex Network Management System and directly from IBM's NetView.

In addition to V.32 modems, Codex produces the 2500 Series of network-managed modems for users new to network management.

To support its digital networking strategy and expand solutions capabilities, Codex entered into a new field in December 1989 by announcing the formation of a LAN Internetworking Group. The first product of the group, the 6310 EtherSpan Bridge, is a full-functioned IEEE 802.3 Ethernet MAC Learning Bridge. The 6310 bundles any multiple of 24 DS0 64K bps circuits.

Figure 1.
Products with MNP Class Identified



General DataComm

General DataComm maintains a strong presence in the modem market by offering an exceptionally comprehensive line of products. Recently, the company has promoted the "uncluttered desk" concept through its line of desktop modems. General DataComm has incorporated V.32 features into its desktop line via the DeskTop V.32.

Outside the U.S., General DataComm has entered into contracts with Telecom Canada and the Hong Kong and Shanghai Banking Corporation. The two-year agreement with Telecom Canada covers a full line of modems featuring data rates ranging from 300 bps to 9600 bps. The five-year agreement with Hong Kong and Shanghai Banking Corporation authorizes General DataComm to supply, install, and maintain equipment

and software for the financial organization's worldwide information network.

Hayes Microcomputer Products

Hayes has an enviable position in the microcomputer modem market: its name almost generically signifies modem because its AT Command set has become a de facto standard in the industry. In October 1989, Hayes announced a major repositioning of its products and marketing strategy, which focused on encouraging users to move into higher-speed brackets and to make use of sophisticated features. As a catalyst for change, Hayes reduced prices on modems in the Advanced System Product and Standard Business Product segments. Hayes offered a 28 percent reduction for V-series Smartmodem 2400 and a 23 percent reduction on V-series Smartmodem 9600.

Dennis C. Hayes, president of the company, outlined the reasons for repositioning. "Hayes is well known for leadership in technology, features, quality, and service. This new positioning addresses the perception that Hayes products are too expensive and eliminates price as a factor in the purchase decision. Our competitors may not appreciate this strategy, but end users and resellers will appreciate the new prices and margins."

Hayes actively participated in the adaptation of V.42 bis as the standard for data compression, which includes enhancements proposed by IBM, British Telecom, and Hayes. Shortly after the CCITT Study Group XVIII approved V.42 bis, Hayes announced support for the standard in its V-series system products. In December 1989, customers with V-series products incorporating V.42 could upgrade to V.42 bis.

Recognizing the emergence of a PC fax market, Hayes acquired the JT Fax brand and its line of hardware and software facsimile products for microcomputers from Asher Technologies and Quadram, L.P., subsidiaries of Intelligent Systems Master L.P., in June 1989.

IBM

Until recently, users did not identify IBM with the modem market. In 1988, IBM changed that perception by introducing the 7860 high-end, leased line modem as part of its strategy to position itself as a provider of total network solutions. In addition, IBM promotes the use of the modems with its NetView network management system, which centralizes monitoring and control.

The 7860s are 19.2K bps models with innovative features, most notably a multipoint capability that eliminates the need for separate modems or controller ports. IBM incorporated very large scale integrated (VLSI) circuits into the products and built them around a powerful, single digital signal processor. The 7860 also supports bidirectional 14.4K operation in multipoint mode and 9600 bps operation with Trellis Coded Modulation.

By letting loose a barrage of communication products, IBM has not yet captured the flag, but is steadily encroaching on the opposition's territory. The 7860 sent tremors through the industry, which realizes only too well that IBM's huge installed base represents a receptive audience.

Microcom

A pioneer in error-correction protocols, Microcom continues to stretch the limits of the technology. The modem market welcomed Microcom Networking Protocol (MNP) with such enthusiasm that many vendors installed it on their products and enhanced their lines with new versions. The most recent class of MNP, MNP 10, made its debut on Microcom's QX/2400t modem in November 1989. MNP 10 tackles the tough job of optimizing data transmission over poor lines and cellular connections. Reflecting the trend of "combination modems," the QX/2400t also features MNP 7, which sustains throughputs of up to 12,000 bits per second over dial-up lines. Priced at $699, QX/2400t responds quite well to the needs of an imperfect world populated with less than ideal line equipment and transmission environments.

When Microcom spots a need, such as the elimination of cumbersome equipment and cables, it quickly moves to fill the void. In November 1989, the company announced the QX/24LTc laptop modem featuring MNP Class 5. Functioning as an internal laptop modem, QX/24LTc enables executives, journalists, technicians, and other professionals who frequently access computers to communicate simply by plugging into a phone line. MNP 5 data compression techniques reduce the cost of the phone connection and support speeds up to 4800 bps. Microcom priced the QX/24LTc at $599.

Although innovative, Microcom does not pursue novelty at the expense of quality, as evidenced by its rating in *PC Digest*, which issues independent comparative ratings reports produced by National Software Testing Labs (NSTL) of Plymouth Meeting, PA. In a comparison of high-speed modems from 10 leading vendors that included U.S. Robotics, Racal-Vadic, General DataComm, Multi-Tech, Hayes, SmarTeam, Telebit, Ven-Tel, and Cermetek, Microcom's QX/V.32c modem outdistanced all of them. NSTL awarded an overall rating of 8.5 out of a possible 10 to the product, stating that its outstanding performance "is largely attributable to its MNP Level 7 data compression. The Microcom's (QX/V.32c) maximum system connection of 38,000 bps also boosts its performance."

Racal-Milgo

At TCA in San Diego in September 1989, Racal-Milgo performed the first public demonstration of its Excalibur family of integrated network access products, which include leased line and dial-up modems, and digital access devices. With these products, Racal-Milgo is easing its customers into the digital '90s by offering them economical migration paths.

In keeping with the trend toward trim products, the standalone units of the Excalibur family reside in compact, desktop enclosures that can fit in attache cases. A central site nest accommodates central-site Excalibur configurations by providing high-density mounting space for all printed circuit boards.

Racal-Milgo has aimed the Excalibur family at the international market for high-speed leased line and dial modems. Since the company has an installed customer base of network users in 82 countries, Excalibur should generate a high level of interest. The Communications Management Series (CMS) external network management system can direct the family. Customers can, however, control these devices via a common central site nest control system and LCD front panel display for remote units.

Survey Results

Microcom Networking Protocol (MNP) continues to win favor with vendors. The survey indicated that 269 vendors have incorporated one of the classes of MNP into their products. Some of them designated which Class of MNP they used, the classes running between 1 and 10. Microcom introduced Class 10 as part of its QX/2400t modem in November 1989. Class 9 did not appear in any of the vendors' products. This class of MNP connects MNP- and non-MNP-compatible modems at the highest performance levels. Figure 1 shows the breakout of the various MNP classes recorded in the survey.

MNP Class 5 ranks as the dominant choice of vendors at this time, followed by MNP Class 4. MNP Class 5 handles data compression and dynamically adjusts to the type of data being sent. MNP Class 4 attains up to 120 percent link throughput efficiency, automatically adjusts packet sizes to meet line conditions, and reduces protocol overhead. A combination of MNP Class 4 and 5 increases link throughput up to 200 percent.

Modems conforming to V.33 specifications cropped up during the survey, but not too frequently. Fifty-five products used V.33, representing 6.52 percent of the modems in the low/medium/high section of the survey. Possibly, the small showing of V.33 results from its being the standard for leased-line, full-duplex modems running at speeds up to 14.4K bps. Since many users skip 14.4K bps on their way to 19.2K bps, V.33 has not made much of an impact. Some vendors offer proprietary versions of V.33 or combine it with V.32. The trend toward speeds up to 19.2K is reflected in the survey. Vendors reported 50 products which attain that level.

The two most recent CCITT recommendations, V.42 (for error correction) and V.42 bis (for data compression), have only sparsely shown up in the surveyed products. Perhaps vendors have been reluctant to introduce V.42 and V.42 bis products because the CCITT did not ratify V.42 until 1988 and V.42 bis until late in 1989. Of 269 products in the low/medium/high categories, only 9 used V.42 and 2 used V.42 bis.

Many vendors marketing Radio Frequency modems are directing their products toward the cellular market. In the fiber optic category of the survey, plastic as a transmission medium shows up fairly often. A breakout of the categories of products surveyed and the number in each category follows:

Low speed	311
Medium speed	238
High speed	108
Line Drivers	72
Limited Distance	134
Fiber Optic	92
Radio Frequency	55
Modem Eliminators	30

Trends and Issues

During 1989, the modem industry witnessed price reductions, a flurry of international activity, marketing agreements and acquisitions, and the emergence of modems with fax capabilities.

Lower Prices

Codex has taken the lead in bringing down prices in the 19.2K modem market. In January 1990, Codex triggered pricing realignments throughout the industry by announcing a 19.2K bps leased-line modem selling for $2,995, almost half the price of the company's existing 19.2K device, the Model 2382. The new model, the 3380, is a leased-line modem with diagnostic features. By pricing the 3380 so attractively, Codex is signaling users of 9.6K bps modems that the time has come for them to enter the 19.2K bps camp.

Now that prices have come tumbling down, users of 9.6K bps have lost their last objection to switching to 19.2K. Codex attributes the price slashing of the 3380 to a manufacturing process that refined production procedures and pared down costs. Users of the 3380 can configure remote modems from the local modems, a feature that eliminates the need to send staff to remote locations.

Another leading vendor, Hayes Microcomputer Products, has taken a similar approach. In October 1989, the company adopted a marketing strategy to change its image in the marketplace as a producer of excellent, but expensive modems. To accomplish this goal, Hayes made deep price reductions, as much as 43 percent on some products. The price of the Smartmodem 1200B dropped from $349 to $199. The price of the Smartmodem 1200B/Smartcom II modem dropped from $399 to $249, a difference of 38 percent.

International Activity

In preparation for the opening up of European markets in 1992, U.S. vendors are producing products that will meet PTT standards in various countries and are making a point of indicating where their products can operate. Vendors without strong international bases are teaming up with companies that have already established them. A case in point is AT&T's acquisition of Paradyne, undertaken primarily because of Paradyne's strong foothold in the international market.

Vendors have set their sights beyond Europe as well. They are seeking and receiving approvals to market their products in the Middle East, Far East, South America, and the Pacific Rim.

Data Race won an order to supply the Turkish PTT with 200 standalone and 200 rackmount Rally 9600 modems equipped with asynchronous adapters. This year, the Turkish national phone company is expected to order 3,000 Rally 9600 modems. Staking out marketing territory in the United Kingdom, U.S. Robotics acquired Miracom Technology Ltd., a British modem manufacturer.

Activity, however, is not all one-sided. To stretch their market opportunities, international vendors look to the United States. British Telecom acquired Mitel Datacom in 1988 and combined Mitel's operations with the data communications division of British Telecom, forming BT Datacom. Fortified by its parent company's research and development funds of $300 million, BT Datacom introduced an international version of its 4142TCX modem in April 1989.

Alliances and Acquisitions

Many vendors are entering into marketing and technology agreements to pool their expertise and resources.

In August 1989, CASE/Datatel entered into a joint marketing and service agreement with NCR which authorizes NCR to offer CASE/Datatel communications products, including dial-up, leased line, and limited distance modems. Under the nonexclusive agreement, NCR can purchase from CASE/Datatel and resell the products to its customers or the two companies can market jointly.

Hayes joined forces in a marketing alliance with Prodigy Services Company and developed the Personal Modem 2400 for the PRODIGY interactive personal service. Prodigy markets the modem

with the PRODIGY Service Start-up Kit, which contains software and three months' use of the service. Developed by a partnership of IBM and Sears, PRODIGY enables subscribers with personal computers in their homes to conduct a variety of transactions such as shopping, securities trading, banking, and reservations.

In another alliance, Hayes and Silicon Systems announced in August 1989 the development of the first complete V.42 circuit set for 2400 bps modems. This integrated circuit is the first to incorporate CCITT V.42 and the Hayes Standard AT Command, as well as Hayes AutoSync, Hayes Adaptive Compression, and Hayes Automatic Feature Negotiation, all of which are featured in Hayes V-series products.

Telebit announced an agreement with ACCESS Graphics Technology of Boulder, CO, that authorizes ACCESS Graphics to distribute Telebit's high-speed, dial-up modems. A national distributor, ACCESS also represents the products of Digital Equipment Corporation, Vermont Microsystems, Mitsubishi, Calcomp, Hitachi, Hewlett-Packard, and Summagraphics.

Emerald Technology signed an agreement with LeeMah DataCom Security under which Emerald will sell security systems produced by LeeMah as dial-back security units to its IBM midrange users. LeeMah markets InfoKey, an analog security device that performs three security checks before authorizing dial-in access to host computers from remote locations.

Concord Data Systems entered into a joint marketing agreement with Communications Research Group of Baton Rouge, LA, which calls for Concord to promote Communications Research Group's BLAST file transfer and terminal emulation software. In return, Communications Research distributes BLAST preset for operation with a Concord modem. BLAST supports the industry-standard AT command set, command sets based on V.32, and other high-speed modems from Hayes, Telebit, Universal Data Systems, Microcom, U.S. Robotics, Concord, and Data Race.

In September 1989, Telenetics announced the acquisition of the security modem business of Tri-Data Systems. The agreement covers the "Oz" trademark for 2400 and 9600 bps models. Both companies had worked together before the acquisition, cross-licensing products. Security modems under the Oz trademark have been on the market for almost 10 years and have a substantial installed base.

Modems for Fax

As fax usage increases, vendors are responding with modems to support it. Rockwell International, Semiconductor Products Division, recognized the need early and developed the MONOFAX line of single device package modems for facsimile applications. In September 1989, Rockwell introduced the R96DFX as the latest 9600 bps in the MONOFAX line. The unique characteristic of the product is its capability to support HDLC framing and DTMF detection without the addition of external components. The MONOFAX line also includes 2400 bps and 4800 bps versions. Rockwell has set a price of $48.50 each based on a quantity of 10,000.

Zoom Telephonics of Boston is marketing Zoom/Modem HC 2400S with Sendfax (Sendfax is a trademark of Sierra Semiconductor). After writing a letter on a PC, a user can send the letter to any Group 3 fax machine. The Zoom/Modem HC 2400S is a full-featured 2400/1200/300 bps modem with Hayes compatibility. It features auto dial/auto answer, call progress tone detection, support for four COM ports, a high-speed UART, and a wait-state generator. The suggested retail price of under $200 adds to the attractiveness of the product.

In November 1989, Everex Systems announced the release of the internal EverFax 24/96 and the external EverFax 24/96E. Both units combine 9600 bps fax capability with a 2400 bps Hayes-compatible data modem and feature MNP Class 5 data compression and Class 2 through Class 4 error correction. The EverFax 24/96 lists for $399 and the EverFax 24/96E for $499. ■

Modems: Technology Overview

In this report:

Synopsis

Editor's Note
This report focuses entirely on the technology of modems. For insight into the modem market, see Report 570-101. For detailed information on approximately 500 microcomputer modems offered by over 60 vendors, see Report 570-301.

Technology Highlights
Until ISDN becomes a reality, the modem will remain an integral part of computer systems. This relatively inexpensive commodity item still supports data transmission over the analog telephone system. Converting digital signals into analog signals requires a process called *modulation.* After the modulated signals reach their destinations, the *demodulation process* changes them to their original digital formats. The term "modem" originated from the dual functions of the device: modulation and demodulation.

Anticipating an ongoing need for their products, modem vendors have refined the technology over the years by increasing speeds, pricing competitively, enhancing reliability, and designing more compactly. By incorporating Very Large Scale Integration (VLSI) manufacturing techniques into their products, vendors have produced sophisticated high-speed modems.

No longer viewed as isolated units in a communications scheme, many modems now operate with network management systems, which support central-site monitoring and control of a large number of devices. Many modems also incorporate features once considered value-added, such as auto dial, auto answer, and self-diagnosis.

Most modems are compatible not only with AT&T and Hayes standards, but also with recommendations of the CCITT. Recently, V.32 has emerged as the standard of choice by many vendors because V.32 modems broaden the range of 9600 bps networks and can function as leased-line or dial-up units. The latest standard to affect the industry, V.42 bis, deals with data compression methods.

Analysis

Technology Basics

Modems: Common Elements

Although there are many different types of modems, all units share common elements: power supply, transmitter, and receiver. The power supply usually takes 120 or 220 V AC and transforms it into the DC voltage required to operate the modem's internal circuitry. The transmitter modulates the digital data into analog form; the receiver demodulates analog signals and reverts them to their original digital format (see Figure 1).

Modems designed for asynchronous or synchronous operation differ in one major aspect: a synchronous modem contains a clock source and phasing circuits; an asynchronous modem does not. Asynchronous modems do not need clocking sources because data is transmitted at irregular intervals. In synchronous transmission, data is sent continuously in regular, clocked intervals.

Additional components of modems are:

Data encoder: Part of the transmitter, this unit determines the modulation changes to the carrier frequency at each sampling segment.

Modulator: Also part of the transmitter, this component changes the carrier frequency, as determined by the encoder.

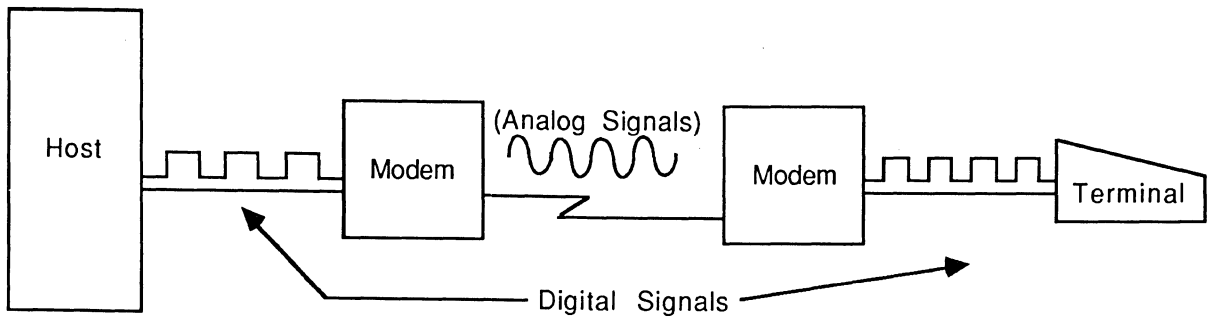
Filters: Part of the transmitter and receiver, these circuits transmit signals of frequencies within one or more bands. They also screen signals of other frequencies, thus eliminating noise and other impairments to the information stream.

Line amplifier: Part of the transmitter providing the connection between the modem and the carrier, an amplifier boosts the strength or amplitude of a signal. In a modem, the line amplifier is actually a variable-gain device, usually adjustable in two-decibel steps to accommodate the modem's transmit signal to the requirements of the communications line. The amplifier is configured so that its impedance matches that of the line over the represented frequency range.

AGC amplifier: Part of the receiver, this unit supplies automatic gain control (AGC), allowing the modem to compensate for amplitude variations on the line.

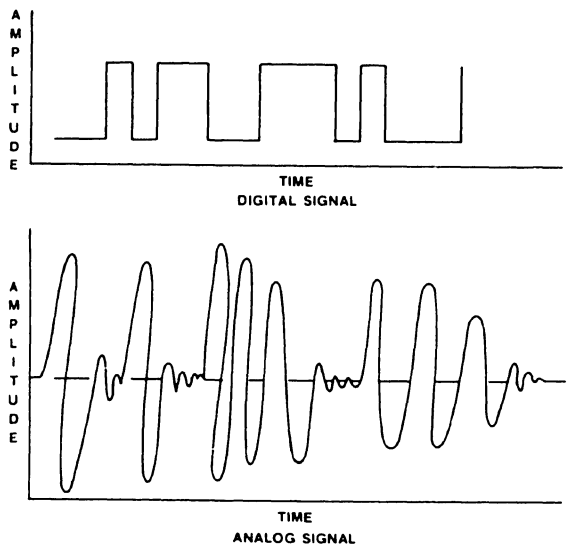
Equalizer: Generally incorporated into modems transmitting data at 2400 bps and higher, this element is basically an inverse filter whose amplitude and phase characteristics are the inverse of those

Figure 1.
Conversion Process



A modem accepts digital signals from the sending device and converts them into analog pulses that are sent over the public telephone network. At the receiving end, a corresponding modem converts the analog signals back into digital ones.

Figure 2.
Digital versus Analog Signals



presented on the telephone line. The equalizer corrects amplitude and delay distortions that, if uncorrected, can lead to interference during transmission.

Demodulator: Part of the receiver, this unit retrieves data from a modulated carrier wave and passes it on to the decoder.

Decoder: In conjunction with the demodulator, the decoder formats received data into a serial binary pattern and sends it to the receiving data device. This component is also part of the receiver.

Digital vs. Analog

Modems are essential components of a data communications network because they allow communication between *digital* devices transmitting information over the public or private telephone network comprised of *analog* facilities. Without conversion, soundless digital signals cannot be sent over an analog facility, which is designed to carry sounds. Figure 2 illustrates the differences in the ways in which digital and analog signals are formed.

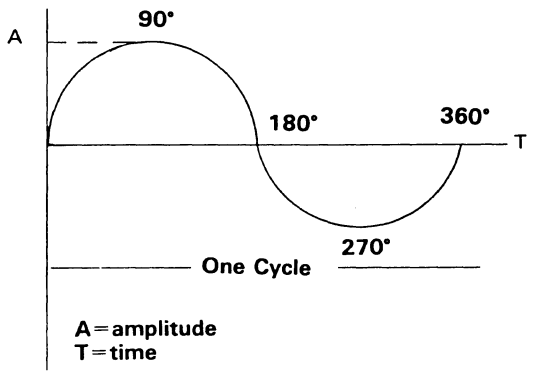
Analog signals are waves, and digital signals are a series of pulses with very short rise (leading edge of signal) and fall (trailing edge) times, culminating in a squared-off signal pattern. Technically, these quick transitions result from high-frequency harmonic signals that are often over 10,000 cycles per second. In a digital datastream, information sent in a series of pulses represents a binary 1 or 0—a rise represents a binary 1, and a fall represents a binary 0 (see Figure 2, top diagram). Since the telephone system is designed to carry the human voice within a frequency range from 300 Hz to 3300 Hz, it cannot accommodate these high-frequency signals. Any attempt to send such information down an analog facility will result in a blurring or distortion of the digital pulse, making it lose its "squared-off" appearance. Once this happens, it is impossible to see where a digital pulse begins and ends. The information becomes useless.

Other factors affect the integrity of digital transmissions. A loss of signal strength occurs as the distance between modems increases. Transmission speed also affects data integrity—the higher the data rate, the more pulses sent. As more pulses are sent, they grow closer together and become more prone to distortion. Random noise, caused by molecular vibrations on a communications circuit, generates a low-level mixture of electromagnetic waves at different frequencies, producing a "hiss" on the line. If the transmission signal power falls beyond an acceptable level, the digital bit stream may become corrupted. Noise from other sources, such as electrical equipment or atmospheric conditions, also affects the digital datastream.

Modulation

Since the public telephone network was designed to carry analog signals, digital signals must be converted into analog form by a process called *modulation.* Modems modulate the digital signals used

Figure 3.
Sine Waves



Analog signals are transmitted over the public network in sine waves, depicted here.

by computers and other types of data equipment into audio tones that can be carried by the analog network. Once the modulated signals reach their destinations, they are *demodulated* to their original digital formats and sent to receiving data equipment. Figure 1 shows modulation and demodulation on a point-to-point communications link.

Modems support modulation techniques to fulfill the requirements of various applications. Simple, slow-speed devices use a technique called frequency-shift keying (FSK); higher-speed devices of 9600 bps and above use a a technique called quadrature amplitude modulation (QAM).

The terminology and mathematical theory describing electrical signals are based on the concept that a signal is composed of multiple simple signals called sine waves. Most modems transmit a continuous sine wave, defined by two parameters: amplitude and time. Once defined, the wave possesses two properties convenient to mathematical manipulation: frequency and phase. Any combination of three of the parameters—amplitude, frequency, and phase—can serve as the basis for a modulation technique. The three basic types of modulation techniques are *amplitude modulation*, *frequency modulation*, and *phase modulation.*

Amplitude Modulation (AM)

The simplest technique, amplitude modulation generates a single carrier frequency signal. If the resultant wave is of high amplitude, it denotes a binary 1; if it is of low amplitude, it denotes a binary 0. AM is highly susceptible to line interference. Quadrature amplitude modulation (QAM), a combination of amplitude modulation and phase modulation, is essentially a four-phase technique. This method uses two signals at the same frequency, but they are 90 degrees out of phase with each other. For each signal, four possible levels of amplitude can be applied (A1, A2, A3, and A4). By combining the two signals that are 90 degrees out of phase, 16 different conditions, each representing four bits of information, can be generated. It is also possible to represent 32 different states, generating twice as much information.

Frequency Modulation

The most common frequency modulation is *Frequency-Shift Keying (FSK)*, a two-level technique used on AT&T 103 and 113 Series modems. FSK modulation represents changes in the binary bit pattern by alterations in the frequency of an audio tone. This line is assumed to be in a steady binary 1 or "mark" state when it is idle, represented by one frequency of tone. When the data bit value 0 is sent, the modem changes to another tone frequency, causing a unique, almost musical, effect during the sending of data. FSK modulation works well for relatively low speeds, but as the speed of the digital signal increases, the time allocated to shift frequencies is reduced. Both the production and detection of audible changes become more difficult.

Phase Modulation

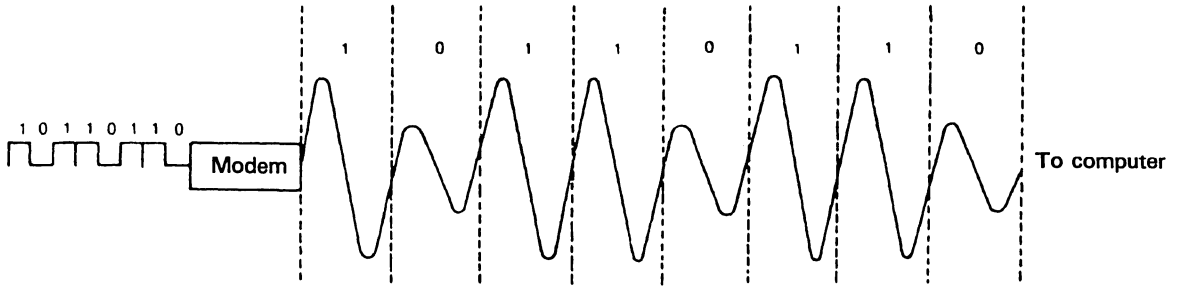
Phase-shift keying (PSK) uses changes in the phase of a signal or its timing relationship to a fixed reference to indicate a change in the bit pattern. A reference oscillator determines the phase angle change of the incoming signal, which, in turn, determines which bit or dibit is being transmitted. *Differential Phase-Shift Keying (DPSK)* compares the phase angle of the incoming signal to the previously received dibit. One change in phase is interpreted as a binary 0 if the preceding phase has been interpreted as a binary 1. This method does not require a separate reference wave, thereby reducing the amount of circuitry in the modem. PSK is used in many medium-speed modems and is combined with amplitude modulation in high-speed applications to form *quadrature amplitude modulation (QAM)*, the technique for 9600 bps and higher.

Communications Facilities

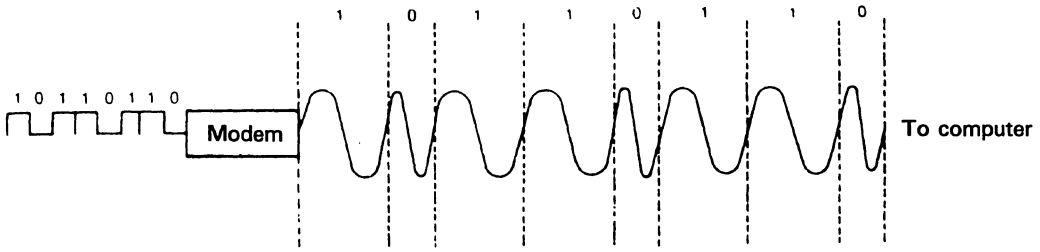
Primarily because of cost, most data communications applications use the public switched (dial-up) network (DDD) or equivalent leased lines. Many other facilities exist, however, such as radio links, direct cable connections, fiber optic links, infrared links, lasers, and other common-carrier facilities. The public telephone network and equivalent leased lines are referred to as voice grade lines. Lines of lower capacity are called narrow-band lines; ones of higher capacity are called broadband or wideband lines. Communications line describes a path over which a particular connection is established. The exact physical nature of the connection can vary, and several different types of links can be used for one connection.

In general, a narrow-band line accommodates up to 300 bits per second, a voice grade line up to

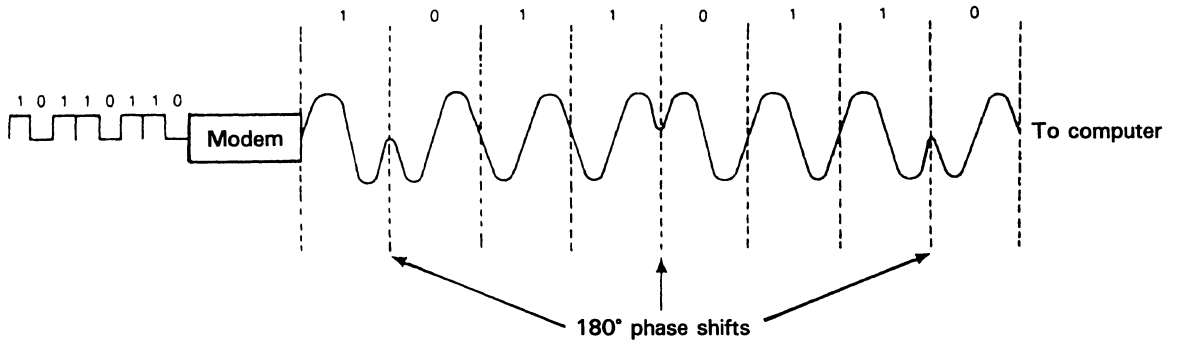
Figure 4.
Basic Modulation Techniques



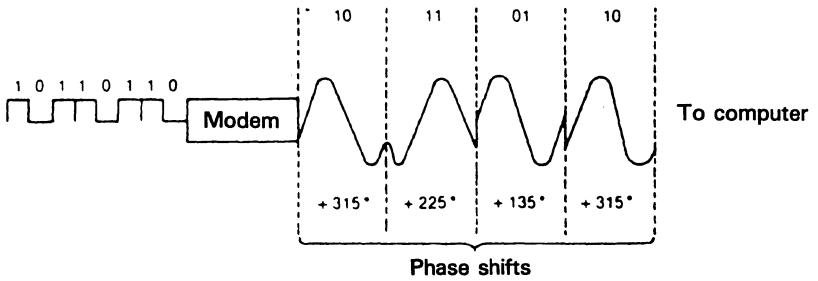
Amplitude modulator (AM) *converts digital data to analog signals using a single frequency carrier signal. A high amplitude wave denotes a mark (binary 1), and a low amplitude wave denotes a space (binary 0). Amplitude modulation is seldom used alone for modems because the signals it produces are susceptible to noise and because of the length of time it takes to sample the amplitude of the signal.*



Frequency-shift keying (FSK) *uses a constant amplitude carrier signal and two frequencies to distinguish between a mark and a space. One of the simpler modulation schemes, FSK is normally used in 1200-bps and slower modems.*

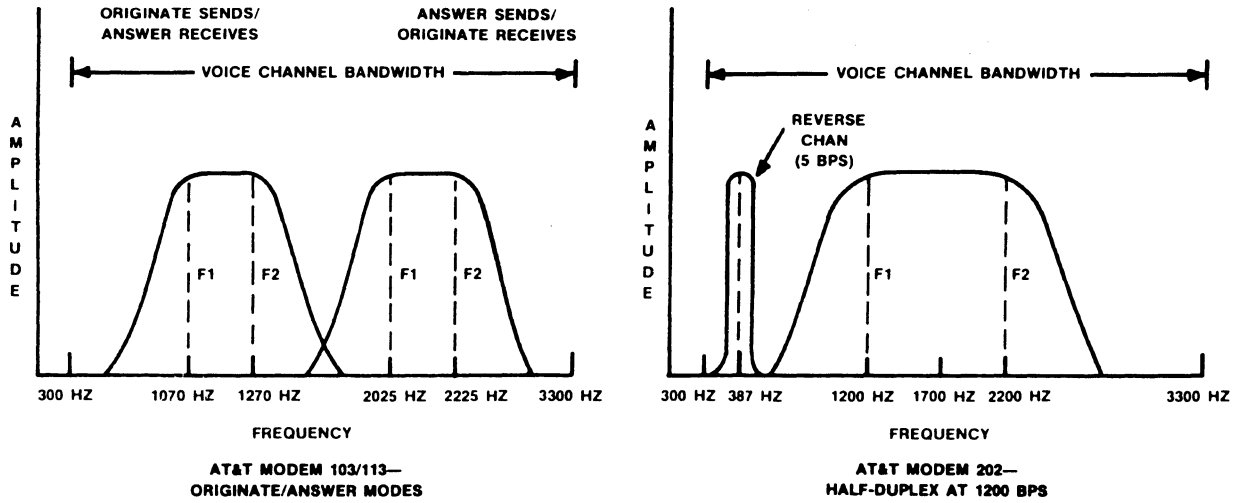


Phase-shift keying (PSK) *uses a phase shift at transition points in the carrier frequency to represent separate marks and spaces. In the example, a 180° phase shift indicates a space. High-speed modems use as many as eight phase shifts.*



Differential phase-shift keying (DPSK) *uses different phase shifts to represent the four possible combinations of 0 and 1 bits: In the example, a 45° represents "00", 135° stands for "01", 225° for "11" and 315° for "10." The pairs are called di-bits. By sending di-bits instead of single bits over the same carrier, DPSK modems achieve high transfer rates. Still other modems use combination encoding techniques such as quadrature amplitude modulation (QAM) that send three (tri-bit) or more bits per cycle to reach even higher rates.*

Figure 5.
Modem Bandwidth Usage



9600 bits per second, and a wideband line considerably more. Cables and other types of facilities generally have large capacities, but are limited by technical considerations.

Dial-up modems operate on the public switched telephone network, while *leased-line* units operate on private facilities. *Limited-distance* modems operate on private lines in local applications, while *line drivers* and *modem eliminators* operate on the customer's premises. Figure 6 shows the relationship between the communication facility and modem types.

