

# Renex Protocol Converters

## MANAGEMENT SUMMARY

**UPDATE:** *Renex Corporation has reviewed this report and informed us that only pricing changes are necessary at the present time.*

"We do business in an IBM world. From mainframes to printers, large data centers are dominated by IBM products," said Ray Gwinn, president of Renex. Gwinn realized, thirteen years ago, that many companies would seek means to interface their ASCII devices with their IBM mainframes. For that reason, he developed Renex and committed his new company to designing and manufacturing products for firms that could not reconstruct their networks to accommodate IBM's SNA/SDLC architecture. The company released its first protocol converter the year that Gwinn established it. When the protocol conversion market began growing dramatically in the early 1980s, Renex was already poised to reap the rewards of expansion. According to Gwinn, Renex's protocol converters sales have quadrupled since 1981.

Renex converters can operate with almost any asynchronous ASCII terminal that operates in full-duplex, character mode and has an addressable cursor. Most personal computers running an asynchronous terminal emulation package will operate with a Renex converter. The company also offers an optional software package for the IBM personal computer that allows the PC to emulate a Renex R-378 asynchronous terminal.

This report covers the technical characteristics of four Renex products: the RT74 Family, the RT51 family, the TMS-One asynchronous controller, and the Bi-Path Deconverter. The RT74 family consists of two products—one handling asynchronous ASCII to 3270 BSC conversion, the other offering ASCII to 3270 SNA/SDLC conversion. An RT74 appears to the host as an IBM 327X cluster controller, allowing asynchronous ASCII CRTs to emulate 3278/3279 Model 2 and 5 devices. RT51 converters emulate an IBM 5251-12 controller, providing ASCII to SNA/SDLC conversion for asynchronous terminals and printers. These devices appear to an IBM System/34/36/38 host as 5251-11 workstations. Both the RT74 and RT51 are available in single-board systems with from 5 to 11 asyn-

Renex Corporation was established to support "those companies locked into IBM, who would not or could not revamp their entire communications systems to accommodate the SNA/SDLC architecture," according to Renex President Ray Gwinn. Today, Renex offers several protocol converters and a controller that allow asynchronous ASCII terminals to access IBM hosts. One product, Bi-Path, allows users of IBM 3270 displays to communicate with asynchronous hosts, thus providing access to public networks and databases. The company also offers software packages that allow IBM and compatible microcomputers to emulate asynchronous terminals.

**MODELS:** RT74 Family, RT51 Family, TMS-One, Bi-Path, RTC Miniverter (one- and three-port version of RT units).

**CONVERSION:** RT74—ASCII to 3270 synchronous lines and up to 19.2K bps on asynchronous lines.

**COMPETITION:** Protocol Computers Inc., Datastream, Local Data, Icot.

**PRICE:** From \$695 for a Bi-Path unit to \$13,745 for a 32-port TMS-One controller.

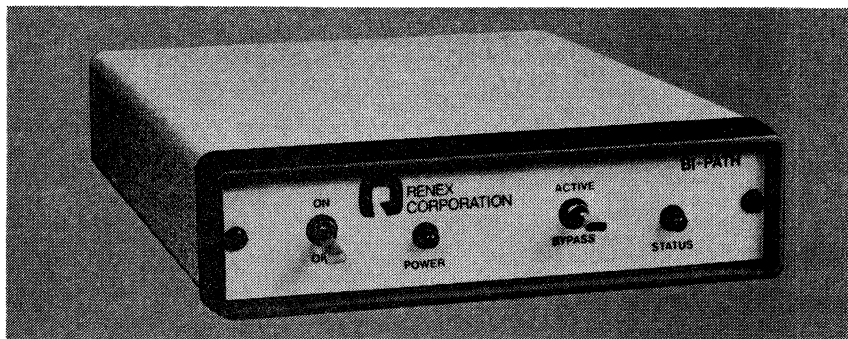
## CHARACTERISTICS

**VENDOR:** Renex Corporation, 1513 Davis Ford Road, Woodbridge, Virginia 22192. Telephone (703) 494-2200.

**DATE OF ANNOUNCEMENT:** RT74 Family—1980; RT51 Family—1983; TMS-One—1985; Bi-Path—information not available.

**DATE OF FIRST DELIVERY:** RT74 Family—October 1980; RT51 Family—January 1984; TMS-One—February 1985; Bi-Path—information not available.

