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# Memorex Telex 3270-Compatible Display System

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**In this report:**

Analysis.....	-102
Characteristics.....	-105
Pricing.....	-108

**Product Summary****Editor's Note**

For Memorex Telex, a \$2 billion international company, 3270 products comprise the largest part of its business. The company is second only to IBM in the 3270 market, and is one of the few companies gaining market share. This report covers Memorex Telex' 3270-compatible terminals, network controllers, and printers.

**Description**

Memorex Telex' family of 3270 plug-compatible display stations incorporate enhanced features such as a complete set of international languages, DFT and CUT mode operation, and light pen and screen printer support. The company also offers a complete line of controllers and printers.

**Strengths**

Memorex Telex' terminals are 100 percent plug compatible, as opposed to just "system compatible." Consequently, a user can literally unplug an IBM 3270 terminal and plug in a Memorex Telex terminal and get the same or better performance. Memorex Telex' displays also offer enhanced functionality. Finally,

Memorex Telex has an excellent service organization; its service does not rely on third-party providers.

**Limitations**

As a plug compatible manufacturer, Memorex Telex must follow in IBM's technological wake—it does not set the course itself. It fares better, however, where networking enhancements are possible under the SAA umbrella, or where surface mount technology can be used to increase reliability.

**Competition**

Memorex Telex' top competitor is IBM, which has about 50 percent of the display terminal market. Memorex Telex has about 28 percent of the market.

**Vendor**

Memorex Telex Corp.  
6422 E. 41st Street  
Tulsa, OK 74135  
(918) 627-1111

**Price**

Terminals: \$995 to \$2,960; 3270  
Controllers: \$2,360 to \$10,960;  
Printers: \$420 to \$13,500.

**GSA Schedule**

Yes.

# Analysis

## Product Strategy

Memorex Telex is the largest and most successful vendor of 3270-compatible display terminals. The company has a long-standing practice of making its terminals plug compatible, in that they are 100 percent compatible with IBM's terminals. Other vendors have emulated this practice only recently. Its line of 3270-compatible products includes displays, controllers, multiplexers, combined function terminals, and printers. The following strategic points direct the company's business:

- It ensures product compatibility with industry standards.
- Its products reflect the latest technologies.
- Its products work with networks that are based on IBM connectivity.
- It maintains high standards for product quality.
- It emphasizes and leverages off of its strong worldwide service organization; services offered include system engineering and consulting.

Memorex Telex sees itself as providing solutions—something more in keeping with what its market demands. “We are not selling personal computers to the masses,” is how a Memorex Telex representative put it during a recent meeting with Datapro.

The current installed base of display terminals stands at more than 5 million units. Although analysts predict that overall demand for display terminals will flatten through 1993, Memorex Telex likes to point out that analysts' prior claims that the 3270 market would soon die were dead wrong. In fact, the 3270 market as a whole is growing but the mix of equipment is changing. Users are moving toward the “local area network workstation” concept. Display units are likely to remain viable products until well into the 1990s.

## Corporate Organization

Memorex Telex organizes its operations by market segmentation (e.g., 3270, networks, personnel computers, storage and midrange). Accordingly, there are product development organizations (Business Groups) that develop product lines and provide them to each country. Each country's marketing organization and sales team oversees sales in its particular area.

## Display Terminals

Memorex Telex offers a comprehensive line of terminals ranging from a monochrome basic function display to a color enhanced function display. The Memorex Telex display product strategy is to “move customers to intelligent workstation solutions that incorporate communications boards.” The following is a brief description of some of the benefits Memorex Telex offers in its terminal product line.

- The latest display product line, the Series II, offers many desirable features. A calculator integrated into the display saves desktop space and increases productivity.
- Light pen support enhances option selection, reduces operator error, and increases productivity.
- Local screen printer support is included in the base product. This support provides the user with immediate hard copy without waiting for a system printer.
- The options of 88-key, 102-key, 104-key, or 122-key keyboards allow the user to customize the display.

## 3270 Controllers

The role of the traditional 3270 cluster controller is evolving. Previously, their network management functions were limited to 3270 displays and printers. Presently, a need exists to integrate LANs, PCs, and ASCII systems into the corporate network. In recognition of this need, Memorex Telex has developed the 1174 Network Controller Family. This IBM plug compatible controller provides all the networking capability of the latest IBM controller, according to Memorex Telex.

The 1174 Network Controller uses an exclusive multiprocessor design with concurrent processing. The concurrent processing reportedly enables the 1174 to maintain high performance

## Company Profile Memorex Telex Corporation

### Corporate Headquarters

6422 E. 41st Street  
Tulsa, OK 74135  
(918) 627-1111

### In Canada

Memorex Telex Canada  
7050 Woodbine Avenue  
Markham, ON L3R 4G8  
(416) 494-4444

International headquar-  
ters in Amsterdam, The  
Netherlands.  
Offices in 27 countries  
worldwide; distributor  
links with an additional 50  
markets.

### Officers

*CEO/President:* Giorgio  
Ronchi  
*Vice Chairman:* Steve Ja-  
tras  
*Corporate Planning:* Rich-  
ard Clarke  
*CFO:* David Faulkner  
*Executive V.P. European  
Operations:* Jean-Claude  
Zanelli  
*Executive V.P. Marketing*

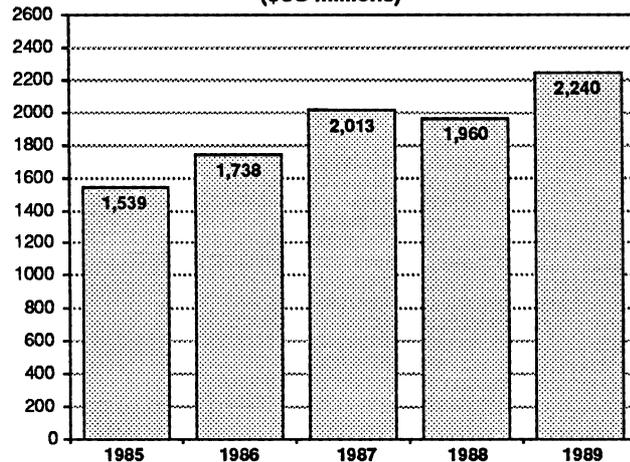
*and Business Develop-  
ment:* J.E.M. Kitching

### Company Background

*Year Founded:* 1987  
*No. Employees:* 11,000  
(worldwide)  
*No. Devices Installed:* 1.5  
million

With operations in 27  
countries and distributor  
links in 50 other markets,  
Memorex Telex is the  
world's largest supplier of  
3270 plug-compatible  
computer equipment and  
accessories. The com-  
pany is the result of the  
1987 merger of Memorex  
and Telex, two leading  
high-technology compa-  
nies. Telex, developer of  
the first hearing aid, was  
founded in 1936. The  
company later migrated  
into other products, in-  
cluding workstations.  
Memorex was founded in  
1961 as a manufacturer of  
high-performance mag-  
netic instrumentation and  
computer tape. It later

**Memorex Telex Revenue Growth  
(\$US millions)**



introduced terminal prod-  
ucts. In 1987, Telex  
agreed to an amicable  
\$1,150 million package  
merger with Memorex.

Memorex Telex sells IBM  
plug-compatible storage  
and data communications  
devices, intelligent work-  
stations, local area net-  
work products and  
services, airline reserva-  
tion systems, PBX equip-  
ment and station  
instruments, OEM tape  
drives, and computer sup-  
plies.

### Management Statement

"The benefits of the  
Memorex Telex combina-  
tion are beginning to  
show in our results, with  
particularly strong perfor-  
mances achieved by  
3270-communications  
products, intelligent sys-  
tems, OEM and tape stor-  
age products. During the  
year we achieved a net  
debt reduction of \$157  
million."

levels as its networking responsibilities expand. In traditional 3270 environments, the 1174 supports up to 96 terminals and four 3270 hosts.

Memorex Telex feels that as token-ring connectivity requirements continue to grow, corporate users will need increased flexibility. The 1174 supports two token-ring adapters, and simultaneous token-ring Gateway and Downstream Physical Unit support to maximize network flexibility. Host communications speed will grow even more important as token-ring sites proliferate. In light of this growing market, Memorex Telex has expanded the

number of devices the 1174 supports. Full duplex communications between the front-end processor and the 1174 controller enables users to maintain performance levels and decrease line costs.

In addition, the 1174 has the following productivity features:

- Windowing for CUT-mode. Users can cut and paste between windows.
- An on-screen calculator, which includes a cut and paste feature.
- Local print buffering.

Additional details and specifications are included in the Characteristics section of this report.

### Printers

Memorex Telex claims it is the leading vendor of 3270 printers. Its printer sales have increased 79 percent (measured in unit shipment growth) since 1987. Indeed, the company offers a broad range of printers, from dot matrix printers to heavy-duty system printers to high-quality graphics printers.

Memorex Telex' strategy has been to differentiate its product line by adding features to meet customer requirements. For instance, screen printers enable users to produce hard copy locally without waiting for a system print.

Its printers incorporate a document on demand feature that reduces wasted paper by giving users precise control over paper ejection. The printers also include Intelligent Printer Data Stream (IPDS) technology, which allows users to remain within IBM SAA strategy and produce sophisticated graphics. Capabilities include vector graphics, bar codes, and forms overlay.

The company's line printers use a shuttle matrix technology, which Memorex Telex claims is superior to band printer technology. This technology provides a variety of fonts, character sets, and graphics without any loss of speed or change of bands.

Memorex Telex' laser printers feature a variety of speeds (8 to 15 pages per minute) with enhanced paper handling features and integrated coax interfaces. Consequently, there is no need for an external protocol; users are assured of full access to all the printer's features.