Bandwidth

Bandwidth refers to the information-carrying capacity of a transmission facility. It actually defines the range of frequencies, measured in hertz (cycles per second), that a transmission medium can accommodate without interference or signal loss. The greater the range of frequencies a medium can handle, the greater its information-carrying capacity. Most modems transmit data within a 300 to 3000 Hz frequency range in the middle of a bandwidth.

Although signal characteristics are usually optimal in the middle of a bandwidth, transmission limited to the middle of the band restricts the amount of bandwidth available for data. To compensate for this factor, conventional modems use sophisticated, multiple-bit encoding algorithms to squeeze as much data as possible over one carrier in each direction. The downside of this solution, however, is an increase in data lost during line hits or other error-inducing conditions on the transmission medium. The goal of much modem design work is to minimize data loss while transferring greater amounts of data.

Transmission Characteristics

Data Rates

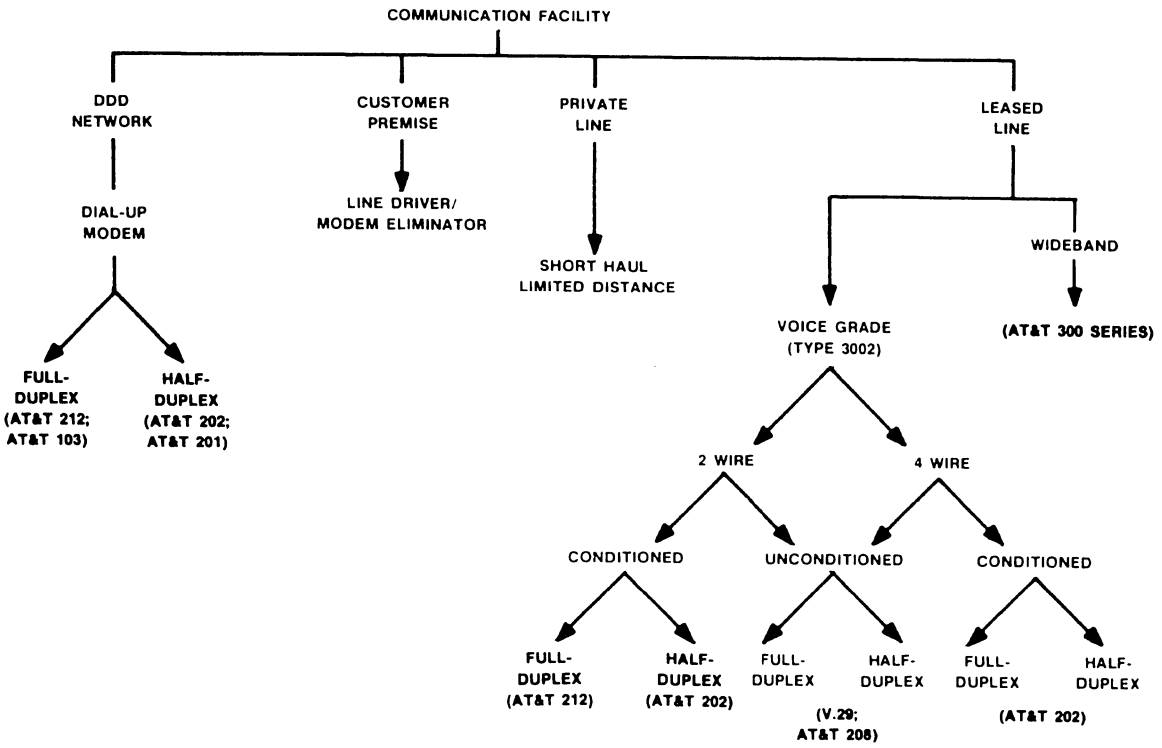
Depending on other transmission characteristics, modems operate at a fixed speed or at the speed of the sending device—up to a specified limit. Some modems can be equipped to operate at several different speeds. Users can adjust operation speeds via software commands or changes in components, wires, or switch settings.

A modem's *fallback rate* refers to its capability to detect poor line conditions and to lower transmission speed to prevent errors. For example, a modem operating at 9600 bps may fall back to 7200 bps or 4800 bps when line conditions deteriorate.

As the data rate increases in limited-distance modems, the distance over which transmission is effective decreases.

Data transmission speed is usually measured in *bits per second (bps)*, but it is not uncommon for a data rate to be expressed in *baud*. Although often used synonymously, the terms bps and baud rarely mean the same thing. The bps designation expresses the data signaling rate, while baud measures modulation rate.

Figure 6.
Communications Facility Versus Modem Type



Line Conditioning

The telephone network is not a perfect electrical path, even for voice communication. As the speed of data exchange increases, it becomes increasingly difficult for modems to manage the precise signaling required for accurate information transfer. A number of problems affect the performance of a circuit, such as line failure, electrical interference, or random noise.

Variation in the strength of the signal itself, independent of noise, can cause a problem called *amplitude distortion.* To combat amplitude distortion, modems must adjust the properties of the communications line to prevent the signal from getting too far out of shape. Circuit problems also arise from changes in the analog signal, caused by uneven propagation of low and high frequencies, a condition known as *phase jitter.*

To minimize problems in leased circuit transmission, users can pay a premium for a line that is specially *conditioned.* The telephone company will either select a path that meets the more stringent requirements of the conditioning or it will service the path to meet necessary standards.

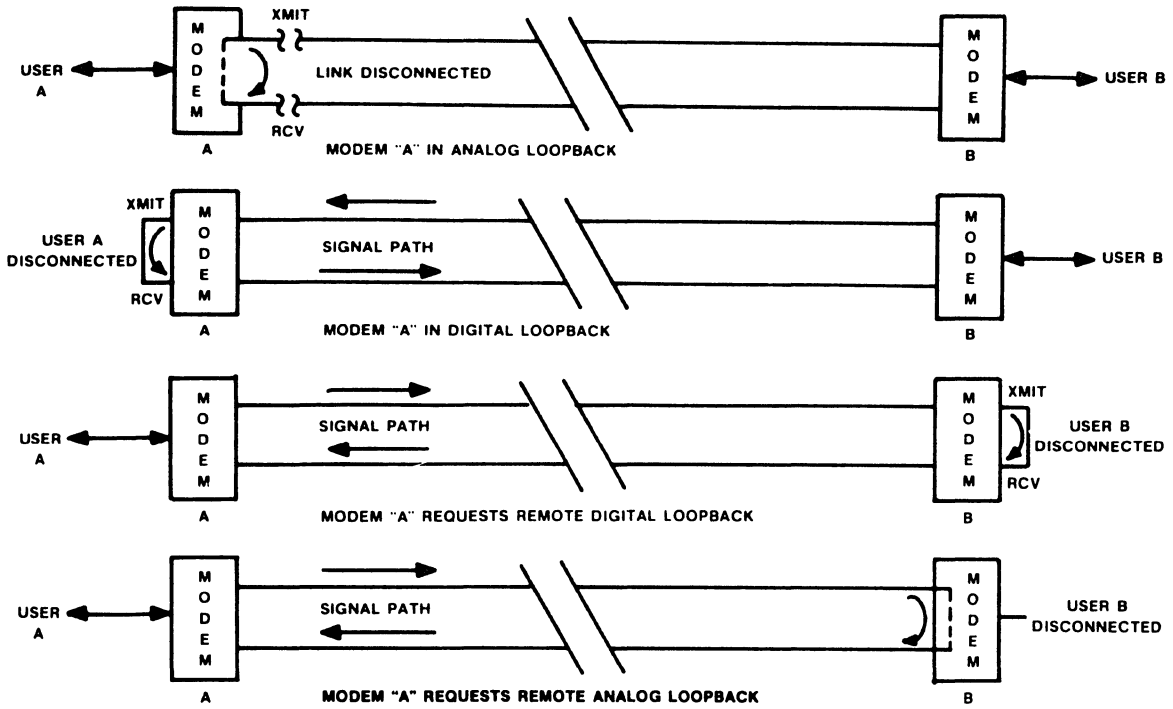
Synchronization

To ensure an orderly data flow across a communications facility, a time relationship, known as synchronization, must exist among the bits that make up the messages. The two basic forms of synchronization are asynchronous and synchronous.

Asynchronous or stop-start transmission refers to data transmitted in an irregular manner, one character at a time as it is being keyed. The time interval between sequentially keyed characters varies in duration because of the impracticality of keying consecutive characters at precise intervals. With asynchronous transmission, each character (byte) is delineated with one start bit, one or two stop bits, and an optional parity bit. The parity bit is part of a simple error detection scheme known as parity checking.

Synchronous transmission occurs in a continuous stream. Data transmitted from files on storage media can be handled as a continuous datastream. Electronic or mechanical methods can accurately control the flow. Since only a few control characters are needed to delineate large blocks

Figure 7.
Analog and Digital Loopback Tests



of several characters (bytes), communications overhead is lower and more time can be spent transmitting useful data. Circuitry to establish the timing of the datastreams is more complicated, however, making synchronous modems more expensive than asynchronous models.

Asynchronous modems can usually transmit data at any rate up to the specified maximum rate of the modem. Synchronous modems operate at fixed transmission rates, established by internal or external clocking sources.

Modems operate in these transmission modes: simplex, half-duplex, or full-duplex. The simplex mode supports unidirectional data transmission, i.e., data is transmitted only or received only. The half-duplex mode supports data transmission in either direction, but not simultaneously. In full-duplex mode, data is transmitted in both directions simultaneously. Many modems operate in both half- and full-duplex modes.

Equalization

Equalization neutralizes the undesirable electrical characteristics of a communications line that distort transmission, increase the error rate, and degrade operating performance. This technique matches line conditions to take full advantage of the line's data rate capability. The faster the modem, the greater the need for equalization and the more complex the equalizer. Most low- and medium-speed modems contain fixed (nonadjustable) equalizers.

Fixed equalization handles the average group delay distortion for all telephone lines and may be of no use if the actual connection does not fall within this range. *Manually adjustable equalizers* are preset at the time of installation to match the line and are normally used for leased or private service. *Compromise equalization* compensates only for a fixed distortion on a specific, standard telephone line. Most AT&T 212A-compatible modems use compromise equalization.

Modems built around microprocessors offer distinct advantages: improved equalization, increased reliability, added flexibility, and faster speeds. The powerful capabilities of a microprocessor support the implementation of sophisticated algorithms that enable equalizations to be performed automatically on changing line conditions. Many newer medium-speed and nearly all high-speed modems offer *automatically adaptive equalization,* which samples the line several times a

second to determine the parts of the transmitted signal that need enhancement to be readable. Many new modems check the need for signal enhancement before they transmit, a technique known as *forward compensation.*

Error Correction

One of the chief problems of data transmission is the varying quality of the analog voice grade telephone lines. In addition to the usual limitations of the analog line, many errors can enter the bit stream from transient noise, harmonic distortion, phase jitter, and other signal disruptions. Current solutions to these problems include expensive line conditioning and/or the selection of modems that perform sophisticated line equalization functions.

Forward error correction (FEC) techniques enable a processor to put a bit stream through a series of complex algorithms before transmission occurs, resulting in a rearranged bit sequence with extra bits added to the original block of data. At the receiving end of the communications circuit, another processor decodes the bit stream. The bits inserted at the transmitting end determine if the block was received correctly. These bits correct any blocks received incorrectly. All these adjustments occur without retransmission of any part of the original data.

To accommodate the growth in the use of microcomputer dial-up links, error correction protocols have been introduced to ensure file transfer data integrity. Online information services, electronic mail facilities, and packet networks all require different protocols. Furthermore, PC-to-host links have their own protocol specifications. No single protocol meets all communications needs, but users have several options. Some facilities have circumvented the protocol compatibility issue by implementing error-correcting modems that allow a host to communicate with various ASCII-based systems without disturbing the host software or communications port.

MNP: Microcom Networking Protocol (MNP) conforms to the International Organization for Standardization (ISO) Model for Open Systems Interconnection (OSI). Microcom claims that MNP offers several advantages over xmodem, the leading software-based protocol. According to the vendor, MNP supports five of the seven OSI layers, while xmodem supports one.

Direct support of the OSI model allows MNP to adapt to different systems. The model's layered design and its protocol separate different functions, such as electrical connection and data link. Modifications do not require total redesign. MNP is a full-duplex protocol, and xmodem is half duplex. In full-duplex mode, ACKs and NAKs sent along with the data block do not interrupt the flow of data, thereby increasing throughput. In half-duplex transmission, data transfer is halted because transmission occurs in only one direction. MNP also shortens the data block size on noisy lines and sends packet acknowledgments as part of the frame.

MNP is divided into Classes 1 through 10. *MNP Classes 1 to 3* packetize data and protect data integrity via CRC, a method for detecting packet errors. When necessary, devices equipped with these classes ensure that packets are retransmitted. *MNP Class 4* attains up to 120 percent link throughput efficiency, automatically adjusts packet sizes to meet line conditions, and reduces protocol overhead. *MNP Class 5 Data Compression* dynamically adjusts to the type of data being sent. A combination of MNP Class 5 and Class 4 increases link throughput by up to 200 percent. *MNP Class 7 Enhanced Data Compression* offers higher compression efficiencies. When combined with Class 4, Class 7 improves throughput by delivering efficiencies up to 300 percent.

MNP Class 9 includes features such as Enhanced Universal Link Negotiation, Piggy Back Acknowledgments, and Multiple Selective Negative Acknowledgments. Enhanced Universal Link Negotiation supports the connection of MNP- and non-MNP-compatible modems at the highest performance levels. The Piggy Back Acknowledgments feature integrates Packet Acknowledgments into data frames, thereby lowering link overhead. The Multiple Selective Negative Acknowledgments feature dispenses with unnecessary retransmissions by rejecting data frames erroneously received.

In November 1989, Microcom announced *MNP Class 10* as part of its QX/2400t modem. MNP Class 10 optimizes data transmission over poor lines, including cellular connections. According to Richard Sterry, vice president of marketing, "MNP 10 releases the land line terminal from the office and opens the door for a variety of exciting mobile applications in the news media, delivery, and public safety arenas." MNP 10 compensates

Table 1. AT&T Modem Specifications

Data Rate (bps)	AT&T Name	PSTN Hdx	PSTN Fdx	Private 2-Wire Hdx	Private 2-Wire Fdx	Private 4-Wire Hdx	Private 4-Wire Fdx	Synchronization Async	Synchronization Sync	Line Configuration Conditioning
300 *(1)*	103 Series		•					•		P
300 *(2)(3)*	108			•	•	•	•	•		P
300	113		•					•		P
1200 *(4)(5)*	202 S, T	•		•			•	•	•	P
1200 *(6)(7)*	212, 212A		•					•	•	P
2400 *(8)*	201B			•			•		•	P
2400 *(8)*	201C	•							•	P
4800	208A			•	•		•		•	P, M
4800	208B	•							•	P
9600	209			•			•		•	P, M, D1

• = higher data rates now available from AT&T with Dataphone II modems
bps = bits per second
Hdx = half duplex
Fdx = full duplex
Async = Asynchronous
P = Point-to-point
M = Multipoint
D1 = D1 line conditioning
Sync = Synchronous

(1) 103J is originate/answer with auto answer.
(2) 108F, G have RS-232-C interface and two- or four-wire line connections.
(3) 108H, J have 20 mA current loop interface.
(4) 202S supports 1800 bps on private line with C2 conditioning. Auto answer and synchronous capability standard. Reverse channel optional.
(5) 202T is the same as 202S, but with manual operation.
(6) 212A adds scrambler-kicker to avoid occasional data lockup experienced with earlier 212 modems. Includes 300 bps operation in 103J-compatible mode.
(7) Defines EIA interface to be similar (functionally compatible) with CCITT Recommendation V.24.
(8) PSK modulation.

Courtesy of Concord Data Systems.

for signal fade and interruptions, and raises performance to levels approaching land line conditions.

The Adverse Channel Enhancements (ACE) feature of MNP 10 improves connections over low-quality lines and triggers certain performance-enhancing features when line quality deteriorates. ACE includes the Robust Auto Reliable feature, which enables the modem to make multiple attempts to overcome channel interference at linkup. This feature also supports backward compatibility with non-MNP modems. The Aggressive Adaptive Packet Assembly feature improves link performance in unfavorable channel conditions by changing adaptive packet sizes over the link to accommodate levels of interference. The Dynamic and Negotiated Speed Shifts feature enables the modem to increase speed as line conditions improve and to increase the chances of successful connection at the highest possible speed.

LAP D: The major rival to MNP is Link Access Protocol D (LAP D), a member of the High Level Data Link Control (HDLC) protocol family. As the error-control protocol in CCITT Recommendation X.25, LAP D is slated for use in ISDN. LAP D offers the advantages of being HDLC based, logical, and reliable. Many DTE manufacturers already support LAP D, and many test instruments exist for it.

Proponents of MNP point out that MNP has an installed base of over 200,000 units and a large number of vendors supply it on their products. Initial problems with MNP on dial-up lines have been solved. Like SNA, MNP is on its way to becoming a de facto standard, despite LAP D's rise to prominence among vendors and users.

Trellis Coding Algorithm: The preferred error-correcting technique for private-line modems is currently the Trellis Coding Algorithm, which derives its name from the trellis-like signal constellation created by this type of signal modulation. Trellis encoding, part of the V.32 standard, is an extension of quadrature amplitude modulation, which allows a modem to tolerate more than double the amount of noise tolerated by a conventional unit at the same block error rate. Basically, this scheme compares redundantly transmitted data

and rejects distorted bits. At an equivalent signal-to-noise ratio, a Trellis-coded modem enhances throughput by reducing the error rate almost three decibels. The Trellis modem may require a retransmission only once in every 10,000 blocks, while another type of modem may require retransmission after every 10 blocks. Trellis coding is usually incorporated only on high speed, synchronous modems on private circuits or on CCITT V.32 dial-up modems.

Compatibility

The term "handshaking" describes the exchange of control signals that establish a connection between two modems. Standards govern the signals required to set up, transmit, and terminate calls. For a handshake to occur, modems must be compatible.

Mixing modems from different suppliers in one network is a common practice because data communications networks are frequently implemented in stages, with ongoing equipment procurements over long periods of time. When organizational changes occur, suppliers that first provide network modems may not continue to do so. In addition, in organizations without central network management, several individuals may be purchasing equipment for one integrated network.

Since most equipment in a network is replaced as it begins to age or malfunction, users can easily switch suppliers. Data communications involves both geographical and corporate distance, which can lead to a division of responsibility and to different restrictions on the communications facilities.

Compatibility, therefore, becomes a critical issue.

AT&T Compatibility

Just as IBM has traditionally set the standards for peripheral media, AT&T has set the standards for communications. Although this situation is changing in the postdivestiture environment, many older AT&T modems (often referred to as Bell System modems) are still well known, widely used, and frequently duplicated by other vendors. Modems compatible with a particular AT&T modem specification are likely to be compatible with one another, even if manufactured by different vendors. Manufacturers of AT&T-compatible modems, however, tend to embellish original AT&T specifications with convenience features to distinguish their products from those of competitors.

Compatibility between modems depends greatly on the exactness with which their modulation techniques conform to the AT&T specification. A vendor who has benefited from refining an AT&T standard may alter a specification to such a degree that the unit is incompatible with the original AT&T product.

For the most part, manufacturers claiming AT&T compatibility need not be regarded with suspicion. Table 1 outlines standard AT&T modems and related specifications.

CCITT Compatibility

Many dial-up and private-line modems conform to CCITT standards, the most popular being V.22 and V.22 bis for medium speed dial-up modems, and V.32 for 4800 bps and 9600 bps dial-up units. Other CCITT recommendations in North America are V.26, V.27, V.29, V.33, and their alternatives.

CCITT V.XX modem specifications call for newer, faster modems to be backward compatible with their earlier counterparts. For example, a 2400 bps V.22 bis modem will be compatible with its 1200 bps V.22 counterpart at the V.22 bis fallback operating speed of 1200 bps. It also will be operationally compatible with most AT&T 212A modems operating at 1200 bps since the standards are closely related.

CCITT V.XX recommendations are directed mostly toward European telephone facility specifications, but U.S. vendors are increasingly incorporating them into their products. Since signaling conventions and equipment differ from continent to continent, compatibility problems can arise when modems designed primarily for European facilities are used on North American networks. For example, a V.22 bis modem made for U.S. operation can generally initiate a call to a European-based V.22 bis modem because it will tolerate the minor differences in facilities encountered while establishing the call. The same call cannot be completed, however, if the European modem is the originator.

Hayes Compatibility

Another type of compatibility, indigenous to microcomputer modems, involves the Hayes *AT* command structure. Primarily, Hayes compatibility

relates to modem commands, modem responses, and the ability to provide settings that are compatible with various communications programs. For example, modems compatible with the Hayes Smartmodem 1200 obey the 22 modem commands and 16 register settings stipulated for that device. Hayes compatibility also involves compatibility with the AT&T 103 operating standard at 0 to 300 bps and the AT&T 212 standard at 1200 bps. Hayes-compatible products have speakers for audibly following calls in progress; front-panel status lights on external units; and auto dial, auto answer, manual dial, and manual answer features for asynchronous operation.

Standards Issues

New high speed modems use modulation schemes compatible with, or similar to, CCITT Recommendation V.32, which facilitates synchronous, full-duplex transmission over two-wire switched circuits at 9600 bps, with a fallback speed of 4800 bps for deteriorating line conditions. V.32 specifies the use of Trellis-coded modulation to overcome noise problems on dial-up lines. Because V.32 has been difficult to perfect, modems designed to V.32 standards were originally expensive. Production difficulties centered around effectively implementing echo-cancellation, which allows high-speed signals traveling in opposite directions to coexist on the same two-wire switched line in the same frequency band. V.32 is presently a growth area in the modem market, effectively handling microcomputer-to-host file transfers.

The V.33 recommendation for point-to-point transmission over leased lines is very similar to V.32. Transmission is synchronous, half duplex over two-wire, and full duplex over four-wire, leased, voice grade lines. The specification calls for primary transmission rates of 14.4K bps, with fallback to 12K bps. CCITT M.1020 line conditioning, equivalent to AT&T C1 specifications, is recommended. Modems using implementations of the V.33 scheme are now achieving 14.4K and 16.8K bps transmission rates.

In April 1988, the CCITT approved the V.42 recommendation for specifying error correction for asynchronous modems. V.42 error-correction protocol enables modems to conduct asynchronous-to-synchronous conversion between the DTE and DCE. Incorporated within the V.42 modem, Link Access Procedure for Modems (LAP M) handles error correction. LAP M is an extension of LAP B, the error correction protocol specified as part of the X.25 packet switch network standard.

CCITT Study Group XVII approved V.42 bis on September 29, 1989. The V.42 bis recommendation specifies the data compression techniques required to increase the throughput of modems that feature LAP M error control protocol. Based on the Lempel-Ziv compression algorithm developed by AT&T Bell Laboratories, the V.42 bis standard also includes enhancements suggested by IBM, British Telecom, and Hayes Microcomputer Products.

Diagnostics

Diagnostic capabilities range from basic functions, such as local and/or remote loopback, to sophisticated forms of testing that analyze the quality of the received signal.

The most common form of diagnostics is the *loopback test*, in which the user completely checks the data link from one site. The local modem, remote modem, and interconnecting telephone facilities are included. The test returns or loops back the output of the transmitting device to its input. This return occurs via the local modem interface (local digital loopback), the local modem itself (local analog loopback), the opposite end of the communications line (remote analog loopback), or the remote modem (remote digital loopback). Figure 7 illustrates the various types of loopback tests on modems.

Microprocessor-based modems frequently feature advanced capabilities for diagnosing communications failures. A self-test feature determines the operational status of the modem before connecting it into the network. Random pattern generation (511 test pattern) diagnoses errors resulting from random noise, harmonic distortion, and phase jitter—problems that influence the quality of the transmitted signal.

Selection Guidelines

The highly competitive nature of the modem market forces manufacturers to add new features to their products. A few years ago, modems with comprehensive diagnostics and microprocessor-based capabilities represented new advances in technology. Today, these capabilities are fairly common. Advancements in modulation, error-correction,

data compression, higher speed transmission, and fiber optics represent the most current trends in the industry at present.

Data Compression

Introduced in the mid-1970s, data compression delivers higher data speeds at lower transmission costs. Modems with data compression use an algorithm that eliminates repetitious characters from high-speed data transmission and encodes regularly-recurring character groups. The words *the* and *it*, for example, would fit into a single character. The data is transmitted in this reduced form and reconstructed at the receiving end of the transmission line, resulting in a transmission rate 20 to 50 percent higher than the basic transmission rate.

Data compression enables data that would otherwise have to be transmitted over a high-speed line with D1 conditioning to be compressed and transmitted at a lower speed over an unconditioned line. In addition, compressed data has a built-in safeguard against eavesdropping and unauthorized system intrusion because individuals with such an inclination would need identical equipment to be successful.

Reverse and Secondary Channels

Many modems support a reverse channel that relieves the primary channel on four-wire circuits of the burden of carrying acknowledgment data. This reverse channel operates simultaneously with the primary channel, but at a much slower speed. A secondary channel, used in a variety of applications, can serve as a path for high-speed and low-speed terminals at the same time, eliminating the need for an additional line. A secondary channel can also function as a reverse channel. Reverse channels operate on both two- and four-wire circuits, while secondary channels operate only on four-wire circuits.

Integrated Multiplexing (Multiport Modems)

Units with this capability contain a limited-function, time-division multiplexer (TDM) that allows the user to transmit more than one synchronous datastream over a single transmission line. The multiport modem's TDM uses the modem's clock for synchronization, thus eliminating the need for one of its own. Less complex than a standalone unit, the integral multiplexer is also less expensive; however, it handles only synchronous data.

Multiple Speed Selection (Dial Backup)

Modems operating on leased lines must switch automatically to dial-up lines when the dedicated circuit fails or degrades. Since leased-line operation generally occurs at a higher speed, users can ensure backup by lowering the speed of the modem so that it can operate on the dial-up line until the leased line is restored.

Security Features

Modem security features include password protection in which the modem accepts or rejects user access codes; callback capabilities through which the modem returns a user call to verify access; and data encryption in which the datastream is coded.

Voice/Data Capability

Modems equipped with this feature usually have an adapter to accommodate voice communications over the same line used for data transmission. Although vendors advertise this capability as simultaneous, on most units, the voice and data transmit alternately.

Network Management

Many modems operate in conjunction with a network management system, through which large networks of modems are monitored from a central site. In this type of environment, the modem monitors its own status, as well as that of its received line signal, reporting conditions automatically to a central control panel. ■

Microcomputer Modems: Comparison Columns

In this report:

Synopsis

Editor's Note
For information on the modem market, see Report 570-101; for information on modem technology, see Report 570-201. To assist readers in researching microcomputer modems, this report contains comparison columns listing the principal characteristics of approximately 500 modems offered by more than 60 vendors.

In the Comparison Column Entry Descriptions, we have briefly defined the row headings used in the columns. We suggest that the reader consult the key to become familiar with the information before reading through the columns.

Vendors furnished information for the columns during December 1989. When a vendor did not provide information for a specific entry and we could not locate that information in our files, we listed "Vendor did not specify" on the appropriate line. Datapro wishes to thank the vendors for their cooperation.

In addition to the lines allocated for vendors to indicate specified information for their models, we have added space at the bottom of the columns for vendor notations about options or special features.

The absence of any company or product from these columns means that the company either failed to respond to our repeated information requests or declined to be part of the survey.

Product Categories

For your convenience in locating modems with a specific speed or function, we have divided the microcomputer modems listed in this report into three categories: low, medium, and high speed. Although we have grouped products according to generally accepted industry standards, you should note that modem speed classifications may vary elsewhere.

Low Speed Modems (up to 2400 bps)—operate on voice grade, dial-up, or private lines at essentially unlimited distances.

Medium Speed Modems (2401 to 9600 bps)—also operate over voice grade, dial-up, or private lines at unlimited distances. Their use is more widespread, and they are generally more expensive than low-speed devices.

High Speed Modems (9600 bps and above)—operate over voice grade, dial-up, and private lines or wideband facilities.

Vendors

Adaptive Computer Technologies
20111 Stevens Creek Boulevard, #100
Cupertino, CA 95014-2345

Amstrad, Inc.
1915 Westridge Drive
Irving, TX 75038 (214) 518-0668

Apple Computer, Inc.
20525 Mariani Avenue
Cupertino, CA 95014 (408) 996-1010

Applied Engineering
P.O. Box 5100
Carrollton, TX 75011 (214) 241-6060

ATI Technologies Inc.
3761 Victoria Park Avenue
Scarborough, ON, Canada M1W 352 (416) 756-0718

Barr Systems, Inc.
4131 NW 28 Lane
Gainesville, FL 32606 (904) 371-3050

BCH Equipment Corp.
2601 Ulmerton Road E., Suite 101
Largo, FL 34641 (813) 530-9177

BT Datacom, Inc.
3701 Concord Parkway, Suite 100
Chantilly, VA 22021 (703) 818-1770

CASE/Datatel, Inc.
Building 55, Carnegie Plaza
Cherry Hill, NJ 08003 (609) 424-4451

Cermetek Microelectronics, Inc.
1308 Borregas Avenue
Sunnyvale, CA 94089 (408) 752-5000

Chartered Electronics Inc.
21 Airport Boulevard, Suites G & H
South San Francisco, CA 94080 (415) 875-3636

Computer Peripherals, Inc.
667 Rancho Conejo Boulevard
Newbury Park, CA 91320 (805) 499-5751

Comspec Digital Products, Inc.
2313 W. Sam Houston Parkway, N., Suite 145
Houston, TX 77043 (713) 461-4487

CXR Telcom/Anderson Jacobson
521 Charcot Avenue
San Jose, CA 95131 (408) 435-8520

Data Race
12758 Cimarron Path, Suite 108
San Antonio, TX 78249 (512) 692-3909

Develcon Electronics Ltd.
515 Consumers Road
Willowdale, ON, Canada M2J 4Z2 (416) 495-8666

DFI, Inc.
2544 Port Street
West Sacramento, CA 95691 (916) 373-1234

E-Tech Research
2700 Augustine Drive, #275
Santa Clara, CA 95054 (408) 982-0270

Eicon Technology
2196 32nd Avenue
Lachine, PQ, Canada H8T 3H7 (514) 631-2592

Emerald Technology
18912 N. Creek Parkway
Bothell, WA 98011 (206) 485-8200

Everex Systems, Inc.
48431 Milmont Drive
Fremont, CA 94538 (415) 498-1111

Fastcomm Communications Corp.
12347 E. Sunrise Valley Drive
Reston, VA 22091 (703) 620-3900

Fujitsu America, Inc.
77 Rio Robles
San Jose, CA 95134 (408) 434-6777

Galacticomm
4101 SW 47th Avenue, Suite 101
Ft. Lauderdale, FL 33314 (305) 583-5990

Gandalf Data, Inc.
1020 S. Noel Avenue
Wheeling, IL 60090 (312) 541-6060

General DataComm, Inc.
5179 Straights Turnpike
Middlebury, CT 06762-1299 (203) 574-1118

Hayes Microcomputer Products, Inc.
P.O. Box 105203
Atlanta, GA 30348 (404) 449-8791

Henricks Technologies
3924 Green Industrial Way
Atlanta, GA 30341 (404) 452-8420

Holmes Microsystems
2620 S. 900 W.
Salt Lake City, UT 84119 (801) 975-9929

Inmac
2465 Augustine Road
Santa Clara, CA 95052 (408) 727-1970

International Business Machines Corp. (IBM)
Old Orchard Road
Armonk, NY 10504
Contact your local IBM representative.

Longshine Technology
2013 N. Capitol Avenue
San Jose, CA 95132 (408) 942-1746

Memotec
600 McCaffrey Street
Montreal, PQ, Canada H4T 1N1 (514) 738-4781

Microcom
Software Div.
55 Federal Road
Danbury, CT 06810 (203) 798-3800

MicroGate Corp.
9501 Capital of Texas Highway, Suite 105
Austin, TX 78759 (512) 345-7791

Mitsuba Corp.
650 Terrace Drive
San Dimas, CA 91773 (714) 592-2866

Multi-Tech Systems, Inc.
82 Second Avenue SE
New Brighton, MN 55112 (617) 785-3500

Mux Lab, Inc.
165 Graveline
St. Laurent, PQ, Canada H4T 274 (514) 735-2741

Natural Microsystems Corp.
8 Erie Drive
Natick, MA 01760 (508) 650-1300

NEC America, Inc.
Data/Video Communications Div.
110 Rio Robles
San Jose, CA 95134 (408) 433-1250

Network Software Associates, Inc.
39 Argonaut
Laguna Hills, CA 92656 (714) 768-4013

Nu Data Corp.
32 Fairview Avenue
Little Silver, NJ 07739 (201) 842-5757

Octocom Systems, Inc.
225 Ballardvale Street
Wilmington, MA 01887 (508) 658-6050

Okidata Corp.
532 Fellowship Road
Mount Laurel, NJ 08054 (609) 235-2600

Omnitel, Inc.
3500 W. Warren Avenue
Fremont, CA 94538 (415) 490-2202

Patton Electronics, Inc.
7958 Cessna Avenue
Gaithersburg, MD 20879 (301) 795-1000

Penril DataCom
Data Communications Div.
300 Quince Orchard Boulevard
Gaithersburg, MD 20878 (301) 921-8600

Practical Peripherals, Inc.
31245 LaBaya Drive
Westlake Village, CA 91362 (818) 706-0333

Racal-Milgo
1601 N. Harrison Parkway
Sunrise, FL 33323-2899 (305) 846-1601

Racal-Vadic, Inc.
1525 McCarthy Boulevard
Milpitas, CA 95035 (408) 432-8008

Rohm Corp.
8 Whatney
Irvine, CA 92713 (714) 855-2131

Scitec Communication Systems, Ltd.
26 Valley Road
Middletown, RI 02840 (401) 849-4353

Smarteam
19205 Parthencia Street, Suite J
Northridge, CA 91324 (818) 886-9726

Spectrum Cellular Corp.
2710 Stemmons Freeway, 800 N. Tower
Dallas, TX 75207 (214) 630-9825

Tek-Com Corp.
2343 Bering Drive
San Jose, CA 95131 (408) 435-9515

Telcor Systems Corp.
4 Strathmore Road
Natick, MA 01760 (508) 653-3995

Telebit Corp.
1310 Chesapeake Terrace
Sunnyvale, CA 94089 (415) 940-4834

Telenetics Corp.
5109 E. La Palma Avenue
Anaheim, CA 92807 (714) 779-2766

TIL Systems, Inc.
225 Stedman Street, Suite 27
Lowell, MA 01851 (508) 970-1189

Universal Data Systems
5000 Bradford Drive
Huntsville, AL 35805 (205) 721-8000

U.S. Robotics, Inc.
8100 N. McCormick Boulevard
Skokie, IL 60076 (708) 982-5001

Visionary Electronics, Inc.
141 Parker Street
San Francisco, CA 94118 (415) 751-8811

Western DataCom
P.O. Box 45113
Westlake, OH 44145-0113 (216) 835-1510

Xecom Inc.
374 Turquoise Street
Milpitas, CA 95035 (408) 945-6640

Zoom Telephonics, Inc.
207 South Street
Boston, MA 02111 (617) 423-1072

Low, Medium, and High Speed Microcomputer Modems

Comparison Column Entry Descriptions

Hardware Configuration
This entry indicates whether the model is housed in an enclosure and suitable for placement on a desktop (standalone), is a circuit board suitable for mounting in a standard equipment rack (rackmount) that holds many modem cards, or is a plug-in circuit board for mounting in a slot in a terminal or microcomputer (plug-in). Frequently, vendors offer models in standalone and rackmount versions.