**NUMBER DELIVERED TO DATE:** RT74 Family—over 14,000 ports; RT51 Family—over 300 ports; TMS-One—3200 ports; Bi-Path—information not available.



*The Bi-Path Deconverter, which can be used with compatible BSC, SNA/SDLC, and local channel protocols, allows IBM 3270 displays to access asynchronous hosts, public networks and databases.*

## Renex Protocol Converters

➤ Chronous ports or multiboard systems with from 8 to 25 asynchronous ports. An RTC Miniverter version of these converters offers 1 or 3 ports.

The TMS-One asynchronous communications controller emulates an IBM 274 Model 41C, 51C, or 61C or 3276-2 Model 12 cluster controller. The unit allows asynchronous terminals and personal computers to operate as both interactive (3270, 3290, 5250) or batch (3767, 3770) systems in a two-host environment in which one host is operating in SNA/SDLC protocol and the other in BSC. TMS-One operates with IBM 43XX, 308X, 303X, 360, 370, and plug-compatible hosts. It supports 32 physical ports and 128 logical sessions.

The Bi-Path converter allows IBM 3270 display stations to emulate Digital Equipment Corporation VT100 or IBM 3101 asynchronous terminals. On the host side, Bi-Path attaches to a 3274/76 controller. On the terminal side, the converter attaches to one terminal and a printer. This unit operates with IBM's 43XX and 30XX hosts.

Renex converters can be used in a variety of network applications. The units can communicate with a host through leased lines or direct connection to a front-end processor. TMS-One's 128 logical units may be distributed among up to five control units that are multidropped over one or two synchronous lines. This unit also allows one terminal to function as both an interactive and batch terminal, with simultaneous access to both a BSC and SNA/SDLC host. Renex converters support automatic baud rate detection, individual transmission rates on each asynchronous line, and automatic answer and disconnection. Some units can be equipped with an inactivity timeout feature on each port to allow a terminal to be automatically logged off if not in use for a specified period of time.

Installing a Renex protocol converter requires the definition of operating parameters through menu-driven prompts displayed on any terminal connected to the converter. Setting up a configuration sequence involves a simple procedure in which a terminal operator stops all communication between the converter and a host, presses a reset key on the converter's front panel, presses a return key on the terminal, selects the proper terminal type, and presses an escape sequence followed by a space. The terminal screen clears and the first menu appears. At this point the operator can define or redefine various parameters, including specifying a terminal type, selecting baud rate and parity, entering passwords, and so forth.

Renex converters will operate with over 100 asynchronous ASCII terminals and printers, but if a customer wants to use the product with a device that has not been previously defined to the system, Renex will adapt its products to the device if it receives the proper documentation outlining the characteristics of the terminal.

IBM 327X displays have program keys and special keys that are not available on asynchronous ASCII equipment. ➤

➤ **SERVICED BY:** Renex Corporation.

### MODELS

The Renex product line consists of the following models:

- **RT74 Family**—consists of two units, one handling asynchronous ASCII to 3270 BSC protocol, the other handling ASCII to 3270 SNA/SDLC protocol. The RT74 appears to the host as a 327X cluster controller and allows asynchronous ASCII CRTs to emulate IBM 3278/3279 Model 2 and 5 devices. Within this family of converters are RTS and RTM models. RTS models are single-board units that provide 3, 5, 7, or 9 asynchronous ports; the RTM models are multiboard units offering 8, 12, 16, 20, or 24 asynchronous ports. A transparent print feature allows a terminal and printer to share a single port if the terminal supports display/printer message switching. Both the BSC and SNA/SDLC converters operate identically and differ only in the type of protocol supported. The units support both 1,920- and 3,168-character screens.
- **RT51 Family**—emulates an IBM 5251-12 controller and provides ASCII to SNA/SDLC conversion, allowing asynchronous ASCII CRTs and printers to appear to System/34/36/38 hosts as 5251-11 workstations. A single-board RTS version of the RT51 provides 3, 5, 7, or 9 asynchronous ports; an RTM multiboard version provides 8, 12, 16, 20, or 24 asynchronous ports. RT51 converters support only a 1,920-character screen.
- **TMS-One**—an asynchronous communications controller that allows asynchronous terminals and personal computers to operate as both interactive (3270, 3290, and 5250) and batch (3767, 3770) systems in a two-host environment in which one host may be running SNA/SDLC and the other running BSC. TMS-One emulates an IBM 3274 Model 41C, 51C, or 61C or an 3276-2 Model 12 cluster controller. The unit will operate with IBM 43XX, 308X, 303X, 360, 370, and plug-compatible hosts. It supports up to 32 physical and 128 logical ports, as well as all virtual screen sizes.
- **Bi-Path**—allows IBM 3270 display stations to emulate Digital Equipment Corporation VT100 or IBM 3101 asynchronous ASCII terminals. Bi-Path operates with a number of hosts, including IBM's 43XX and 30XX. On the host side, Bi-Path attaches to a 3274/76 controller. The unit has a communications port and a printer port.