Table 2 provides key specifications for the company's 3270 printer line.

### Applications

Memorex Telex' 3270-compatible products are intended for a wide range of applications including insurance, manufacturing, banking, travel, and the government. The company does not generally target vertical markets. Rather, it focuses on a specific customer profile, namely *Fortune* 1000 companies with large IBM 3270 installations.

Memorex Telex, does, however, have a large stake in the travel industry, particularly in the airline business. For example, its contract with a European airlines consortium called Galileo calls for

a large number of Memorex Telex displays and controllers. And the Societe Internationale de Telecommunications Aeronautiques (SITA) recently awarded Memorex Telex a \$3 million contract to develop a computer-based software system for shared airport environments.

### Competitive Position

Memorex Telex ranks number two in the industry, directly behind IBM. The market breakdown, based on Dataquest figures, is shown in Figure 1. Memorex Telex claims it is gaining market share while IBM is losing it. A commitment to the market, the company says, is responsible for its success. Other competitors include AT&T, Lee Data, IDEA Courier, and Harris. (Harris' Data Communications Division was recently sold to Adacom Corporation; the combined businesses will operate under the name Harris-Adacom).

Of these competitors, AT&T is perhaps the most formidable next to IBM since it is gaining market share. To strengthen its competitiveness, Memorex Telex continues to add enhanced feature sets to meet customer requirements and emphasize intelligent workstation solutions coupled with 3270 connectivity.

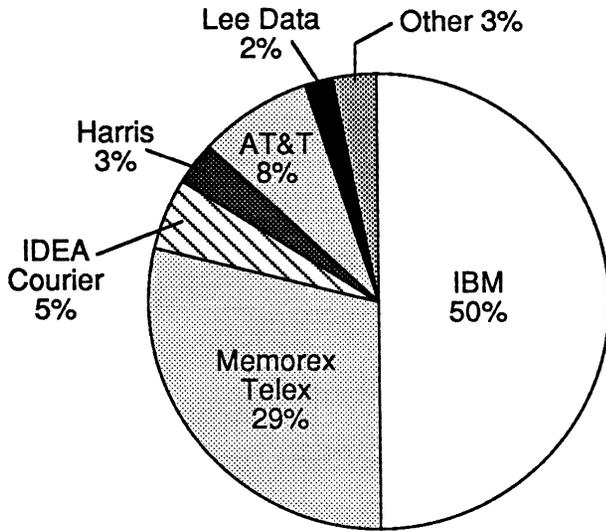
### Sales and Distribution

Memorex Telex sells its products via a direct sales force consisting of 350 sales representatives in the United States. These individuals are organized into regions, districts, and territories across the U.S. A marketing support group is appointed for each region and district. The sales force targets the *Fortune* 1000 IBM mainframe environment.

### Support

Service is a key part of Memorex Telex' marketing strategy; in fact, service represents more than 30 percent of its business. Memorex Telex has more than 2,000 service personnel, located in over 250 locations. The company offers a variety of service options to meet specific customer requirements. It also offers third party service on other vendors' products.

Figure 1.  
The 3270 Market



How the various competitors have carved up the 3270 market.

Figures provided by Dataquest.

## Decision Points

### Memorex Telex

- has always stressed plug compatibility.
- offers a complete product line.
- services what it sells.
- is the number two vendor in the market, and the only one gaining market share at any appreciable rate.

## Characteristics

**Models:** Terminals—1091 C Color Display Station; 1091D/E 3270 Basic Function Display Station; 1191 A/B Monochrome Display Station; 1191D2/E2 3270 Enhanced Function Monochrome Display Station; 1192 3270 Enhanced Function Display Series; C19A-C/D Combined Function Terminals. Connectivity devices—

1174 Network Controller; 1174-60R Desktop Controller; 1374-1L Local Cluster Controller; 1374-OXR Remote Cluster Controller; 1374-8XR Remote Cluster Controller; 1199-2 Terminal Multiplexer. Printers—1173 Screen Printer; 1187, 1387A Coax Matrix Printers; 1201/1202 Screen Message Printers; 1208 24-Wire PC Matrix Printer; 1210 Desktop Matrix Printer; 1324 Coax Matrix Printer; 1815 Laser Printer; 2108 Eight Page Per Minute Laser Printer; 2115 Desktop Laser Printer; 262 Matrix Line Printer.

## Transmission Specifications

### Network Controllers

**1174 Network Controllers** provide concurrent connection via token-ring, SNA/SDLC, BSC, and X.25. With full-duplex SDLC, they can support the SDLC protocol in full duplex mode. Multiple line addresses can be used on a given communication line (especially useful when using the BSC protocol).

**1374-1L Local Cluster Controller** can reach speeds of up to 1.2M bps. The controller is compatible with SNA and non-SNA protocols. It offers single-tag interlocked and two-tag, high-speed transfer.

**1374-OXR Remote Cluster Controllers** offers full compatibility with SNA, BSC, and X.25. Communication speeds range from 9.6K bps in BSC to 64K bps in SNA/SDLC and 4M bps in SNA via Token-Ring LAN.

**1374-8XR Remote Cluster Controllers (Model 81R)** communicate via SNA/SDLC, SNA/X.25, or BSC. The 82R unit provides an X.21 nonswitched host interface and operates in SNA/SDLC or SNA/X.25. Communication speeds range from 9.6K bps in BSC to 64K bps in SNA/SDLC and 4M bps in SNA via token-ring LAN.

### Terminals

#### System Attachment

**1091C Color Display** is 3270 plug-compatible through category A coax. Cluster controller attachment to all Memorex Telex 076/1274/1374 Control Units. Attaches to IBM 4321 or 4331 with display/printer adapter or workstation. Attaches to IBM 4361 with display printer adapter or workstation adapter.

**1091D/E Basic Function Display Station** is 3270 plug-compatible through category A coax. Cluster controller attachment to all Memorex Telex 076/1274/1374 Control Units. Attaches to IBM 4321 or 4331 with display/printer adapter. Attaches to IBM 4361 or 9370 with display/printer adapter or workstation adapter.

**1191A/B Monochrome Display Station** is 3270 plug-compatible through category A coax. Cluster controller

**Table 1. Overview of Terminal Specifications**

System	1091C	1091D/E	1191A/B	1191D2/E2	1192 Models C2, C19A-C/D D2, and F2	1192 Models C2, C19A-C/D D2, and F2
Screen color(s)	7 colors (see Note 1)	Monochrome (green or amber)	Monochrome (green or amber)	Monochrome (green or amber)	Monochrome (green or amber) or 7 colors	Monochrome (green or amber) or Color (see Note 2)
Character capacity	1,920 (24 x 80 plus status line)	1,920 (24 x 80 plus status line)	1,920 (24 x 80 plus status line)	1,920 or 2,560	From 1,920 to 3,564 (varies with model)	1,920 (24 x 80 plus 2 status lines)
Screen size (diagonal)	12 inches	14 inches	12 inches	14 inches	14 or 15 inches (dep. on model)	14 inches
Keyboard	88 or 122 keys	88, 102/103, 104, or 122 keys	88, 102, 104, or 122 keys	88, 102/103, 104, or 122 keys	88, 102, 104, or 122 keys	122 keys
Ergonomics	Adj. height, tilt, and swivel; detachable keyboard	Adj. height, tilt, and swivel; detachable keyboard, nonglare screen	Adj. height, tilt, and swivel; detachable keyboard, nonglare screen	Adj. height, tilt, and swivel; detachable keyboard	Adj. height, tilt, and swivel; detachable keyboard	Adj. height, tilt, and swivel; detachable keyboard
Options	Light pen, local screen printer, magnetic stripe card reader	Light pen, local screen printer	Light pen, local screen printer, magnetic stripe card reader	Light pen, local screen printer, magnetic slot card reader	Light pen, local screen printer, magnetic slot card reader	Light pen, headset

Note 1. Colors include red, green, blue, white, yellow, pink, and turquoise.

Note 2. Colors include red, blue, green, and white.

attachment to all Memorex Telex 076/1274/1374 Control Units. Attaches to IBM 4321 or 4331 with display/printer adapter. Attaches to IBM 4361 with display/printer adapter or workstation adapter.

**1191D2/E2 Enhanced Function Display** is 3270 plug-compatible through category A coax. Cluster controller attachment to all Memorex Telex 076/1174/1274/1374 Control Units and IBM 3274, 3174, and 3276 Control Units. Attaches to IBM 4321 or 4331 with display/printer adapter. Attaches to IBM 4361 or 9370 with display/printer adapter or workstation adapter.

**1192 Enhanced Function Display** is 3270 plug-compatible through category A coax. Cluster controller attachment to all Memorex Telex 076/1174/1274/1374 Control Units and IBM 3274, 3174, and 3276 Control Units. Attaches to IBM 4321 or 4331 with display/printer adapter. Attaches to IBM 4361 or 9370 with display/printer adapter or workstation adapter.

**C19A-C/D Combined Function Terminal** is a control unit attachment to all IBM 3174, 3274, 3276, or Memorex Telex 076, 276, 1174 product family, 1274 product family, 1374 product family.

#### **Communications (C19A-C/D Combined Function Terminal)**

Offers an asynchronous interface with an RS-232-C internal modem (300/1200 Baud, Bell 212A compatible). In the 3270 mode, abides by the SDLC/SNA (or BSC) Type "A" coax protocol.

#### **Device Control**

**Compatibility:** All terminals are IBM 3270 plug compatible.

**Visual Attributes:** Extended highlighting features enable users to display fields or characters to reverse video, blinking, or underscore, when attached to appropriately configured control units.