Used with Microcomputers. Vendors responded with a yes or no answer; those that answered no were eliminated from the survey. If yes, they checked if their models worked with the Apple II family, Apple Macintosh, IBM PC family, PS/2, or Other.

Hayes AT Command Set Compatible. Hayes AT Command Set compatibility relates primarily to modem commands, modem responses, and the provision of settings compatible with various communications programs.

Compatibility. Various choices on the questionnaire were AT&T 103/113, AT&T 108, AT&T 212/212A, CCITT V.21, CCITT V.22, CCITT V.22 bis, CCITT V.29, CCITT V.33, and Other.

Communications Facility
This term refers to the communications path over which connections are made. Most data communications applications use the common telephone network *(dial-up)* or equivalent *leased lines*. Some devices included in the survey operate on both types of facilities.

Maximum Data Rate (bps). Under this entry, vendors expressed the *highest transmission rates* supported by their modems in bits per second (bps).

Fallback Speed (bps). Vendors also indicated *fallback speeds*, which refer to the capability of most medium and high speed modems to detect poor conditions on a telephone line and to lower transmission speed to prevent errors.

Synchronization. The time relationship that exists among the bits that make up messages can be *asynchronous* or *synchronous*, both of which are supported by modems. Asynchronous transmission, also called start/stop, refers to the occurrence of data transmission in an irregular fashion, or one character at a time, usually as it is being keyed. Synchronous transmission occurs in a continuous stream.

Transmission Mode. Modems operate in three transmission modes: *simplex*, *half-duplex*, or *full-duplex.* Simplex mode supports unidirectional data transmission; i.e., data can either be transmitted only or received only. Half-duplex mode supports data transmission in either direction, but not simultaneously. Full-duplex operation simultaneously transmits and receives data over a common communications facility. Some devices operate in half/full duplex mode.

Configuration. Modems generally operate in one or a combination of configurations, including *point-to-point* and *multipoint*. In a point-to-point configuration, a connection is permanently established between two specific points. A multipoint configuration consists of a circuit that connects three or more locations.

Line Conditioning. Since the telephone network is not a perfect electrical path, as the speed of data exchange increases, it becomes increasingly difficult for modems to manage the precise signaling for accurate information transfer. To minimize problems on leased circuits, users pay a premium for a specially conditioned line. The telephone company will either select a path that meets the more stringent requirements of the conditioning or service the path to meet the standards. On the questionnaire, vendors selected *D1*, *D2*, or *Other.*

Modulation. The various types of modulation techniques used by a modem to convert digital information into analog signals for transmission over the public telephone network are FSK—frequency shift key; PSK—phase shift key; DPSK—differential phase shift key; AM—amplitude modulation; and QAM—quadrature amplitude modulation.

Terminal Interface. Most modems provide standard electrical interfaces, such as those established by the Electronics Industries Association (EIA), the most common of these being *RS-232-C* and *RS-449*. Standards established by the Consultative Committee on International Telegraphy and Telephony (CCITT) include

V.24 and *V.28*. Other interfaces can include the PS/2 Micro Channel and PC Bus.

Line Interface. This entry describes the physical connection of the modem to the communications facility, usually by *two-wire*, *four-wire*, or *two/four wire* arrangements. Two-wire usually handles dial-up connections and four-wire, leased line connections.

Setup. Users set operating configurations through straps, thumbwheels, or DIP switches. Users of intelligent modems configure parameters via single keystrokes on a connected CRT terminal or from a network control terminal keyboard. Vendors indicated if setup occurred via *hardware only*, *software only*, or *hardware/software*.

Auto Answer/Dial. *Automatic answering* is required for unattended operation of a terminal on the dial-up network. Most recent modems contain integral automatic dialers. Many *auto dial* modems have large memories for storing directories and commands.

Alternate Voice/Data. Many modems switch between voice and data transmission. Some newer products support data-over-voice capabilities in which the band is split, and data and voice transmit at different frequencies over the same band.

Equalization. This feature neutralizes the undesirable characteristics of a communications line that distort transmission. It matches line conditions to achieve the full data rate capability of the line. Two common methods are *fixed compromise* and *automatic adaptive*.

Protocol/Error Correction. The two most popular error-correcting protocols are *Microcom Networking Protocols (MNP)* and *Link Access Procedure D (LAP D)*.

Data Compression. This technique increases the effective transmission rate by eliminating gaps and redundancies in the datastream.

Price/Availability
Purchase refers to the base price of the modem, excluding options. *Date of First Installation* indicates the first commercial availability of the product.

Comments
In this section, vendors listed special characteristics of the devices or mentioned other products with which they can be used.

Vendor	Amstrad, Inc.	Apple Computer, Inc.	Apple Computer, Inc.	Apple Computer, Inc.
Product	**MC2400 PC**	**Apple Data Modem 2400**	**Apple Personal Modem**	**Macintosh Portable Data Modem 2400**
Hardware Configuration	Plug in	Standalone	Standalone	Plug in
Used With Microcomputers	Yes, IBM PC family	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	2400 bps	2400	1200	2400
Fallback Speed (bps)	1200, 300	1200, 300	300	1200, 300
Sychronization	Asynchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	Full duplex	Full duplex	Full duplex	Full duplex
Configuration	Point-to-point	Multipoint	Multipoint	Multipoint
Line Conditioning	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Modulation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Terminal Interface	RS-232-C	RS-232-C, RS-422	RS-232-C	RS-232-C, RS-422
Line Interface	Vendor did not specify	Two-wire	Two-wire	Two-wire
Setup	Software only	Hardware only	Hardware only	Hardware only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	No	No
Equalization	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Protocol/Error	Vendor did not specify	MNP	Vendor did not specify	MNP
Data Compression	Vendor did not specify	No	No	No
Price/Availability				
Purchase ($)	99	499	279	449
Date Of First Installation	August 1988	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	Order #: COOO2LL1A; includes Apple Data Modem 2400; telephone cord with RJ-11 plug	Order #: A9MO334; includes Apple Personal modem; telephone cord with RJ-11 plug	Order # MO250

Vendor	Applied Engineering	Applied Engineering	Applied Engineering	Applied Engineering
Product	**Datalink 2400**	**Datalink Express**	**Datalink Express w/FAX Option**	**Datalink Express w/MNP Option**
Hardware Configuration	Plug in	Standalone	Standalone	Standalone
Used With Microcomputers	Yes, Apple II family	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any with RS-232 port	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any with RS-232 port
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, any with RS-232 port	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, any with RS-232 port
Communications Facility	Dial-up	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200, 300	1200, 300	1200, 300	1200, 300
Sychronization	Asynchronous	Async/sync	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Modulation	FSK, QAM, PSK, DPSK, QPSK, DCPSK	FSK, QAM, PSK, QPSK, DCPSK	FSK, QAM, PSK, QPSK, DCPSK	FSK, QAM, PSK, DPSK, QPSK, DCPSK
Terminal Interface	Apple II series	RS-232-C	RS-232-C	RS-232-C
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware/software	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	CRC, xmodem	CRC, xmodem, Kermit	CRC, Xmodem, Kermit, group 3	CRC, xmodem, MNP, Kermit
Data Compression	No	No	No	Yes
Price/Availability				
Purchase ($)	239	249	349	348
Date Of First Installation	August 1988	October 1989	February 1990	November 1989
Comments	—	—	Also serves as 4800 bps Fax	—

Vendor	Applied Engineering	ATI Technologies Inc.	ATI Technologies Inc.	Barr Systems, Inc.
Product	**Datalink/Mac**	**2400 etc/e External Modem**	**2400 etc/e Internal Modem**	**PC-SYNC 201C**
Hardware Configuration	Plug in	Standalone	Plug in	Plug in
Used With Microcomputers	Yes, Apple Macintosh	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any terminal with RS 2.32 port	Yes, IBM PC family	Yes, IBM PS/2, models 25 & 30
Hayes AT Command Set Compatible	Yes	Yes	Yes	No
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.42	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.42	Bell 201C
Communications Facility	Dial-up	Dial-up/leased	Dial-up/leased	Dial-up
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200, 300	1200, 300	1200, 300	Vendor did not specify
Sychronization	Asynchronous	Async/sync	Asynchronous	Synchronous
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half duplex
Configuration	Vendor did not specify	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	Vendor did not specify	None	Vendor did not specify	None
Modulation	FSK, QAM, PSK, QPSK, DCPSK	QAM	QAM	DPSK
Terminal Interface	NuBus	RS-232-C	PC Bus	PC Bus
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware/software	Hardware/software	Software only	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Vendor did not specify
Protocol/Error	CRC, xmodem, MNP, Kermit	MNP, V.42 including LAP-M	MNP, V.42 including LAP-M	CRC
Data Compression	Yes	Vendor did not specify	Yes	Yes
Price/Availability				
Purchase ($)	Vendor did not specify	299	239	1,090
Date Of First Installation	February 1990	September 1989	August 1988	1986
Comments	Also serves as 4800 bps Fax	Features front panel push button commands for auto answer, re-dial; sync/async	Product is bundled with Mirror III communications systems	1,190 with RJE + 3270

Vendor	BT Datacom, Inc.	BT Datacom, Inc.	BT Datacom, Inc.	CASE/Datatel, Inc.
Product	**Datel 4122 ACX**	**Datel 4123X**	**Datel 4242X**	**DCM 2120**
Hardware Configuration	Standalone, plug in, rack	Standalone, plug in, rack	Standalone, plug in, rack	Standalone, rackmount
Used With Microcomputers	Yes	Yes	Yes	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	No	No	No	Yes
Compatibility	V.22	V.21, V.23	V.22, V.22 bis	AT&T 103/113, AT&T 212/212A
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	1200	See comments	2400	1200
Fallback Speed (bps)	Not applicable	1200, 600, 300, 75	1200	0 to 300
Sychronization	Async/sync	Asynchronous	Async/sync	Async/sync
Transmission Mode	Vendor did not specify	Half/full duplex	Vendor did not specify	Vendor did not specify
Configuration	Point-to-point	Point-to-point, multipoint	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	DPSK	FSK	DPSK	FSK, DPSK
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	V.28, V.24	RS-232-C, V.28, V.24
Line Interface	Two-wire	Two-/four-wire	Two-wire	Two-wire
Setup	Hardware only	Hardware only	Hardware only	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Fixed compromise, automatic adaptive	Fixed compromise	Fixed compromise, automatic adaptive	Fixed compromise
Protocol/Error	Vendor did not specify	Vendor did not specify	V.42	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Contact vendor
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	1200; 9600 using buffer; asymetric mode option	X.25 PAD	—

Vendor	CASE/Datatel, Inc.	CASE/Datatel, Inc.	CASE/Datatel, Inc.	Cermetek Microelectronics, Inc.
Product	**DCM 4212**	**DCM 4624**	**DCM 4648**	**Cermetek 1200**
Hardware Configuration	Standalone, rackmount	Standalone, plug in, rack	Standalone, plug in, rack	Standalone
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	No	Yes	Yes	Yes
Compatibility	V.22, V.22 bis, V.21, AT&T 202T	AT&T 103/113, V.22, AT&T 108, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, AT&T 108, V.22 bis, AT&T 212/212A	AT&T 103/113, AT&T 212/212A
Communications Facility	Leased lines	Dial-up/leased	Dial-up/leased	Vendor did not specify
Maximum Data Rate (bps)	1800	2400	2400	2400
Fallback Speed (bps)	Vendor did not specify	1200, 300	1200, 300	300/110
Sychronization	Asynchronous	Async/sync	Async/sync	Async/sync
Transmission Mode	Vendor did not specify	Vendor did not specify	Vendor did not specify	Half/full duplex
Configuration	Point-to-point, multipoint	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK	FSK, QAM, DPSK	FSK, QAM, DPSK	PSK
Terminal Interface	RS-232-C	RS-232-C, V.28, V.24, PC Bus	RS-232-C, V.28, V.24, PC Bus	RS-232-C
Line Interface	Two-/four-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware only	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	No	Yes	Yes	Yes
Alternate Voice/Data	Vendor did not specify	Yes	Yes	No
Equalization	Fixed compromise	Automatic adaptive	Automatic adaptive	Vendor did not specify
Protocol/Error	Vendor did not specify	MNP	MNP	Vendor did not specify
Data Compression	Vendor did not specify	No	Yes	No
Price/Availability				
Purchase ($)	Contact vendor	Contact vendor	Contact vendor	295
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	1984
Comments	—	—	—	—

Vendor	Cermetek Microelectronics, Inc.	Cermetek Microelectronics, Inc.	Cermetek Microelectronics, Inc.	Chartered Electronics Inc.
Product	**Cermetek 1200 SM**	**Cermetek 2400 R**	**CMI 2400 SPCU**	**CEI Link 1200I/2400I**
Hardware Configuration	Standalone	Standalone	Plug in	Plug in
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, IBM PC family	Yes, IBM PC family
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	V.22, V.22 bis, AT&T 212/212A, V.21
Communications Facility	Vendor did not specify	Dial-up	Vendor did not specify	Dial-up
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	300/110	1200/300/110	1200/300/110	Vendor did not specify
Sychronization	Async/sync	Async/sync	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	Vendor did not specify
Modulation	PSK	PSK	PSK	Vendor did not specify
Terminal Interface	RS-232-C	RS-232-C	PC Bus	RS-232-C, dual RJ11 jacks
Line Interface	Two-wire	Two-wire	Two-wire	Four-wire
Setup	Hardware/software	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	No	Yes
Equalization	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	695	395	285	85; 125
Date Of First Installation	1985	1985	1986	Vendor did not specify
Comments	—	—	—	Half-size, internal modem

Vendor	Chartered Electronics Inc.	Computer Peripherals, Inc.	Computer Peripherals, Inc.	CXR Telcom/Anderson Jacobson
Product	**CEI Link 1200S/2400S Miniature**	**Hook-Up 2400S**	**VIVA 24**	**AJ 1212-AD3H**
Hardware Configuration	Standalone	Plug in	Standalone	Standalone
Used With Microcomputers	Yes, IBM PC family	Yes, IBM PC family	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any RS-232 interface	Yes, Apple II family, Apple Macintosh, IBM PC family
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	AT&T 103/113, V.22, AT&T 212/212A
Communications Facility	Dial-up	Dial-up	Dial-up/leased	Dial-up
Maximum Data Rate (bps)	2400	2400	2400	1200
Fallback Speed (bps)	Vendor did not specify	1200, 300	1200, 300	0 to 300
Sychronization	Async/sync	Asynchronous	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Full duplex	Full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	D1	D1	None
Modulation	Vendor did not specify	FSK, PSK	FSK, PSK	FSK, QAM, DPSK
Terminal Interface	RS-232-C, dual RJ11 jacks	PC Bus	RS-232-C	RS-232-C, V.24
Line Interface	Four-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware/software	Software only	Software only	Vendor did not specify
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	No
Equalization	Vendor did not specify	Fixed compromise, automatic adaptive, fixed Trans/Adapt	Fixed compromise, automatic adaptive, fixed Trans/Adapt	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	195	245	299	495
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	1985
Comments	—	—	—	Setup features; switches and softstraps

Vendor	CXR Telcom/Anderson Jacobson	CXR Telcom/Anderson Jacobson	CXR Telcom/Anderson Jacobson	CXR Telcom/Anderson Jacobson
Product	**AJ 1212-STH**	**AJ 2412-2H1**	**AJ 2412-3H1**	**AJ 2412-AD3H**
Hardware Configuration	Standalone	Plug in	Plug in	Standalone
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family	Yes, IBM PC family	Yes, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, AT&T 212/212A, V.21	AT&T 103/113, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up	Dial-up	Dial-up	Dial-up
Maximum Data Rate (bps)	1200	2400	2400	2400
Fallback Speed (bps)	0 to 300	1200, 300	1200, 300	1200, 0 to 300
Sychronization	Async/sync	Asynchronous	Asynchronous	Async/sync
Transmission Mode	Half/full duplex	Full duplex	Full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, QAM, DPSK
Terminal Interface	RS-232-C, V.28, V.24	V.24, PC Bus	PS/2 Micro Channel	RS-232-C, V.24
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Vendor did not specify	Hardware/software	Hardware/software	Vendor did not specify
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	Yes	Yes	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	Vendor did not specify	Vendor did not specify	No
Price/Availability				
Purchase ($)	295	399	449	695
Date Of First Installation	1986	1988	1988	1985
Comments	Setup features; switches and softstraps	—	—	Setup features; switches + softstraps

Vendor	CXR Telcom/Anderson Jacobson	CXR Telcom/Anderson Jacobson	CXR Telcom/Anderson Jacobson	CXR Telcom/Anderson Jacobson
Product	**AJ 2412-STH**	**AJ 2441-1**	**AJ 2441-2**	**AJ 2441-3**
Hardware Configuration	Standalone	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family	Yes, Apple II family, Apple Macintosh, IBM PC family	Yes, Apple II family, Apple Macintosh, IBM PC family	Yes, Apple II family, Apple Macintosh, IBM PC family
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21
Communications Facility	Dial-up	Dial-up/leased, with unatt. automatic dial back-up	Dial-up	Leased lines
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200, 0 to 300	1200, 0 to 300	1200, 0 to 300	1200, 0 to 300
Sychronization	Async/sync	Async/sync	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, QAM, DPSK
Terminal Interface	RS-232-C, V.24	RS-232-C, V.24	RS-232-C, V.24	RS-232-C, V.24
Line Interface	Two-wire	Two-/four-wire	Two-wire	Two-/four-wire
Setup	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Auto Answer/Dial	Yes	Yes	Yes	No
Alternate Voice/Data	No	No	No	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	MNP	MNP	MNP
Data Compression	Yes	Yes	Yes	Yes
Price/Availability				
Purchase ($)	495	695	495	495
Date Of First Installation	1986	1986	1988	1988
Comments	Setup features; switches and softstraps, data compression; MNP 5	Setup features; switches and softstraps, data compression; MNP 5	Setup features; switches and softstraps, data compression; MNP 5	Setup features; switches and softstraps, data compression; MNP 5

Vendor	Data Race	Data Race	DFI, Inc.	DFI, Inc.
Product	**Action 24**	**PC Race 24**	**FaxModem-100**	**MD-2400**
Hardware Configuration	Standalone, rackmount	Plug in	Plug in	Plug in
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes	Yes, IBM PC family	Yes, IBM PC family
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.23	AT&T 103/113, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21
Communications Facility	Dial-up/leased	Dial-up	Dial-up	Dial-up
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200	1200, 300	1200	1200
Sychronization	Async/sync	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	Full duplex	V.22bis	Half duplex	Vendor did not specify
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, PSK	FSK, PSK	Vendor did not specify	Vendor did not specify
Terminal Interface	RS-232-C	PC Bus	PC Bus	PC Bus
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware/software	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Fixed compromise	Fixed compromise
Protocol/Error	MNP	Vendor did not specify	CRC, xmodem, Kermit	CRC, xmodem, Kermit
Data Compression	Vendor did not specify	Yes	Vendor did not specify	Vendor did not specify
Price/Availability				
Purchase ($)	595 (30 days ARO)	595	Vendor did not specify	Vendor did not specify
Date Of First Installation	July 1988	October 1987	October 1989	Vendor did not specify
Comments	Unit has Hayes autosync for use with SNA and 3780 bisync remote packages	—	Includes 4800 bps fax and Bitpaint and Bitcom software	Includes Bitcom software

Vendor	Eicon Technology	Emerald Technology	Emerald Technology	Everex Systems, Inc.
Product	**Dial Network Adapter**	**201 B/C**	**V22**	**Evercom 12**
Hardware Configuration	Plug in	Standalone	Standalone	Plug in
Used With Microcomputers	Yes, IBM PC family, IBM PS/2, model 30	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any	Yes, IBM PC family, IBM PC/XT/AT compatibles
Hayes AT Command Set Compatible	Yes	No	Yes	Yes
Compatibility	V.22 bis	201 B/C	V.22 bis, Bell 103,212A	AT&T 103/113, V.22, AT&T 212/212A, V.21
Communications Facility	Dial-up, dial-up/leased, leased lines, switched	Dial-up/leased, 2-wire half-duplex, 4-wire full-duplex	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	2400	2400	2400	1200
Fallback Speed (bps)	1200	None	1200, 300, 120	Vendor did not specify
Sychronization	Synchronous	Synchronous	Async/sync	Asynchronous
Transmission Mode	Vendor did not specify	Half/full duplex	Full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point, multipoint	Point-to-point	Point-to-point
Line Conditioning	None	None	None	PSTN
Modulation	QAM	DPSK	See comments	FSK, PSK, DPSK
Terminal Interface	RS-232-C, V.24, X.21	RS-232-C	RS-232-C, V.28, V.24	PC Bus
Line Interface	Two-wire	Two-/four-wire	Two-wire	Two-wire
Setup	Hardware/software	Hardware only	Hardware only	Hardware/software
Auto Answer/Dial	Yes	Vendor did not specify	Yes	Yes
Alternate Voice/Data	No	Yes	Yes	Yes
Equalization	Fixed compromise	Fixed compromise	Automatic adaptive	Automatic adaptive
Protocol/Error	X.25	Vendor did not specify	Vendor did not specify	CRC, X/Ymodem, Kermit
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	1,295	685	575	99
Date Of First Installation	1984	1986	1988	February 1988
Comments	—	Has auto answer but not auto dial	Modulation; QAM(2400 bps), DPSK(1200 bps), FSK(300 bps)	—

Vendor	Everex Systems, Inc.	Everex Systems, Inc.	Everex Systems, Inc.	Everex Systems, Inc.
Product	**Evercom 24**	**Evercom 24**	**Evercom 24E**	**Evercom II 24**
Hardware Configuration	Plug in	Plug in	Standalone	Plug in
Used With Microcomputers	Yes, IBM PC family, IBM PC/XT/AT compatibles	Yes, IBM PC family, IBM PS/2, IBM PC/XT/AT compatibles	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any with Rs-232 interface	Yes, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Vendor did not specify	Vendor did not specify	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, CCITT V.42 alt. procedure	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, CCITT V.42 alt. procedure	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, CCITT V.42 alt. procedure
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	2400	4800	4800	2400
Fallback Speed (bps)	1200, 300	2400, 1200, 300	2400, 1200, 300	1200, 300
Sychronization	Asynchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	PSTN	PSTN	PSTN	PSTN
Modulation	FSK, QAM, PSK, DPSK	FSK, QAM, PSK, DPSK	FSK, QAM, PSK, DPSK	FSK, QAM, PSK, DPSK
Terminal Interface	PC Bus	PC Bus	RS-232-C	PS/2 Micro Channel
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware/software	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	CRC, X/Ymodem, Kermit	CRC, X/Ymodem, MNP, Kermit	CRC, X/Ymodem, MNP, Kermit	CRC, X/Ymodem, Kermit
Data Compression	No	Yes	Yes	No
Price/Availability				
Purchase ($)	199	249	299	299
Date Of First Installation	August 1986	March 1988	October 1989	December 1987
Comments	—	—	—	—

Vendor	Everex Systems, Inc.	Everex Systems, Inc.	Everex Systems, Inc.	Galacticomm
Product	**Evercom II 24**	**EverFax 24/96**	**EverFax EF-12/48**	**2408**
Hardware Configuration	Plug in	Plug in	Standalone	Plug in
Used With Microcomputers	Yes, IBM PS/2	Yes, IBM PC family, IBM PC/XT/AT compatibles	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any with Rs-232 interface	Yes, IBM PC family
Hayes AT Command Set Compatible	Vendor did not specify	Yes	Yes	No
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, CCITT V.42 alt. procedure	AT&T 103/113, V.22, AT&T 212/212A, V.21	AT&T 103/113, V.22 bis, AT&T 212/212A, V.21
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up
Maximum Data Rate (bps)	2400	4800	1200	2400
Fallback Speed (bps)	1200, 300	2400, 1000, 300	300	Vendor did not specify
Sychronization	Asynchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	PSTN	PSTN	PSTN	Vendor did not specify
Modulation	FSK, QAM, PSK, DPSK	FSK, QAM, PSK, DPSK	FSK, PSK, DPSK	FSK, PSK
Terminal Interface	PS/2 Micro Channel	PC Bus	RS-232-C	PC Bus
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware/software	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	CRC, X/Ymodem, MNP, Kermit	CRC, X/Ymodem, MNP, Kermit	CRC, X/Ymodem, Kermit	Vendor did not specify
Data Compression	Vendor did not specify	Yes	Vendor did not specify	Vendor did not specify
Price/Availability				
Purchase ($)	349	399	299	1,816 (2 modems) 3,772 (8 modems)
Date Of First Installation	September 1989	November 1989	Feburary 1988	Vendor did not specify
Comments	—	This unit includes 9600 bps fax-sending and receiving capabilities	This unit includes 4800 bps fax-sending and receiving capabilities	Circuit card for the XT/AT/EISA bus

Vendor	Galacticomm	Galacticomm	Gandalf Data, Inc.	Gandalf Data, Inc.
Product	**Model 16**	**Model 4**	**Access Series 24A**	**Access Series 24EC**
Hardware Configuration	Plug in	Plug in	Standalone	Standalone
Used With Microcomputers	Yes, IBM PC family	Yes, IBM PC family, IBM PS/2	Yes	Yes
Hayes AT Command Set Compatible	No	No	Yes	Yes
Compatibility	AT&T 103/113, AT&T 212/212A	AT&T 103/113, AT&T 212/212A	AT&T 212/212A, AT&T 103, V.22 bis	AT&T 212/212A, AT&T 103, V.22, V.22 bis
Communications Facility	Dial-up	Dial-up	Dial-up/leased, 2 wire	Dial-up/leased
Maximum Data Rate (bps)	1200	1200	2400	2400
Fallback Speed (bps)	300	Vendor did not specify	300, 1200	300, 1200
Sychronization	Asynchronous	Asynchronous	Asynchronous	Async/sync
Transmission Mode	Full duplex	Full duplex	Full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	Vendor did not specify	Vendor did not specify	Not required	Not required
Modulation	FSK, PSK	FSK, PSK	FSK, QAM, PSK	FSK, QAM, DPSK
Terminal Interface	PC Bus	PC Bus	RS-232-C, V.28/V.24	RS-232-C, V.28/V.24
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware/software	Hardware/software	Vendor did not specify	Vendor did not specify
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	MNP
Data Compression	No	No	No	Yes
Price/Availability				
Purchase ($)	2,942 (18 modems) 4,474 (16 modems)	922 (2 modems) 1,292 (4 modems)	350	495
Date Of First Installation	Vendor did not specify	Vendor did not specify	1987	1989
Comments	Circuit card with up to 16 modems	Circuit card with up to 4 modems	Setup; interface commands	Setup; interface commands

Vendor	Gandalf Data, Inc.	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.
Product	**Access Series 24V**	**DataComm 108-3M**	**DataComm 201-7**	**DataComm 201C/L**
Hardware Configuration	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount
Used With Microcomputers	Yes	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	No	No	No
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 108, 103	201C/V.26	201
Communications Facility	Dial-up/leased	Vendor did not specify	Leased lines	Dial-up/leased
Maximum Data Rate (bps)	2400	Up to 300	2400	2400
Fallback Speed (bps)	1200, 300	Not applicable	1200	1200
Sychronization	Async/sync	Asynchronous	Synchronous	Synchronous
Transmission Mode	Full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point, multipoint/drop	Point-to-point, multipoint/drop	Point-to-point, multipoint/drop
Line Conditioning	Not required	Vendor did not specify	Vendor did not specify	Vendor did not specify
Modulation	FSK, QAM, DPSK	FSK	DPSK	DPSK
Terminal Interface	RS-232-C, V.28/V.24	RS-232-C	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
Line Interface	Two-wire	Two-/four-wire	Two-/four-wire	Two-/four-wire
Setup	Vendor did not specify	Hardware only	Hardware only	Hardware only
Auto Answer/Dial	Yes	No	No	Yes
Alternate Voice/Data	Yes	No	No	Yes
Equalization	Automatic adaptive	Fixed compromise	Fixed compromise	Fixed compromise
Protocol/Error	MNP	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	Vendor did not specify	No	No	No
Price/Availability				
Purchase ($)	495 - 500	375	695	785
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	Setup - screen menu, Straps	16 modems per rack	16 modems fit in a single rack	801 ACU support; 16 modems per rack

Vendor	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.
Product	**DataComm 202ST**	**DataComm 202T**	**DataComm 212A/L**	**DataComm 224**
Hardware Configuration	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	No	No	No	Yes
Compatibility	202	202	AT&T 103/113, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.25bis async/sync
Communications Facility	Leased lines	Leased lines	Dial-up/private lines	Dial-up/leased
Maximum Data Rate (bps)	Up to 1800	Up to 1800	1200	2400
Fallback Speed (bps)	Not applicable	Not applicable	300	1200, 0-300
Sychronization	Asynchronous	Asynchronous	Asynchronous	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Vendor did not specify	Vendor did not specify
Configuration	Point-to-point, multipoint/drop	Point-to-point, multipoint/drop	Point-to-point	Point-to-point
Line Conditioning	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Modulation	FSK	FSK	FSK	FSK, QAM, PSK
Terminal Interface	RS-232-C	RS-232-C	RS-232-C	RS-232-C, V.28, V.24
Line Interface	Two-/four-wire	Two-/four-wire	Two-wire	Two-wire
Setup	Hardware only	Hardware only	Hardware only	Hardware/software
Auto Answer/Dial	Yes	No	Yes	Yes
Alternate Voice/Data	Yes	No	Yes	Yes
Equalization	Fixed compromise	Fixed compromise	Fixed compromise	Fixed compromise
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	MNP, X.25, V.42, V.42bis
Data Compression	No	No	No	Yes
Price/Availability				
Purchase ($)	535	480	675	580
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	16 modems per rack	16 modems per rack	16 modems per rack	16 datasets per shelf

Vendor	**General DataComm, Inc.**	**General DataComm, Inc.**	**General DataComm, Inc.**	**General DataComm, Inc.**
Product	**DataComm 2400ASM**	**DeskTop 201**	**Desktop 202**	**DeskTop 224**
Hardware Configuration	Standalone, rackmount	Standalone	Standalone	Standalone
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	No	No	No	Yes
Compatibility	201/V.26	201/V.26	202	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
Communications Facility	Leased lines	Dial-up/leased	Leased lines	Dial-up
Maximum Data Rate (bps)	2400	2400	Up to 1800	2400
Fallback Speed (bps)	1800, 1200, 600, 300	1200, 300	Not applicable	1200, 300
Sychronization	Async/sync	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	Full duplex	Vendor did not specify	Half/full duplex	Full duplex
Configuration	Point-to-point, multipoint/drop	Vendor did not specify	Point-to-point, multipoint/drop	Point-to-point, multipoint
Line Conditioning	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Modulation	DPSK	FSK, QAM, DPSK	FSK	Vendor did not specify
Terminal Interface	RS-232-C	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
Line Interface	Four-wire	Two-wire	Two-/four-wire	Two-wire
Setup	Hardware only	Hardware only	Hardware only	Software only
Auto Answer/Dial	No	Yes	No	Yes
Alternate Voice/Data	No	Yes	No	Yes
Equalization	Fixed compromise	Fixed compromise	Fixed compromise	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	825	645	400	375
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	16 modems per rack	Desktop enclosure; 511 bit pattern test generator	—	Extensive diagnostics; self test, digital/analog/remote digital loopback

Vendor	**General DataComm, Inc.**	**General DataComm, Inc.**	**Hayes Microcomputer Products, Inc.**	**Hayes Microcomputer Products, Inc.**
Product	**Desktop 224E**	**Diagnostic Modem NMS 2418**	**Personal Modem 1200**	**Personal Modem 2400**
Hardware Configuration	Standalone	Standalone, rackmount	Standalone	Standalone
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, NMC 30B laptop computer (MS/Dos based)	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	Vendor did not specify	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.25bis async/sync	Bell 201/202; V.23/V.26	AT&T 103/113, AT&T 212/212A	AT&T 103/113, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up	Leased lines	Dial-up	Dial-up
Maximum Data Rate (bps)	2400	2400	1200	2400
Fallback Speed (bps)	1200, 300	1200 to 0	300	1200, 300
Sychronization	Async/sync	Async/sync	Asynchronous	Asynchronous
Transmission Mode	Vendor did not specify	Full duplex	Full duplex	Full duplex
Configuration	Point-to-point	Point-to-point, multipoint	Point-to-point	Point-to-point
Line Conditioning	None	Vendor did not specify	None	None
Modulation	DPSK	FSK, DPSK, CCITT V.26,V.26bis	FSK, DPSK	FSK, QAM, DPSK
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.24	RS-232-C, V.24
Line Interface	Two-wire	Four-wire	Two-wire	Two-wire
Setup	Hardware/software	Software only	Software only	Software only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	No	Yes	Yes
Equalization	Fixed compromise	Automatic adaptive, adjustable compromise ACE	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP, X.25, V.42, V.42bis	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	Yes	Vendor did not specify	No	No
Price/Availability				
Purchase ($)	495	Vendor did not specify	199	199
Date Of First Installation	Vendor did not specify	April 1988	Vendor did not specify	Vendor did not specify
Comments	Stylish desktop enclosure; 10 min. test abort timer	Controlled/configured via GDC Netcon NMS; line & business int. measurements	Contains RS-232; telco cables	Contains RS-232; telco cables