In addition to the models described above, Renex offers an RTC converter, which is a compact version of the RT74 and RT51 units. It provides one or three ports.

### TRANSMISSION SPECIFICATIONS

Renex converters support an RS-232-C interface on the host side and an RS-232-C or RS-449 interface on the terminal side. Converters with more than 17 ports use a 9-pin (DB9) connector; models with 17 or less ports use a 25-pin (DB25) connector. The maximum transmission speed on a synchronous line is 9600 bps and from 50 to 19.2K bps on an asynchronous line. The operating mode on the host line is half- or full-duplex; on the terminal line operation is in full-duplex mode only. The units support automatic baud rate detection, individual transmission rates on each line, internal or external clocking (for direct connection to a front-end processor), and automatic answer and disconnection. The TMS-One has a built-in asynchronous modem with callback capability for verifying authorized connection to the system. This unit also supports an inactivity time-out feature on each port.

Renex converters communicate with a host system through leased (multipoint) lines or through direct connection to a front-end processor using an SNA/SDLC line operating at ➤

## Renex Protocol Converters

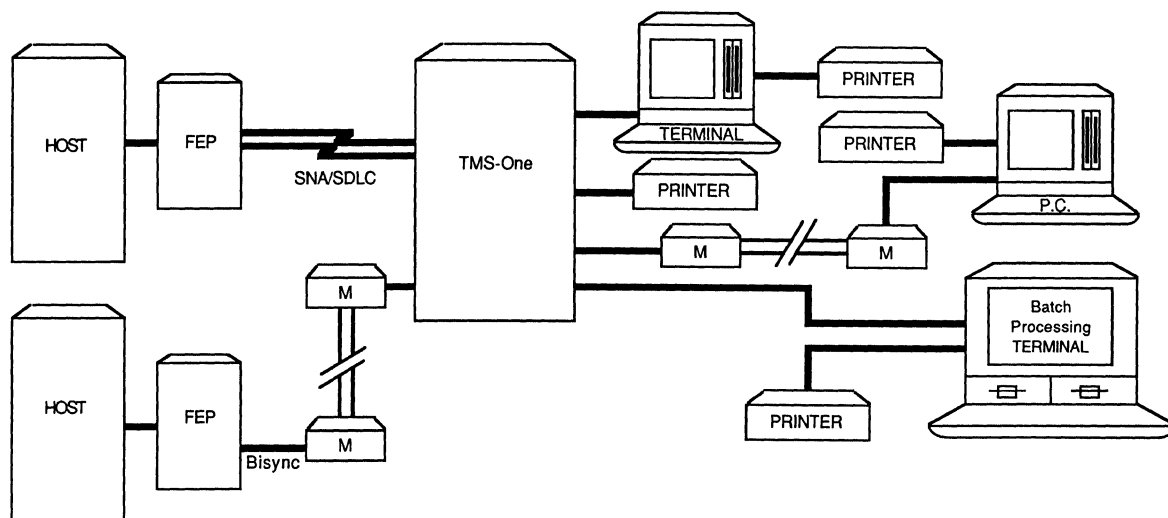


Figure 1. In this configuration, the TMS-One Asynchronous Controller offers two ports to support both interactive and batch hosts. The unit supports up to 32 asynchronous ports and 128 logical units, and each port can have 4 sessions and printing running at one time.

➤ To allow this equipment to operate as an IBM device, the Renex converter has been designed to recognize multiple key sequences, control sequences, or escape sequences for special keys and program keys. The company provides charts of the various sequences necessary to effect IBM functionality on specific ASCII equipment.

Renex offers a number of options for its converters, as well as RLink and RAP software packages for IBM and compatible microcomputers. An auxiliary printer feature allows a terminal and printer to share the same port; a KSR option allows hardcopy keyboard terminals full-screen editing capability; and a color enhancement feature allows color terminals to act as IBM 3279's with seven-color support and extended highlighting. RAP is a message-oriented protocol that allows the downloading of an entire 3270 datastream to a microcomputer. RLink is a microcomputer terminal emulation program that processes the 3270 datastream directly, eliminating the need to maintain an internal screen buffer for attached devices.