**Display Colors:** Models 1091C and 1192 offer seven-color support (red, green, blue, white, yellow, pink, and turquoise). Model C19A-C/D offers red, blue, green, white support. All other terminals offer green/amber support.

## **Components**

#### **Terminals**

Table 1 presents an overview of Memorex Telex' 3270-compatible terminal product line.

#### **Network Controllers**

Memorex Telex offers a variety of network controllers, as follows:

##### **1174 Network Controller/1174-60R Desktop Controller**

The 1174 controller, modular in design, has a base configuration consisting of a general purpose processor and memory, host communications and coax device controllers. It supports up to 96 devices and 4 host

**Table 2. Overview of Printer Specifications**

Model	1173	1187	1387A	1201	1202	1208	1210	1324	1815	2108	2115	262
Type	screen printer	dot matrix	dot matrix	dot matrix	dot matrix	dot matrix	dot matrix	dot matrix	laser printer	laser printer	laser printer	matrix line printer
Print speed	120 cps draft; 30 cps nlq	200 cps draft; 100 cps high density;	400 cps draft; 200 cps high density; 100 cps nlq	270 cps draft; 54 cps nlq	270 cps draft; 54 cps nlq	240 cps draft; 60 cps "letter mode"	270 to 324 cps draft; 54 cps nlq	250 to 400cps	15 pgs./min.	8 pgs./min.	15 pgs./min.	300-800 lines per minute (lpm) draft; 66-165 lpm letter quality
Paper feed	pin, tractor, or friction	pull tractor	pull tractor	push tractor feed	push tractor feed	friction	friction	pull tractor	auto	auto or manual	auto	pull tractor
Buffer size, K bytes	2	4	4	10	8	8	2-4	4	2	4	4	4

links. The 1174-60R desktop model supports 32 coax devices and 8 ASCII devices.

These controllers offer the following features:

- Modular design
- Multiprocessor architecture
- Multiple hosts supported
- Increased device connectivity
- Enhanced ASCII support
- Multiple logical sessions and windowing
- Advanced data handling
- Improved network management

The 1174 controllers offer high-speed processing and maximum device support. They support a mix of devices, reside in a compact housing, and are compatible with industry standards. The 1174 controllers are compatible with the IBM 3174-1L, and attach directly to a host processor via an IBM or IBM-compatible System 370 channel interface.

#### **1374-OXR Remote Cluster Controllers**

These remote controllers provides high-speed advanced control for remote 3270 environments. They provide support for up to 32 devices in a compact housing, offer an extensive complement of features, and can

support a wide variety of devices. They can accommodate dual host support and support a variety of protocols including:

- SNA
- BSC
- X.25

#### **1374-8XR Remote Cluster Controllers**

A line of streamlined controllers with 3.5-inch drives. These controllers offer extended features and are economical. They support a wide variety of devices including ASCII display terminals (via an optional serial port) and personal computers. They support the following protocols:

- SNA/SDLC
- X.25
- BSC

#### **Printers**

Memorex Telex' line of 3270-compatible printers ranges from dot matrix printers to high-quality graphics printers that function as heavy-duty system printers (see Table 2).

#### **Pricing**

Current pricing information for Memorex Telex' line of 3270-compatible displays, network controllers, and printers follows. Contact the company for additional details.

**Equipment Prices/Displays**

		<b>Purchase Price (\$)</b>
<b>Display Terminal Models</b>		
1091C	Color display station with 7-color 12-inch display screen. Closest IBM equivalent: Model 3192-C (2080).	1,765
1091D/E	3270 Basic function display station. Includes a 14-inch screen. Closest IBM equivalent: Model 3471 (1230).	995
1191A/B	Basic function monochrome display station. Includes a 12-inch, nonglare screen. Closest IBM equivalent: Model 3191A (1350).	995
1191D2/E2	3270 enhanced function monochrome display station. Includes a 14-inch screen. Closest IBM equivalent: Model 3191D (1560).	1,295
1192D2	Enhanced function display series 2. Includes a 14-inch screen. Closest IBM equivalent: Model 3192D (1970).	1,495
1192F2	Color display station. Includes a 15-inch screen. Closest IBM equivalent: Model 3192F (2300).	1,620
C19A	Combined function terminal, includes both data and voice features. Includes a 14-inch screen.	2,695

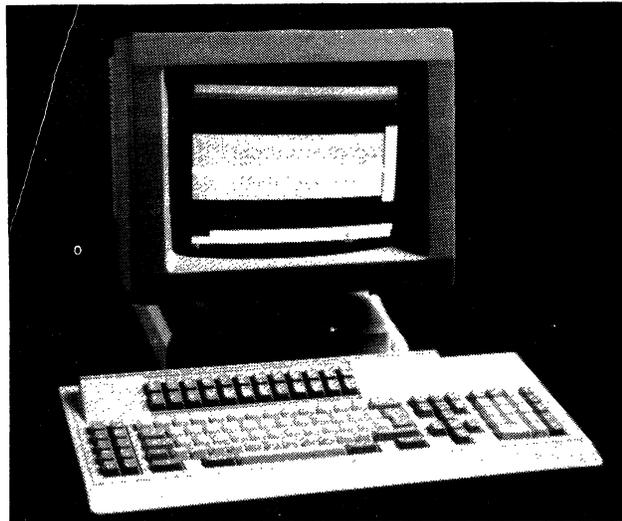
**Equipment Prices/Network Controllers**

		<b>Purchase Price (\$)</b>
<b>Network Controller Models</b>		
1174	Supports up to 96 devices and 4 host links simultaneously. Features a modular design, and the capability of supporting additional processors, memory, ASCII ports, and a second diskette drive.	10,960
1174-60R	Desktop controller that supports 32 coax devices and 8 ASCII devices; otherwise, provides same functionality as the 1174 controller.	7,800
1374-1L	A local cluster controller intended for local 3270 clusters. Attaches directly to a host processor via an IBM or IBM-compatible System 370 channel interface. A plug-compatible replacement for the IBM 3174-1L.	14,260
1374-1R	A remote cluster controller offering high-speed advanced control for remote 3270 environments.	10,960
1374-81R	A remote cluster controller featuring a compact design. Can communicate with a host processor through attachment to an IBM or IBM-compatible 37X5 front-end processor. A plug-compatible alternative to the IBM 3174-8XR.	3,855
1374-83R	A remote cluster controller with communications facilities supporting an IBM-compatible Token-Ring interface or SNA.	5,730

**Equipment Prices/Printers**

		<b>Purchase Price (\$)</b>
<b>Printer Models</b>		
1173	Screen printer designed for users who need fast hard copy of what is on their terminal screens.	445
1187	A 9-wire bidirectional matrix impact printer capable of print speeds up to 200 characters per second.	3,670
1387A	A coax matrix printer available with either a high-speed draft printhead or a near letter-quality print head.	5,245
1201	A screen message printer, using a 9-wire printhead, that prints from 54 characters per second to 257 characters per second.	645
1202	Similar to the 1201 model, this screen message printer has a greater number of print positions, but a slightly smaller print buffer.	845
1208	A 24-wire matrix printer offering print speeds from 60 cps to 240 cps. Features a wide range of graphics and an optional color ribbon.	1,095
1210	Desktop matrix printer designed for low volume and bar code printing requirements.	2,195
1324	A coax matrix printer designed for high-volume 3270 environments. Features three operator-selectable modes for up to 132 columns.	6,595
1815	Laser printer that prints 15 pages per minute, and which can handle a wide range of applications.	8,995
2108	Laser printer with a capacity of 8 pages per minute.	2,895
2115	A high-performance desktop laser printer with a capacity of 15 pages per minute.	7,495
262	A 400/800 line per minute matrix line printer.	10,500

# Memorex 3270 Plug-Compatible Display System



*The most recent addition to the Memorex 3270-replacement display station line is the 2179, a plug-compatible replacement for the IBM 3179 or 3279. Equipped with a 14-inch display screen, the 2179 can display two, four, or seven colors. The terminal features three-piece modular construction, a tilt/swivel monitor, and a 122-key keyboard that adjusts to five heights.*

## MANAGEMENT SUMMARY

**UPDATE:** Memorex has made several additions to its line of IBM 3270 plug-compatible replacement products since the last version of this report. New products include the 2174 and 2274 controllers (which replace the older 2074 controller models), the 2080 monochrome display, the 2179 color display, and the 2114 and 2173 printers.

Memorex entered the IBM 3270-compatible market in 1976 with the introduction of the 137X product line, replacements for the first-generation IBM components (3271, 3277). The 207X family was unveiled in 1980, as replacements for the second-generation IBM equipment. Memorex, now a subsidiary of Burroughs Corporation, has continued to upgrade and enhance its IBM 3270 plug-compatible product line. In 1984, Memorex introduced its third generation of IBM 3270 plug-compatible display stations, the 217X family. A key feature of the Memorex products is their plug-compatibility with the IBM components; customers can mix IBM and Memorex devices in the same configuration

The initial controller introduced for the 207X family was the 2076, a plug-compatible replacement for the IBM 3276 Control Unit (without the built-in display that the 3276 includes). Still a part of the Memorex cluster controller family, the 2076 provides for the remote attachment of up to eight devices in a BSC environment. In May 1983, Memorex introduced the 2074 Cluster Controller, the company's first SNA control unit. In April 1985, Memorex introduced the 2174-8, a plug-compatible alternative to the

Memorex offers a family of communications products designed as plug-compatible replacements for members of the IBM 3270 Information Display System. Members of the Memorex 3270-replacement family include BSC and SNA/SDLC controllers, monochrome and color display stations, and local and remote printers.