Vendor	Hayes Microcomputer Products, Inc.	Hayes Microcomputer Products, Inc.	Hayes Microcomputer Products, Inc.	Hayes Microcomputer Products, Inc.
Product	**Smartmodem 1200B**	**Smartmodem 2400**	**Smartmodem 2400B**	**Smartmodem 2400M**
Hardware Configuration	Plug in	Standalone	Plug in	Plug in
Used With Microcomputers	Yes, IBM PC family	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, IBM PC family	Yes, Apple Macintosh
Hayes AT Command Set Compatible	Yes	Yes	Yes	Vendor did not specify
Compatibility	AT&T 103/113, V.22, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up	Dial-up	Dial-up	Dial-up
Maximum Data Rate (bps)	1200	2400	2400	2400
Fallback Speed (bps)	300	1200, 300	1200, 300	1200, 300
Sychronization	Asynchronous	Async/sync, Hayes AutoSync	Async/sync, Hayes AutoSync	Async/sync
Transmission Mode	Full duplex	Full duplex	Full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, QAM, DPSK
Terminal Interface	PC Bus	RS-232-C, V.24	PC Bus	NuBus
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Software only	Software only	Software only	Software only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Fixed compromise, automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	199	499	349	499
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	Bundled with Smartcom II V3.1 for IBM PCs & compatibles	AutoSync enables modems to call from an async terminal, then switch to sync	AutoSync switches from async to sync without a sync adapter	Includes Hayesconnect + Hayesconnect Server software

Vendor	Hayes Microcomputer Products, Inc.	Hayes Microcomputer Products, Inc.	Hayes Microcomputer Products, Inc.	Hayes Microcomputer Products, Inc.
Product	**Smartmodem 2400P**	**Smartmodem 2400Q**	**V-Series Smartmodem 2400 X.25/V.42**	**V-Series Smartmodem 2400B X.25/V.42**
Hardware Configuration	Plug in	Plug in	Standalone	Plug in
Used With Microcomputers	Yes, IBM PS/2	Yes, Compaq Portable III	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, IBM PC family
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up	Dial-up	Dial-up	Dial-up
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200, 300	1200, 300	1200, 300	1200, 300
Sychronization	Async/sync, Hayes AutoSync	Async/sync, Hayes AutoSync	Async/sync, Hayes AutoSync	Async/sync, Hayes AutoSync
Transmission Mode	Full duplex	Half/full duplex	Full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point, multipt./session	Point-to-point, multipt./session
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, QAM, DPSK
Terminal Interface	PS/2 Micro Channel	PC Bus	RS-232-C, V.24	PC Bus
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Software only	Software only	Software only	Software only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	MNP, V.42, LAPB	MNP, V.42, LAPB
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	499	499	649	599
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	AutoSync switches from async to sync without a sync adapter	AutoSync switches from async to sync without a sync adapter	AutoSync switches from async to sync without a sync adapter	AutoSync switches from async to sync without a sync adapter

Vendor	Hayes Microcomputer Products, Inc.	Henricks Technologies	Holmes Microsystems	Holmes Microsystems
Product	**V-Series Smartmodem 2400M**	**HTI-2400**	**FAX'EM 96**	**FAX'EM T-96**
Hardware Configuration	Plug in	Standalone	Plug in	Plug in
Used With Microcomputers	Yes, Apple Macintosh	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family, also serves IBM compatables	Yes, IBM PC family, also serves IBM compatibles
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21
Communications Facility	Dial-up	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200, 300	1200, 300	1200, 300	1200, 300
Sychronization	Async/sync	Async/sync	Asynchronous	Asynchronous
Transmission Mode	Full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point, multipt./session	Point-to-point	Vendor did not specify	Vendor did not specify
Line Conditioning	None	None	Vendor did not specify	Vendor did not specify
Modulation	FSK, QAM, DPSK	Vendor did not specify	FSK, PSK, DPSK	FSK, PSK, DPSK
Terminal Interface	NuBus	RS-232-C	PC Bus	PC Bus
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Software only	Hardware only	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Vendor did not specify	Vendor did not specify	Vendor did not specify
Protocol/Error	MNP, V.42, LAPB	Vendor did not specify	CRC, xmodem, MNP, Kermit	CRC, xmodem, MNP, Kermit
Data Compression	No	No	Yes	Vendor did not specify
Price/Availability				
Purchase ($)	699	159	499	699
Date Of First Installation	Vendor did not specify	September 1985	December 1990	December 1990
Comments	Supports CCITT X.32 (Dial X.25) & V.42bis data compression functionality	—	Also serves as a 9600bps Fax machine	Also serves as a 9600bps Fax machine

Vendor	Holmes Microsystems	Inmac	Inmac	Inmac
Product	**T-2400**	**PN801910**	**PN801920**	**PN801930**
Hardware Configuration	Plug in	Standalone	Plug in	Internal PS/2 card
Used With Microcomputers	Yes, IBM PC family, also serves IBM compatables	Yes, Apple II family, Apple Macintosh, IBM PC XT/AT & compatibles	Yes, IBM PS/2, Model 30, PC XT/AT	Yes, IBM PS/2, Procomm software
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	AT&T 103/113, V.22, AT&T 212/212A	AT&T 103/113, V.22, AT&T 212/212A	AT&T 103/113, V.22, AT&T 212/212A
Communications Facility	Dial-up/leased	Dial-up	Dial-up, Procomm software	Dial-up
Maximum Data Rate (bps)	2400	1200	1200	1200
Fallback Speed (bps)	1200, 300	0-300	0-300	0-300
Sychronization	Asynchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Vendor did not specify	Multipoint	Multipoint	Multipoint
Line Conditioning	Vendor did not specify	None	None	None
Modulation	FSK, PSK, DPSK	DPSK	DPSK	DPSK
Terminal Interface	PC Bus	RS-232-C	RS-232-C	PS/2 Micro Channel
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware/software	Hardware only	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Vendor did not specify	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	CRC, xmodem, MNP, Kermit	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	Yes	No	No	No
Price/Availability				
Purchase ($)	279	105	105	199
Date Of First Installation	1987	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	—	—

Vendor	Inmac	Inmac	Inmac	Inmac
Product	**PN802010**	**PN802020**	**PN802030**	**PN802040**
Hardware Configuration	Standalone	Plug In	Plug In	Plug In
Used With Microcomputers	Yes, Most PCs and IBM 3270	Yes, IBM PC and compatibles	Yes, IBM PS/2, Models 50, 60, 70, 80	Yes, IBM PC & compatibles
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up	Dial-up, Procomm software	Dial-up	Dial-up, Procomm software
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	0-300	0-300	0-300	0-300
Sychronization	Async/sync	Asynchronous	Asynchronous	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Multipoint	Multipoint	Multipoint	Multipoint
Line Conditioning	None	None	None	None
Modulation	QAM	QAM	QAM	QAM
Terminal Interface	RS-232-C	RS-232-C	PS/2 Micro Channel	RS-232-C
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware only	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	MNP
Data Compression	No	No	No	Yes
Price/Availability				
Purchase ($)	209	199	315	355
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	—	—

Vendor	Inmac	International Business Machines Corp. (IBM)	Longshine Technology	Longshine Technology
Product	**PN802050**	**5853 Model 001**	**LCS-8824**	**LCS-8824B**
Hardware Configuration	Standalone	Standalone	Standalone	Rackmount
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC & compatibles	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family	Yes, IBM PC family
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22 bis, AT&T 212/212A, V.25bis, V.24/V.28	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up	Dial-up	Vendor did not specify	Dial-up
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	0-300	Vendor did not specify	Vendor did not specify	Vendor did not specify
Sychronization	Async/sync	Async/sync	Async/sync	Asynchronous
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Multipoint	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	Vendor did not specify	Vendor did not specify
Modulation	QAM	Vendor did not specify	Vendor did not specify	Vendor did not specify
Terminal Interface	RS-232-C	RS-232-C, RS-334	RS-232-C	PC Bus
Line Interface	Two-wire	Two-wire	Vendor did not specify	Vendor did not specify
Setup	Hardware only	Hardware only	Vendor did not specify	Vendor did not specify
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Vendor did not specify	Vendor did not specify
Equalization	Automatic adaptive	Automatic adaptive	Vendor did not specify	Vendor did not specify
Protocol/Error	MNP	MNP	Vendor did not specify	Vendor did not specify
Data Compression	Yes	No	Vendor did not specify	Vendor did not specify
Price/Availability				
Purchase ($)	355	760	99	79
Date Of First Installation	Vendor did not specify	February 1988	1986	1986
Comments	—	—	—	—

Vendor	Longshine Technology	Longshine Technology	Longshine Technology	Memotec
Product	**LCS-8824B/II**	**LCS-8824MNP**	**LCS-8824P**	**224 Series II**
Hardware Configuration	Rackmount	Standalone	Standalone	Standalone, rackmount
Used With Microcomputers	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family	Yes, IBM PC family	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32
Communications Facility	Vendor did not specify	Vendor did not specify	Vendor did not specify	Dial-up/leased
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	Vendor did not specify	Vendor did not specify	Vendor did not specify	1200, 300
Sychronization	Asynchronous	Async/sync	Asynchronous	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	Vendor did not specify	Vendor did not specify	Vendor did not specify	None
Modulation	Vendor did not specify	Vendor did not specify	Vendor did not specify	QAM
Terminal Interface	PS/2 Micro Channel	RS-232-C	RS-232-C	RS-232-C, V.28, V.24
Line Interface	Vendor did not specify	Vendor did not specify	Vendor did not specify	Two-/four-wire
Setup	Vendor did not specify	Vendor did not specify	Vendor did not specify	Software only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Vendor did not specify	Vendor did not specify	Vendor did not specify	Yes
Equalization	Vendor did not specify	Vendor did not specify	Vendor did not specify	Automatic adaptive
Protocol/Error	Vendor did not specify	MNP	Vendor did not specify	MNP
Data Compression	Vendor did not specify	Vendor did not specify	Vendor did not specify	Yes
Price/Availability				
Purchase ($)	109	129	109	695 (standalone) 645 (rackmount)
Date Of First Installation	September 1989	May 1989	May 1989	1985
Comments	Internal 2400 modem for PS/2	MNP 5 Protocol; external 2400 modem	Pocket modem for laptops and portables	Off-the-shelf

Vendor	MicroGate Corp.	MicroGate Corp.	MicroGate Corp.	Mitsuba Corp.
Product	**SyncLink 2400**	**SyncLink 2400/2**	**SyncLink 2422**	**SM-12H**
Hardware Configuration	Plug in	Plug in	Plug in	Plug in
Used With Microcomputers	Yes, IBM PC family	Yes, IBM PS/2, with Micro Channel Architecture	Yes, IBM PC family	Yes, IBM PC family
Hayes AT Command Set Compatible	No	Vendor did not specify	Yes	Yes
Compatibility	Bell AT&T 201	Bell AT&T 201	V.22, V.22 bis, Bell AT&T 201,212A,103	AT&T 103/113, AT&T 212/212A
Communications Facility	Dial-up, dial-up/leased, leased lines	Dial-up, dial-up/leased, leased lines	Dial-up, dial-up/leased, leased lines	Dial-up
Maximum Data Rate (bps)	2400	2400	2400	1200
Fallback Speed (bps)	Vendor did not specify	Vendor did not specify	1200, 300	300
Sychronization	Synchronous	Synchronous	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point, multipoint	Vendor did not specify	Vendor did not specify	Vendor did not specify
Line Conditioning	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Modulation	DPSK	Vendor did not specify	PSK, DPSK	FSK, PSK
Terminal Interface	PC Bus	PS/2 Micro Channel	PC Bus	PC Bus
Line Interface	Two-/four-wire	Two-/four-wire	Two-/four-wire	Two-/four-wire
Setup	Hardware/software	Hardware/software	Hardware/software	Hardware only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Vendor did not specify	Vendor did not specify	Vendor did not specify	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	CRC	CRC	CRC	Vendor did not specify
Data Compression	Vendor did not specify	Vendor did not specify	Vendor did not specify	No
Price/Availability				
Purchase ($)	795	845	925	Contact vendor
Date Of First Installation	New product	New product	New product	Vendor did not specify
Comments	Runs Microgate sync software including 3870 and 3270 emulation	Runs Microgate sync. software including 3870 and 3270 emulation	Runs Microgate sync. software and 3rd party async. software.	—

Vendor	Mitsuba Corp.	Mitsuba Corp.	Mitsuba Corp.	Multi-Tech Systems, Inc.
Product	**SM-24**	**SM-24H**	**SM-24M**	**MT212AR2**
Hardware Configuration	Standalone	Plug In	Standalone	Rackmount
Used With Microcomputers	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family	Yes, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, AT&T 212/212A
Communications Facility	Dial-up	Dial-up	Dial-up	Dial-up/leased
Maximum Data Rate (bps)	2400	2400	2400	1200
Fallback Speed (bps)	1200, 300	1200, 300	1200, 300	Not applicable
Sychronization	Async/sync	Async/sync	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Vendor did not specify	Vendor did not specify	Vendor did not specify	Point-to-point
Line Conditioning	Vendor did not specify	Vendor did not specify	Vendor did not specify	None
Modulation	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, PSK
Terminal Interface	RS-232-C	RS-232-C, PC Bus	RS-232-C	RS-232-C
Line Interface	Two-/four-wire	Two-/four-wire	Two-/four-wire	Two-wire
Setup	Software only	Hardware/software	Software only	Hardware only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	MNP	Vendor did not specify
Data Compression	No	No	Yes	No
Price/Availability				
Purchase ($)	Contact vendor	Vendor did not specify	Contact vendor	350
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	1983
Comments	—	—	—	—

Vendor	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.
Product	**MT212ER**	**MT224AR**	**MT224ER**	**MultiModem 212AH3**
Hardware Configuration	Rackmount	Rackmount	Rackmount	Standalone
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, AT&T 212/212A	AT&T 103/113, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, AT&T 212/212A, V.21
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	1200	2400	2400	1200
Fallback Speed (bps)	Not applicable	Not applicable	Not applicable	Not applicable
Sychronization	Async/sync	Async/sync	Async/sync	Asynchronous
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK, PSK
Terminal Interface	RS-232-C	RS-232-C	RS-232-C	RS-232-C
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware only	Hardware only	Hardware only	Hardware only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	No	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	Vendor did not specify	MNP	Vendor did not specify
Data Compression	Yes	No	Yes	No
Price/Availability				
Purchase ($)	400	480	530	349
Date Of First Installation	1987	1985	1985	1983
Comments	Data compression; MNP 5	—	Data compression; MNP 5	—

Vendor	**Multi-Tech Systems, Inc.**	**Multi-Tech Systems, Inc.**	**Multi-Tech Systems, Inc.**	**Multi-Tech Systems, Inc.**
Product	**MultiModem 212E**	**MultiModem 212TL**	**MultiModem 224AH**	**MultiModem 224E**
Hardware Configuration	Standalone	Plug in	Standalone	Standalone
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Toshiba, Laptop 1100 plus, T1200	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, AT&T 212/212A, V.21	AT&T 103/113, V.22, AT&T 212/212A, V.21, V.32/V.23	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up/leased	Dial-up	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	1200	1200	2400	2400
Fallback Speed (bps)	Not applicable	Not applicable	Not applicable	Not applicable
Sychronization	Asynchronous	Asynchronous	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK
Terminal Interface	RS-232-C	Toshiba 60-pin bus	RS-232-C	RS-232-C
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware only	Hardware/software	Hardware only	Hardware only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	Vendor did not specify	Vendor did not specify	MNP
Data Compression	Yes	No	No	Yes
Price/Availability				
Purchase ($)	399	299	599	599
Date Of First Installation	1987	1987	1985	1985
Comments	Data compression; MNP 5	Includes Procomm software	—	Data compression; MNP 5

Vendor	**Multi-Tech Systems, Inc.**	**Multi-Tech Systems, Inc.**	**Multi-Tech Systems, Inc.**	**Multi-Tech Systems, Inc.**
Product	**MultiModem 224EC**	**MultiModem 224ES**	**MultiModem 224PC**	**MultiModem 224PS**
Hardware Configuration	Plug in	Plug in	Plug in	Plug in
Used With Microcomputers	Yes, IBM PC family	Yes, IBM PS/2	Yes, IBM PC family	Yes, IBM PS/2
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up	Dial-up	Dial-up	Dial-up
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	Not applicable	Not applicable	Not applicable	Not applicable
Sychronization	Asynchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK
Terminal Interface	PC Bus	PS/2 Micro Channel	PC Bus	PS/2 Micro Channel
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware/software	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	No	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	MNP	Vendor did not specify	Vendor did not specify
Data Compression	Yes	Yes	No	No
Price/Availability				
Purchase ($)	499	549	449	449
Date Of First Installation	1985	1988	1985	1988
Comments	Data compression; MNP 5	Data compression; MNP 5	Includes Procomm software	Includes Procomm software

Vendor	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.	Natural Microsystems Corp.	NEC America, Inc.
Product	**MultiModem 224TL**	**MultiModem PC5**	**Watson**	**I2432C**
Hardware Configuration	Plug in	Plug in	Plug in	Rackmount
Used With Microcomputers	Yes, Toshiba, T3100; T3100/20; T5100	Yes, IBM PC family	Yes, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any serial device
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up	Dial-up	Dial-up, dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	2400	1200	2400	2400
Fallback Speed (bps)	Not applicable	Not applicable	1200, 300	300, 1200
Sychronization	Asynchronous	Asynchronous	Asynchronous	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Vendor did not specify
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK	FSK, PSK	FSK, QAM, PSK, DPSK	QAM
Terminal Interface	RS-232-C	PC Bus	RS-232-C, PC Bus, PS/2 Micro Channel	RS-232-C, V.28, V.24
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware/software	Hardware/software	Hardware/software	Software only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	CRC, prop., Xmodem, Kermit	MNP
Data Compression	No	No	No	Yes
Price/Availability				
Purchase ($)	499	249	249 To 599	Contact vendor
Date Of First Installation	1987	1986	September 1984	Vendor did not specify
Comments	Includes Procomm software	Includes Procomm software	Also provides voice messaging capabilities	—

Vendor	NEC America, Inc.	NEC America, Inc.	NEC America, Inc.	NEC America, Inc.
Product	**N212AR**	**N212BR**	**N2432C**	**SPN2400**
Hardware Configuration	Standalone, rackmount	Standalone, rackmount	Standalone	Standalone, rackmount
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any serial device	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any serial device	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all serial ports	Yes, IBM PC family
Hayes AT Command Set Compatible	No	Vendor did not specify	Yes	No
Compatibility	AT&T 103/113, AT&T 212/212A	AT&T 103/113, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Vendor did not specify
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Leased lines
Maximum Data Rate (bps)	1200	1800	2400	2400
Fallback Speed (bps)	300	300	300, 1200	1200
Sychronization	Async/sync	Async/sync	Async/sync	Synchronous
Transmission Mode	Vendor did not specify	Vendor did not specify	Vendor did not specify	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point, multipoint
Line Conditioning	None	None	None	None
Modulation	DPSK	DPSK	QAM	DPSK
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
Line Interface	Two-wire	Two-wire	Two-wire	Four-wire
Setup	Software only	Software only	Hardware/software	Software only
Auto Answer/Dial	Yes	Yes	Yes	No
Alternate Voice/Data	No	No	Yes	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Fixed compromise
Protocol/Error	Vendor did not specify	Vendor did not specify	MNP	Vendor did not specify
Data Compression	No	No	Yes	No
Price/Availability				
Purchase ($)	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	—	—

Vendor	Network Software Associates, Inc.	Network Software Associates, Inc.	Network Software Associates, Inc.	Network Software Associates, Inc.
Product	**AdaptModem 201/212**	**AdaptModem 2400**	**AdaptModem V.22 bis**	**AdaptModem2 2400**
Hardware Configuration	Plug in	Plug in	Plug in	Plug in
Used With Microcomputers	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	No	Yes	No
Compatibility	AT&T 212/212A, Bell 201C	Bell 201C	V.22 bis	Bell 201C
Communications Facility	Dial-up	Dial-up	Dial-up	Dial-up
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Sychronization	Async/sync	Synchronous	Async/sync	Synchronous
Transmission Mode	Half duplex	Half duplex	Full duplex	Half duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, DPSK	DPSK	FSK, DPSK	DPSK
Terminal Interface	PC Bus	PC Bus, PS/2 Micro Channel	PC Bus	PC Bus, PS/2 Micro Channel
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware only	Hardware only	Hardware only	Hardware only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	No	No
Equalization	Fixed compromise	Fixed compromise	Automatic adaptive	Fixed compromise
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	845	625	575	625
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	—	Network software Associates

Vendor	Nu Data, Inc.	Optocom Systems, Inc.	Optocom Systems, Inc.	Optocom Systems, Inc.
Product	**5108**	**OSI8224A**	**OSI8224APC**	**OSI8224APS**
Hardware Configuration	Standalone	Standalone	Plug in	Plug in
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family	Yes, IBM PS/2
Hayes AT Command Set Compatible	No	Yes	Yes	Yes
Compatibility	AT&T 108	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, AT&T 202S, CCITT V.23	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, AT&T 202S, CCITT V.23	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, CCITT V.23 AT&T 202S
Communications Facility	Leased lines	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	300	2400	2400	2400
Fallback Speed (bps)	Not applicable	1200	1200	1200
Sychronization	Asynchronous	Async/sync	Asynchronous	Asynchronous
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK	FSK, QAM, PSK, DPSK	FSK, QAM, PSK, DPSK	FSK, QAM, PSK, DPSK
Terminal Interface	RS-232-C, V.24, current loop	RS-232-C, V.28, V.24	PC Bus	PS/2 Micro Channel
Line Interface	Two-/four-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware only	Software only	Software only	Software only
Auto Answer/Dial	No	Yes	Yes	Yes
Alternate Voice/Data	No	Yes	Yes	Yes
Equalization	Vendor did not specify	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	MNP	MNP	Proprietary, MNP
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	298	Contact vendor	Contact vendor	Contact vendor
Date Of First Installation	1978	March 1986	June 1986	Vendor did not specify
Comments	—	Remote configuration supported	—	—

Vendor	Octocom Systems, Inc.	Optocom Systems, Inc.	Optocom Systems, Inc.	Okidata Corp.
Product	**OSI8224B**	**OSI8226A**	**OSI8242A**	**CLD 2400**
Hardware Configuration	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount	Standalone
Used With Microcomputers	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.23, 202S	V.22, V.22 bis, AT&T 212/212A, V.21, AT&T 202S, CCITT V.23	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.23 Bell 202S	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	2400	2400	2400	2400, (4800 w/compression)
Fallback Speed (bps)	1200	1200	1200	1200
Sychronization	Async/sync	Async/sync	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK, DPSK	QAM, PSK, DPSK	FSK, QAM, PSK, DPSK	FSK, QAM, PSK
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
Line Interface	Two-/four-wire	Two-wire	Two-wire	Two-wire
Setup	Software only	Software only	Software only	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP, V.42	MNP	Proprietary, MNP	MNP
Data Compression	Yes	No	Yes	Yes
Price/Availability				
Purchase ($)	Contact vendor	Contact vendor	Contact vendor	549
Date Of First Installation	December 1988	December 1987	December 1988	Vendor did not specify
Comments	Automatic dial restored; automatic mode detection	AT&T 201C and CCITT V.26 bis compatible	Auto detection of rate and sync	Front panel dialing option; -1dBm transmit option for leased line

Vendor	Okidata Corp.	Okidata Corp.	Okidata Corp.	Okidata Corp.
Product	**CLD 4800 A/B**	**Okitel 1200**	**Okitel 1200B**	**Okitel 2400**
Hardware Configuration	Standalone	Standalone	Plug in	Standalone
Used With Microcomputers	Yes, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, IBM PC family	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	No	Yes	Yes	Yes
Compatibility	Bell 208 A/B	AT&T 103/113, AT&T 212/212A	AT&T 103/113, V.22, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up/leased	Dial-up	Dial-up	Dial-up/leased
Maximum Data Rate (bps)	4800	1200	1200	2400
Fallback Speed (bps)	None	0-300	300	1200, 0-300
Sychronization	Synchronous	Async/sync	Asynchronous	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point, multipoint	Vendor did not specify	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	PSK	FSK, PSK	FSK	FSK, QAM, PSK
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	PC Bus	RS-232-C, V.28, V.24
Line Interface	Two-/four-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware/software	Hardware/software	Software only	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	No	No	No
Equalization	Automatic adaptive	No	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	895	259	219	399
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	Remote configuration; front panel dialing of 2 telephone numbers; SADL compatible	5 year warranty	5 year warranty	5 year warranty, manual & software speaker volume settings

Vendor	Okidata Corp.	Okidata Corp.	Okidata Corp.	Omnitel, Inc.
Product	**Okitel 2400 Plus**	**Okitel 2400B**	**Okitel 2400B Plus**	**Encore 1200HB**
Hardware Configuration	Standalone	Plug in	Plug in	Plug in
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, IBM PC family	Yes, IBM PC family	Yes, IBM PC family
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	V.22, AT&T 212/212A, V.21
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up
Maximum Data Rate (bps)	2400, 4800 with compression	2400	2400, 4800 with compression	1200
Fallback Speed (bps)	1200	1200, 0-300	1200	300
Sychronization	Async/sync	Async/sync	Asynchronous	Asynchronous
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK, PSK
Terminal Interface	RS-232-C, V.28, V.24	PC Bus	PC Bus	PC Bus
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Software only	Software only	Software only	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	No	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Vendor did not specify
Protocol/Error	MNP	Vendor did not specify	MNP	Vendor did not specify
Data Compression	Yes	No	Yes	No
Price/Availability				
Purchase ($)	549	349	499	139
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	October 1984
Comments	Manual/software speaker volume settings	5 year warranty	5 year warranty, com 1,2,3 & 4 supported	—

Vendor	Omnitel, Inc.	Omnitel, Inc.	Omnitel, Inc.	Omnitel, Inc.
Product	**Encore 1200SD**	**Encore 2400HB**	**Encore 2400PS**	**Encore 2400SD**
Hardware Configuration	Standalone	Plug in	Plug in	Standalone
Used With Microcomputers	Yes, IBM PC family	Yes, IBM PC family	Yes, IBM PS/2	Yes, IBM PC family
Hayes AT Command Set Compatible	Yes	Yes	Vendor did not specify	Yes
Compatibility	V.22, AT&T 212/212A, V.21	V.22, V.22 bis, AT&T 212/212A, V.21	V.22, V.22 bis, AT&T 212/212A, V.21	V.22, V.22 bis, AT&T 212/212A, V.21
Communications Facility	Dial-up	Dial-up	Dial-up	Dial-up
Maximum Data Rate (bps)	1200	2400	2400	2400
Fallback Speed (bps)	300	1200, 300	Vendor did not specify	1200, 300
Sychronization	Async/sync	Asynchronous	Asynchronous	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, PSK	DPSK	QAM, DPSK	DPSK
Terminal Interface	PC Bus	PC Bus	PC Bus, PS/2 Micro Channel	PC Bus
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware only	Hardware/software	Hardware/software	Hardware only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Protocol/Error	Vendor did not specify	MNP	MNP	MNP
Data Compression	No	Yes	Yes	Yes
Price/Availability				
Purchase ($)	255	349; 499 (MNP 5)	399	449; 599 (MNP 5)
Date Of First Installation	July 1985	November 1986	November 1987	February 1987
Comments	—	4800 bps with data compression	4800 bps with data compression; price is $499 with MNP	—

Vendor	Patton Electronics, Inc.	Patton Electronics, Inc.	Patton Electronics, Inc.	Penril DataCom
Product	**612 Hayes-Compatible Modem**	**624 Hayes-Compatible Modem**	**6245 Miniature Passthru Modem**	**Cadet 1200**
Hardware Configuration	Standalone, plug in	Standalone, plug in	Port-connected	Standalone, rackmount
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2, all with RS-232-C interface
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, CCITT V.32	AT&T 103/113, AT&T 212/212A
Communications Facility	Dial-up	Dial-up/leased	Dial-up	Dial-up/leased
Maximum Data Rate (bps)	1200	2400	2400	1200
Fallback Speed (bps)	Vendor did not specify	Vendor did not specify	Vendor did not specify	0-300
Sychronization	Asynchronous	Async/sync	Async/sync	Asynchronous
Transmission Mode	Half/full duplex	Half/full duplex	Full duplex	Vendor did not specify
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	Vendor did not specify	None	None
Modulation	PSK	QAM, PSK	QAM, PSK	FSK, PSK
Terminal Interface	RS-232-C, PC Bus	RS-232-C, PC Bus	RS-232-C	RS-232-C, V.28, V.24
Line Interface	Two-wire	Vendor did not specify	Vendor did not specify	Two-wire
Setup	Hardware/software	Software only	Software only	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	Yes	Yes	Yes
Equalization	Fixed compromise	Vendor did not specify	Fixed compromise, automatic adaptive	Fixed compromise
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	175 (standalone) 145 (half card)	295 (standalone) 275 (half card)	349	289 stand alone/269 rackmount
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	Designed for portable PCs and port sharing (built-in switch)	—

Vendor	Penril DataCom	Penril DataCom	Penril DataCom	Practical Peripherals, Inc.
Product	**Cadet 2400**	**Datalink 2400**	**Pacer 2400**	**PM1200SA Mini**
Hardware Configuration	Standalone	Standalone, rackmount	Plug in	Standalone
Used With Microcomputers	Yes, IBM PC family, IBM PS/2, all with RS-232-C interface	Yes, IBM PC family, IBM PS/2, all with RS-232-C interface	Yes, IBM PC family	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, AT&T 212/212A	AT&T 103/113, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	2400	2400	2400	1200
Fallback Speed (bps)	1200, 0-300	1200, 0-300	1200, 0-300	300
Sychronization	Asynchronous	Async/sync	Asynchronous	Asynchronous
Transmission Mode	Vendor did not specify	Vendor did not specify	Vendor did not specify	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK	PSK
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	PC Bus	RS-232-C
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware only	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Fixed compromise	Fixed compromise	Fixed compromise	Automatic adaptive
Protocol/Error	MNP, option	MNP	Vendor did not specify	Vendor did not specify
Data Compression	No	Yes	No	No
Price/Availability				
Purchase ($)	535	695 stand alone/675 rackmount	475	Vendor did not specify
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	—	—

Vendor	Practical Peripherals, Inc.	Practical Peripherals, Inc.	Practical Peripherals, Inc.	Practical Peripherals, Inc.
Product	**PM2400 Half Card w/ProComm**	**PM1200 Half Card w/ProComm**	**PM2400 MNP**	**PM2400 PS/2 Full Card w/ProComm**
Hardware Configuration	Plug in	Plug in	Plug in	Plug in
Used With Microcomputers	Yes, IBM PC family	Yes, IBM PC family	Yes, IBM PC family	Yes, any Micro-channel PC
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, AT&T 212/212A	AT&T 103/113, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up	Dial-up/leased
Maximum Data Rate (bps)	2400	1200	2400	2400
Fallback Speed (bps)	1200, 300	300	1200, 300	1200, 300
Sychronization	Asynchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	QAM	PSK	QAM	QAM
Terminal Interface	PC Bus	PC Bus	PC Bus	PS/2 Micro Channel
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware/software	Hardware/software	Hardware/software	Software only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	MNP	Vendor did not specify
Data Compression	No	No	Vendor did not specify	No
Price/Availability				
Purchase ($)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	—	—

Vendor	Practical Peripherals, Inc.	Practical Peripherals, Inc.	Racal-Milgo	Racal-Milgo
Product	**PM2400SA MNP**	**PM2400SA Standalone**	**RM-24**	**RM-4492E**
Hardware Configuration	Standalone	Standalone	Standalone, plug in, rack	Rackmount
Used With Microcomputers	Yes, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	Yes	No	Yes
Compatibility	AT&T 103/113, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22 bis, AT&T 212/212A	V.26 B 201 B/C	AT&T 103/113, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200, 300	1200, 300	Not applicable	1200, 300
Sychronization	Asynchronous	Asynchronous	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point, multipoint	Point-to-point
Line Conditioning	None	None	None	None
Modulation	QAM	QAM	DPSK	FSK, QAM
Terminal Interface	RS-232-C	RS-232-C	RS-232-C, V.24	RS-232-C
Line Interface	Two-wire	Two-wire	Two-/four-wire	Two-wire
Setup	Software only	Software only	Hardware only	Hardware only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	No	Yes
Equalization	Automatic adaptive	Automatic adaptive	Vendor did not specify	Automatic adaptive
Protocol/Error	MNP	Vendor did not specify	Vendor did not specify	MNP
Data Compression	Vendor did not specify	No	No	No
Price/Availability				
Purchase ($)	Vendor did not specify	Vendor did not specify	685	1,395
Date Of First Installation	Vendor did not specify	Vendor did not specify	1985	Vendor did not specify
Comments	—	—	—	—

Vendor	Racal-Milgo	Racal-Milgo	Racal-Vadic, Inc.	Racal-Vadic, Inc.
Product	**RMD 2412**	**RMD 2412/2**	**1200PA**	**1200VP**
Hardware Configuration	Standalone	Standalone	Standalone	Standalone
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, AT&T 212/212A	AT&T 103/113, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up/leased	Dial-up	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	2400	2400	1200	1200
Fallback Speed (bps)	1200, 300	1200, 300	300	300
Sychronization	Async/sync	Async/sync	Async/sync	Asynchronous
Transmission Mode	Vendor did not specify	Vendor did not specify	Full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, PSK	FSK, PSK
Terminal Interface	RS-232-C	RS-232-C	RS-232-D	RS-232-D
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware/software	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	MNP	MNP	Vendor did not specify
Data Compression	Vendor did not specify	Vendor did not specify	No	No
Price/Availability				
Purchase ($)	795	595	495	295
Date Of First Installation	Vendor did not specify	Vendor did not specify	March 1986	July 1986
Comments	—	—	—	—