### COMPETITIVE POSITION

Renex Corporation has been in the protocol conversion business for 12 years, and like its major competitors—Protocol Computers, Lee Data/Datastream, Local Data, and Icot—the company experienced significant growth during the past few years. However, recent developments in the protocol conversion marketplace have dampened the spectacular rise in sales figures for major vendors.

Most protocol conversion companies specialize in equipment that allows asynchronous ASCII equipment to access IBM hosts. Until recently, IBM did not offer conversion products because the company attempted to disregard the importance of the asynchronous environment while highlighting the benefits of the SNA world. However, in the past

➤ 9600 bps. Terminals may directly attach to the converter or attach remotely via leased or dialup lines. When a converter is directly connected to a front-end processor, a synchronous crossover cable must be attached to the synchronous port. An asynchronous crossover cable is necessary for the converter's direct attachment to a terminal or printer. The maximum distance for a direct connection between the converter and a front-end processor is 50 feet.

The TMS-One's 128 logical units may be distributed among up to five control units that are multidropped over one or two synchronous lines.

### DEVICE CONTROL

For a Renex converter to function properly, the user must define its operating parameters through menu-driven prompts displayed on any terminal attached to the converter. To begin a configuration sequence, an operator stops all communication between the host and the converter, presses a reset key on the converter's front panel, presses the Return key on the terminal, selects the proper terminal type, and presses the Escape key twice followed by a space. At this point, the terminal screen is cleared, and the first prompt appears.

The first set of prompts deals with connection between the synchronous port and the host front end. Subsequent menus provide the prompts to request a physical unit identification sequence, which is necessary in SDLC dial-up applications; enable a Terminate Self message (used only if sessions are not terminated via an Unbind command from the host); enter an inactivity disconnect value on systems using disconnect timers; coordinate the addition of a status line for asynchronous terminals that do not have a twenty-fifth line; select parity and baud rate; specify terminal type (including printers) used on each port; and establish passwords.

Upon exiting configuration mode, the terminal screen clears and configuration parameters are stored in battery backup or EEPROM memory, which protect parameters even during a power down. If battery backup should fail, the converter will return to default options in firmware.

➤ RT74 and RT51 converters have two front-panel controls—one for power and the other for reset. Pressing the reset

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two years, IBM has announced two protocol converters, the 7171 and 7426, and two other conversion products, the 3710 controller and the 3708 Network Conversion Unit. In addition to protocol conversion, the 3708 and 3710 provide line concentration, ASCII pass through support, and protocol enveloping, and the products operate with IBM's network management products. The pricing for IBM converters is very competitive, and all of the major protocol conversion vendors face serious competition from these products.

While prices for protocol converters have begun to erode in a more competitive marketplace, vendors have had to maintain large investments in research and development projects to make their equipment more attractive to the end user. This has occurred during a general slump in the computer industry, and most protocol conversion vendors, including Renex, have felt the pinch of a sagging market.

### ADVANTAGES AND RESTRICTIONS

Renex converters offer users flexibility in using various types of terminals and personal computers in environments in which they may be incompatible. The products help a user protect investments in existing equipment and allow an organization to purchase inexpensive peripherals to access an IBM host. Renex also offers a product that will allow users of IBM 3270 terminals to access asynchronous hosts, thus providing access to public data bases, packet networks, and other types of private networks. Renex products offering ASCII to SNA/SDLC conversion support from one to 24 asynchronous ports; the company's TMS-One controller supports up to 32 asynchronous ports and 128 logical units, allowing a user to place up to five sessions onto a single port. TMS-One and RT51 offer online diagnostics for easy system ractive because it allows a terminal and printer to share the same port.

Although protocol converters offer several important advantages, they do have some disadvantages, and Renex has developed two software products that address major weaknesses inherent in hardware conversion systems. Protocol converters, whether manufactured by Renex or any other vendor, cannot offer an error-free asynchronous data transmission; therefore, the user must detect and correct any transmission errors by checking the integrity of data on the terminal screen. While the lack of error correction methods may not be a problem in some applications, it can be a serious problem during the transmission of financial data. Error correction modems and intelligent network PADs can alleviate the problem, but they also add significantly to the cost of the network.