**MODELS:** 2076, 2174-8, 2274-1C, and 2274-2C Remote Cluster Controllers; 2274-2A Local Cluster Controller; 2078, 2080, and 2178 Monochrome Display Stations; 2079 and 2179 Color Display Stations; 2068 and 2114 Cluster Printers; and 2173 Screen Printer.

**DISPLAY:** The 2078 and 2080 feature a 15-inch display; the 2079 and 2179 include 14-inch monitors; and the 2178 features a 12-inch display. Monochrome models (2078, 2080, and 2178) are available with either green or amber character displays. Color models (2079 and 2179) feature seven-color display capability. All Memorex display stations feature a tilt/swivel monitor (except the 2079, which features tilt only).

**KEYBOARD:** The 2078 offers a choice of 11 keyboard layouts; the 2080 offers 15 layouts; the 2178 offers 4 layouts; the 2079 offers 10 layouts; and the 2179 offers a choice of 3 layouts. All keyboard layouts for the 2078, 2080, and 2079 are available in either standard or ergonomic design; keyboards for the 2178 and 2179 are available in ergonomic design only. All Memorex keyboards are detachable.

**COMPETITION:** IBM, ITT Courier, Telex, Harris, Lee Data, AT&T, and others.

**PRICE:** Single quantity purchase prices for the Memorex display stations range from \$1,795 to \$2,595.

## CHARACTERISTICS

**VENDOR:** Memorex Corporation (A Burroughs Company), San Tomas at Central Expressway, Santa Clara, CA 95052. Telephone (408) 987-1000 or (800) 538-9303.

**DATE OF ANNOUNCEMENT:** February 1980.

**DATE OF FIRST DELIVERY:** February 1980.

**NUMBER DELIVERED TO DATE:** Information not available.

**SERVICED BY:** Memorex.

## Memorex 3270 Plug-Compatible Display System

▷ now discontinued IBM 3274-51C. The 2174-8 supports the remote attachment of up to eight devices in an SNA/SDLC environment. In October 1985, Memorex introduced the 2274 Cluster Controller, available in two models: the 2274-1C, with 8 to 16 ports, and the 2274-2C, with 16 to 32 ports. Both models are capable of operating at speeds up to 19,200 bps, in either BSC or SNA/SDLC environments. With the introduction of the 2174 and 2274 controllers, the 2074 is no longer marketed by Memorex.

Memorex currently provides five display stations for attachment to the Memorex (or equivalent IBM) controllers. The 2078, which is the senior member of the family, is an IBM 3278 replacement. The 2078 is available in four models, featuring display capacities of 1,920, 2,560, 3,440, and 3,564 characters. All four models contain a 15-inch tilt/swivel display, green or amber characters, and a detachable keyboard (available in 11 layouts). The newest monochrome display station introduced by Memorex, the 2080, is also an IBM 3278 replacement. The 2080 combines all of the features found on the 2078, including four display capacities, into one model that allows the operator to select screen formats and operate control settings through the keyboard.

The third generation of Memorex plug-compatible monochrome displays is represented by the 2178, a replacement for IBM's 3178. The 2178 features a compact, modular design, with a 12-inch removable tilt/swivel monitor and green or amber display. Standard on the 2178 is a 1,920-character display capacity and a detachable keyboard (available in three layouts).

The 2079 Color Display Station provides seven-color capability (red, green, blue, white, turquoise, pink, and yellow) on a 14-inch monitor. The 2079, a replacement for IBM's 3279 color display, features a graphics option and is avail-



Another new addition to the Memorex product line is the 2080 display station. The 2080 provides four operator-selectable display capacities, ranging from 1,920 to 3,564 characters.

### ► CONFIGURATION

Memorex communications peripherals are plug-compatible replacements for members of the IBM 3270 Information Display System. Memorex communications peripherals can transmit and receive data to and from the following host computers: IBM System/360, System/370, 303X, 308X, 43XX, 8100, and IBM-compatible systems. The Memorex family of 3270 plug-compatible communications peripherals consists of the following products: 2076, 2174-8, 2274-1C, 2274-2C, and 2274-2A Cluster Controllers; 2078, 2080, and 2178 Monochrome Display Stations; 2079 and 2179 Color Display Stations; 2068 and 2114 Cluster Printers; and the 2173 Screen printer.

The Memorex 2076 Cluster Controller, a plug-compatible replacement for the IBM 3276 (models 1 through 4), operates at speeds up to 9600 bps and controls the functions of up to eight printers and/or display stations in remote binary synchronous (BSC) environments. Up to three Device Adapters may be added to the 2076, providing for the attachment of two additional devices each.

The 2174-8 Cluster Controller is a plug-compatible replacement for the IBM 3274-51C (which has been discontinued by IBM). Like the 2076, the 2174-8 operates at speeds up to 9600 bps, and controls the functions of up to eight devices. However, the 2174-8 operates in Systems Network Architecture/Synchronous Data Link Control (SNA/SDLC) environments.

Memorex 2274 Remote Cluster Controllers (Models -1C and -2C) are available in either BSC or SNA/SDLC versions. The 2274-1C is a plug-compatible alternative to the IBM 3274-61C control unit, and is available with 8 or 16 ports. The 2274-2C is a plug-compatible alternative to the IBM 3274-41C control unit, and is available with 16 or 32 ports. Both the 2274-1C and 2274-2C can be upgraded in the field, and all versions operate at speeds up to 19,200 bps.

The 2274-2A Local Cluster Controller is also available in BSC and SNA/SDLC versions. The 2274-2A is a plug-compatible replacement for the IBM 3274-41A and 3274-41D control units; it can support up to 32 devices, attached directly or through the IBM 3299 Terminal Multiplexer.

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### TRANSMISSION SPECIFICATIONS

Transmission is performed synchronously, in half- or full-duplex modes, over leased or dial-up communications lines via the appropriate modems. Transmission is point-to-point or multipoint at rates up to 9600 bps when using the 2076 or 2174-8 controllers, and at rates up to 9600 bps when using one of the 2274 controller models. Memorex display stations and printers operate in both SNA/SDLC and BSC environments (the 2076 supports only BSC protocol, while the 2174-8 supports only SNA/SDLC). An RS-232-C interface for modem attachment is standard. All devices connecting to the Memorex Remote Cluster Controllers use IBM-compatible Category A interfaces. Displays and printers attach to the controllers via coaxial cable.

### DEVICE CONTROL

The Memorex 2078, 2079, 2080, 2178, and 2179 Display Stations operate under the direct control of the Memorex 2174, 2274, or 2076 Cluster Controllers, or the IBM 3276 or 3274 Control Units. Conversely, Memorex 2076, 2174-8, and 2274 Cluster Controllers provide for the attachment of the IBM 3178, 3180, 3278, and (pre-converged) 3179 and 3279 Display Stations. All IBM 3270 display terminal functions are supported on the Memorex display stations, including visual attributes, character editing, erase func-

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## Memorex 3270 Plug-Compatible Display System

able in two models, providing either 1,920- or 2,560-character display capability. Ten keyboard layouts are available. A new addition to the Memorex product line is the 2179 Color Display Station. A replacement for the IBM 3179 or 3279 color displays, the 2179 combines modular design with seven-color display capability, and includes a 14-inch removable tilt/swivel monitor and a 1,920-character display capacity. The 2179 also allows operators to control settings and other screen functions through the keyboard; it is the first plug-compatible 3270 color terminal to incorporate this feature.

For applications that require hard copy, Memorex provides the IBM plug-compatible 2068 Multifunction and 2114 Dot Matrix cluster printers, as well as the 2173 Screen Printer (which can only be used with Memorex displays).

In addition to its 3270 plug-compatible products, Memorex also manufactures and markets a line of plug-compatible display stations and printers for use with the IBM System/34/36/38 minicomputers.

### COMPETITIVE POSITION

Memorex has a significant installed base of 3270-compatible terminals, and is one of the major competitors in this market, along with ITT Courier, Telex, AT&T, Harris, and Lee Data; several other vendors participate actively in this lucrative market. The market for 3270-replacement products has tightened up considerably in the past two years, due mainly to IBM's aggressive strengthening of the 3270 family through a host of new products and accompanying price cuts. The moves forced the IBM 3270-replacement vendors to either expand and upgrade their product lines to meet the challenge, or leave the market. Memorex, now a subsidiary of Burroughs, has taken the first route, adding new products which include the 2174 and 2274 controllers, the 2080 and 2179 displays, and the 2114 and 2173 printers. Despite the inroads made by microcomputers in many applications that have traditionally been handled exclusively by terminals, the 3270 market remains healthy and continues to grow. Memorex is committed to this market, and should remain one of the leaders among the independents.

### ADVANTAGES AND RESTRICTIONS

A major advantage of the Memorex 3270-replacement product line is its plug compatibility with IBM components. All Memorex displays and printers (except for the 2173) can attach to IBM controllers; likewise, most IBM Category A devices (except for 3279 color displays that have not been preconverged) can be connected to the Memorex controllers. In effect, this allows Memorex components to be sold into DP shops that have already made an investment in IBM gear, without obsoleting that investment. This plug-compatibility, which is also offered by Telex and on some ITT Courier components, makes for an easier sale when dealing with IBM shops. Look for more of the independent vendors to provide plug-compatibility on their 3270 products in the future.

tions, and protected formats. The cursor can be chosen as a blinking or nonblinking block or underline.