Vendor	Racal-Vadic, Inc.	Racal-Vadic, Inc.	Racal-Vadic, Inc.	Racal-Vadic, Inc.
Product	**2400PAM2**	**2400PS/2**	**2400VP**	**2422PA-SC**
Hardware Configuration	Standalone	Plug in	Standalone	Standalone
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with serial port	Yes, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21
Communications Facility	Dial-up/leased	Dial-up	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200, 300	1200, 0-300	1200, 300	1200, 0-300
Sychronization	Async/sync	Asynchronous	Async/sync	Asynchronous
Transmission Mode	Full duplex	Full duplex	Full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK
Terminal Interface	RS-232-D	RS-232-D	RS-232-D	V.24
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware/software	Software only	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	MNP	MNP	MNP
Data Compression	Yes	Yes	Yes	Yes
Price/Availability				
Purchase ($)	795	395	595	795
Date Of First Installation	March 1987	May 1989	September 1986	May 1989
Comments	—	—	—	Also has V.25bis autodial compatibility

Vendor	Racal-Vadic, Inc.	Racal-Vadic, Inc.	Racal-Vadic, Inc.	Racal-Vadic, Inc.
Product	**2440PX**	**4224E**	**4492E**	**LC2400PC**
Hardware Configuration	Rackmount	Rackmount	Rackmount	Plug in
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Yes, IBM PC family
Hayes AT Command Set Compatible	Vendor did not specify	Yes	Yes	Yes
Compatibility	Bell 201 B/C	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200, 0-300	1200, 300	1200, 300	1200, 0-300
Sychronization	Synchronous	Async/sync	Async/sync	Asynchronous
Transmission Mode	Half duplex	Full duplex	Full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK
Terminal Interface	RS-232-D	RS-232-D	RS-232-D	RS-232-D
Line Interface	Two-/four-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware only	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	Yes	Yes
Equalization	Coherent detection	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	MNP	MNP	MNP
Data Compression	No	Yes	Yes	Yes
Price/Availability				
Purchase ($)	575	595	1,295	395
Date Of First Installation	November 1982	July 1985	May 1986	May 1982
Comments	Auto answer but no auto dial	—	—	Service available at Flat Rate or Emergency exchgange

Vendor	Racal-Vadic, Inc.	Racal-Vadic, Inc.	Racal-Vadic, Inc.	Rohm Corp.
Product	**VA1244**	**VA1250PX**	**VA1251KX**	**BP 4501**
Hardware Configuration	Rackmount	Standalone	Standalone	Plug in
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Yes, IBM PC family
Hayes AT Command Set Compatible	No	No	No	Yes
Compatibility	Bell 202	Bell 202	V.26, Bell 202	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up/leased	Dial-up	Leased lines	Dial-up/leased
Maximum Data Rate (bps)	1200	1200	1200	Vendor did not specify
Fallback Speed (bps)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Sychronization	Asynchronous	Asynchronous	Asynchronous	Async/sync
Transmission Mode	Half duplex	Half duplex	Half duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK	FSK	FSK	FSK, QAM, PSK, DPSK
Terminal Interface	RS-232-D	RS-232-D	RS-232-D	RS-232-C, RS-232C on TTL Levels
Line Interface	Two-wire	Two-wire	Two-/four-wire	Two-wire
Setup	Hardware only	Hardware only	Hardware only	Hardware/software
Auto Answer/Dial	Yes	Yes	No	Yes
Alternate Voice/Data	Vendor did not specify	No	No	No
Equalization	Coherent detection	Coherent detection	Coherent detection	Automatic adaptive, p
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	Yes
Price/Availability				
Purchase ($)	400	425	425	89-quantity discounts available
Date Of First Installation	August 1982	January 1979	August 1988	June 1989
Comments	—	Auto answer but no auto dial	—	No DAA on board, EEPROM for phone # & customer configuration on board

Vendor	Smarteam	Smarteam	Tek-Com Corp.	Tek-Com Corp.
Product	**1200 ST**	**2400 AT**	**202T**	**P-202T**
Hardware Configuration	Standalone	Rackmount	Standalone, plug in, rack	Standalone, rackmount
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	Vendor did not specify	No	No
Compatibility	AT&T 103/113, V.22, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Bell 202T	AT&T 202T
Communications Facility	Leased lines	Leased lines	Leased lines	Leased lines
Maximum Data Rate (bps)	1200	2400	1800	1800
Fallback Speed (bps)	Vendor did not specify	1200, 300	Vendor did not specify	Vendor did not specify
Sychronization	Asynchronous	Async/sync	Asynchronous	Asynchronous
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Multipoint	Multipoint	Point-to-point, multipoint	Point-to-point, multipoint
Line Conditioning	Vendor did not specify	Vendor did not specify	None	None
Modulation	FSK, PSK	FSK, QAM, PSK	FSK	FSK
Terminal Interface	RS-232-C	RS-232-C	RS-232-C	RS-232-C
Line Interface	Four-wire	Four-wire	Two-/four-wire	Two-/four-wire
Setup	Vendor did not specify	Vendor did not specify	Hardware only	Hardware only
Auto Answer/Dial	Yes	Yes	No	No
Alternate Voice/Data	Yes	Yes	No	No
Equalization	Fixed compromise	Fixed compromise, automatic adaptive	Fixed compromise	Fixed compromise
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	Vendor did not specify	No
Price/Availability				
Purchase ($)	67	99	Vendor did not specify	425
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	—	—

Vendor	Tek-Com Corp.	Tek-Com Corp.	Tek-Com Corp.	Tek-Com Corp.
Product	**P-212/V.22**	**P-212AD**	**P-212ZX**	**P2424**
Hardware Configuration	Standalone, rackmount	Standalone, rackmount	Standalone	Standalone, rackmount
Used With Microcomputers	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2	Yes, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	No	Vendor did not specify	Yes	Yes
Compatibility	AT&T 103/113, V.22, AT&T 212/212A, V.21	AT&T 103/113, AT&T 212/212A	AT&T 103/113, AT&T 212/212A	Vendor did not specify
Communications Facility	Dial-up/leased	Dial-up	Dial-up	Dial-up/leased
Maximum Data Rate (bps)	1200	1200	1200	2400
Fallback Speed (bps)	600, 300	300	300	1200, 300
Sychronization	Async/sync	Asynchronous	Asynchronous	Async/sync
Transmission Mode	Full duplex	Full duplex	Half/full duplex	Vendor did not specify
Configuration	Point-to-point	Point-to-point	Multipoint	Multipoint
Line Conditioning	None	None	None	None
Modulation	FSK, DPSK	FSK, DPSK	FSK, DPSK	FSK, QAM, DPSK
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C	RS-232-C	RS-232-C, V.24
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire, two-/four-wire
Setup	Hardware only	Hardware/software	Hardware only	Hardware only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	No	No
Equalization	Fixed compromise	Fixed compromise	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	495	395	295	495
Date Of First Installation	Vendor did not specify	Vendor did not specify	1985	1983
Comments	Product does not feature auto-dial	—	—	—

Vendor	Tek-Com Corp.	Telcor Systems Corp.	Telenetics Corp.	Telenetics Corp.
Product	**TC202S**	**2424**	**24 I/2**	**TC1200**
Hardware Configuration	Standalone, rackmount	Standalone, rackmount	Plug in	Standalone
Used With Microcomputers	Yes, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, IBM PC family	Yes, Apple II family, Apple Macintosh, IBM PC family
Hayes AT Command Set Compatible	No	Yes	Yes	Yes
Compatibility	AT&T 202S	AT&T 103/113, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up	Dial-up/leased	Dial-up	Dial-up
Maximum Data Rate (bps)	1200	2400	2400	1200
Fallback Speed (bps)	Vendor did not specify	1200, 300	1200 to 300	300
Sychronization	Asynchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	Half duplex	Full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK	Vendor did not specify	FSK, QAM, PSK	FSK
Terminal Interface	RS-232-C	RS-232-C	PC Bus	RS-232-C
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware only	Hardware/software	Software only	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	Yes	No	Yes
Equalization	Fixed compromise	Automatic adaptive	Automatic adaptive	Fixed compromise
Protocol/Error	Vendor did not specify	Proprietary, MNP	Vendor did not specify	Vendor did not specify
Data Compression	No	No	Vendor did not specify	Vendor did not specify
Price/Availability				
Purchase ($)	345	695	190 (2 weeks ARO)	139 (2 weeks ARO)
Date Of First Installation	Vendor did not specify	1986	1987	May 1988
Comments	Modem does not feature auto-dial	3 year warranty; DES encryption option - $100	5-year warranty; return to factory	5-year warranty; return to factory

Vendor	Telenetics Corp.	Telenetics Corp.	Telenetics Corp.	TIL Systems, Inc.
Product	**TC2400**	**TC2400S**	**TC921-24**	**EM2400**
Hardware Configuration	Standalone	Standalone	Standalone, rackmount	Standalone, plug in, rack
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up	Dial-up	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200 to 300	1200 to 300	1200 to 300	1200, 300
Sychronization	Asynchronous	Asynchronous	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	Vendor did not specify
Modulation	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK
Terminal Interface	RS-232-C	RS-232-C	RS-232-C	PC Bus
Line Interface	Two-wire	Two-wire	Two-wire	Two-/four-wire
Setup	Software only	Software only	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	MNP	MNP	X.25
Data Compression	Vendor did not specify	Vendor did not specify	Vendor did not specify	No
Price/Availability				
Purchase ($)	239 (2 weeks ARO)	395 (2 weeks ARO)	545 (995 - X.25 pad - optional)	795
Date Of First Installation	October 1988	June 1989	June 1988	1987
Comments	5-year warranty; return to factory	5-year warranty; return to factory	X.25 internal PAD is optional; 2 weeks ARO; 5-year warranty	—

Vendor	TIL Systems, Inc.	Universal Data Systems	Universal Data Systems	Universal Data Systems
Product	**EM2410**	**103J LP**	**212A LP**	**FasTalk 1200E**
Hardware Configuration	Standalone, plug in, rack	Standalone	Standalone	Standalone, plug in, rack
Used With Microcomputers	Yes, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family	Yes, Apple II family, Apple Macintosh, IBM PC family	Yes, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	No	No	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113	AT&T 212/212A	Vendor did not specify
Communications Facility	Dial-up/leased	Dial-up, leased lines	Dial-up, leased lines	Dial-up
Maximum Data Rate (bps)	2400	300	1200	1200
Fallback Speed (bps)	1200, 300	Vendor did not specify	Vendor did not specify	300, 1200
Sychronization	Async/sync	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	Half/full duplex	Half/full duplex	Vendor did not specify	Full duplex
Configuration	Point-to-point	Vendor did not specify	Vendor did not specify	Vendor did not specify
Line Conditioning	Vendor did not specify	None	None	Vendor did not specify
Modulation	FSK	FSK	PSK	DPSK
Terminal Interface	PC Bus	RS-232-C	RS-232-C	Vendor did not specify
Line Interface	Two-/four-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware/software	Hardware only	Hardware only	Hardware only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Vendor did not specify
Equalization	Automatic adaptive	Fixed compromise	Fixed compromise	Automatic adaptive
Protocol/Error	X.25	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	895	185	195	400
Date Of First Installation	1987	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	Telephone line powered	Telephone line powered	—

Vendor	Universal Data Systems	Universal Data Systems	Universal Data Systems	Universal Data Systems
Product	**FasTalk 1200E PC**	**FasTalk 2/1200**	**FasTalk 2/2400**	**FasTalk 2/2400/5**
Hardware Configuration	Plug in	Plug in	Plug in	Plug in
Used With Microcomputers	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Communications Facility	Dial-up	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	1200	1200	2400	2400
Fallback Speed (bps)	300, 1200	300, 1200	300 - 2400	300 - 2400
Sychronization	Asynchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	Vendor did not specify	Full duplex	Full duplex	Full duplex
Configuration	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Line Conditioning	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Modulation	DPSK	DPSK	QAM	QAM
Terminal Interface	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Line Interface	Vendor did not specify	Two-wire	Two-wire	Two-wire
Setup	Hardware only	Hardware only	Hardware only	Hardware only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Vendor did not specify	No	No	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	400	400	495	550
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	—	—

Vendor	Universal Data Systems	Universal Data Systems	Universal Data Systems	Universal Data Systems
Product	**FasTalk 2400 PC**	**FasTalk 2400/5**	**FasTalk 2400/5 PC**	**FasTalk V.22/42 bis**
Hardware Configuration	Plug in	Standalone	Plug in	Standalone, plug in, rack
Used With Microcomputers	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	Vendor did not specify	Vendor did not specify	Vendor did not specify	V.22 bis, V.42bis
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	300 - 2400	300 - 2400	Vendor did not specify	300 to 2400
Sychronization	Asynchronous	Async/sync	Async/sync	Async/sync
Transmission Mode	Full duplex	Full duplex	Full duplex	Half/full duplex
Configuration	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Line Conditioning	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Modulation	QAM	QAM	QAM	QAM
Terminal Interface	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware only	Hardware only	Hardware only	Hardware only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	No	Vendor did not specify
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	MNP	MNP	MNP
Data Compression	No	No	No	Yes
Price/Availability				
Purchase ($)	495	550	550	550
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	—	Begin shipping 1st quarter 1990

Vendor	Universal Data Systems	Universal Data Systems	Universal Data Systems	Universal Data Systems
Product	**Sync-Up 2/201**	**Sync-Up 2/201/212**	**Sync-Up 2/V.22 bis**	**Sync-Up 201C**
Hardware Configuration	Plug in	Plug in	Plug in, IBM Micro Channel	Plug in
Used With Microcomputers	Yes, IBM PS/2	Yes, IBM PS/2	Yes, IBM PS/2	Yes, IBM PC family
Hayes AT Command Set Compatible	No	Yes	Yes	No
Compatibility	AT&T 201C	AT&T 212/212A, AT&T 201C	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 201C
Communications Facility	Dial-up	Dial-up	Dial-up, dial-up/leased, leased lines	Dial-up
Maximum Data Rate (bps)	2400	2400, 1200	2400	2400
Fallback Speed (bps)	Vendor did not specify	300	1200, 600, 300	Vendor did not specify
Sychronization	Synchronous	Async/sync	Async/sync	Synchronous
Transmission Mode	Vendor did not specify	Half/full duplex	Vendor did not specify	Vendor did not specify
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	DPSK	FSK, DPSK	FSK, QAM, DPSK	DPSK
Terminal Interface	PS/2 Micro Channel	PS/2 Micro Channel	PS/2 Micro Channel	RS-232-C, V.28, V.24, PC Bus
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Software only	Software only	Software only	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Fixed compromise	Fixed compromise	Fixed compromise	Fixed compromise
Protocol/Error	Provided in sync protocol	CRC, Xmodem, Kermit	CRC, xmodem, Kermit	Provided in sync protocol
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	625	840	575	625
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	—	—

Vendor	Universal Data Systems	Universal Data Systems	Universal Data Systems	U.S. Robotics, Inc.
Product	**Sync-Up 201C/212A**	**Sync-Up V.22 bis**	**Sync-Up V.26**	**Courier 1200**
Hardware Configuration	Plug in	Plug in	Plug in	Standalone
Used With Microcomputers	Yes, IBM PC family	Yes, IBM PC family	Yes, IBM PC family	Yes, all with RS-232-C interface
Hayes AT Command Set Compatible	Yes	Yes	No	Yes
Compatiblity	AT&T 212/212A, AT&T 201C	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	CCITT V.26 bis	AT&T 103/113, AT&T 212/212A
Communications Facility	Dial-up	Dial-up, dial-up/leased, leased lines	Dial-up	Dial-up
Maximum Data Rate (bps)	2400, 1200	2400	2400	1200
Fallback Speed (bps)	300	1200, 600, 300	Vendor did not specify	300
Sychronization	Async/sync	Async/sync	Synchronous	Asynchronous
Transmission Mode	Half/full duplex	Vendor did not specify	Vendor did not specify	Vendor did not specify
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, DPSK	FSK, QAM, DPSK	DPSK	FSK, PSK, DPSK
Terminal Interface	PC Bus	PC Bus	RS-232-C, V.28, V.24, PC Bus	RS-232-C
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware/software	Hardware/software	Hardware/software	Hardware only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	No
Equalization	Fixed compromise	Fixed compromise	Fixed compromise	Fixed compromise
Protocol/Error	CRC, Xmodem, Kermit,	CRC, xmodem, Kermit	Provided in sync protocol	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	840	575	625	349
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	January 1986
Comments	—	—	—	—

Vendor	U.S. Robotics, Inc.	U.S. Robotics, Inc.	U.S. Robotics, Inc.	U.S. Robotics, Inc.
Product	**Courier 2400**	**Courier 2400e**	**Sportster 1200**	**Sportster 2400**
Hardware Configuration	Standalone, Internal	Standalone, Internal	Standalone, Internal	Standalone, Internal
Used With Microcomputers	Yes, IBM PS/2, all with external RS-232-C interface	Yes, Apple Macintosh, IBM PC family, IBM PS/2, all with external RS-232-C interface	Yes, IBM PC family, all with external RS-232-C interface	Yes, IBM PC family, external-any RS-232-C
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22 bis, AT&T 212/212A	AT&T 103/113, AT&T 212/212A	AT&T 103/113, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up	Dial-up
Maximum Data Rate (bps)	2400	2400	1200	2400
Fallback Speed (bps)	1200, 300	300, 1200	300	1200, 300
Sychronization	Asynchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK, DPSK	FSK, QAM, PSK, DPSK	FSK, PSK, DPSK	FSK, QAM, PSK, DPSK
Terminal Interface	RS-232-C, PS/2 Micro Channel, USR Rackmount 30	RS-232-C, PC Bus, PS/2 Micro Channel, USR Rack 30	RS-232-C, PC Bus	RS-232-C, PC Bus
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware/software	Hardware/software	Hardware only	Hardware only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	No	No
Equalization	Automatic adaptive	Automatic adaptive	Fixed compromise	Automatic adaptive
Protocol/Error	Vendor did not specify	MNP	Vendor did not specify	Vendor did not specify
Data Compression	No	Yes	No	No
Price/Availability				
Purchase ($)	449	699-549	139(internal)-149(external)	239 (internal)-(external) 249
Date Of First Installation	January 1985	January 1986	January 1987	January 1988
Comments	—	—	—	—

Vendor	Visionary Electronics, Inc.	Visionary Electronics, Inc.	Western DataCom	Western DataCom
Product	**1200B**	**2400 XT**	**424 Autodial**	**424 Class 5**
Hardware Configuration	Plug in	Standalone	Rackmount	Standalone
Used With Microcomputers	Yes, IBM PC family	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, AT&T 212/212A, V.21	AT&T 103/113, AT&T 212/212A, CCITT V.21, V.22 & V.22bis	AT&T 103/113, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up	Dial-up	Dial-up, dial-up/leased, leased lines	Dial-up, dial-up/leased, leased lines
Maximum Data Rate (bps)	1200	2400	2400	2400
Fallback Speed (bps)	300	300	1200, 0-300	1200, 300
Sychronization	Asynchronous	Asynchronous	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	FDX	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	Vendor did not specify	D2	None	None
Modulation	FSK, PSK	FSK, PSK	FSK, QAM, DPSK	FSK, QAM, DPSK
Terminal Interface	RS-232-C	RS-232-C	RS-232-C, V.24	RS-232-C, V.24
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware/software	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Vendor did not specify	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Xmodem	Xmodem	Vendor did not specify	MNP
Data Compression	No	No	No	Yes
Price/Availability				
Purchase ($)	395 w/8K RAM	495 w/8K RAM	495	595
Date Of First Installation	1988	1989	1984	1987
Comments	Modem sends/receives files independent of composer	Modem sends/receives files independent of composer	16 modems/chassis; extended warranty available	Speed conversion and remote configuration supported

Vendor	Western DataCom	Western DataCom	Western DataCom	Western DataCom
Product	**424 Crypto Card**	**424 Error Free**	**424 Line Backer**	**424 MNP**
Hardware Configuration	Rackmount	Rackmount	Standalone	Standalone
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up, dial-up/leased, leased lines	Dial-up	Dial-up, dial-up/leased, leased lines	Dial-up, dial-up/leased, leased lines
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200, 0-300	1200, 0-300	1200, 300	1200, 300
Sychronization	Async/sync	Async/sync	Async/sync	Async/sync
Transmission Mode	FDX	FDX	FDX	FDX
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, QAM, DPSK
Terminal Interface	RS-232-C, V.24	RS-232-C, V.24	RS-232-C, V.24	RS-232-C, V.24
Line Interface	Two-/four-wire	Two-wire	2-wire, 2-/4-wire, 4-wire	Two-wire
Setup	Hardware/software	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	MNP	MNP	MNP
Data Compression	Yes	No	Yes	No
Price/Availability				
Purchase ($)	895	545	695	545
Date Of First Installation	1987	1985	1986	1986
Comments	NBS DES encryption	—	Remote configuration, call back security, and leased line dial back up supported	Speed conversion supported

Vendor	Western DataCom	Western DataCom	Western DataCom	Western DataCom
Product	**424 Network Node**	**MESA 424**	**USA 212A**	**USA 224A**
Hardware Configuration	Rackmount	Standalone	Standalone	Standalone
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface
Hayes AT Command Set Compatible	Yes	Yes	Yes	Vendor did not specify
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, AT&T 212/212A	AT&T 103/113, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up, dial-up/leased, leased lines	Dial-up, dial-up/leased, leased lines	Dial-up	Dial-up
Maximum Data Rate (bps)	2400	2400	1200	2400
Fallback Speed (bps)	1200, 0-300	1200	0-300	0-300, 1200
Sychronization	Async/sync	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	FDX	FDX	FDX	FDX
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, DPSK	FSK, QAM, DPSK
Terminal Interface	RS-232-C, V.24	RS-232-C, V.24	RS-232-C, V.24	RS-232-C, V.24
Line Interface	2-wire, 2-/4-wire, 4-wire	2-wire, 2-/4-wire, 4-wire	Two-wire	Two-wire
Setup	Hardware/software	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	MNP	Vendor did not specify	Vendor did not specify
Data Compression	Yes	Yes	No	No
Price/Availability				
Purchase ($)	645	995	295	395
Date Of First Installation	1987	1986	1988	1988
Comments	Extensive diagnostics, remote configuration	NBS DES compatibility	—	—

Vendor	Western DataCom	Western DataCom	Western DataCom	Western DataCom
Product	**USA 224AR**	**Worldcom 200V**	**Worldcom 202**	**Worldcom 223**
Hardware Configuration	Rackmount	Standalone	Rackmount	Standalone
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface
Hayes AT Command Set Compatible	Yes	Yes	Yes	Vendor did not specify
Compatibility	AT&T 103/113, V.22 bis, AT&T 212/212A	V.23/Videotex	AT&T 103/113, V.23/Bell 202	AT&T 103/113, V.22, V.21, V.23/Bell 202
Communications Facility	Dial-up	Dial-up	Dial-up	Dial-up
Maximum Data Rate (bps)	2400	1200 (75/150 reverse)	1200	1200
Fallback Speed (bps)	0-300, 1200	Vendor did not specify	None	0-300
Sychronization	Asynchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	FDX	Half/full duplex	HDX	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, DPSK	DPSK	DPSK	FSK, DPSK
Terminal Interface	RS-232-C, V.24	RS-232-C, V.24	RS-232-C, V.24	RS-232-C, V.24
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware/software	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	395	545	445	495
Date Of First Installation	1988	1986	1984	1987
Comments	—	Videotex compatible with integral autodialer	202/V.23 modem with integral "AT" auto-dialer	—

Vendor	Xecom Inc.	Xecom Inc.	Xecom Inc.	Xecom Inc.
Product	**XE1201**	**XE1203**	**XE1212**	**XE1212E**
Hardware Configuration	Component modem	Component modem	Component modem	Component modem
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	No	No	Yes	Yes
Compatibility	Bell 103,212A	Bell 103,212A	V.22, V.21, Bell 103, 212A	V.22, V.21, Bell 103, 212A
Communications Facility	Dial-up	Dial-up	Dial-up	Dial-up
Maximum Data Rate (bps)	1200	1200	1200	1200
Fallback Speed (bps)	300	300	300	300
Sychronization	Async/sync	Async/sync	Asynchronous	Asynchronous
Transmission Mode	Full duplex	Full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, DPSK	FSK, DPSK	FSK, PSK	FSK, PSK
Terminal Interface	Parallel-8251A USART	Parallel-8251A USART	PC Bus, 8250 UART	PC Bus, 8250 UART
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware/software	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	No	No	Yes	Yes
Alternate Voice/Data	Yes	Yes	No	No
Equalization	Fixed compromise	Fixed compromise	Fixed compromise	Fixed compromise
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	165	199	116	82
Date Of First Installation	January 1985	January 1985	January 1987	January 1987
Comments	Basic component; diag.; phone line analysis: frequency error, signal/noise	Enhanced component that includes voice synthesis; diagnostics	—	—

Vendor	Xecom Inc.	Xecom Inc.	Xecom Inc.	Xecom Inc.
Product	**XE1212L**	**XE1214**	**XE1214E**	**XE2400**
Hardware Configuration	Component modem	Component modem	Component modem	Component modem
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	V.22, V.21, Bell 103, 212A	V.22, V.21, Bell 103,212A	V.22, V.21, Bell 103,212A	V.22, V.22 bis, V.21, Bell 103, 212A
Communications Facility	Dial-up	Dial-up	Dial-up	Dial-up
Maximum Data Rate (bps)	1200	1200	1200	2400
Fallback Speed (bps)	300	300	300	1200, 300
Sychronization	Asynchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, PSK	FSK, PSK	FSK, PSK	FSK, QAM, PSK
Terminal Interface	PC Bus, 8250 UART	Serial - TTL	Serial - TTL	Serial TTL
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware/software	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	No	No
Equalization	Fixed compromise	Fixed compromise	Fixed compromise	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	116	116	82	269
Date Of First Installation	January 1987	January 1987	January 1987	January 1988
Comments	Low power version without telephone handset interface circuitry	—	—	—

Vendor	Xecom Inc.	Xecom Inc.	Xecom Inc.	Xecom Inc.
Product	**XE2400A**	**XE2400AE**	**XE2400DT**	**XE2400DT5**
Hardware Configuration	Component modem	Component modem	Plug in	Plug in
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM compatibles	Yes, IBM PC family, IBM compatibles
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	V.22, V.22 bis, V.21, Bell 103, 212A	V.22, V.22 bis, V.21, Bell 103, 212A	V.22, V.22 bis, V.21, AT&T 103, 212A	V.22, V.22 bis, V.21, AT&T 103, 212A
Communications Facility	Dial-up	Dial-up	Dial-up	Dial-up
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200, 300	1200, 300	1200, 300	1200, 300
Sychronization	Asynchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	Full duplex	Full duplex	Full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK
Terminal Interface	Serial TTL	Serial TTL	PC Bus	PC Bus
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware/software	Hardware/software	Software only	Software only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	No	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	MNP
Data Compression	No	No	No	Yes
Price/Availability				
Purchase ($)	165	135	225	275
Date Of First Installation	January 1988	January 1988	January 1990	January 1990
Comments	—	—	Incorporates Xecom technology on IBM PC half card	Desktop; incorporates technology on IBM PC half card.

Vendor	Xecom Inc.	Xecom Inc.	Xecom Inc.	Xecom Inc.
Product	**XE2400MNP**	**XE2400MNP/E**	**XE24C05**	**XE24CO**
Hardware Configuration	Component modem	Component modem	Plug in	Plug in
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Compaq 286/SLT laptop	Yes, Compaq 286/SLT laptop
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	V.22, V.22 bis, V.21, Bell 103, 212A	V.22, V.22 bis, V.21, Bell 103, 212A	V.22, V.22 bis, V.21, Bell 103, 212A	V.22, V.22 bis, V.21, Bell 103, 212A
Communications Facility	Dial-up	Dial-up	Dial-up	Dial-up
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200, 300	1200, 300	1200, 300	1200, 300
Sychronization	Async/sync	Async/sync	Asynchronous	Asynchronous
Transmission Mode	Full duplex	Full duplex	Full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QSM, PAK	FSK, QSM, PAK	FSK, QAM, PSK	FSK, QAM, PSK
Terminal Interface	Serial - TTL	Serial - TTL	Special	Special
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware/software	Hardware/software	Software only	Software only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	No	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	MNP	MNP	Vendor did not specify
Data Compression	Yes	Yes	Yes	No
Price/Availability				
Purchase ($)	269	235	449	379
Date Of First Installation	November 1988	November 1988	November 1989	November 1989
Comments	—	Same as XE2400MNP without D.A.A.	Implements CMOS integrated circuits & power-down circuitry.	Implements CMOS integrated circuits & power-down circuitry

Vendor	Xecom Inc.	Xecom Inc.	Xecom Inc.	Xecom Inc.
Product	**XE24FT**	**XE24MP**	**XE24MP5**	**XE24MT**
Hardware Configuration	Standalone	Plug in	Plug in	Plug in
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple Macintosh Portable	Yes, Apple Macintosh Portable	Yes, Apple Macintosh II
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	V.22, V.22 bis, V.21, Bell 103, 212A	V.22, V.22 bis, V.21, AT&T 103, 212A	V.22, V.22 bis, V.21, AT&T 103, 212A	V.22, V.22 bis, V.21, AT&T 103, 212A
Communications Facility	Dial-up	Dial-up	Dial-up	Dial-up
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200, 300	1200, 300	1200, 300	1200, 300
Sychronization	Asynchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	Full duplex	Full duplex	Full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK
Terminal Interface	RS-232-C	Modem slot	Modem slot	NuBus
Line Interface	2-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware/software	Software only	Software only	Software only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	No	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	MNP	Vendor did not specify
Data Compression	No	No	Yes	No
Price/Availability				
Purchase ($)	249	349	419	349
Date Of First Installation	November 1988	November 1989	November 1989	November 1989
Comments	—	CMOS integrated circuits to conserve batteries of portable MAC	Implements CMOS integrated circuits to conserve Macintosh battery	Contains a 68008 co-processor and three serial ports (RS-422)

Vendor	Xecom Inc.	Xecom Inc.	Xecom Inc.	Xecom Inc.
Product	**XE24MTS**	**XE24NE**	**XE24NE5**	**XE24NP**
Hardware Configuration	Plug in	Plug in	Plug in	Plug in, (half card)
Used With Microcomputers	Yes, Apple Macintosh II	Yes, NEC ProSpeed 286 laptop	Yes, NEC ProSpeed 286 laptop	Yes, IBM PC family
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	V.22, V.22 bis, V.21, AT&T 103, 212A	V.22, V.22 bis, V.21, Bell 103, 212A	V.22, V.22 bis, V.21, Bell 103, 212A	V.22, V.22 bis, V.21, Bell 103,212A
Communications Facility	Dial-up	Dial-up	Dial-up	Dial-up
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200, 300	1200, 300	1200, 300	1200, 300
Sychronization	Asynchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	Full duplex	Full duplex	Full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK
Terminal Interface	NuBus	Special	Special	PC Bus
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Software only	Software only	Software only	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	No	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	Vendor did not specify	MNP	Vendor did not specify
Data Compression	Yes	No	Yes	No
Price/Availability				
Purchase ($)	419	349	419	Vendor did not specify
Date Of First Installation	November 1989	November 1989	November 1989	November 1988
Comments	Has 68008 co-processor & 3 serial ports	Implements CMOS integrated circuits to conserve batteries	Implements CMOS integrated circuits to conserve batteries	The XE24NP is identical to the XE24NP5 but lacks MNP

Vendor	Xecom Inc.	Xecom Inc.	Xecom Inc.	Xecom Inc.
Product	**XE24NP5**	**XE24QP**	**XE24QP5**	**XE24SE**
Hardware Configuration	Plug in	Plug in	Plug in	Plug in
Used With Microcomputers	Yes, IBM PC family	Yes, Apple Macintosh II	Yes, Apple Macintosh II	Yes, Apple Macintosh SE
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	V.22, V.22 bis, V.21, AT&T 103, 212	V.22, V.22 bis, V.21, AT&T 103,212A	V.22, V.22 bis, V.21, AT&T 103,212A	V.22, V.22 bis, V.21, AT&T 103, 212A
Communications Facility	Dial-up	Dial-up	Dial-up	Dial-up
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200, 300	1200, 300	1200, 300	1200, 300
Sychronization	Asynchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	Full duplex	Full duplex	Full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK
Terminal Interface	PC Bus	NuBus	NuBus	68000 PDS Bus
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware/software	Software only	Software only	Software only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	No	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	MNP	MNP	Vendor did not specify
Data Compression	Yes	Yes	Yes	No
Price/Availability				
Purchase ($)	349	1,499	1,799	329
Date Of First Installation	November 1989	November 1989	November 1989	November 1989
Comments	When not in use as modem, can be RS-232C-D89 port	Contains four modems and one 68008 co-processor	Contains four modems and one 68008 co-processor	Part of of Xecom's NewPort family for Apple Macintosh SE.

Vendor	Xecom Inc.	Xecom Inc.	Xecom Inc.	Xecom Inc.
Product	**XE24SE5**	**XE24ST**	**XE24ST5**	**XE24TO**
Hardware Configuration	Plug in	Plug in	Plug in	Plug in
Used With Microcomputers	Yes, Apple Macintosh SE	Yes, Apple Macintosh SE30	Yes, Apple Macintosh SE30	Yes, Toshiba T1600 laptop
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	V.22, V.22 bis, V.21, AT&T 103, 212A	V.22, V.22 bis, V.21, AT&T 103,212A	V.22, V.22 bis, V.21, AT&T 103, 212A	V.22, V.22 bis, V.21, Bell 103, 212A
Communications Facility	Dial-up	Dial-up	Dial-up	Dial-up
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200, 300	1200, 300	1200, 300	1200, 300
Sychronization	Asynchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	Full duplex	Full duplex	Full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK
Terminal Interface	68000 PDS Bus	68030 PDS Bus	68030 PDS Bus	Special
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Software only	Software only	Software only	Software only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	No	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	Vendor did not specify	MNP	Vendor did not specify
Data Compression	Yes	No	Yes	No
Price/Availability				
Purchase ($)	399	349	419	379
Date Of First Installation	November 1989	November 1989	November 1989	November 1989
Comments	For the Apple Macintosh SE; includes one (RS-422) port	Part of of Xecom's Newport family for Apple Macintosh SE30	3 RS-422 ports; built-in 68008 co-processor	Implements CMOS integrated circuits & power-down circuitry.