The 2076 and 2174-8 Cluster Controllers support the attachment of up to eight devices, for use in BSC and SNA/SDLC environments, respectively. Up to three device adapters, each supporting two additional devices, can be added to the 2076. The 2274 Remote Cluster Controllers provide support for from 8 to 32 devices, either displays or printers, in any combination, for use in either BSC or SNA/SDLC environments. The 2274 controllers use four 5¼-inch diskettes for system configuration, diagnostics, languages, and dump operations. Special Local Control Point (LCP) software provides clear English menus for performance monitoring and easy configuration; users need only specify link polling address and printer authorization matrix, and menus can be accessed from any attached display station. All Memorex cluster controllers offer self-diagnostics, remote diagnostic capability, and cluster usage statistics. In addition, Memorex controllers support graphics, seven-color display stations, APL/Text, light pens, and different ASCII/EBCDIC keyboard configurations.

An APL/Text (A Programming Language/Text) feature enables Memorex display terminals to display the 122-character APL/Text character set and to support host systems running APL software. APL/Text is standard on the 2078, 2079, 2080, and 2179 display stations; it is not available on the 2178. The feature operates in EBCDIC mode and requires an appropriate APL or Text keyboard layout, specific controller support, and the ECS (Extended Character Set) feature (also standard on all Memorex display stations except the 2178). The ECS feature uses reverse video, underline, and/or blinking visual attributes to highlight selected characters or fields of data. It can also be used to identify error or exception conditions.

A Programmed Symbols Option is available on the 2078 and 2079, providing these displays are equipped with graphics capabilities. The Programmed Symbols Option allows for access of up to six 190-symbol sets whose shapes and codes are user defined. Symbol sets are loaded under program control, and accessed for display through programming or from the keyboard.

### COMPONENTS

**2076 REMOTE CLUSTER CONTROLLER:** Provides control for up to eight devices, in any combination of display stations and/or printers (one display station required as system console). The 2076 supports only BSC protocol. The following devices can be attached to the 2076: Memorex 2078, 2080, and 2178 Monochrome Display Stations; 2079 and 2179 Color Display Stations; and the 2068 and 2114 Multifunction Matrix Printers. The 2076 also supports attachment of most IBM Category A devices, including the following: 3178, 3180, and 3278 monochrome display stations; preconverged 3179 and 3279 color display stations; 3268 and 3287 matrix printers; and 3262 line printer.

**2174-8 REMOTE CLUSTER CONTROLLER:** Provides control for up to eight devices, in any combination of display stations and/or printers. The 2174-8 supports only SNA/SDLC protocol. The following devices can be attached to the 2174-8: Memorex 2078, 2080, and 2178 Monochrome Display Stations; 2079 and 2179 Color Display Stations; and the 2068 and 2114 Multifunction Matrix Printers. The 2174-8 also supports attachment of most IBM Category A devices, including the following: 3178, 3180, and 3278 monochrome display stations; preconverged 3179 and 3279 color display stations; 3268 and 3287 matrix printers; and 3262 line printer.

**2274-1C REMOTE CLUSTER CONTROLLER:** Provides control for up to 8 or 16 devices, in any combination of

## Memorex 3270 Plug-Compatible Display System

Currently, Memorex is providing only replacements for the IBM 3270 controllers, displays, and printers. The company does not provide the option of adding personal computing capability to a Memorex cluster (it recently discontinued its PC Attach option); nor does it provide the multifunctionality offered by Lee Data and AT&T, competitors who have added value to their 3270-replacement product lines by providing controllers that can access both asynchronous and synchronous hosts. Memorex is concentrating on providing straight IBM plug-compatibility in its 3270 product line.

### USER REACTION

In Datapro's 1985 Terminal Users Survey, conducted in conjunction with *Data Communications* magazine, responses were received from 20 users of the Memorex 2078 and 2079 Display Stations. These users, who represented an installed base of over 11,000 terminals, were asked to rate the Memorex displays with regard to seven specific categories. Their ratings are summarized in the following table.

	Excellent	Good	Fair	Poor	WA*
Overall performance	3	16	1	0	3.1
Ease of operation	5	15	0	0	3.3
Display clarity	7	12	1	0	3.3
Keyboard feel & usability	3	10	5	1	2.8
Ergonomics	6	8	5	0	3.1
Hardware reliability	2	14	4	0	2.9
Mfr.'s maintenance service/technical support	1	17	2	0	3.0

\*Weighted Average on a scale of 4.0 for Excellent.

When asked whether or not they would recommend the Memorex displays to other users with similar applications, 15 of the respondents answered that they would; the remaining five users were undecided or did not answer the question. The users were also asked to name the factor which *most* influenced their decision to purchase Memorex displays. Almost 70 percent of the users cited price as the chief purchase factor. □

display stations and/or printers. A field upgrade option is available. The 2274-1C supports BSC and SNA/SDLC protocols, and is plug-compatible with the IBM 3299 Terminal Multiplexer. The following devices can be attached to the 2274-1C: Memorex 2078, 2080, and 2178 Monochrome Display Stations; 2079 and 2179 Color Display Stations; and the 2068 and 2114 Multifunction Matrix Printers. The 2274-1C also supports attachment of most IBM Category A devices, including the following: 3178, 3180, and 3278 monochrome display stations; preconverged 3179 and 3279 color display stations; 3268 and 3287 matrix printers; and 3262 line printer.

**2274-2C REMOTE CLUSTER CONTROLLER:** Provides control for up to 16 or 32 devices, in any combination of display stations and/or printers. A field upgrade option is available. The 2274-1C supports BSC or SNA/SDLC protocols, and is plug-compatible with the IBM 3299 Terminal Multiplexer. The following devices can be attached to the 2274-2C: Memorex 2078, 2080, and 2178 Monochrome Display Stations; 2079 and 2179 Color Display Stations;

and the 2068 and 2114 Multifunction Matrix Printers. The 2274-2C also supports attachment of most IBM Category A devices, including the following: 3178, 3180, and 3278 monochrome display stations; preconverged 3179 and 3279 color display stations; 3268 and 3287 matrix printers; and 3262 line printer.

**2274-2A LOCAL CLUSTER CONTROLLER:** Provides control for up to 32 devices, in any combination of display stations and/or printers, attached directly or through an IBM 3299 Terminal Multiplexer. The 2274-2A operates in SNA or non-SNA (Extended 3272) mode. The following devices can be attached to the 2274-2A: Memorex 2078, 2080, and 2178 Monochrome Display Stations; 2079 and 2179 Color Display Stations; and the 2068 and 2114 Multifunction Matrix Printers. The 2274-2A also supports attachment of most IBM Category A devices, including the following: 3178, 3180, and 3278 monochrome display stations; preconverged 3179 and 3279 color display stations; 3268 and 3287 matrix printers; and 3262 line printer.

All Memorex cluster controllers are plug-compatible, without hardware or software modifications.

**2078 DISPLAY STATION:** Available in four models, all of which include a 15-inch (diagonally measured) display screen. Model 82 features a 1,920-character display capacity, arranged in 24 lines of 80 characters each. Model 83 features a 2,560-character capacity, arranged in 32 lines of 80 characters each. Model 84 has a 3,440-character screen capacity, arranged in 43 lines of 80 characters each. Model 85 contains a 3,564-character display capacity, arranged in 27 lines of 132 characters each. An additional line, for the display of terminal status, is standard on all models. Characters are formed within a 9-by-16 dot matrix on Models 82 and 83, and within a 9-by-12 dot matrix on Models 84 and 85. All models are available with green (P39) or amber phosphor characters. The full ASCII and EBCDIC character sets are displayable. The display monitor tilts and swivels for operator convenience. The 2078 attaches to the Memorex 2174-8, 2274 series, and 2076 Cluster Controllers, as well as to the IBM 3274 and 3276 Control Units.

**2079 COLOR DISPLAY STATION:** Available in two models, both of which contain a 14-inch (diagonally measured) display screen. Model S2B features a 1,920-character display capacity, arranged in 24 lines of 80 characters each. Model S3B features a 2,560-character capacity, arranged in 32 lines of 80 characters each. A terminal status line is available on both models. Characters are formed within a 9-by-12 dot matrix. Seven-color capability is standard on both models—four basic colors (red, green, blue, and white) and three extended colors (turquoise, pink, and yellow). The controller and program must support seven-color capability in order to access the extended colors. The full ASCII and EBCDIC character sets are displayable. The display monitor tilts and swivels for operator convenience. The 2079 attaches to the Memorex 2174-8, 2274 series, and 2076 Cluster Controllers, as well as to the IBM 3274 and 3276 Control Units.

**2080 DISPLAY STATION:** Contains a 15-inch (diagonally measured) display screen with four user-selectable display formats. The display formats are the same as those available on the four different 2078 models; 1,920 characters (24 lines of 80 characters), 2,560 characters (32 lines of 80 characters), 3,440 characters (43 lines of 80 characters), and 3,564 characters (27 lines of 132 characters). An additional terminal status line is standard. Characters are formed within a 7-by-9 dot matrix for the 1,920- and 3,564-character formats, and within a 7-by-8 dot matrix for the 2,560- and 3,440-character formats. The 2080 is available with either green (P39) or amber phosphor characters. The full ASCII and EBCDIC character sets are displayable. The display monitor tilts and swivels for operator convenience. The 2080

## Memorex 3270 Plug-Compatible Display System

attaches to the Memorex 2174-8, 2274 series, and 2076 Cluster Controllers, as well as to the IBM 3274 and 3276 Control Units.

**2178 DISPLAY STATION:** Contains a 12-inch (diagonally measured) display screen with a 1920-character capacity, arranged in 24 lines of 80 characters each. A terminal status line is standard. Characters are formed using a 7-by-14 dot matrix within a 9-by-16 window, and displayed in green (P39) or amber phosphor. The full ASCII and EBCDIC character sets are displayable. The 2178 features a modular, three-piece construction with a compact design and a tilt/swivel monitor. The 2178 attaches to the Memorex 2174-8, 2274 series, and 2076 Cluster Controllers, as well as to the IBM 3274 and 3276 Control Units.

**2179 COLOR DISPLAY STATION:** Contains a 14-inch (diagonally measured) display screen with a 1,920-character display capacity, arranged in 24 lines of 80 characters each. A terminal status line is standard. Characters are formed using a 7-by-14 dot matrix within a 9-by-16 dot window. Seven-color display capability is standard—four basic colors (red, green, blue, and white) and three extended colors (turquoise, pink, and yellow). The controller and program must support seven-color capability in order to access the extended colors. The full ASCII and EBCDIC character sets are displayable. The 2179 features a modular, three-piece construction with a compact design and a removable, tilt/swivel monitor. The 2179 attaches to the Memorex 2174-8, 2274 series, and 2076 Cluster Controllers, as well as to the IBM 3274 and 3276 Control Units.

**KEYBOARDS:** The 2078 offers a choice of 11 keyboard layouts. The 2079 offers a choice of 10 keyboard layouts, and the 2080 provides the user with a choice of 15 keyboard layouts. The 2178 and 2179 offer a choice of four and three different keyboard layouts, respectively. All keyboard layouts for the 2078, 2079, and 2080 are available in either standard or ergonomic (adjustable height) versions; both types feature a low-profile design. Keyboards for the 2178 and 2179 are available in the ergonomic version only. N-key rollover, selectable click or nonclick keys, and typamatic keys are standard features on all keyboard models. All keyboards are detachable.

**2068 MULTIFUNCTION PRINTER:** A matrix printer capable of both high-speed and letter-quality printing. Print speeds are 350 cps (high speed) and 80 cps (dynamic letter quality). Memorex's patented stored-force flexhammer print mechanism is used. Six fonts and thirteen international character sets are available, plus double size, elongated, boldface, and italics. Print matrix is 9-by-10 (high speed) or 18-by-20 (dynamic letter quality); the print matrix varies depending on the font selected. Character spacing is 10, 12, or 17 cpi, or proportional spacing; line spacing is selectable at 2, 3, 4, 8, or 12 lpi. Forms are fed using a combination of adjustable tractors, pressure rollers, and belt guides. Six-part fanfold paper, up to 15 inches wide, can be accepted, as well as single sheets up to 11¾ inches wide. Formats, fonts, character spacing, line spacing, and diagnostics are selected using the printer's operator control keypad. Two-digit LED indicators give a readout of status and error conditions. The 2068 operates at 55-58 decibels. The 2068 attaches to the Memorex 2174-8, 2274 series, and 2076 Cluster Controllers, as well as to the IBM 3274 and 3276 Control Units.

**2114-1 MULTIFUNCTION PRINTER:** A matrix printer capable of printing at three different speeds—220 cps (draft quality), 110 cps (correspondence quality), and 55 cps (near

letter quality). The 2114-1 uses a 9-pin, 200 million character-life print head. Fonts are selectable, including standard, elongated, proportional, and underlined; print matrix is dependent on the font selected. Character spacing is 10, 12, 15, or 17.1 cpi, with line spacing selectable at 3, 4, 6, 8, or 12 cpi. Forms are fed from the rear or bottom, using a dual feed system that combines push-pull tractors and friction feed. Cut sheets and continuous feed paper is accepted. Formats, fonts, character spacing, line spacing, and diagnostic routines are selected using the printer's control panel. LCD readouts give printer status and error conditions. The 2114-1 operates at 55 decibels. The 2114-1 attaches to the Memorex 2174-8, 2274 series, and 2076 Cluster Controllers, as well as to the IBM 3274 and 3276 Control Units.

**2173 SCREEN PRINTER:** A matrix printer with a print speed of 120 cps. The 2173 uses a bidirectional, logic seeking, 9-wire print head. Eight ASCII-compatible and 12 EBCDIC-compatible international character sets are available. Print matrix is 9-by-9 (standard) or 9-by-15 (high resolution). Character spacing is 10, 12, or 17 cpi (standard), and 10 cpi or proportional (high resolution). Paper is fed using a tractor or friction feed mechanism. Fanfold paper, up to 11 inches wide and four parts thick, can be accepted, as well as manually fed, single part cut sheets up to 11 inches wide. On command, the 2173 provides a printed record of the information on the display station screen, without the intervention of a central processor. For use only with Memorex display stations, the 2173 attaches directly to a 2078, 2079, 2080, 2178, or 2179, and does not require the use of an additional port on the cluster controller.

### PRICING

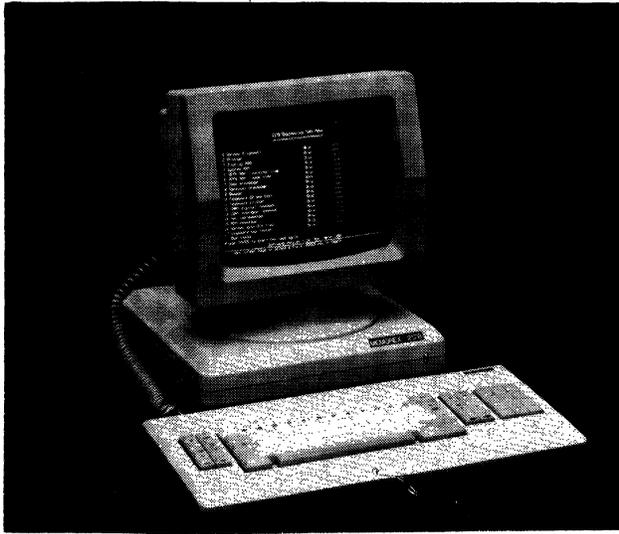
Memorex 3270-type, Category A, plug-compatible communications peripherals are available for purchase, or on a lease basis. A variety of maintenance plans are available. Memorex supplied us with the following single-unit purchase prices; for quantity discount pricing, as well as for lease plan and maintenance plan pricing, contact Memorex.

### EQUIPMENT PRICES

		Purchase Price (\$)
2076	Remote Cluster Controller (8-port BSC)	3,595
2174-8	Remote Cluster Controller (8-port SNA/SDLC)	5,595
2274-1C	Remote Cluster Controller (16-port)	8,500
2274-2C	Remote Cluster Controller (32-port)	13,000
2274-2A	Local Cluster Controller (32-port)	17,000
2078	Monochrome Display Station (4 models) w/keyboard	1,795 & up
2079	Color Display Station (2 models) w/keyboard	2,295 & up
2080	Monochrome Display Station w/keyboard	1,995
2178	Monochrome Display Station w/keyboard	1,485
2179	Color Display Station w/keyboard	2,095
2068	Multifunction Printer	6,495
2114-1	Multifunction Printer	3,600
2173	Screen Printer	995 ■



# Memorex 207X Display System



*The 2178, Memorex's newest addition to the 207X family, is a plug-compatible replacement for the IBM 3178. The 2178 contains a 12-inch display screen with a 24-line by 80-column format. The terminal features three-piece modular construction, weighs 25 pounds, and measures 15 inches high by 14 inches deep by 13½ inches wide (without keyboard). The monitor tilts 20 degrees and swivels through 90 degrees.*

## MANAGEMENT SUMMARY

Memorex entered the IBM 3270-compatible market in 1976 with the introduction of the 137X product line, replacements for the first-generation IBM components (3271, 3277). The 207X family was unveiled in 1980, as replacements for the second-generation IBM equipment. Memorex, now a subsidiary of Burroughs Corporation, has recently made several enhancements to the 207X product line in response to recent moves by IBM. These include the introduction of a low-priced, compact display (the 2178), and a personal computing attachment option.

The initial controller of the 207X family is the 2076, a plug-compatible replacement for the IBM 3276 Control Unit (without the built-in display that the 3276 includes). The 2076 provides for the remote attachment of up to eight devices in a BSC environment. In May 1983, Memorex introduced the 2074 Cluster Controller, the company's first SNA control unit. The 2074 supports the remote attachment of up to 32 devices in an SNA/SDLC environment. In December 1983, Memorex introduced two additional versions of the 2074, for local SNA and BSC environments.

Memorex currently provides three display stations for attachment to the Memorex controllers. The 2078, which is the senior member of the family, is an IBM 3278 replacement. The 2078 is available in four models, featuring display capacities of 1920, 2560, 3440, and 3564 characters. All four models contain a 15-inch tilt/swivel display, green ▶

The Memorex 207X Display System is a family of products designed as plug-compatible replacements for members of the IBM 3270 Information Display System. Family members include controllers, monochrome and color displays, and printers. Memorex has also added a personal computing attachment feature to the 207X family.

**MODELS:** 2074 and 2076 Cluster Controllers, 2078 and 2178 Display Stations, 2079 Color Display Station, 2068 and 2087 Printers, PC Attach.

**DISPLAY:** The 2078 features a 15-inch display; the 2079, a 14-inch display; and the 2178, a 12-inch display. The 2078 and 2178 display characters in green or amber (selectable); the 2079 features seven-color capability. All three models feature a tilt/swivel monitor.

**KEYBOARDS:** A choice of 13 keyboard layouts, in low-profile or ergonomic designs, are available for the 2078 and 2079. The 2178 features a choice of three keyboard layouts, in a low-profile design. All keyboards are detachable.