Vendor	Xecom Inc.	Xecom Inc.	Xecom Inc.	Xecom Inc.
Product	**XE24TO5**	**XE24ZE**	**XE24ZE5**	**XE9624CO**
Hardware Configuration	Plug in	Plug in	Plug in	Plug in
Used With Microcomputers	Yes, Toshiba T1600 laptop	Yes, Zenith SuperSport 286 laptop	Yes, Zenith SuperSport 286 laptop	Yes, Compaq 286/SLT laptop
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	V.22, V.22 bis, V.21, Bell 103, 212A	V.22, V.22 bis, V.21, Bell 103, 212A	V.22, V.22 bis, V.21, Bell 103, 212A	V.22, V.22 bis, V.29, V.21, V.27ter, Bell 103, 212A
Communications Facility	Dial-up	Dial-up	Dial-up	Dial-up
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200, 300	1200, 300	1200, 300	1200, 300
Sychronization	Asynchronous	Asynchronous	Asynchronous	Asynchronous, synchronous
Transmission Mode	Full duplex	Full duplex	Full duplex	Half duplex, full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK
Terminal Interface	Special	Special	Special	Special
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Software only	Software only	Software only	Software only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	No	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	Vendor did not specify	MNP	MNP
Data Compression	Yes	No	Yes	Yes
Price/Availability				
Purchase ($)	449	349	419	625
Date Of First Installation	November 1989	November 1989	November 1989	January 1990
Comments	Implements CMOS integrated circuits & power-down circuitry	Implements CMOS integrated circuits & power-down circuitry	Implements CMOS integrated circuits & power-down circuitry	Also supports 9600 bps Group 3 fax

Vendor	Xecom Inc.	Xecom Inc.	Xecom Inc.	Xecom Inc.
Product	**XE9624DT**	**XE9624NE**	**XE9624TO**	**XE9624ZE**
Hardware Configuration	Plug in	Plug in	Plug in	Plug in
Used With Microcomputers	Yes, IBM PC family, IBM compatibles	Yes, NEC Prospeed 286 laptop	Yes, Toshiba T1600 laptop	Yes, Zenith SuperSport 286 laptop
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	V.22, V.22 bis, V.29, V.21, V.27ter, Bell 103, 212A	V.22, V.22 bis, V.29, V.21, V.27ter, AT&T 103,212A	V.22, V.22 bis, V.29, V.21, V.27ter, Bell 103, 212A	V.22, V.22 bis, V.29, V.21, V.27ter, AT&T 103,212A
Communications Facility	Dial-up	Dial-up	Dial-up	Dial-up
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200, 300	1200, 300	1200, 300	1200, 300
Sychronization	Asynchronous, synchronous	Asynchronous, synchronous	Asynchronous, synchronous	Asynchronous, synchronous
Transmission Mode	Half duplex, full duplex	Half duplex, full duplex	Half duplex, full duplex	Half duplex, full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK
Terminal Interface	PC Bus	Special	Special	Special
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Software only	Software only	Software only	Software only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	No	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	MNP	MNP	MNP
Data Compression	Yes	Yes	Yes	Yes
Price/Availability				
Purchase ($)	525	625	625	625
Date Of First Installation	January 1990	January 1990	January 1990	January 1990
Comments	Also supports 9600 bps Group 3 fax	Also supports 9600 Bps Group III fax	Also supports 9600 bps Group 3 fax	Also supports 9600 Bps Group III fax

Vendor	Xecom Inc.	Xecom Inc.	Xecom Inc.	Xecom Inc.
Product	**XEFDMP**	**XEFDMT**	**XEFDQP**	**XEFDSE**
Hardware Configuration	Plug in	Plug in	Plug in	Plug in
Used With Microcomputers	Yes, Apple Macintosh Portable	Yes, Apple Macintosh II	Yes, Apple Macintosh II	Yes, Apple Macintosh SE
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.29, V.21, V.27ter	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.29, V.21, V.27ter	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.29, V.21, V.27ter	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.29, V.21, V.27ter
Communications Facility	Dial-up	Dial-up	Dial-up	Dial-up
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200, 300	1200, 300	1200, 300	1200, 300
Sychronization	Asynchronous, async/sync	Asynchronous, synchronous	Asynchronous, async/sync	Asynchronous, async/sync
Transmission Mode	Half duplex, full duplex	Half duplex, full duplex	Half duplex, full duplex	Half duplex, full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK
Terminal Interface	Modem slot	NuBus	NuBus	68000 PDS-Bus
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Software only	Software only	Software only	Software only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	No	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	MNP	MNP	MNP
Data Compression	Yes	Yes	Yes	Yes
Price/Availability				
Purchase ($)	699	899	2,999	799
Date Of First Installation	December 1989	December 1989	December 1989	December 1989
Comments	Also supports 9600 bps Group 3 fax	Also supports 9600 bps Group 3 fax	Also supports 9600 bps Group 3 fax	Also supports 9600 bps Group 3 fax

Vendor	Xecom Inc.	Zoom Telephonics, Inc.	Zoom Telephonics, Inc.	Zoom Telephonics, Inc.
Product	**XEFDST**	**Zoom/Modem HC2400R**	**Zoom/Modem HC2400S with Sendfax**	**Zoom/Modem MX2400R**
Hardware Configuration	Plug in	Plug in	Plug in	Standalone
Used With Microcomputers	Yes, Apple Macintosh SE30	Yes, IBM PC family	Yes, IBM PC family	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, Amiga, any computer with serial port
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.29, V.21, V.27ter	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, Group 3 facsimile transmission	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up	Dial-up	Dial-up	Dial-up
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200, 300	1200, 300	1200, 300	1200, 300
Sychronization	Asynchronous, async/sync	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	Half duplex, full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Multipoint	Multipoint	Multipoint
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK	FSK, QAM, PSK, DPSK	FSK, QAM, PSK, DPSK	FSK, QAM, PSK, DPSK
Terminal Interface	68030 PDS bus	PC Bus	PC Bus	RS-232-C
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Software only	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	No	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	CRC, xmodem, MNP, Kermit	CRC, xmodem, MNP, Kermit	CRC, xmodem, MNP, Kermit
Data Compression	Yes	No	No	No
Price/Availability				
Purchase ($)	899	199	199	199
Date Of First Installation	December 1989	1987	January 1990	1988
Comments	Also supports 9600 Bps Group III fax	Rockwell-based modem with non-volatile RAM; seven-year warranty	Hayes-compatible; can send files to a Group 3 facsimile at 4800 bps	Rockwell-based modem with non-volatile RAM; seven-year warranty.

Vendor	Adaptive Computer Technologies	ATI Technologies Inc.	Barr Systems, Inc.	Barr Systems, Inc.
Product	**ACT 154**	**9600 etc/e External Modem**	**PC-SYNC 208AB**	**PC-SYNC 9600**
Hardware Configuration	Standalone	Standalone	Plug in	Plug in
Used With Microcomputers	Yes, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2, models 25 & 30	Yes, IBM PC family, IBM PS/2, models 25 & 30
Hayes AT Command Set Compatible	Yes	Vendor did not specify	No	No
Compatibility	AT&T 103/113, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32, V.42 with LAP-M	Bell 208AB	V.29, UDS 9600B
Communications Facility	Dial-up	Dial-up/leased	Dial-up	Dial-up
Maximum Data Rate (bps)	9600	9600	4800	9600
Fallback Speed (bps)	2400, 1200, 300	2400, 1200, 300	Vendor did not specify	Vendor did not specify
Sychronization	Vendor did not specify	Async/sync	Synchronous	Synchronous
Transmission Mode	Vendor did not specify	Half/full duplex	Half/full duplex	Half duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK, DPSK	QAM	DPSK	QAM
Terminal Interface	RS-232-C	RS-232-C	PC Bus	PC Bus
Line Interface	Two-wire	Two-wire	Two-/four-wire	Two-wire
Setup	Software only	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Fixed compromise	Automatic adaptive	Vendor did not specify	Vendor did not specify
Protocol/Error	Proprietary	MNP, V.42 including LAP-M	CRC	CRC
Data Compression	Yes	Yes	Yes	Yes
Price/Availability				
Purchase ($)	695	799	1,990	2,490
Date Of First Installation	Vendor did not specify	March 1990	1986	1986
Comments	—	Features front panel push button commands for auto answer, redial, sync/async	2,190 with RJE + 3270	2,790 with RJE + 3270

Vendor	Barr Systems, Inc.	Barr Systems, Inc.	Barr Systems, Inc.	BCH Equipment Corp.
Product	**PC-SYNC V.32**	**PC-SYNC/2 208/201**	**PC-SYNC/2 V.32**	**48/208 AB Model 1**
Hardware Configuration	Plug in	Plug in	Plug in	Standalone, rackmount
Used With Microcomputers	Yes, IBM PC family, IBM PS/2, models 25 & 30	Yes, IBM PS/2, MCA	Yes, IBM PS/2, MCA	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	No	No	No	No
Compatibility	V.22, V.32	Bell 208B; 201C	V.22, V.32	AT&T 208
Communications Facility	Dial-up/leased	Dial-up	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	9600	4800	9600	4800
Fallback Speed (bps)	4800, 2400	Vendor did not specify	4800, 2400	2400
Sychronization	Async/sync	Synchronous	Async/sync	Synchronous
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	QAM	DPSK	QAM	DPSK
Terminal Interface	PC Bus	PS/2 Micro Channel	PS/2 Micro Channel	RS-232-C
Line Interface	Two-/four-wire	Two-/four-wire	Two-/four-wire	Two-/four-wire
Setup	Hardware/software	Software only	Software only	Hardware only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Vendor did not specify	Vendor did not specify	Automatic adaptive
Protocol/Error	CRC	CRC	CRC	Vendor did not specify
Data Compression	Yes	Yes	Yes	No
Price/Availability				
Purchase ($)	2,490	1,990	2,490	795
Date Of First Installation	1986	1989	1989	1985
Comments	2,790 with RJE + 3270	2,190 with RJE + 3270	2,790 with RJE + 3270	—

Vendor	BCH Equipment Corp.	BCH Equipment Corp.	BCH Equipment Corp.	BCH Equipment Corp.
Product	**48/208A Model 3**	**48/V.27 Model 4**	**9600 FP**	**9600/V.29**
Hardware Configuration	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	No	No	No	No
Compatibility	AT&T 208 and 201C	V.27	V.29	V.29
Communications Facility	Dial-up/leased	Leased lines	Leased lines	Leased lines
Maximum Data Rate (bps)	4800	4800	9600	9600
Fallback Speed (bps)	2400	2400	7200, 4800	7200, 4800
Sychronization	Synchronous	Synchronous	Synchronous	Synchronous
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point, multipoint	Multipoint	Point-to-point
Line Conditioning	None	None	None	None
Modulation	DPSK	DPSK	QAM	QAM
Terminal Interface	RS-232-C	RS-232-C	RS-232-C	RS-232-C
Line Interface	Two-/four-wire	Four-wire	Four-wire	Four-wire
Setup	Hardware only	Hardware only	Hardware only	Hardware only
Auto Answer/Dial	Yes	No	No	No
Alternate Voice/Data	Yes	Yes	No	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	950	895	1,250-FPM; 1,095-FPS	995
Date Of First Installation	1985	1985	1985	1985
Comments	—	—	—	—

Vendor	BT Datacom, Inc.	Cermetek Microelectronics, Inc.	Comspec Digital Products, Inc.	CXR Telcom/Anderson Jacobson
Product	**Datel 4962TCX**	**Spectrum 9600**	**9600 C**	**AJ 9641-1**
Hardware Configuration	Standalone, plug in, rack	Standalone	Standalone, rackmount	Standalone, rackmount
Used With Microcomputers	Yes	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, IBM PC family	Yes, IBM PC family
Hayes AT Command Set Compatible	No	Yes	No	No
Compatibility	V.29, V.29, V.32	V.22 bis, V.32	V.29	V.29
Communications Facility	Dial-up/leased, two-wire leased lines	Dial-up, dial-up/leased, leased lines	Dial-up, dial-up/leased, leased lines	Leased lines
Maximum Data Rate (bps)	9.6K	9600 (full duplex)	9600	9600
Fallback Speed (bps)	7200, 4800	4800	7200, 4800, 2400	7200, 4800
Sychronization	Async/sync	Async/sync	Synchronous	Async/sync
Transmission Mode	Vendor did not specify	Vendor did not specify	Half/full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point, multipoint
Line Conditioning	None	D2	None	None
Modulation	QAM, Trellis coding	QAM, DPSK	QAM, DPSK	QAM
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.24	RS-232-C	RS-232-C, V.24
Line Interface	Two-/four-wire	Two-/four-wire	Two-/four-wire	Four-wire
Setup	Hardware/software	Hardware/software	Software only	Vendor did not specify
Auto Answer/Dial	Yes	Yes	Yes	No
Alternate Voice/Data	Yes	Yes	Yes	No
Equalization	Fixed compromise, automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Not applicable	MNP	Vendor did not specify	Vendor did not specify
Data Compression	No	Yes	No	No
Price/Availability				
Purchase ($)	Vendor did not specify	995	3,495	1,295
Date Of First Installation	April 1986	No	1984	1987
Comments	Parallel dial 801C option available; TDM, STDM, PAD	—	Additional diagnostics; end to end BERT line loss, round trip delay	—

Vendor	CXR Telcom/Anderson Jacobson	CXR Telcom/Anderson Jacobson	CXR Telcom/Anderson Jacobson	CXR Telcom/Anderson Jacobson
Product	**AJ 9641-1D**	**AJ 9641-1F**	**AJ 9641-1FD**	**AJ 9651-1MV**
Hardware Configuration	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount
Used With Microcomputers	Yes, IBM PC family	Yes, IBM PC family	Yes, IBM PC family	Yes, Apple II family, Apple Macintosh, IBM PC family
Hayes AT Command Set Compatible	No	No	No	Yes
Compatibility	V.29	V.29	V.29	V.22, V.22 bis, AT&T 212/212A, V.32
Communications Facility	Dial-up/leased, w/unatt-ended automatic dial back-up	Leased lines	Dial-up/leased, w/unatt-ended automatic dial back-up	Dial-up/leased, w/unatt-ended automatic dial back-up
Maximum Data Rate (bps)	9600	9600	9600	9600
Fallback Speed (bps)	7200, 4800	7200, 4800	7200, 4800	4800
Sychronization	Async/sync	Async/sync	Async/sync	Async/sync
Transmission Mode	Full duplex	Full duplex	Full duplex	Half/full duplex
Configuration	Point-to-point, multipoint	Point-to-point, multipoint	Point-to-point, multipoint	Point-to-point
Line Conditioning	None	None	None	None
Modulation	QAM	QAM	QAM	QAM, Trellis coding, DPSK
Terminal Interface	RS-232-C, V.24	RS-232-C, V.24	RS-232-C, V.24	RS-232-C, V.24
Line Interface	Two-/four-wire	Four-wire	Two-/four-wire	Two-/four-wire
Setup	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Auto Answer/Dial	Yes	No	Yes	Yes
Alternate Voice/Data	No	No	No	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	MNP
Data Compression	No	No	No	Yes
Price/Availability				
Purchase ($)	1,595	1,595	1,895	1,545
Date Of First Installation	1987	1987	1987	1988
Comments	Setup features; switches and softstraps	Multipoint fast poll; 23ms operation, setup features; switches and softstraps	—	Clock/calendar control of dial back-up/setup features; data compression

Vendor	CXR Telcom/Anderson Jacobson	Data Race	Data Race	Develcon Electronics Ltd.
Product	**AJ 9651-2MV**	**Action 32**	**PC Race 24/48**	**Alliance V.32 - 9600**
Hardware Configuration	Standalone, rackmount	Standalone, rackmount	Plug in	Standalone, rackmount
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, IBM PC family	Yes, all
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	V.22, V.22 bis, AT&T 212/212A, V.32	V.22, V.22 bis, AT&T 212/212A, CCITT V.32	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, AT&T 201C, AT&T 208B	V.22, V.22 bis, CCITT V.32, Bell 212A, 103
Communications Facility	Dial-up	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	9600	9600	4800	9600
Fallback Speed (bps)	4800	7200/4800/2400/1200	2400, 1200	4800/2400/1200/300
Sychronization	Async/sync	Async/sync, Hayes AutoSync	Async/sync, Hayes AutoSync	Async/sync
Transmission Mode	Half/full duplex	Full duplex	Half/full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point, multipoint
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, Trellis coding	FSK, PSK, Trellis coding	FSK, PSK	FSK, QAM, Trellis coding, DPSK
Terminal Interface	RS-232-C, V.24	RS-232-C	PC Bus	RS-232-C, V.28, V.24
Line Interface	Two-wire	Two-/four-wire	Two-wire	Two-/four-wire
Setup	Vendor did not specify	Hardware/software	Hardware/software	Hardware only
Auto Answer/Dial	Yes	Yes	Vendor did not specify	Yes
Alternate Voice/Data	Yes	No	No	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Fixed compromise, automatic adaptive
Protocol/Error	MNP	MNP	MNP	MNP
Data Compression	No	Vendor did not specify	Vendor did not specify	Yes
Price/Availability				
Purchase ($)	1,395	1,295	1,195	Contact vendor
Date Of First Installation	1988	July 1989	November 1988	Vendor did not specify
Comments	Setup features; switches + softstraps, data compression; MNP 5	—	Unit has Hayes autosync for use with SNA and bisync remote packages	—

Vendor	Develcon Electronics Ltd.	Develcon Electronics Ltd.	Develcon Electronics Ltd.	Develcon Electronics Ltd.
Product	**M1915EZ**	**M1915L**	**M1921EZ**	**M1921L**
Hardware Configuration	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount
Used With Microcomputers	Yes, all	Yes, all	Yes, all	Yes, all
Hayes AT Command Set Compatible	No	No	No	No
Compatibility	CCITT V.27 bis	CCITT V.27	V.29	V.29
Communications Facility	Leased lines	Leased lines	Leased lines	Leased lines
Maximum Data Rate (bps)	4800	4800	9600	9600
Fallback Speed (bps)	2400	2400	7200, 4800	7200, 4800
Sychronization	Synchronous	Synchronous	Synchronous	Synchronous
Transmission Mode	Full duplex	Full duplex	Full duplex	Full duplex
Configuration	Point-to-point, multipoint	Point-to-point, multipoint	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	PSK	PSK	QAM	QAM
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
Line Interface	Four-wire	Four-wire	Four-wire	Four-wire
Setup	Hardware only	Hardware only	Hardware only	Hardware only
Auto Answer/Dial	No	No	No	No
Alternate Voice/Data	No	No	No	No
Equalization	Fixed compromise, automatic adaptive, fixed line	Automatic adaptive	Fixed compromise, automatic adaptive, fixed line	Automatic adaptive
Protocol/Error	ARQ	ARQ	ARQ	ARQ
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	—	Optional 4-port internal TDM multiplexer

Vendor	Develcon Electronics Ltd.	Develcon Electronics Ltd.	E-Tech Research	E-Tech Research
Product	**M1923L**	**M1924EZ**	**BulletModem E2400M**	**BulletModem PC2400MH**
Hardware Configuration	Standalone, rackmount	Standalone, rackmount	Standalone	Plug in
Used With Microcomputers	Yes, all	Yes, all	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all computers	Yes, IBM PC family
Hayes AT Command Set Compatible	No	No	Yes	Yes
Compatibility	V.29	V.29	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.23	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21
Communications Facility	Leased lines	Leased lines	Dial-up/leased	Dial-up
Maximum Data Rate (bps)	9600	9600	9000	9000
Fallback Speed (bps)	7200, 4800	7200, 4800	2400, 1200, 300	2400, 1200, 300
Sychronization	Synchronous	Synchronous	Async/sync	Async/sync
Transmission Mode	Full duplex	Full duplex	Full duplex	Full duplex
Configuration	Point-to-point	Point-to-point, multipoint	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	QAM	QAM	FSK, QAM, PSK	FSK, QAM, PSK, Trellis coding
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C	PC Bus
Line Interface	Four-wire	Four-wire	Two-/four-wire	Vendor did not specify
Setup	Hardware only	Hardware only	Software only	Software only
Auto Answer/Dial	No	No	Yes	Yes
Alternate Voice/Data	No	No	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive, fixed line	Automatic adaptive	Automatic adaptive
Protocol/Error	ARQ	ARQ	MNP	MNP
Data Compression	No	No	Yes	Yes
Price/Availability				
Purchase ($)	Contact vendor	Contact vendor	395	295
Date Of First Installation	Vendor did not specify	Vendor did not specify	December 1987	January 1988
Comments	—	—	Remote configuration	—

Vendor	Emerald Technology	Fastcomm Data Corporation	Fastcomm Data Corporation	Fastcomm Data Corporation
Product	**208 A/B**	**FDX 2448**	**FDX 9624**	**FDX 9696**
Hardware Configuration	Standalone	Standalone, rack, leased lines	Standalone, rackmount	Standalone, plug in, rack
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any	Yes, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	No	Yes	Yes	Yes
Compatibility	Bell system 208 A/B	V.22, V.22 bis, AT&T 212/212A, V.21, AT&T 103	AT&T 103/113, V.22, V.22 bis, CCITT V.32, AT&T 212A	CCITT V.32, AT&T 103, 212A
Communications Facility	Dial-up/leased, 2 wire half duplex, 2-/4-wire full	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	4800	4800	9600	9600
Fallback Speed (bps)	None	2400, 1200, 300	4800/2400/1200/300	7200/4800/2400/1200/300
Sychronization	Synchronous	Async/sync	Asynchronous	Async/sync (card); async
Transmission Mode	Half/full duplex	Full duplex	Full duplex	Full duplex
Configuration	Point-to-point, multipoint	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	Eight Phase DPSK	FSK, QAM, PSK, DPSK	FSK, QAM, PSK, Trellis coding, DPSK	FSK, QAM, PSK, Trellis coding, DPSK
Terminal Interface	RS-232-C, V.24	RS-232-C	RS-232-C	RS-232-C
Line Interface	Two-/four-wire	Two-/four-wire	Two-/four-wire	Two-/four-wire
Setup	Hardware only	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Vendor did not specify	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Fixed compromise, automatic adaptive	Fixed compromise, automatic adaptive
Protocol/Error	Vendor did not specify	MNP	MNP	MNP
Data Compression	No	Yes	Yes	Yes
Price/Availability				
Purchase ($)	1,295	649	899	999; RMV 1,299
Date Of First Installation	1986	November 1985	May 1988	December 1988
Comments	Has auto answer but no auto dial	Compatibility, MNP 4 & 5, password security	—	—

Vendor	Gandalf Data, Inc.	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.
Product	**Access Series V.32 ENH**	**DataComm 14433**	**DataComm 208B+/SD**	**DataComm 208B/A**
Hardware Configuration	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount
Used With Microcomputers	Yes	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	No	No	No
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32	V.29, V.33	208, V.25bis	208
Communications Facility	Dial-up/leased	Leased lines	Dial-up	Dial-up/leased
Maximum Data Rate (bps)	9600	14.4K	4800	4800
Fallback Speed (bps)	300, 1200, 2400, 4800	12K, 9600	Not applicable	Vendor did not specify
Sychronization	Async/sync	Synchronous	Synchronous	Synchronous
Transmission Mode	Per international specs.	Half/full duplex	Vendor did not specify	Half/full duplex
Configuration	Point-to-point	Vendor did not specify	Point-to-point	Point-to-point, multipoint/drop
Line Conditioning	Not required	D1, or M1020	None	None
Modulation	QAM	QAM	DPSK	DPSK
Terminal Interface	RS-232-C, V.28/V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
Line Interface	Two-wire, four-wire	Four-wire	Two-wire	Two-/four-wire
Setup	Vendor did not specify	Hardware only	Hardware/software	Hardware only
Auto Answer/Dial	Yes	No	Yes	Yes
Alternate Voice/Data	Yes	No	Yes	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	Trellis	Vendor did not specify	Vendor did not specify
Data Compression	Vendor did not specify	No	No	No
Price/Availability				
Purchase ($)	1,145	2,295	1,295	1,345
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	Setup; Command driver	—	—	—

Vendor	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.
Product	**DataComm 296B**	**DataComm 4800**	**DataComm 4827**	**DataComm 596**
Hardware Configuration	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	No	No	Yes
Compatibility	V.32	208	V.27	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32, V.25bis async/sync
Communications Facility	Dial network and leased lines	Leased lines	Leased lines	Dial-up/leased
Maximum Data Rate (bps)	9600	4800	4800	9600
Fallback Speed (bps)	4800	2400	2400	4800, 2400, 1200, 300
Sychronization	Async/sync	Async/sync	Async/sync	Async/sync
Transmission Mode	Vendor did not specify	Half/full duplex	Half/full duplex	Full duplex
Configuration	Point-to-point	Point-to-point, multipoint/drop,	Point-to-point, multipoint/drop	Point-to-point
Line Conditioning	D1	None	None	D1
Modulation	QAM, Trellis coding	DPSK, (8-level)	DPSK, (8-level)	Vendor did not specify
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
Line Interface	Two-/four-wire	Two-/four-wire	Two-/four-wire	Two-/four-wire
Setup	Hardware/software	Hardware only	Hardware only	Hardware/software
Auto Answer/Dial	Yes	No	No	Yes
Alternate Voice/Data	Yes	No	No	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP, Trellis, X.25, V.42bis	Vendor did not specify	Vendor did not specify	MNP, V.42, V.42bis, Trellis
Data Compression	Yes	No	No	Yes
Price/Availability				
Purchase ($)	1,495	1,145	1,145	1,395
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	Password, callback, automatic dial back-up and leased line loopback	16 datasets mount in a 10 1/2 shelf	DATA commonality - 16 datasets to shelf	Extensive diagnostics; self test, digital/analog/remote digital loopback

Vendor	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.
Product	**DataComm 9600RP**	**DataComm 9600RPA**	**DataComm 9600SP**	**DataComm 9600SPA**
Hardware Configuration	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	No	No	No	No
Compatibility	V.29	V.29	V.29	V.29
Communications Facility	Leased lines	Leased lines	Leased lines	Leased lines
Maximum Data Rate (bps)	9600	9600	9600	9600
Fallback Speed (bps)	7200, 4800	7200, 4800	7200, 4800	7200, 4800
Sychronization	Synchronous	Async/sync	Synchronous	Async/sync
Transmission Mode	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Configuration	Point-to-point, multipoint	Point-to-point, multipoint/drop	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	QAM	QAM	QAM	QAM
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
Line Interface	Four-wire	Four-wire	Four-wire	Four-wire
Setup	Hardware only	Hardware only	Hardware only	Hardware only
Auto Answer/Dial	No	No	No	No
Alternate Voice/Data	No	No	No	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	1,745	1,995	1,465	1,575
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	Up to 16 datasets in a single 10 1/2" rack	19.5 ms rapid poll; up to 16 datasets in a single 10 1/2 rack	16 units per rack	16 units per rack

Vendor	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.
Product	**DeskTop 208**	**DeskTop 596**	**DeskTop 9600**	**Desktop 9600RPA**
Hardware Configuration	Standalone	Standalone	Standalone	Standalone
Used With Microcomputers	Yes, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	No	Yes	No	No
Compatibility	208	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32, V.25bis async/sync	V.29	V.29
Communications Facility	Leased lines	Dial-up/leased	Leased lines	Leased lines
Maximum Data Rate (bps)	4800	9600	9600	9600
Fallback Speed (bps)	Vendor did not specify	4800, 2400, 1200, 300	7200, 4800	7200, 4800
Sychronization	Synchronous	Async/sync	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Full duplex	Half/full duplex	Vendor did not specify
Configuration	Point-to-point, multipoint/drop	Point-to-point	Point-to-point	Point-to-point, multipoint
Line Conditioning	None	D1	None	None
Modulation	DPSK	Vendor did not specify	QAM	QAM
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
Line Interface	Two-/four-wire	Two-wire	Four-wire	Four-wire
Setup	Hardware only	Hardware/software	Hardware only	Hardware only
Auto Answer/Dial	Yes	Yes	No	No
Alternate Voice/Data	Yes	Yes	No	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	MNP, V.42, V.42bis, Trellis	Vendor did not specify	Vendor did not specify
Data Compression	No	Yes	No	No
Price/Availability				
Purchase ($)	1,095	1,075	1,095	1,595
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	Extensive diagnostics; simplified configuration; office enclosure	Extensive diagnostics; self test, digital/analog/remote digital loopback	Small desktop case	19.5m Sec. rapid poll

Vendor	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.
Product	**Diagnostic Modem NMS 4800**	**Diagnostic Modem NMS 9600**	**Diagnostic Modem NMS 9604A**	**Diagnostic Modem NMS 9644**
Hardware Configuration	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount
Used With Microcomputers	Yes, NMC 30B laptop computer (MS/Dos based)	Yes, NMC 30B laptop computer (MS/Dos based)	Yes, NMC 30B laptop computer (MS/DOS-based)	Yes, NMC 30B laptop computer (MS/DOS-based)
Hayes AT Command Set Compatible	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Compatibility	Bell 208	V.29	V.29	V.29
Communications Facility	Leased lines	Leased lines	Leased lines	Leased lines
Maximum Data Rate (bps)	4800	9600	9600	9600
Fallback Speed (bps)	2400	7200, 4800	7200, 4800	Vendor did not specify
Sychronization	Async/sync	Async/sync	Async/sync	Async/sync
Transmission Mode	Full duplex	Full duplex	Full duplex	Half/full duplex
Configuration	Point-to-point, multipoint	Point-to-point, multipoint	Point-to-point	Point-to-point, multipoint
Line Conditioning	Vendor did not specify	None	None	None
Modulation	V.27 at 2400 bps	QAM	QAM	QAM
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
Line Interface	Four-wire	Four-wire	Four-wire	Four-wire
Setup	Software only	Software only	Software only	Software only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	No	No
Equalization	Automatic adaptive, adjustable compromise ACE	Automatic adaptive, adjustable compromise ACE	Automatic adaptive, adjustable compromise ACE	Automatic adaptive, adjustable compromise ACE
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Price/Availability				
Purchase ($)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date Of First Installation	March 1986	January 1986	April 1988	September 1988
Comments	Controlled/configured via GDC Netcon NMS; line & business int. measurements	Controlled/configured via GDC Netcon NMS; line & business int. measurements	Controlled/configured via GDC Netcon NMS; line & business int. measurements	Controlled/configured via GDC Netcon NMS; line & business int. measurements

Vendor	General DataComm, Inc.	Hayes Microcomputer Products, Inc.	Hayes Microcomputer Products, Inc.	Hayes Microcomputer Products, Inc.
Product	**Multiport 9600**	**Smartmodem 9600**	**V-Series Smartmodem 9600 X.25 or V.42**	**V-Series Smartmodem 9600B V.42/X.25**
Hardware Configuration	Standalone, rackmount	Standalone	Standalone	Plug In
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, IBM PC family
Hayes AT Command Set Compatible	No	Yes	Yes	Yes
Compatibility	V.29	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, Hayes 9600 "Ping Pong
Communications Facility	Leased lines	Dial-up/leased	Dial-up	Dial-up
Maximum Data Rate (bps)	9600	9600	9600	9600
Fallback Speed (bps)	7200, 4800	4800/2400/1200/300	4800/2400/1200/300	4800/2400/1200/300
Sychronization	Async/sync	Async/sync, Hayes AutoSync	Async/sync, Hgayes AutoSync	Async/sync, Hayes AutoSync
Transmission Mode	Vendor did not specify	Full duplex	Half/full duplex	Half/full duplex
Configuration	Vendor did not specify	Point-to-point	Point-to-point, multipoint	Point-to-point, multipoint
Line Conditioning	None	None	None	None
Modulation	QAM	FSK, QAM, Trellis coding, DPSK	FSK, QAM, Trellis coding, DPSK	FSK, QAM, Trellis coding, DPSK
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.24, PC Bus	RS-232-C, V.24	PC Bus
Line Interface	Four-wire	Two-/four-wire	Two-wire	Two-wire
Setup	Hardware/software	Hardware/software	Software only	Software only
Auto Answer/Dial	No	Yes	Yes	Yes
Alternate Voice/Data	No	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	MNP, V.42, LAPB	MNP, V.42, LAPB
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	2,495	1,999	999	779
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	Integral 4 channel mux	AutoSync switches from async to sync without a sync adapter	AutoSync switches from async to sync without a sync adapter	AutoSync switches from async to sync without a sync adapter

Vendor	Hayes Microcomputer Products, Inc.	Inmac	Inmac	Inmac
Product	**V-Series Ultra Smartmodem 9600**	**Clear Signal V.32 Modem 8042-8**	**Clear Signal V.32 Modem 8042-9**	**Standard V.32 Modem 804210**
Hardware Configuration	Standalone	Standalone	Rackmount	Standalone
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	Yes	Yes	Vendor did not specify
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.32/23, Hayes 9600	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, CCITT V.32 2400 bps	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	V.22, V.22 bis, AT&T 212/212A, V.32, V.34 test mode
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	9600	9600	9600	9600
Fallback Speed (bps)	4800/2400/1200/300	4800, 2400, 1200, 300	300	1200
Sychronization	Async/sync, Hayes AutoSync	Async/sync	Async/sync	Async/sync
Transmission Mode	Full duplex	Half/full duplex	Half/full duplex	Full duplex
Configuration	Point-to-point, multipoint	Point-to-point	Point-to-point	Vendor did not specify
Line Conditioning	None	None	None	Vendor did not specify
Modulation	FSK, QAM, Trellis coding, DPSK	FSK, QAM, PSK	FSK, QAM, PSK	QAM, QPSK
Terminal Interface	RS-232-C, V.24	RS-232-C	RS-232-C	RS-232-C, V.24
Line Interface	Two-wire	Two-/four-wire	Two-/four-wire	Two-wire
Setup	Software only	Hardware/software	Hardware/software	Software only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP, V.24bis, LAPB	MNP	MNP	MNP
Data Compression	No	Yes	Yes	Yes
Price/Availability				
Purchase ($)	1,199	1,295	1,265	795
Date Of First Installation	Vendor did not specify	January 1989	January 1989	January 1990
Comments	AutoSync switches from async to sync without a sync adapter	—	—	—