**COMPETITION:** IBM, ITT Courier, Telex, Harris, Lee Data, Teletype, and several others.

**PRICE:** Purchase prices for the Memorex displays range from \$1,485 to \$2,595.

## CHARACTERISTICS

**VENDOR:** Memorex Corporation (a Burroughs company), Communications Group, 18922 Forge Drive, Cupertino, CA 95014. Telephone (408) 996-9000.

**DATE OF ANNOUNCEMENT:** February 1980.

**DATE OF FIRST DELIVERY:** February 1980.

**NUMBER DELIVERED TO DATE:** Information not available.

**SERVICED BY:** Memorex.

## CONFIGURATION

The Memorex 207X family of components are plug-compatible replacements for members of the IBM 3270 Information Display System. The 207X products can transmit data to and receive data from the following host computers: IBM System/360, System/370, 303X, 308X, 43XX, and 8100, plus IBM-compatible systems. The 207X family consists of the 2074 and 2076 Cluster Controllers, 2078 and 2178 Display Stations, 2079 Color Display Station, and 2068 and 2087 Printers. Memorex has also introduced the PC Attach feature, which provides a display station with personal computing capabilities. ▶

## Memorex 207X Display System

or amber characters, and a detachable keyboard (available in several layouts). The newest display station introduced by Memorex, the 2178, is a replacement for IBM's 3178. The 2178 features a smaller footprint than the 2078, with a 12-inch tilt/swivel display and a compact, modular design. Standard on the 2178 is a 1920-character display capacity and a low-profile detachable keyboard (available in three layouts).

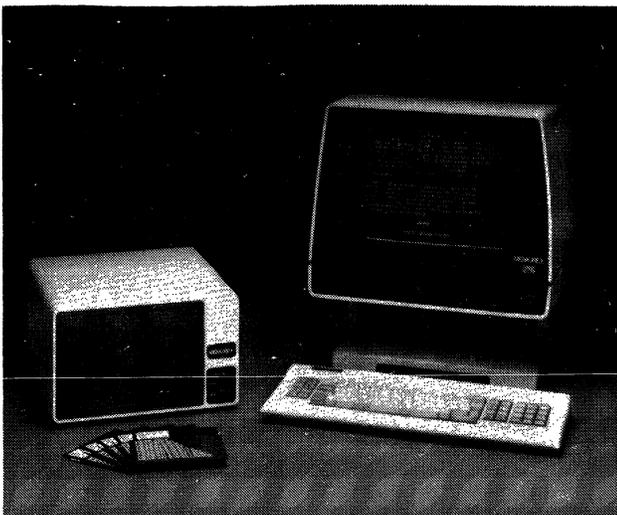
The 2079 Color Display Station provides seven-color capability (red, green, blue, white, turquoise, pink, and yellow). The 2079, a replacement for IBM's 3279 color display, contains the same terminal design as the 2078 (except for a 14-inch screen). It is available in two models, providing either 1920- or 2560-character display capability.

A significant new addition to the 207X product line is the PC Attach feature. PC Attach provides for the integration of personal computing capabilities into a 207X cluster. Available in four configurations, PC Attach provides complete IBM Category A terminal and controller plug compatibility, IBM PC and PC XT media compatibility, DEC VT100 terminal emulation, and both the MS-DOS and CP/M-80 operating systems. A variety of optional software is also available.

For applications that require hard copy, Memorex provides the 2087 Matrix Printer and the 2068 Multifunction Printer for use as part of the 207X family.

### COMPETITIVE POSITION

Memorex has a significant installed base of 3270-compatible terminals, and is one of the major competitors in this market, along with ITT Courier, Telex, Teletype, Harris, Lee Data, Racal-Milgo, and several other vendors. This market has tightened up considerably in the past several months due to IBM's aggressive strengthening of the 3270



*Memorex's new PC Attach feature provides the 2078 Display Station (shown here) with personal computing capabilities. PC Attach can also be used with the Memorex 2178 and 2079 displays, as well as with the IBM 3178, 3278, and 3279 displays.*

The Memorex 2076 Cluster Controller provides for the attachment of up to eight devices, in any combination of display stations and/or printers. Device Adapters may be added to the 2076, providing for the attachment of two additional devices each (up to three device adapters are supported). The Memorex 2074 Cluster Controller provides for attachment of up to 32 devices, in any combination of display stations and/or printers. The Memorex controllers are functional replacements for the IBM 3276 and 3274 Control Units, respectively. In addition to the Memorex devices, the following IBM devices attach to the Memorex controllers: 3178 and 3278 Display Stations, 3262, 3268, 3287, and 3289 Printers. The Memorex display stations and printers may also be attached to the IBM 3274 and 3276 controllers, using a standard Category A interface.

Memorex' PC Attach feature provides personal computing capabilities for the 207X family. PC Attach attaches to the Memorex 2078, 2079, and 2178 Display Stations, as well as to the IBM 3178, 3278, and 3279 displays. The feature is available in four system configurations: with a single 5¼-inch diskette, a dual 5¼-inch diskette, a 10MB Winchester disk with a 5¼-inch diskette, and a 20MB Winchester disk with a 5¼-inch diskette.

### TRANSMISSION SPECIFICATIONS

Transmission is performed synchronously, in half- or full-duplex modes, over leased or dial-up communications lines via the appropriate modems. Transmission is point-to-point or multipoint at rates up to 5600 bps when using the 2074 controller, and at rates up to 9600 bps when using the 2076 controller. The 207X Display System operates in both SNA/SDLC and BSC environments (the 2076 supports only BSC protocol). An RS-232-C interface for modem attachment is standard. A printer interface for local printer attachment is standard on all display stations. All devices connecting to the 2074 and 2076 Cluster Controllers use IBM-compatible Category A interfaces.

### DEVICE CONTROL

The Memorex 2078, 2079, and 2178 Display Stations operate under the direct control of the Memorex 2074 or 2076 Cluster Controllers, or the IBM 3276 or 3274 Control Units. Conversely, the 2074 and 2076 Cluster Controllers provide for the attachment of the IBM 3178, 3278, and 3279 Display Stations. All IBM 3270 display terminal functions are supported on the Memorex display stations, including visual attributes, character editing, erase functions, and protected formats. The cursor can be chosen as a blinking or nonblinking block or underline.

The 2074 Cluster Controller supports attachment of up to 32 devices, either displays or printers, in any combination (one display is required to serve as system console). The 2076 Cluster Controller supports attachment of up to eight devices; up to three device adapters may be added, supporting an additional two devices each. The 2074 controller is configured using Memorex-provided configuration and printer authorization matrix worksheets. The information on these sheets is keyed into the controller using the system console display, aided by a series of menu prompts on the display screen. Self-diagnostics and power-on diagnostics are standard on the 2074, and problem determination aids identify problems and recovery routines; these routines operate in VTAM and TCAM to determine if a problem has been caused by a cluster unit, a system unit, operator error, or a function outside the controller. Error messages and/or error-condition codes are displayed on the 2074's control panel. The 2076 controller provides power-on diagnostics, as well as on-line (user) and off-line (Memorex Field Engineer) diagnostics.

An APL/Text feature is standard on the 2079 and optional on the 2078. This feature enables the terminal to display the

## Memorex 207X Display System

► family through a host of new products and accompanying price cuts. Already, two major vendors, Raytheon (once IBM's number-one competitor in the 3270 arena) and MDS Trivex, have dropped out of the market. Memorex, now a subsidiary of Burroughs, has recently made some much-needed additions to its 207X product line; like all of the competitors in this market, Memorex will have to continue to actively upgrade its offerings in order to maintain or increase its installed base.

### ADVANTAGES AND RESTRICTIONS

A major advantage of the Memorex 207X product line is its plug compatibility with IBM components. All Memorex displays and printers can attach to IBM controllers; likewise, most IBM Category A devices (a notable exception is the 3279) can be connected to the Memorex controllers. This plug compatibility also extends to Memorex' new PC Attach feature, which can connect to IBM as well as Memorex displays. The PC Attach feature, which provides personal computing capabilities, is a key here. IBM has fully integrated its tremendously successful PC product line into the 3270 Information Display System; we believe that all 3270-compatible vendors must integrate some sort of personal computing capability (either the IBM PC or its own) into its product lines in order to survive in this market. Most have already; significantly, MDS Trivex and Raytheon did not.

Memorex had been somewhat slow in introducing an SNA/SDLC controller, a fact which had hurt the company somewhat. That problem has been rectified with the introduction of the 2074.

### USER REACTION

In Datapro's 1983 Terminal Users Survey, conducted in conjunction with *Data Communications* magazine, responses were received from seven users of the Memorex 2078 Display Station. These users, who represented an installed base of 557 terminals, were asked to rate the 2078 with regard to seven specific categories. Their ratings are summarized in the following table.

	Excellent	Good	Fair	Poor	WA*
Overall performance	2	4	0	0	3.3
Ease of operation	5	2	0	0	3.7
Display clarity	4	3	0	0	3.6
Keyboard feel & usability	4	3	0	0	3.6
Ergonomics	2	4	0	0	3.3
Hardware reliability	2	5	0	0	3.3
Mfr.'s maintenance service/technical support	3	2	2	0	3.1

\*Weighted Average on a scale of 4.0 for Excellent.

When asked whether or not they would recommend the Memorex 2079 to other users with similar applications, all seven of the respondents answered that they would. □

► 222-character APL/Text character set and to support host systems running APL software. (This feature is not available on the 2078 Model 85.) The feature operates in EBCDIC mode and requires an appropriate APL or text keyboard layout, specific controller support, and the ECS (Extended Character Set) feature (also standard on the 2079 and optional on the 2078). The ECS feature uses reverse video, underline, and/or blinking visual attributes to highlight selected characters or fields of data. It can also be used to identify error or exception conditions.

A Programmed Symbols Option is available on the 2078 (Models 83 and 84) and the 2079, providing these displays with graphics capabilities. The Programmed Symbols Option allows for access of up to six 190-symbol sets whose shapes and codes are user defined. Symbol sets are loaded under program control, and accessed for display through programming or from the keyboard.

The PC Attach feature provides a Memorex or IBM display station with personal computing capabilities. The feature can attach to all Memorex display stations, plus the IBM 3178, 3278, and 3279. Standard features of PC Attach include: IBM 3270 Category A terminal and controller compatibility; IBM PC and PC XT media compatibility; MS-DOS and CP/M-80 operating systems; and DEC VT100 asynchronous terminal emulation. Several optional capabilities are available, including host file transfer.

### COMPONENTS

**2074 CLUSTER CONTROLLER:** Provides control for up to 32 devices, in any combination of display stations and/or printers (one display station required as system console). Three models are available: Model S4C is a remote SNA/SDLC unit; Model S4A is a local SNA/SDLC unit; and Model S4D is a local BSC unit. The 2074 supports attachment of the following devices: Memorex 2078 and 2178 Display Stations, 2079 Color Display Station, 2087 Matrix Printer, and 2068 Multifunction Printer. The 2074 also supports attachment of the following IBM devices: 3178 and 3278 Display Stations, 3268 and 3287 Matrix Printers, and 3262 Line Printer (most IBM Category A terminal devices can attach to the 2074). The 2074 is fully compatible with data links controlled by the IBM 3704, 3705, 3725, and compatible communications controllers, as well as with the IBM 4300 Integrated Communications Adapter. The 2074 features a modular design called Memorex Common Architecture (MECA). Each functional component is separated into independent hardware and firmware modules, which communicate with each other over a high-speed parallel bus.

**2076 CLUSTER CONTROLLER:** Provides control for up to eight devices, in any combination of display stations and/or printers (one display station required as system console). The 2076 supports only BSC protocol. The following devices may be attached to the 2076: Memorex 2078 and 2178 Display Stations, 2079 Color Display Station, 2087 Matrix Printer, and 2068 Multifunction Printer. The 2076 also supports attachment of the following IBM devices: 3178 and 3278 Display Stations, 3268 and 3287 Matrix Printers, and 3262 Line Printer (most IBM Category A terminal devices can attach to the 2076).

**2078 DISPLAY STATION:** Available in four models, all of which include a 15-inch (diagonally measured) display screen. Model 82 features a 1920-character display capacity, arranged in 24 lines of 80 characters each. Model 83 features a 2560-character capacity, arranged in 32 lines of 80 characters each. Model 84 has a 3440-character screen capacity, arranged in 43 lines of 80 characters each. Model 85 contains a 3564-character display capacity, arranged in 27 lines of 132 characters each. An additional line, for the display of terminal status, is standard on all models. Char-

## Memorex 207X Display System

Characters are formed within a 9-by-16 dot matrix on Models 82 and 83, and within a 9-by-12 dot matrix on Models 84 and 85. Green (P39) or amber phosphor characters may be selected. The full ASCII and EBCDIC character sets are displayable. The display monitor tilts and swivels for operator convenience. The 2078 attaches to the Memorex 2074 and 2076 Cluster Controllers, as well as to the IBM 3274 and 3276 Control Units.

**2079 COLOR DISPLAY STATION:** Available in two models, both of which contain a 14-inch (diagonally measured) display screen. Model S2B features a 1920-character display capacity, arranged in 24 lines of 80 characters each. Model S3B features a 2560-character capacity, arranged in 32 lines of 80 characters each. A terminal status line is available on both models. Seven-color capability is standard on both models—four basic colors (red, green, blue, and white) and three extended colors (turquoise, pink, and yellow). The controller and program must support seven-color capability in order to access the extended colors. Characters are formed within a 9-by-12 dot matrix. The full ASCII and EBCDIC character sets are displayable. The display monitor tilts and swivels for operator convenience. The 2079 attaches to the Memorex 2074 and 2076 Cluster Controllers, as well as to the IBM 3274 and 3276 Control Units.

**2178 DISPLAY STATION:** Contains a 12-inch (diagonally measured) display screen with a 1920-character capacity, arranged in 24 lines of 80 characters each. A terminal status line is available. Characters are formed using a 7-by-14 dot matrix within a 9-by-16 window, and displayed in green (P39) or amber phosphor. The full ASCII and EBCDIC character sets are displayable. The 2178 features a modular, three-piece construction with a compact design and a tilt/swivel monitor. The 2178 attaches to the Memorex 2074 and 2076 Cluster Controllers, as well as to the IBM 3274 and 3276 Control Units.

**2078/2079 KEYBOARDS:** A choice of 13 keyboard layouts are available, in either a low-profile or ergonomic keyboard design. Available keyboards include: 75-key EBCDIC Typewriter; 75-key ASCII Typewriter; 75-key EBCDIC Data Entry; 87-key EBCDIC Typewriter; 87-key EBCDIC Typewriter w/10-key numeric pad; 75- or 87-key EBCDIC or ASCII Typewriter w/modified PF functions and Alternate key; 87-key EBCDIC Typewriter (IBM RPQ 8K0808-compatible); 87-key ASCII Typewriter; 87-key EBCDIC Typewriter/APL; 87-key EBCDIC Typewriter/Text; 87-key EBCDIC Attribute Select Typewriter; 87-key EBCDIC Attribute Select Typewriter/APL; 87-key EBCDIC Typewriter Overlay. N-key rollover, selectable click or non-click keys, and typamatic keys are standard features on all keyboard models. A security keylock and keyboard numeric lock are optional. All keyboards are detachable.

**2178 KEYBOARDS:** A choice of three keyboard layouts is available, all with a low-profile design. These include: 75-key Data Entry; 87-key Typewriter; and 87-key Typewriter w/10-key numeric pad. N-key rollover, selectable key click, and typamatic keys are standard. All keyboards are detachable.

**2068 MULTIFUNCTION PRINTER:** A matrix printer capable of both high-speed and letter quality printing. Print speeds are 350 cps (high speed) and 80 cps (letter quality). Memorex's patented stored-force flexhammer print mechanism is used. Six fonts and thirteen international character sets are available, plus double size, elongated, boldface, and italics. Print matrix is 9-by-7 (high speed) or 18-by-20 (letter quality); the print matrix varies depending on the font selected. Character spacing is 10, 12, or 18 cpi, with line

spacing selectable at 2, 4, 6, 8, or 12 lpi. Forms are fed using a combination of adjustable tractors, pressure rollers, and belt guides. Six-part fanfold paper, up to 15 inches wide, can be accepted, as well as single sheets up to 11¼ inches wide. Formats, fonts, character spacing, line spacing, and diagnostics are selected using the printer's operator control keypad. Two-digit LED indicators give a readout of status and error conditions.

**2087 MATRIX PRINTER:** A matrix printer with line lengths up to 132 characters at 10 characters per inch. Maximum print speed is 180 characters per second. Characters are formed using a 7-by-8 dot matrix. The 2087 can accommodate up to six-part forms from 4 to 17.3 inches wide. Forms are advanced via a tractor feed mechanism; rear or bottom feed options are available. A membrane switch panel, controls, and LED indicators are located on the printer's front panel. Buffer sizes range from 960 to 3564 characters. Internal diagnostics are included.

**PC ATTACH:** Provides the Memorex 2078, 2079, and 2178 Display Stations with personal computing capabilities. Also attaches to the IBM 3178, 3278, and 3279 displays, and is compatible with the Memorex 2074 and 2076 Cluster Controllers, as well as with the IBM 3274 and 3276 Control Units. The PC Attach feature is available in four configurations: Model 2201, including a single 5¼-inch diskette; Model 2202, with a dual 5¼-inch diskette; Model 2210, including a 10MB Winchester disk and a 5¼-inch diskette; and Model 2220, with a 20MB Winchester disk and a 5¼-inch diskette. PC Attach provides IBM 3270 Category A terminal and controller plug compatibility, IBM PC and PC XT media compatibility, DEC VT100 asynchronous terminal emulation, and both MS-DOS and CP/M-80 operating systems. Optional software available includes WordStar (word processing), CalcStar (electronic spreadsheet), and SuperCalc (electronic spreadsheet). File transfer software is also optional. Memory capacity is 128K, expandable to 256K. The PC Attach unit is user-installable, and fits on a desktop.

### PRICING

The Memorex 207X components are available for purchase, or on a lease basis. A variety of maintenance plans are available. Memorex supplied us with the following single-unit purchase prices; for quantity discount pricing, as well as for lease plan pricing, contact Memorex.

Models	Purchase Price (\$)
2074-S4C Remote Cluster Controller	13,595
2074-S4A Local Cluster Controller (SNA)	15,595
2074-S4D Local Cluster Controller (BSC)	15,595
2076 Remote Cluster Controller (BSC)	3,595
2078-82 Display Station w/keyboard	1,795
2078-83 Display Station w/keyboard	1,795
2078-84 Display Station w/keyboard	2,095
2078-85 Display Station w/keyboard	2,095
2079-S2B Color Display Station w/keyboard	2,295
2079 S3B Color Display Station w/keyboard	2,595
2178 Display Station w/keyboard	1,485
2201 PC Attach	2,545
2202 PC Attach	3,195
2210 PC Attach	5,395
2220 PC Attach	6,195
2068 Multifunction Printer	6,495
2087 Matrix Printer	5,159