Vendor	Inmac	Memotec	Memotec	Microcom
Product	**Standard V.32 Modem 804220**	**DialAccess 296**	**V.32 Trellis**	**2400c**
Hardware Configuration	Plug in	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount
Used With Microcomputers	Yes, IBM PC family	Yes, Apple II family, Apple Macintosh, IBM PC family	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	V.22, AT&T 212/212A, V.32, V.34 test mode	V.22, V.22 bis, AT&T 212/212A, V.32	V.32	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	9600	9600	9600	4800
Fallback Speed (bps)	1200	4800, 2400, 1200	4800	2400, 1200, 300
Sychronization	Async/sync	Async/sync	Async/sync	Asynchronous
Transmission Mode	Full duplex	Full duplex	Full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	QAM, QPSK	QAM, Trellis coding	QAM, Trellis coding	FSK, QAM, PSK, DPSK
Terminal Interface	RS-232-C, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C
Line Interface	Two-wire	Two-/four-wire	Two-/four-wire	Two-wire
Setup	Software only	Software only	Software only	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	MNP	Vendor did not specify	MNP
Data Compression	Yes	Yes	No	Yes
Price/Availability				
Purchase ($)	795	1,195	695 standalone/rackmount	599
Date Of First Installation	January 1990	1986	1986	Vendor did not specify
Comments	—	Off-the-shelf	Off-the-shelf	RJ45 - MI/MIC support; data commpression; MNP 5; HP ENQ/ACK hardware support

Vendor	Microcom	MicroGate Corp.	MicroGate Corp.	MicroGate Corp.
Product	**24Ltc**	**SLAM/32**	**SyncLink 4822**	**SyncLink 4824**
Hardware Configuration	Plug in	Plug in	Plug in	Plug in
Used With Microcomputers	Yes, Zenith, Compaq, NEC, Toshiba laptops	Yes, IBM PS/2	Yes, IBM PC family	Yes, IBM PC family
Hayes AT Command Set Compatible	Yes	Vendor did not specify	Vendor did not specify	No
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	CCITT V.32	V.22, V.22 bis, Bell 201,208,212A,103	Bell AT&T 201 & 208
Communications Facility	Dial-up/leased	Dial-up, dial-up/leased, leased lines	Dial-up, dial-up/leased, leased lines	Dial-up, dial-up/leased, leased lines
Maximum Data Rate (bps)	4800	9600	4800	4800
Fallback Speed (bps)	2400, 1200, 300	Vendor did not specify	2400, 1200, 300	2400
Sychronization	Asynchronous	Synchronous	Async/sync	Synchronous
Transmission Mode	Full duplex	Full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Vendor did not specify	Vendor did not specify
Line Conditioning	None	Vendor did not specify	Vendor did not specify	Vendor did not specify
Modulation	FSK, QAM, PSK, DPSK	Trellis coding	PSK, DPSK	DPSK
Terminal Interface	PC Bus	PS/2 Micro Channel	PC Bus	PC Bus
Line Interface	Two-wire	Two-wire	Two-/four-wire	Two-/four-wire
Setup	Software only	Software only	Vendor did not specify	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	Yes	Vendor did not specify	Vendor did not specify
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	CRC	CRC	CRC
Data Compression	Yes	Vendor did not specify	Vendor did not specify	Vendor did not specify
Price/Availability				
Purchase ($)	599	1,595	1,175	1,040
Date Of First Installation	Vendor did not specify	New product	New product	New product
Comments	Data commpression; MNP 5	Card; half-size compatable with IBM multiprotocol adapter/A	Runs Microgate sync. software and 3rd party async. software.	Runs Microgate sync software, including 3780 and 3270 emulation

Vendor	MicroGate Corp.	Mitsuba Corp.	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.
Product	**SyncLink 4824/2**	**SM-96M**	**MT224EH7**	**MT224EM7**
Hardware Configuration	Plug in	Standalone	Standalone	Standalone
Used With Microcomputers	Yes, IBM PS/2, with Micro Channel Architecture	Yes, IBM PC family, IBM PS/2	Yes, Apple Macintosh, IBM PC family, IBM PS/2, any computer with RS-232 interface	Yes, Apple Macintosh
Hayes AT Command Set Compatible	Vendor did not specify	Yes	Yes	Yes
Compatibility	Vendor did not specify	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.25bis, V.42	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.42
Communications Facility	Dial-up, dial-up/leased, leased lines	Dial-up	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	4800	9600	7200 with data compression	7200 with data compression
Fallback Speed (bps)	2400	4800, 2400, 1200, 300	2400	2400
Sychronization	Synchronous	Async/sync	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Full duplex	Half/full duplex
Configuration	Vendor did not specify	Vendor did not specify	Point-to-point	Point-to-point
Line Conditioning	Vendor did not specify	Vendor did not specify	None	None
Modulation	Vendor did not specify	FSK, QAM, Trellis coding, DPSK	FSK, QAM, PSK	FSK, QAM, PSK
Terminal Interface	PS/2 Micro Channel	RS-232-C	RS-232-C	RS-232-C, & RS-422
Line Interface	Two-/four-wire	Two-/four-wire	Two-wire	Two-wire
Setup	Hardware/software	Software only	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Vendor did not specify	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	CRC	MNP	X/Ymodem, MNP, Kermit	X/Ymodem, MNP, Kermit
Data Compression	Vendor did not specify	Yes	Yes	Yes
Price/Availability				
Purchase ($)	1,085	Contact vendor	649	649
Date Of First Installation	New product	Vendor did not specify	May 1989	Vendor did not specify
Comments	Runs Microgate sync software including 3780 and 3270 emulation	—	Also supports remote configuration	MNP levels 5 and 7; V.25bis dialing and remote configuration

Vendor	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.
Product	**MT932ER**	**MultiModem 696E**	**MultiModem V.29**	**MultiModem V.32**
Hardware Configuration	Rackmount	Standalone	Standalone	Standalone
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.32/V.23	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	V.29, V.27	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.32/V.23
Communications Facility	Dial-up/leased	Dial-up/leased	Leased lines	Dial-up/leased
Maximum Data Rate (bps)	9600	9600	9600	9600
Fallback Speed (bps)	4800	Not applicable	Not applicable	4800
Sychronization	Async/sync	Async/sync	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK, TCM	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK, TCM
Terminal Interface	RS-232-C	RS-232-C	RS-232-C	RS-232-C
Line Interface	Two-wire	Two-wire	Four-wire	Two-wire
Setup	Hardware only	Hardware only	Hardware only	Hardware only
Auto Answer/Dial	Yes	Yes	No	Yes
Alternate Voice/Data	No	No	No	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	MNP	Vendor did not specify	MNP
Data Compression	Yes	Yes	No	Yes
Price/Availability				
Purchase ($)	1.050	795	1,395	1,195
Date Of First Installation	January 1989	1988	1987	1988
Comments	—	Data compression; MNP 6	—	Data compression; MNP Class 5

Vendor	NEC America, Inc.	NEC America, Inc.	NEC America, Inc.	NEC America, Inc.
Product	**DSP4800III**	**DSP4800RIII**	**DSP9600 MII**	**DSP9600III**
Hardware Configuration	Standalone, rackmount	Standalone, rackmount	Standalone	Standalone, rackmount
Used With Microcomputers	Yes, IBM PC family	Yes, IBM PC family	Yes, IBM PC family	Yes, IBM PC family
Hayes AT Command Set Compatible	No	No	No	No
Compatibility	V.27	Vendor did not specify	V.29	V.29
Communications Facility	Leased lines	Leased lines	Leased lines	Leased lines
Maximum Data Rate (bps)	4800	4800	9600	9600
Fallback Speed (bps)	2400	2400	4800, 7200	4800, 7200
Sychronization	Synchronous	Synchronous	Synchronous	Synchronous
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point, multipoint	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	PSK	PSK	QAM	QAM
Terminal Interface	RS-232-C, V.28	RS-232-C, V.28, V.24	RS-232-C, V.28	RS-232-C, V.28
Line Interface	Two-/four-wire	Two-/four-wire	Two-/four-wire	Two-/four-wire
Setup	Hardware only	Hardware only	Hardware only	Hardware only
Auto Answer/Dial	No	No	No	No
Alternate Voice/Data	No	No	No	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	—	—

Vendor	NEC America, Inc.	NEC America, Inc.	NEC America, Inc.	NEC America, Inc.
Product	**DSP9600RC**	**DSP9600RIII**	**DSP9601**	**DSP9630**
Hardware Configuration	Standalone, rackmount	Standalone	Rackmount	Standalone, rackmount
Used With Microcomputers	Yes, IBM PC family	Yes, IBM PC family	Yes, IBM PC family	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all serial ports
Hayes AT Command Set Compatible	Vendor did not specify	No	No	Yes
Compatibility	Vendor did not specify	Vendor did not specify	V.29	V.32
Communications Facility	Leased lines	Leased lines	Leased lines	Dial-up/leased
Maximum Data Rate (bps)	9600	9600	9600	9600
Fallback Speed (bps)	2400, 4800, 7200	7200, 4800	4800, 7200	4800
Sychronization	Synchronous	Synchronous	Synchronous	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Vendor did not specify
Configuration	Point-to-point	Point-to-point, multipoint	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	QAM	QAM	QAM	Trellis coding
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28	RS-232-C, V.28, V.24
Line Interface	Two-/four-wire	Two-/four-wire	Two-/four-wire	Two-/four-wire
Setup	Hardware only	Hardware only	Hardware only	Hardware/software
Auto Answer/Dial	No	No	No	Yes
Alternate Voice/Data	No	No	No	Yes
Equalization	Fixed compromise	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Trellis encoding
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	—	—

Vendor	NEC America, Inc.	NEC America, Inc.	NEC America, Inc.	NEC America, Inc.
Product	**N4810II**	**N4811**	**N9631**	**N9635**
Hardware Configuration	Standalone	Rackmount	Standalone	Standalone
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any serial device	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any serial device	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all serial ports	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all serial ports
Hayes AT Command Set Compatible	No	No	Yes	Yes
Compatibility	AT&T 208	AT&T 208	AT&T 103/113, V.22 bis, AT&T 212/212A, V.32	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Leased lines
Maximum Data Rate (bps)	4800	4800	9600	9600
Fallback Speed (bps)	Vendor did not specify	Vendor did not specify	300, 1200, 2400, 4800	300, 1200, 2400, 4800
Sychronization	Synchronous	Synchronous	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Vendor did not specify	Vendor did not specify	Vendor did not specify
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	Vendor did not specify	None	None	None
Modulation	PSK	PSK	Trellis coding	Trellis coding
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
Line Interface	Two-/four-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware only	Hardware only	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	MNP	MNP
Data Compression	No	No	No	Yes
Price/Availability				
Purchase ($)	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	—	—

Vendor	NEC America, Inc.	NEC America, Inc.	NEC America, Inc.	Network Software Associates, Inc.
Product	**SPN4800**	**SPN9600**	**SPN9600M**	**AdaptModem 4800**
Hardware Configuration	Standalone, rackmount	Standalone, rackmount	Standalone	Plug in
Used With Microcomputers	Yes, IBM PC family	Yes, IBM PC family	Yes, IBM PC family	Yes, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	No	No	No	No
Compatibility	Vendor did not specify	Vendor did not specify	Vendor did not specify	Bell 208A/B
Communications Facility	Leased lines	Leased lines	Leased lines	Dial-up/leased
Maximum Data Rate (bps)	4800	9600	9600	4800
Fallback Speed (bps)	2400	7200, 4800, 2400	7200, 4800, 2400	Vendor did not specify
Sychronization	Synchronous	Synchronous	Synchronous	Synchronous
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point, multipoint	Point-to-point, multipoint	Point-to-point	Point-to-point, multipoint
Line Conditioning	None	None	None	None
Modulation	DPSK	QAM	QAM	PSK
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	PC Bus, PS/2 Micro Channel
Line Interface	Four-wire	Four-wire	Four-wire	Two-/four-wire
Setup	Software only	Software only	Software only	Hardware only
Auto Answer/Dial	No	No	No	Yes
Alternate Voice/Data	No	No	No	No
Equalization	Fixed compromise	Fixed compromise	Fixed compromise	Fixed compromise
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	Contact vendor	Contact vendor	Contact vendor	1,140
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	—	—

Vendor	Network Software Associates, Inc.	Network Software Associates, Inc.	Optocom Systems, Inc.	Octocom Systems, Inc.
Product	**AdaptModem V.32**	**AdaptModem2 4800**	**OSI8196**	**OSI8596**
Hardware Configuration	Plug in	Plug in	Standalone	Standalone, rackmount
Used With Microcomputers	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2, also compatible with any V.24	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any RS-232C,V.24
Hayes AT Command Set Compatible	Yes	No	Yes	Yes
Compatibility	CCITT V.32	Bell 208A/B	AT&T 103/113, 212/212A, V.22, V.22bis, V.21, V.23, V.29, V.33, V.32	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.32, V.23, V.26bis
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	9600	4800	9600	4800
Fallback Speed (bps)	Vendor did not specify	Vendor did not specify	2400, 2400, 1200, 300	1200, 300
Sychronization	Async/sync	Synchronous	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point, multipoint	Point-to-point, multipoint	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	QAM	PSK	FSK, QAM, PSK, Trellis coding, DPSK	FSK, PSK, Trellis coding, DPSK
Terminal Interface	PC Bus	PC Bus, PS/2 Micro Channel	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
Line Interface	Two-/four-wire	Two-/four-wire	Two-wire	Two-wire
Setup	Hardware only	Hardware only	Software only	Software only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	Yes	Yes
Equalization	Automatic adaptive	Fixed compromise	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	MNP, V.42	MNP, V.42/V.42bis
Data Compression	No	No	Yes	Vendor did not specify
Price/Availability				
Purchase ($)	1,295	1,140	Contact vendor	Contact vendor
Date Of First Installation	Vendor did not specify	Vendor did not specify	December 1988	Vendor did not specify
Comments	—	—	Automatic rate detection and constant speed; terminal interface	Compatible with NMS OSI 810/821/821E/821N/830

Vendor	Okidata Corp.	Okidata Corp.	Okidata Corp.	Okidata Corp.
Product	**CLP 9600**	**CLX 96**	**CLX 96DP**	**CLX 96M**
Hardware Configuration	Standalone	Standalone	Standalone	Standalone
Used With Microcomputers	Yes, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple Macintosh, IBM PC family, IBM PS/2, all serial parts	Yes, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple Macintosh, IBM PC family, IBM PS/2, all serial parts
Hayes AT Command Set Compatible	No	No	No	No
Compatibility	V.29	V.29	V.29	V.29
Communications Facility	Dial-up/leased	Leased lines	Leased lines	Leased lines
Maximum Data Rate (bps)	9600	9600	9600	9600
Fallback Speed (bps)	7200, 4800	7200, 4800	7200, 4800	7200, 4800
Sychronization	Synchronous	Synchronous	Synchronous	Synchronous
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	QAM	QAM	QAM	QAM
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
Line Interface	Two-/four-wire	Four-wire	Two-/four-wire	Four-wire
Setup	Hardware only	Hardware only	Hardware only	Hardware only
Auto Answer/Dial	Yes	No	Yes	No
Alternate Voice/Data	No	No	Yes	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	Contact vendor	995	1,395	1,495
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	Menu driven LCD display, autodial backup, remote configuration	—	—	4 port TDM

Vendor	Omnitel, Inc.	Omnitel, Inc.	Penril DataCom	Penril DataCom
Product	**Encore 9632BT**	**Encore 9632SDT**	**Alliance 9600 FT**	**Alliance V.32**
Hardware Configuration	Plug in	Standalone	Standalone, rackmount	Standalone, rackmount
Used With Microcomputers	Yes, IBM PC family	Yes, IBM PC family	Yes, IBM PC family, IBM PS/2, any with RS-232-C interface	Yes, IBM PC family, IBM PS/2, any with RS-232-C interface
Hayes AT Command Set Compatible	Yes	Vendor did not specify	No	Yes
Compatibility	V.22, V.22 bis, AT&T 212/212A, V.21, V.32	V.22, V.22 bis, AT&T 212/212A, V.21, V.32	V.29, V.27 bis/ter	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32
Communications Facility	Dial-up	Dial-up	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	9600	9600	9600	9600
Fallback Speed (bps)	4800, 2400, 1200	4800, 2400, 1200	7200, 4800, 2400	4800, 2400, 1200, 300
Sychronization	Async/sync	Async/sync	Synchronous	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point, multipoint	Point-to-point
Line Conditioning	None	None	None	None
Modulation	QAM, Trellis coding	QAM, Trellis coding	QAM	FSK, QAM, PSK
Terminal Interface	PC Bus	PC Bus	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
Line Interface	Two-/four-wire	Four-wire	Two-/four-wire	Two-/four-wire
Setup	Hardware/software	Hardware only	Hardware only	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	No	Yes
Equalization	Vendor did not specify	Vendor did not specify	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	MNP	Vendor did not specify	MNP
Data Compression	Yes	Yes	No	Yes
Price/Availability				
Purchase ($)	895	995	1,295 (SA), 1,265 (RM)	1,295 (SA), 1,265 (RM)
Date Of First Installation	November 1988	November 1987	Vendor did not specify	Vendor did not specify
Comments	19.2K bps with data compression	19.2K bps with data compression	—	—

Vendor	Penril DataCom	Penril DataCom	Penril DataCom	Racal-Milgo
Product	**Datalink 4800**	**Datalink 9600**	**Datalink 9600FT**	**Omnimode 48**
Hardware Configuration	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount	Standalone, plug in, rack
Used With Microcomputers	Yes, IBM PC family, IBM PS/2, all with RS-232-C interface	Yes, IBM PC family, IBM PS/2, all with RS-232-C interface	Yes, IBM PC family, IBM PS/2, all with RS-232-C interface	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all
Hayes AT Command Set Compatible	Yes	No	No	No
Compatibility	Bell 208 A/B V.27 bis/ter	V.29, V.27 bis/ter	V.29, V.27 bis/ter	V.27 bis/ter
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	4800	9600	9600	4800
Fallback Speed (bps)	2400	7200, 4800, 2400	7200, 4800, 2400	2400
Sychronization	Async/sync	Async/sync,[1]	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point, multipoint	Point-to-point, multipoint	Point-to-point, multipoint	Point-to-point, multipoint
Line Conditioning	None, C1; C2	None, C1; C2	None	None
Modulation	DPSK	QAM	QAM	DPSK
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
Line Interface	Two-/four-wire	Two-/four-wire	Two-/four-wire	Two-/four-wire
Setup	Hardware only	Hardware only	Hardware only	Software only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	No	No
Equalization	Fixed compromise, automatic adaptive	Fixed compromise, automatic adaptive	Fixed compromise, automatic adaptive	Automatic adaptive
Protocol/Error	MNP	MNP	MNP	Vendor did not specify
Data Compression	Yes	No	No	No
Price/Availability				
Purchase ($)	1,295 stand alone/1,265 rackmount	1,795	1,995	1,770
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	1982
Comments	—	—	—	—

Vendor	Racal-Milgo	Racal-Milgo	Racal-Milgo	Racal-Milgo
Product	**Omnimode 96**	**RM-4827**	**RM-4891**	**RM-9629**
Hardware Configuration	Standalone, plug in, rack	Rackmount	Rackmount	Standalone, plug in, rack
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all	Yes	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all
Hayes AT Command Set Compatible	No	No	No	No
Compatibility	V.29	V.27	Bell 208 CCITT V.27bis/ter	V.29
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Leased lines
Maximum Data Rate (bps)	9600	4800	4800	9600
Fallback Speed (bps)	7200, 4800	2400	2400	7200, 4800
Sychronization	Async/sync	Async/sync	Synchronous	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point, multipoint	Point-to-point, multipoint	Point-to-point, multipoint	Point-to-point, multipoint
Line Conditioning	None	None	None	None
Modulation	DPSK	DPSK	QAM	DPSK
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.28, RS-449, V.24	RS-232-C	RS-232-C, V.28, RS-449, V.24
Line Interface	Four-wire	Two-/four-wire	Two-/four-wire	Four-wire
Setup	Software only	Software only	Hardware/software	Software only
Auto Answer/Dial	Yes	Yes	Yes	No
Alternate Voice/Data	No	No	No	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	3,250	1,250	1,395	1,850
Date Of First Installation	1983	1987	Vendor did not specify	1987
Comments	—	—	—	—

Vendor	Racal-Milgo	Racal-Milgo	Racal-Vadic, Inc.	Racal-Vadic, Inc.
Product	**RMD 3221**	**RMD 4850**	**2400LC**	**2450PX**
Hardware Configuration	Standalone	Standalone	Standalone	Standalone
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port
Hayes AT Command Set Compatible	Yes	No	Yes	No
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32	V.27ter, Bell 208B	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Bell 201/BC
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up	Dial-up/leased
Maximum Data Rate (bps)	9600	4800	2400	2400
Fallback Speed (bps)	4800	2400	1200, 0-300	1200
Sychronization	Async/sync	Synchronous	Async/sync	Synchronous
Transmission Mode	Full duplex	Vendor did not specify	Full duplex	Half duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK, Trellis coding, DPSK	PSK	FSK, QAM, PSK	PSK
Terminal Interface	RS-232-C, V.28	RS-232-C	RS-232-D	RS-232-D
Line Interface	Two-wire	Two-wire	Two-wire	Two-/four-wire
Setup	Software only	Hardware/software	Hardware/software	Hardware only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Coherent detection
Protocol/Error	MNP	Vendor did not specify	MNP	Vendor did not specify
Data Compression	Vendor did not specify	Vendor did not specify	No	No
Price/Availability				
Purchase ($)	1,195	1,295	395	725
Date Of First Installation	February 1989	Vendor did not specify	May 1989	November 1980
Comments	—	Supports S.A.D.L	Auto answer but no auto dial	Auto answer but no auto dial

Vendor	Racal-Vadic, Inc.	Racal-Vadic, Inc.	Racal-Vadic, Inc.	Racal-Vadic, Inc.
Product	**4840PX**	**4850PA**	**4891**	**9600VP**
Hardware Configuration	Rackmount	Standalone	Rackmount	Standalone
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Yes, IBM PC family, IBM PS/2, PC needs sync card + software	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port
Hayes AT Command Set Compatible	No	No	No	Yes
Compatibility	Bell 208 A/B	V.27 ter, 208B	Bell 208, CCITT V.27	AT&T 103/113, AT&T 212/212A, V.29
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	4800	4800	4800	9600
Fallback Speed (bps)	Vendor did not specify	Vendor did not specify	Vendor did not specify	1200, 0-300
Sychronization	Synchronous	Synchronous	Synchronous	Async/sync
Transmission Mode	Half duplex	Half duplex	Half duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	PSK	QAM	QAM	FSK, QAM, PSK
Terminal Interface	RS-232-D	RS-232-D	RS-232-D	RS-232-D
Line Interface	Two-/four-wire	Two-wire	Two-/four-wire	Two-wire
Setup	Hardware only	Hardware/software	Software only	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	Yes	No	Yes
Equalization	Coherent detection	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Proprietary
Data Compression	No	No	No	Yes
Price/Availability				
Purchase ($)	1,200	1,295	1,295	995
Date Of First Installation	April 1983	May 1986	May 1986	November 1988
Comments	Auto answer but no auto dial	—	—	—

Vendor	Racal-Vadic, Inc.	Racal-Vadic, Inc.	Racal-Vadic, Inc.	Racal-Vadic, Inc.
Product	**9624E**	**9632**	**9632B**	**9632VP**
Hardware Configuration	Rackmount	Standalone	Rackmount	Standalone
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any PC with a serial port	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port
Hayes AT Command Set Compatible	Vendor did not specify	Yes	Yes	Vendor did not specify
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	9600	9600	9600	9600
Fallback Speed (bps)	4800, 2400, 1200, 300	4800, 2400, 1200, 300	Vendor did not specify	4800, 2400, 1200, 300
Sychronization	Async/sync	Async/sync	Async/sync	Async/sync
Transmission Mode	Full duplex	Half/full duplex	Full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK, Trellis coding	FSK, QAM, PSK, Trellis coding	FSK, QAM, PSK, Trellis coding	FSK, QAM, PSK, Trellis coding
Terminal Interface	RS-232-D	RS-232-D	RS-232-D	RS-232-D
Line Interface	Two-/four-wire	Two-/four-wire	Two-/four-wire	Two-wire
Setup	Hardware/software	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Vendor did not specify	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	MNP	MNP	MNP
Data Compression	Yes	Yes	Yes	Yes
Price/Availability				
Purchase ($)	1,195	1,595	1,695	1,195
Date Of First Installation	August 1989	September 1989	November 1989	April 1989
Comments	—	—	—	—

Vendor	Racal-Vadic, Inc.	Racal-Vadic, Inc.	Rohm Corp.	Rohm Corp.
Product	**9650PA**	**VA9612**	**BP 4521**	**BP 4541**
Hardware Configuration	Standalone	Rackmount	Plug in	Plug in
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, PC needs a sync card & software	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Yes, IBM PC family	Yes, IBM PC family
Hayes AT Command Set Compatible	No	Yes	Yes	Yes
Compatibility	V.29, V.27 ter	AT&T 103/113, V.22, V.29	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	9600	9600	9600	9600
Fallback Speed (bps)	7200, 4800	2400 to 300	2400, 1200, 300	4800, 300
Sychronization	Synchronous	Async/sync	Async/sync	Async/sync
Transmission Mode	Half duplex	Half/full duplex	Half/full duplex	Half duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	QAM	FSK, QAM, PSK	FSK, QAM, PSK, DPSK	FSK, QAM, PSK, DPSK
Terminal Interface	RS-232-D	RS-232-D	RS-232-C, RS-232C on TTL Levels	RS-232-C, RS-232C on TTL Levels (14 Pins)
Line Interface	Two-wire	Two-wire	Two-wire	Two-/four-wire
Setup	Hardware/software	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	No	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	MNP-like proprietary	MNP	MNP
Data Compression	No	Yes	Yes	Yes
Price/Availability				
Purchase ($)	Contact vendor	995	179-quantity discounts available	250-quantity discounts available
Date Of First Installation	April 1987	June 1987	June 1989	July 1989
Comments	Supports S.A.D.L.	Service available at Flat Rate or Emergency exchange	No DAA on board, EEPROM for phone # + configuration saving on board	DAA on board, anti-tapping capability; EEPROM on board

Vendor	Spectrum Cellular	Telcor Systems Corp.	Telebit Corporation	Telenetics Corp.
Product	**The Bridge**	**2496**	**T1000**	**TC921-96**
Hardware Configuration	Standalone, plug in, rack	Standalone, rackmount	Standalone, rackmount, PC	Standalone, rackmount
Used With Microcomputers	Yes, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22 bis, AT&T 212/212A, V.42,V.42bis, SPCL	AT&T 103/113, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.33, V.32
Communications Facility	Dial-up, cellular telephone network	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	9600	9600	9600	9600
Fallback Speed (bps)	2400, 1200, 300	4800/2400/1200/300	In steps of 100 bps	4800/2400/1200/300
Sychronization	Async/sync, AutoSync	Asynchronous	Asynchronous	Async/sync
Transmission Mode	Full duplex	Full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK, DPSK	Vendor did not specify	FSK, QAM, DPSK, DAMQAM	FSK, QAM, PSK, Trellis coding
Terminal Interface	RS-232-C, PC Bus	RS-232-C	RS-232-C	RS-232-C, V.24
Line Interface	Two-/four-wire	Two-wire	Two-wire	Two-/four-wire
Setup	Software only	Hardware/software	Software only	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	T 7TAP adaptive	Fixed compromise
Protocol/Error	Proprietary, V.42	Proprietary, MNP	Proprietary, MNP	MNP
Data Compression	Yes	Yes	No	Vendor did not specify
Price/Availability				
Purchase ($)	795	895	745-795	995 (2 weeks ARO)
Date Of First Installation	Vendor did not specify	1986	September 1988	June 1988
Comments	Patented technology; can be used over cellular or land lines	3 year warranty; DES encryption option - $100	Protocol support for UNIX, UUCP, Kermit, Xmodem, and Ymodem	5-year warranty; return to factory; Internal X.25 PAD is optional

Vendor	TIL Systems, Inc.	TIL Systems, Inc.	TIL Systems, Inc.	TIL Systems, Inc.
Product	**EM1900**	**EM2400**	**EM9600**	**EM9610**
Hardware Configuration	Standalone, plug in, rack	Standalone, plug in, rack	Standalone	Standalone
Used With Microcomputers	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22 bis, AT&T 212/212A	AT&T 103/113, V.32	AT&T 103/113, V.32
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	56K	56K	9600	9600
Fallback Speed (bps)	9600, 4800, 1200, 300	9600, 4800, 1200, 300	4800, 2400, 1200	4800, 2400, 1200
Sychronization	Async/sync	Async/sync	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Modulation	FSK	FSK	FSK	FSK
Terminal Interface	RS-232-C, PC Bus	RS-232-C, PC Bus	RS-232-C	RS-232-C
Line Interface	Two-/four-wire	Two-/four-wire	Two-/four-wire	Two-/four-wire
Setup	Hardware/software	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	X.25	X.25	X.25	X.25
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	1,945	345	1,795	1,945
Date Of First Installation	June 1987	June 1987	1987	1987
Comments	—	—	—	—

Vendor	Universal Data Systems	Universal Data Systems	Universal Data Systems	Universal Data Systems
Product	**9648T**	**FasTalk V.32/5**	**FasTalk V.32/5 PC**	**Sync Up 208A/B**
Hardware Configuration	Standalone, rackmount	Standalone	Plug in	Plug in
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family
Hayes AT Command Set Compatible	Yes	Yes	Yes	Vendor did not specify
Compatibility	V.29, Bell 208, 9600 Trellis	Vendor did not specify	Vendor did not specify	208 A/B
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up, dial-up/leased, leased lines
Maximum Data Rate (bps)	9600	9600	9600	4800
Fallback Speed (bps)	7200, 4800	300 to 9600	300 - 9600	None
Sychronization	Async/sync	Async/sync	Asynchronous	Synchronous
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point, multipoint	Vendor did not specify	Vendor did not specify	Point-to-point, multipoint
Line Conditioning	None	Vendor did not specify	Vendor did not specify	Vendor did not specify
Modulation	QAM, Trellis coding	QAM	QAM	DPSK
Terminal Interface	V.24, EIA-232-D	Vendor did not specify	Vendor did not specify	PC Bus
Line Interface	Two-/four-wire	Two-wire	Two-wire	Two-/four-wire
Setup	Software only	Hardware only	Hardware only	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	No	No	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	MNP	MNP	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	1,695	995	995	1,295
Date Of First Installation	1988	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	—	—

Vendor	Universal Data Systems	Universal Data Systems	Universal Data Systems	Universal Data Systems
Product	**Sync-Up 2/208/201**	**Sync-Up 2/V.32**	**Sync-Up T9628B**	**Sync-Up V.32**
Hardware Configuration	Plug in	Plug in	Plug in	Plug in
Used With Microcomputers	Yes, IBM PS/2	Yes, IBM PS/2	Yes, IBM PC family, PS2-Model 25,30	Yes, IBM PC family, PS2-Model 25,30
Hayes AT Command Set Compatible	No	Yes	No	Yes
Compatibility	AT&T 208/201	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, CCITT V.32	Bell 208	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, CCITT V.32
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	4800	9600	9600	9600
Fallback Speed (bps)	2400	4800, 2400, 1200, 300	7200, 4800	4800, 2400, 1200, 300
Sychronization	Synchronous	Async/sync	Synchronous	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Vendor did not specify	Half/full duplex
Configuration	Point-to-point, multipoint	Point-to-point	Point-to-point, multipoint	Point-to-point
Line Conditioning	None	None	None	None
Modulation	DPSK	FSK, QAM, Trellis coding	QAM, Trellis coding	FSK, QAM, Trellis coding
Terminal Interface	PS/2 Micro Channel	PS/2 Micro Channel	PC Bus	PC Bus
Line Interface	Two-/four-wire	Two-/four-wire	Two-wire	Two-/four-wire
Setup	Software only	Software only	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Fixed compromise	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Provided in sync protocol	Vendor did not specify	Software Protocol SNA,BSC	MNP
Data Compression	No	No	No	Yes
Price/Availability				
Purchase ($)	1,140	1,295	1,540	1,295
Date Of First Installation	Vendor did not specify	November 1988	March 1988	June 1988
Comments	—	—	—	—

Vendor	U.S. Robotics, Inc.	Western DataCom	Western DataCom	Western DataCom
Product	**Courier V.32**	**432 Class 5**	**432 Crypto Card**	**432 Error Free**
Hardware Configuration	Standalone, Internal	Standalone	Rackmount	Rackmount
Used With Microcomputers	Yes, all with RS-232-C	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, CCITT V.32	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32
Communications Facility	Dial-up/leased	Dial-up, dial-up/leased, leased lines	Dial-up, dial-up/leased, leased lines	Dial-up, dial-up/leased, leased lines
Maximum Data Rate (bps)	9600	9600	9600	9600
Fallback Speed (bps)	4800, 2400, 1200, 300	0-9600	0-9600	0-9600
Sychronization	Async/sync	Async/sync	Async/sync	Async/sync
Transmission Mode	Vendor did not specify	FDX	Full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK, Trellis coding, DPSK	FSK, QAM, Trellis coding, DPSK	FSK, QAM, Trellis coding, DPSK	FSK, QAM, Trellis coding, DPSK
Terminal Interface	RS-232-C, PC Bus, USR rackmount 30	RS-232-C, V.24	RS-232-C, V.24	RS-232-C, V.24
Line Interface	Two-wire	Two-wire	2-wire, 2-/4-wire, 4-wire	Two-wire
Setup	Hardware/software	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP, V.42bis	MNP	MNP	MNP
Data Compression	Yes	Yes	Yes	No
Price/Availability				
Purchase ($)	1,099 external	1,195	1,395	995
Date Of First Installation	December 1988	1988	1988	1988
Comments	—	—	NBS DES encryption	—

Vendor	Western DataCom	Western DataCom	Western DataCom	Western DataCom
Product	**432 Line Backer**	**432 MNP**	**432 Network Node**	**MESA 432**
Hardware Configuration	Standalone	Standalone	Rackmount	Standalone
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32
Communications Facility	Dial-up, dial-up/leased, leased lines	Dial-up, dial-up/leased, leased lines	Dial-up, dial-up/leased, leased lines	Dial-up, dial-up/leased, leased lines
Maximum Data Rate (bps)	9600	9600	9600	9600
Fallback Speed (bps)	0-9600	0-9600	0-9600	0-9600
Sychronization	Async/sync	Async/sync	Async/sync	Async/sync
Transmission Mode	Full duplex	Full duplex	Full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, Trellis coding, DPSK	FSK, QAM, Trellis coding, DPSK	FSK, QAM, Trellis coding, DPSK	FSK, QAM, Trellis coding, DPSK
Terminal Interface	RS-232-C, V.24	RS-232-C, V.24	RS-232-C, V.24	RS-232-C, V.24
Line Interface	2-wire, 2-/4-wire, 4-wire	Two-wire	2-wire, 2-/4-wire, 4-wire	2-wire, 2-/4-wire, 4-wire
Setup	Hardware/software	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	MNP	MNP	MNP
Data Compression	Yes	No	Yes	Yes
Price/Availability				
Purchase ($)	1,295	1,095	1,095	1,595
Date Of First Installation	1988	1989	1988	1988
Comments	Auto dial backup for lease lines	—	—	NBS DES encryption

Vendor	Adaptive Computer Technologies	BCH Equipment Corp.	BCH Equipment Corp.	BT Datacom, Inc.
Product	**V32-42**	**14.4 M Model**	**14.4 S Model**	**Datel 4142TCX**
Hardware Configuration	Standalone, custom PCB	Standalone, rackmount	Standalone, rackmount	Standalone, plug in, rack
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2	Yes
Hayes AT Command Set Compatible	Vendor did not specify	No	No	No
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32, V.42, V.42 bis	V.CC, V.29	V.CC, V.29	V.33, V.32 ext, V.32
Communications Facility	Dial-up/leased	Leased lines	Leased lines	Dial-up/leased, two-wire leased line
Maximum Data Rate (bps)	12K (38.4K compressed)	14.4K	14.4K	14.4K; 12K
Fallback Speed (bps)	300 to 9600	9600, 12K	1200, 9600	9600, 7200, 4800
Sychronization	Async/sync	Synchronous	Synchronous	Async/sync
Transmission Mode	Full duplex	Half/full duplex	Half/full duplex	Vendor did not specify
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, Trellis coding, proprietary at 12K	QAM	QAM	QAM, Trellis coding
Terminal Interface	RS-232-C, V.24	RS-232-C	RS-232-C	RS-232-C, V.28, V.24
Line Interface	Two-/four-wire	Four-wire	Four-wire	Two-/four-wire
Setup	Hardware/software	Hardware only	Hardware only	Hardware/software
Auto Answer/Dial	Yes	No	No	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Fixed compromise, automatic adaptive
Protocol/Error	CRC, MNP, LAPM	Vendor did not specify	Vendor did not specify	Not applicable
Data Compression	Vendor did not specify	No	No	Yes
Price/Availability				
Purchase ($)	1,095	1,295-1 port; 1,795 mux	1,295-1 port; 1,795-mux	Vendor did not specify
Date Of First Installation	1989	1985	1985	Vendor did not specify
Comments	Hardware and firmware available for license	Vendor did not specify	—	TDM, STDM, Pad, data compression; V.42 bis

Vendor	CASE/Datatel, Inc.	CXR Telcom/Anderson Jacobson	CXR Telcom/Anderson Jacobson	Data Race
Product	**DCM 4696**	**AJ 1951-1**	**AJ 1951-1D**	**Action 1496**
Hardware Configuration	Standalone, plug in, rack	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, IBM PC family	Yes, IBM PC family	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	No	No	Yes
Compatibility	AT&T 103/113, V.22, AT&T 108, V.22 bis, AT&T 212/212A	Another model AJ 1951-1 unit	Another model AJ 1951-10 Modem	V.22, V.22 bis, AT&T 212/212A, V.29, V.33, CCITT V.23
Communications Facility	Dial-up/leased	Leased lines	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	19.2K	19.2K	19.2K	14.4K
Fallback Speed (bps)	9600, 2400, 1200, 0-300	16.8K, 14.4K, 12K, 9600	16.8K, 14.4K, 12K, 9600	12K, 9600, 4800
Sychronization	Async/sync	Synchronous	Synchronous	Async/sync, Hayes AutoSync
Transmission Mode	Vendor did not specify	Full duplex	Full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, DPSK	QAM, Trellis coding	QAM, Trellis coding	FSK, PSK, Trellis coding
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.24	RS-232-C, V.24	RS-232-C
Line Interface	Two-wire	Four-wire	Four-wire	Two-/four-wire
Setup	Hardware/software	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	No	No	Yes
Alternate Voice/Data	Yes	No	No	Vendor did not specify
Equalization	Fixed compromise, automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	MNP
Data Compression	Yes	Vendor did not specify	Vendor did not specify	Vendor did not specify
Price/Availability				
Purchase ($)	Contact vendor	3,495	3,745	1,795
Date Of First Installation	Vendor did not specify	Vendor did not specify	1989	Vendor did not specify
Comments	—	Available with integral 2-port TDM for rackmount; 4- or 8-port for standalone	Available with Integral 2-port TDM for rackmount; 4- or 8-port for standalone	—

Vendor	Data Race	Data Race	Develcon Electronics Ltd.	Develcon Electronics Ltd.
Product	**PC Race 24/96**	**PC Race 96**	**Alliance V.32 - 14.4**	**LN14.4 Network Modem**
Hardware Configuration	Plug in	Plug in	Standalone, rackmount	Rackmount
Used With Microcomputers	Yes	Yes	Yes, all	Yes, all
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22 bis, AT&T 212/212A	RACE-VM, BMX-VM, Group 3 Fax	V.22, V.22 bis, CCITT V.32, Bell 212A, 103	V.33
Communications Facility	Dial-up/leased	Dial-up	Dial-up/leased	Leased lines
Maximum Data Rate (bps)	19.2K	19.2K	14.4K	14.4K
Fallback Speed (bps)	9600, 7200 4800	9600, 7200, 4800	9600/4800/2400/1200/300	12K, 9600, 7200, 4800
Sychronization	Asynchronous	Async, sync w/autosync	Async/sync	Synchronous
Transmission Mode	Half/full duplex	Half/full duplex	Full duplex	Full duplex
Configuration	Dial-up	Dial-up	Point-to-point, multipoint	Point-to-point, multipoint
Line Conditioning	None	None	None	None
Modulation	FSK, PSK	FSK, PSK	FSK, QAM, Trellis coding, DPSK	FSK, QAM, Trellis coding
Terminal Interface	PC Bus	PC Bus	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
Line Interface	Two-wire	Two-wire	Two-/four-wire	Four-wire
Setup	Hardware/software	Hardware/software	Hardware only	Hardware only
Auto Answer/Dial	Yes	Yes	Yes	No
Alternate Voice/Data	Yes	Yes	Yes	No
Equalization	Automatic adaptive	Automatic adaptive	Fixed compromise, automatic adaptive	Fixed compromise, automatic adaptive
Protocol/Error	CRC, MNP	CRC, MNP	MNP	ARQ
Data Compression	Yes	Yes	Yes	No
Price/Availability				
Purchase ($)	995	795	Contact vendor	Contact vendor
Date Of First Installation	October 1987	October 1987	Vendor did not specify	Vendor did not specify
Comments	Compatibility supports Group 3 Fax, Race & BMX modes	—	—	Other models available for 9600bps, 9600bps fast poll, 4800, 2400bps

Vendor	Develcon Electronics Ltd.	Develcon Electronics Ltd.	Develcon Electronics Ltd.	Develcon Electronics Ltd.
Product	**M1926EZ**	**M1927L**	**M1928L**	**M1928LFT**
Hardware Configuration	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount
Used With Microcomputers	Yes, all	Yes, all	Yes, all	Yes, all
Hayes AT Command Set Compatible	No	No	No	No
Compatibility	Trellis, Viterbi, V.29 (9600)	V.33,V.29, trellis coding	Proprietary, trellis coding	Proprietary, trellis coding
Communications Facility	Leased lines	Leased lines	Leased lines	Leased lines
Maximum Data Rate (bps)	14.4K	14.4K	19.2K	19.2K
Fallback Speed (bps)	9600, 7200, 4800	12K, 9600, 7200, 4800	16.8K, 14.4, 12K, 9600	16.8K, 14.4, 12K, 9600
Sychronization	Synchronous	Synchronous	Synchronous	Synchronous
Transmission Mode	Full duplex	Full duplex	Full duplex	Full duplex
Configuration	Point-to-point	Point-to-point, multipoint, poll	Point-to-point, multipoint, poll	Point-to-point, multipoint, poll
Line Conditioning	None	None	D1	D1
Modulation	PSK	QAM	QAM	QAM
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
Line Interface	Four-wire	Four-wire	Four-wire	Four-wire
Setup	Hardware only	Hardware only	Hardware only	Hardware only
Auto Answer/Dial	No	No	No	No
Alternate Voice/Data	No	No	No	No
Equalization	Fixed compromise, automatic adaptive, fixed line	Automatic adaptive	Fixed compromise, automatic adaptive	Fixed compromise, automatic adaptive
Protocol/Error	ARQ	ARQ	ARQ	ARQ
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	Optional 6-port internal TDM multiplexer	C/w 2 channel TDM multiplexer, 6-port optional addition	C/w 2 channel TDM multiplexer, 6-port optional addition

Vendor	E-Tech Research	E-Tech Research	Fujitsu America, Inc.	Fujitsu America, Inc.
Product	**BulletModem E9696M**	**BulletModem PC9696M**	**EZ Series**	**L Series**
Hardware Configuration	Standalone	Plug in	Standalone, rackmount	Standalone, rackmount
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all computers	Yes, IBM PC family	Yes, Any synchronous port	Yes, Any synchronous port
Hayes AT Command Set Compatible	Yes	Yes	No	No
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.32	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.32	V.22, V.22 bis, V.29, V.33	V.22, V.22 bis, V.29, V.33
Communications Facility	Dial-up	Dial-up	Leased lines	Dial-up/leased
Maximum Data Rate (bps)	19.2K	19.2K	14.4K	19.2K
Fallback Speed (bps)	75-9600	75-9600	2400 to 14.4K	16.8K to 2400
Sychronization	Async/sync	Async/sync	Synchronous	Synchronous
Transmission Mode	Full duplex	Full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point, tail circ.	Point-to-point, multipoint, tail
Line Conditioning	None	None	Vendor did not specify	D1 for 19.2 only
Modulation	Trellis coding	Trellis coding	QAM, Trellis coding	QAM, Trellis coding
Terminal Interface	RS-232-C, V.24	RS-232-C, V.24	RS-232-C	RS-232-C
Line Interface	Two-/four-wire	Vendor did not specify	Four-wire	Four-wire
Setup	Hardware/software	Hardware/software	Vendor did not specify	Vendor did not specify
Auto Answer/Dial	Yes	Yes	No	Yes
Alternate Voice/Data	Yes	Yes	No	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	MNP	Vendor did not specify	Vendor did not specify
Data Compression	Yes	Yes	No	No
Price/Availability				
Purchase ($)	1,095	995	595 - 1,795	845 to 4,495
Date Of First Installation	January 1988	January 1988	1986	1986
Comments	Remote configuration	Remote configuration	—	—

Vendor	Fujitsu America, Inc.	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.
Product	**LN Series**	**DataComm 19202**	**DataComm 19202A**	**DataComm 19202A/ADR**
Hardware Configuration	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount
Used With Microcomputers	Yes, Any synchronous port	Yes, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	No	No	No	Yes
Compatibility	V.22, V.22 bis, V.29, V.33	Proprietary	Proprietary	Proprietary
Communications Facility	Dial-up/leased	Leased lines	Leased lines	Dial-up/leased
Maximum Data Rate (bps)	19.2K	19.2K	19.2K	19.2K
Fallback Speed (bps)	16.8K to 2400	16.8K, 14.4K, 12.2K, 9600	16.8K, 14.4K, 9600	16.8K, 14.4K, 9600
Sychronization	Synchronous	Async/sync	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Full duplex	Vendor did not specify	Vendor did not specify
Configuration	Point-to-point, multipoint, tail	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	D1 for 19.2 only	D1	D1	D1
Modulation	QAM, Trellis coding	Vendor did not specify	Trellis coding	Proprietary
Terminal Interface	RS-232-C	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
Line Interface	Four-wire	Four-wire	Four-wire	Four-wire
Setup	Vendor did not specify	Software only	Software only	Hardware/software
Auto Answer/Dial	Yes	No	No	Yes
Alternate Voice/Data	No	No	No	No
Equalization	Automatic adaptive	Automatic adaptive	Fixed compromise	Fixed compromise
Protocol/Error	Vendor did not specify	Trellis	Trellis	Trellis
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	1,495 - 6,995	3,995	4,395	5,495
Date Of First Installation	1988	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	LCD display; two port mux built-in; has autospeed	LCD display; extensive line impairments info; two port mux; autospeed/port speed control	Automatic dial back-up; integral V.32 modem for dial back-up; LCD display

Vendor	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.
Product	**Diagnostic Modem NMS 14433**	**Diagnostic Modem NMS 14434/36**	**Diagnostic Modem NMS 19202A**	**Multiport 14433**
Hardware Configuration	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount
Used With Microcomputers	Yes, NMC 30B laptop computer (MS/Dos based)	Yes, NMC 30B laptop computer (MS/Dos based)	Yes, NMC 30B laptop computer (MS/Dos based)	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Vendor did not specify	Vendor did not specify	Vendor did not specify	No
Compatibility	Vendor did not specify	Vendor did not specify	Vendor did not specify	V.29, V.33
Communications Facility	Leased lines	Leased lines	Leased lines	Leased lines
Maximum Data Rate (bps)	14.4K	14.4K	19.2K	14.4K
Fallback Speed (bps)	12K, 9600	12K, 9600	16.8K, 14.4K, 9600	12K, 9.6K
Sychronization	Synchronous	Async/sync	Async/sync	Async/sync
Transmission Mode	Full duplex	Full duplex	Full duplex	Vendor did not specify
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	D1	D1	D1	3002 with D1 or M1020
Modulation	FSK, Trellis coding	FSK, Trellis coding	FSK, Trellis coding	QAM, Trellis coding
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
Line Interface	Four-wire	Four-wire	Four-wire	Four-wire
Setup	Software only	Software only	Software only	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	No
Alternate Voice/Data	No	Vendor did not specify	Vendor did not specify	No
Equalization	Automatic adaptive	Automatic adaptive	Fixed compromise, automatic adaptive	Automatic adaptive
Protocol/Error	Proprietary	Proprietary	Proprietary	Trellis
Data Compression	Vendor did not specify	Vendor did not specify	Vendor did not specify	No
Price/Availability				
Purchase ($)	Vendor did not specify	Vendor did not specify	Vendor did not specify	3,495
Date Of First Installation	July 1988	August 1988	February 1987	Vendor did not specify
Comments	Controlled/configured via GDC Netcon Network Management Systems	Integral 4 or 6 channel mux; controlled/configured via GDC Netcon NMS	Integral 2 channel mux; controlled/configured via GDC Netcon NMS	Integral 6 channel mux

Vendor	International Business Machines Corp. (IBM)	Microcom	Microcom	Microcom
Product	**PS/2 Leased Line Modem**	**2400t**	**QX/3296c**	**QX/V.32c**
Hardware Configuration	Plug in	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount
Used With Microcomputers	Yes, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family	Yes, Apple II family, Apple Macintosh, IBM PC family	Yes, Apple II family, Apple Macintosh, IBM PC family
Hayes AT Command Set Compatible	No	Yes	Yes	Yes
Compatibility	786X/586X/3745 LIC 5 modems	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, CCITT V.32
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	14.4K	12K	19.2K	30K
Fallback Speed (bps)	12K	3200, 2400, 1200	9600/4800/2400/1200/300	4800/2400/1200/300
Sychronization	Synchronous	Async/sync	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Full duplex	Full duplex	Full duplex
Configuration	Point-to-point, multipoint	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	Vendor did not specify	None
Modulation	Trellis coding	FSK, QAM, PSK, DPSK	FSK, QAM, PSK, Trellis coding, DPSK	FSK, QAM, PSK, Trellis coding, DPSK
Terminal Interface	RS-232-C	RS-232-C	RS-232-C	RS-232-C
Line Interface	Four-wire	Two-wire	Two-/four-wire	Two-/four-wire
Setup	Software only	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	IBM Netview-LPDAZ	MNP	MNP	MNP
Data Compression	No	Yes	Yes	Yes
Price/Availability				
Purchase ($)	3,335	699	1,199	1,599
Date Of First Installation	New product	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	RJ45 programmable transmit level; remote access and confiuration	RJ45 - MI/MIC support; programmable transmit level	RJ45 - MI/MIC support; programmable transmit level

Vendor	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.	Mux Lab, Inc.
Product	**MT932EC**	**MT932EM**	**MultiModem V32L**	**Fastware**
Hardware Configuration	Internal	Standalone	Standalone	Standalone, plug in
Used With Microcomputers	Yes, IBM PC family, PC AT/XT and compatibles	Yes, Apple Macintosh	Yes, IBM PC family, PC AT/XT and compatibles	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.32	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.32	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.32/V.42	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up	Dial-up/leased	Dial-up/leased, dial back-up	Dial-up/leased
Maximum Data Rate (bps)	19.2K with data compression	19.2K with data compression	19.2K with data compression	19.2K
Fallback Speed (bps)	9600, 4800	9600, 4800	9600, 4800	9600, 4800
Sychronization	Asynchronous	Async/sync	Async/sync	Asynchronous
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK, Trellis coding	FSK, QAM, PSK, Trellis coding	FSK, QAM, PSK, Trellis coding	FSK, QAM, PSK, DPSK
Terminal Interface	RS-232-C	RS-232-C, & RS-422	RS-232-C	RS-232-C, PC Bus
Line Interface	Two-wire	Two-wire	Two-/four-wire	Two-/four-wire
Setup	Hardware/software	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Vendor did not specify	Yes	Yes	No
Alternate Voice/Data	No	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	X/Ymodem, MNP, Kermit	X/Ymodem, MNP, Kermit	X/Ymodem, MNP, Kermit	MNP
Data Compression	Yes	Yes	Yes	Yes
Price/Availability				
Purchase ($)	999	1,195	1,395	895
Date Of First Installation	1989	Vendor did not specify	December 1989	1988
Comments	Also supports remote configuration	V.25bis dialing and remote configuration	—	—

Vendor	NEC America, Inc.	NEC America, Inc.	NEC America, Inc.	NEC America, Inc.
Product	**DSP14400MII**	**DSP1920MII**	**SPN 19205M**	**SPN 19275M**
Hardware Configuration	Standalone	Standalone	Standalone	Standalone
Used With Microcomputers	Yes, IBM PC family	Yes, IBM PC family	Yes, IBM PC family	Yes, IBM PC family
Hayes AT Command Set Compatible	No	No	No	No
Compatibility	V.29, V.33	Vendor did not specify	Vendor did not specify	Vendor did not specify
Communications Facility	Leased lines	Leased lines	Leased lines	Leased lines
Maximum Data Rate (bps)	14.4K	19.2K	19.2K	19.2K
Fallback Speed (bps)	7200, 9600, 12K	16.8K, 14.4K, 12K, 9.6K	9600, 12K, 14.4K, 16.8K	9600, 12K, 14.4K, 16.8K
Sychronization	Synchronous	Synchronous	Synchronous	Synchronous
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	D1	D1	D1	D1
Modulation	QAM	FSK, QAM, Trellis coding	QAM, Trellis coding	QAM, Trellis coding
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28	RS-232-C, V.28, V.24
Line Interface	Four-wire	Four-wire	Four-wire	Four-wire
Setup	Hardware/software	Hardware/software	Software only	Software only
Auto Answer/Dial	No	No	No	No
Alternate Voice/Data	No	No	No	No
Equalization	Automatic adaptive	Fixed compromise	Fixed compromise	Fixed compromise
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase ($)	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	—	—

Vendor	NEC America, Inc.	Octocom Systems, Inc.	Octocom Systems, Inc.	Octocom Systems, Inc.
Product	**SPN14.4M**	**OSI8296 Universal Modem**	**OSI8396**	**OSI8996**
Hardware Configuration	Standalone	Standalone, rackmount	Standalone, rackmount	Standalone, rackmount
Used With Microcomputers	Yes, IBM PC family	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	No	Yes	Yes	Yes
Compatibility	Vendor did not specify	AT&T 103/113, 212/212A, V.22/ V.22bis, V.29, V.21, V.32, V.33, V.26bis, V.27bis/ter	AT&T 103/113, 212/212A, V.22/ V.22bis, V.29, V.21, V.32, V.26/bis, V.27bis/ter	AT&T 103/113, 212/212A, V.22/ V.22bis, V.21, V.23, V.29, V.32, V.33, 201B/C, 208A/B
Communications Facility	Leased lines	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	14.4K	14.4K	14.4K	14.4K
Fallback Speed (bps)	4800, 7200, 9600, 16.8K	4800	1200, 300	1200, 300
Sychronization	Synchronous	Async/sync	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	QAM, Trellis coding	QAM, PSK, Trellis coding, DPSK	FSK, QAM, PSK, Trellis coding, DPSK	FSK, QAM, PSK, Trellis coding, DPSK
Terminal Interface	RS-232-C, V.28	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
Line Interface	Four-wire	Two-/four-wire	Two-/four-wire	Two-/four-wire
Setup	Software only	Software only	Software only	Software only
Auto Answer/Dial	No	Yes	Yes	Yes
Alternate Voice/Data	No	Yes	Yes	Yes
Equalization	Fixed compromise	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	MNP, V.42	MNP, V.42	MNP, V.42
Data Compression	No	Vendor did not specify	Vendor did not specify	Vendor did not specify
Price/Availability				
Purchase ($)	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Date Of First Installation	Vendor did not specify	Vendor did not specify	May 1989	Vendor did not specify
Comments	—	Compatible with NMS OSI 810/821/821E/821N/830	Compatible with NMS OSI 810/821/821E/821N/830	Compatible with NMS OSI 810/821/821E/821N/830

Vendor	Okidata Corp.	Patton Electronics, Inc.	Patton Electronics, Inc.	Penril DataCom
Product	**CLP 14.4**	**696 V.32 Modem**	**696LX V.32 Modem**	**Alliance V.32/14.4**
Hardware Configuration	Standalone	Standalone, plug in	Standalone	Standalone, rackmount
Used With Microcomputers	Yes, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2, RS-232 - C/D compatible
Hayes AT Command Set Compatible	No	Yes	Yes	Yes
Compatibility	V.33	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, CCITT V.32	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, CCITT V.32	AT&T 103/113, 212/212A, V.22/ V.22bis, V.21, V.23, V.32, V.33, 208A/B
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	14.4K	19.2K at DTE	19.2K DTE Rate	14.4K
Fallback Speed (bps)	12K, 9600, 7200, 4800	9600, 4800	9600, 4800	1200 - 0
Sychronization	Synchronous	Async/sync	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	Vendor did not specify	None
Modulation	QAM	FSK, QAM, PSK, Trellis coding	QAM, Trellis coding	FSK, QAM, Trellis coding, DPSK
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C	V.28, V.24	RS-232-C, V.28, V.24
Line Interface	Two-/four-wire	Two-wire	Vendor did not specify	Two-/four-wire
Setup	Hardware only	Software only	Hardware/software	Software only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Fixed compromise, automatic adaptive
Protocol/Error	Vendor did not specify	MNP	MNP	MNP, V.42
Data Compression	No	Yes	Yes	Yes
Price/Availability				
Purchase ($)	1,995	795	1,295	1,595
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	Menu driven LCD display, autodial backup, remote config., set-up features	Supports full V.54 diagnostics	LCD display; front panel controls; remote config.; V.54 diagnostic	—

Vendor	**Penril DataCom**	**Racal-Milgo**	**Racal-Milgo**	**Racal-Milgo**
Product	**Alliance V.32/14.4M**	**Excalibur 19.2**	**Omnimode 14.4**	**Omnimode 14.4FP**
Hardware Configuration	Standalone, rackmount	Standalone, plug in, rack	Standalone, plug in, rack	Standalone, plug in, rack
Used With Microcomputers	Yes, IBM PC family, IBM PS/2, RS-232 - C/D compatible	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, and compatibles
Hayes AT Command Set Compatible	Yes	No	No	No
Compatibility	AT&T 103/113, 212/212A, V.22/ V.22bis, V.21, V.23, V.32, V.33, 208A/B	Racal-Milgo	V.33	Vendor did not specify
Communications Facility	Dial-up/leased	Dial-up/leased	Leased lines	Dial-up/leased
Maximum Data Rate (bps)	14.4K	19.2K	14.4K	14.4K
Fallback Speed (bps)	1200 - 0	16.8K, 14.4K, 12K	12K	12K
Sychronization	Async/sync	Async/sync	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point, multipoint
Line Conditioning	None	D1	D1	D1, D5
Modulation	FSK, QAM, Trellis coding, DPSK	Trellis coding	Trellis coding	Trellis coding
Terminal Interface	RS-232-C, V.24	RS-232-C, V.28, V.24, EIA 530	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
Line Interface	Two-/four-wire	Two-/four-wire	Four-wire	Four-wire
Setup	Software only	Hardware/software	Software only	Software only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	No	No	No
Equalization	Fixed compromise, automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP, V.42	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	Yes	No	No	No
Price/Availability				
Purchase ($)	1,695	6,300	4,145	4,145
Date Of First Installation	Vendor did not specify	1989	1984	1989
Comments	Includes non-interruptive auxiliary channel for remote config., monitoring, mgmt.	—	—	—

Vendor	**Racal-Milgo**	**Racal-Milgo**	**Racal-Milgo**	**Racal-Milgo**
Product	**Omnimode 1614**	**RM-1433**	**RM-1822E/2**	**RM-1916**
Hardware Configuration	Standalone, plug in, rack	Standalone, plug in, rack	Standalone, rackmount	Standalone, plug in, rack
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, and compatibles	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, and compatibles	Yes, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all
Hayes AT Command Set Compatible	No	No	Yes	No
Compatibility	Vendor did not specify	V.33	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, PEP2 Mode	Vendor did not specify
Communications Facility	Dial-up/leased	Leased lines	Dial-up/leased	Leased lines
Maximum Data Rate (bps)	16.8K	14.4K	19.2K w/data compression	19.2K
Fallback Speed (bps)	14.4K, 12K	12K	2400, 1200, 300	16.8K, 14.4K, 12K, 9600
Sychronization	Async/sync	Async/sync	Asynchronous	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point, multipoint	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	D1, CCITT M1020	None	D1
Modulation	Trellis coding	Trellis coding	FSK, QAM, DPSK, MQAM	Trellis coding
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C	RS-232-C, V.28, V.24
Line Interface	Four-wire	Four-wire	Two-wire	Four-wire
Setup	Software only	Software only	Software only	Software only
Auto Answer/Dial	Yes	No	Yes	No
Alternate Voice/Data	No	No	Yes	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	CRC, MNP, Xmodem, Kermit	Vendor did not specify
Data Compression	No	No	Yes	No
Price/Availability				
Purchase ($)	5,160	3,150	1,150	7,600
Date Of First Installation	1985	1987	Vendor did not specify	1987
Comments	—	—	—	—

Vendor	Racal-Milgo	Scitec Communication Systems	Telcor Systems Corp.	Telcor Systems Corp.
Product	**RMD 3222**	**SAT D4**	**2919**	**2938**
Hardware Configuration	Standalone, rackmount	Standalone	Standalone	Standalone
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	Vendor did not specify	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.33, see comments	Vendor did not specify	AT&T 103/113, V.22 bis, AT&T 212/212A, V.29	AT&T 103/113, V.22 bis, AT&T 212/212A, V.29
Communications Facility	Dial-up/leased	Leased lines	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	14.4K	1.544 megabits	19.2K	38.4K
Fallback Speed (bps)	12K, 4800	Vendor did not specify	9600/4800/2400/1200/300	300-19.2K
Sychronization	Async/sync	Synchronous	Asynchronous	Asynchronous
Transmission Mode	Half/full duplex	Full duplex	Full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	DSX	None	None
Modulation	FSK, QAM, PSK, Trellis coding, DPSK	Bipolar	Trellis coding	Trellis coding
Terminal Interface	RS-232-C, V.28	V.35/RS449	RS-232-C	RS-232-C
Line Interface	Two-/four-wire	Four-wire	Two-wire	Two-wire
Setup	Software only	Hardware/software	Hardware/software	Hardware/software
Auto Answer/Dial	Yes	Vendor did not specify	Yes	Yes
Alternate Voice/Data	Yes	Vendor did not specify	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	Vendor did not specify	Proprietary, MNP	Proprietary, MNP
Data Compression	Vendor did not specify	Vendor did not specify	Yes	Yes
Price/Availability				
Purchase ($)	1,595	3,000	995	1,195
Date Of First Installation	1989	1986	1989	1989
Comments	Bell 208 A/B, V.32bis, V.23, V.13, V.54, V.42, V.42bis, V.32	—	3 year warranty; DES encryption option - $100	3 year warranty; DES encryption option - $100

Vendor	Telcor Systems Corp.	Telcor Systems Corp.	Telcor Systems Corp.	Telebit Corp.
Product	**3219**	**3238**	**3257**	**T2000**
Hardware Configuration	Standalone, rackmount	Standalone	Plug in	Standalone, rackmount
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, IBM PC family	Yes, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22 bis, AT&T 212/212A, V.32	AT&T 103/113, V.22 bis, AT&T 212/212A, V.32	AT&T 103/113, V.22 bis, AT&T 212/212A	AT&T 103/113, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	19.2K	38.4K	57.6K	19.2K
Fallback Speed (bps)	9600 to 300	19.2K to 300	38.4K to 300	In 100 bps steps
Sychronization	Asynchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	Full duplex	Vendor did not specify	Full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	Trellis coding	Trellis coding	Trellis coding	FSK, QAM, DPSK, DAMQAM
Terminal Interface	RS-232-C	RS-232-C	PC Bus	RS-232-C
Line Interface	Two-wire	Two-wire	Two-wire	Two-wire
Setup	Hardware/software	Hardware/software	Software only	Software only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Vendor did not specify	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive, T 7TAP adaptive
Protocol/Error	Proprietary, MNP	Proprietary, MNP	Proprietary, MNP	Proprietary, MNP
Data Compression	Yes	Yes	Yes	Yes
Price/Availability				
Purchase ($)	1,295	1,695	1,195	1,395
Date Of First Installation	1989	1989	1989	June 1988
Comments	3 year warranty; DES encryption option - $100	3 year warranty; DES encryption option - $100	3 year warranty; DES encryption option - $100	Protocol support for UNIX, UUCP, Kermit, Xmodem, and Ymodem

Vendor	Telebit Corp.	Telebit Corp.	Universal Data Systems	Universal Data Systems
Product	**T2500**	**TrailBlazer Plus**	**FasTalk V.32/42**	**FasTalk V.32/42 bis**
Hardware Configuration	Standalone, rackmount	Standalone, rackmount	Standalone, plug in, rack	Standalone, plug in, rack
Used With Microcomputers	Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Yes, Apple Macintosh, IBM PC family, IBM PS/2	Yes, IBM PC family, IBM PS/2	Yes, IBM PS/2
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.33	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	V.22 bis, CCITT V.32/V.42	V.22 bis, V.32/V.42bis
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	19.2K	19.2K	19.2K bps	19.2K bps
Fallback Speed (bps)	100 bps increments	In 100 bps steps	9600 to 300	300 to 9600
Sychronization	Async/sync	Asynchronous	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Vendor did not specify	Vendor did not specify
Line Conditioning	None	None	Vendor did not specify	Vendor did not specify
Modulation	FSK, QAM, Trellis coding, DPSK, DAMQAM	FSK, QAM, DPSK, DAMQAM	QAM, Trellis coding	QAM, Trellis coding
Terminal Interface	RS-232-C	RS-232-C, PS/2 Micro Channel, PC bus	Vendor did not specify	Vendor did not specify
Line Interface	Two-wire	Two-wire	Vendor did not specify	Two-wire
Setup	Hardware/software	Software only	Vendor did not specify	Hardware only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	No	Vendor did not specify
Equalization	Automatic adaptive	T 7TAP adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	CRC, X/Ymodem, Kermit, MNP	Proprietary, MNP	MNP, V.42	MNP, V.42
Data Compression	Yes	Yes	Yes	Yes
Price/Availability				
Purchase ($)	1,495	1,095-1,345	1,045	1,145
Date Of First Installation	September 1989	July 1985	Vendor did not specify	Vendor did not specify
Comments	—	Protocol support for UNIX, UUCP, Kermit, Xmodem, and Ymodem	Begin shipping 1st quarter 1990	Begin shipping 1st quarter 1990

Vendor	U.S. Robotics, Inc.	U.S. Robotics, Inc.
Product	**Courier HST**	**Courier HST Dual Standard**
Hardware Configuration	Standalone, rack, internal	Standalone, rack, internal
Used With Microcomputers	Yes, all with RS-232-C	Yes, all with RS-232-C interface
Hayes AT Command Set Compatible	Yes	Yes
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, USR HST	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, CCITT V.32
Communications Facility	Dial-up/leased	Dial-up, dial-up/leased, leased lines
Maximum Data Rate (bps)	14.4K	14.4K
Fallback Speed (bps)	300-9600	9600 to 300
Sychronization	Async/sync	Async/sync
Transmission Mode	Vendor did not specify	Half/full duplex
Configuration	Point-to-point	Point-to-point
Line Conditioning	None	None
Modulation	FSK, QAM, PSK, Trellis coding, DPSK	FSK, QAM, PSK, Trellis coding, DPSK
Terminal Interface	RS-232-C, USR Rackmount 30, PC Bus	RS-232-C, USR Rackmount 30, PC Bus
Line Interface	Two-wire	Two-wire
Setup	Hardware/software	Hardware only
Auto Answer/Dial	Yes	Yes
Alternate Voice/Data	Yes	No
Equalization	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP, V.42bis	MNP, V.42bis
Data Compression	Yes	Yes
Price/Availability		
Purchase ($)	995	1,595
Date Of First Installation	January 1987	December 1988
Comments	—	—