Another problem concerns the asynchronous, full-duplex world of the protocol converter, in which keystroke data are echoed back to attached terminals for display. Problems arise when the data must be transmitted through an X.25 packet switched network because ASCII data must be transported not only through the packet network, but also

button stops communication with the host and terminals and initiates a self-test. Results of the test are either displayed on a terminal screen or available through a breakout box connected to the converter's synchronous port. (The RT51 unit also supports on-line diagnostics, invoked by depressing an Escape sequence at any attached terminal.)

On the Bi-Path front panel are an on/off switch, an active/bypass switch, and two LEDs to monitor system status and power. The active/bypass switch sets operation in either 3270 or ASCII mode.

The TMS-One front panel contains a power push button, select buttons to display the transmission status of asynchronous ports, and LEDs to monitor transmission status on the two connected hosts and each asynchronous port.

Renex converters perform all of the functions related to the screen handling of an IBM device. They maintain an internal image of the screen of any attached terminal, and when a connection is made between the terminal and the converter, the terminal's screen is cleared as is its internal image in the converter. As a new screen is received from the host, it is compared with the previous internal image from the terminal, and only those characters which have changed are transmitted from the converter's buffer to the terminal screen. If the terminal supports dual-intensity characters, the converter determines the characters necessary to display highlighted fields, and nondisplay fields are transmitted to the terminal's screen as blanks.

Characters entered at a keyboard go immediately to the Renex converter and do not affect the terminal's screen. When the converter receives a display character, it checks the terminal's cursor location against the internal screen image, and if the cursor is within an unprotected field, the converter transmits the character to the terminal screen, and the internal image is updated. However, should the cursor be in an unprotected field, a "bell" code is transmitted to sound a tone on the terminal. Subsequent keystrokes also sound the tone until the operator hits a Reset key.

In addition to character keys, IBM 327X displays have Program Function (PF), Program Attention (PA), and other special keys, which are usually not available on asynchronous terminals. To allow these terminal to operate like IBM display stations, the Renex converter recognizes a set of multiple key sequences for special keys, and some keys are replaced by control sequences (pressing a control key as another key is pressed simultaneously) while others are replaced by escape sequences (pressing the Escape key as another key is pressed simultaneously). If an operator enters a PF, PA, or Enter key, the converter performs the appropriate read function and sends a code to identify the pressed key. Like the IBM 327X display station, the converter then refuses further keyboard input until the host sends a response.

The Bi-Path converter supports SNA, BSC, and Local Channel protocols. This device allows IBM 3270 display terminals to access ASCII hosts, including a variety of minicomputers and mainframes, public data bases, packet networks, and microcomputers. Through the Bi-Path's front-panel active/bypass switch, users can allow an attached display station to switch between 3270 and asynchronous ASCII operation. A 3270 device attached to Bi-Path emulates a DEC VT100 with printer option or an IBM 3101 terminal. All VT100 keys and keyboard modes are emulated; keyboard LEDs are displayed on the 3270's status line. When operating in 3270 mode, the Bi-Path converter is transparent to an IBM host, and when switched to ASCII mode, a 3270 display station appears to be powered off to the host. The Bi-Path maintains an ASCII screen buffer, and data is continuously received from the ASCII host.

## Renex Protocol Converters

▶ the asynchronous environment of the protocol converter, and the echo response time for keystroke data on dial-up lines can be very long.

Renex has developed two microcomputer software products, RAP and RLink, which address problems inherent in "black box" protocol converters. RAP, a message-oriented protocol, can download an entire 3270 datastream to a microcomputer. RLink, a terminal emulation program for the microcomputer, processes that datastream directly. By processing the host datastream at the microcomputer, performance problems associated with protocol converters can be eliminated because the converter need no longer maintain an internal screen buffer for attached devices. The software, rather than a protocol converter, handles screen editing and data-entry functions; data is no longer echoed across the network because it is processed by the terminal emulation program. Therefore, problems with echo delay are eliminated. In addition, data integrity is ensured by a CRC error detection method in which RAP breaks down a 3270 datastream into smaller blocks to which a sequence number is appended. This number is used at the receiving end of the communications line to reassemble packets into the original block sequence in the datastream.

Users with a large number of microcomputers should investigate the advantages of using a software-based solution to protocol conversion rather than "black box" products. Those with a large number of asynchronous terminals, on the other hand, will have to use a hardware product, and Renex converters offer all of the basic protocol conversion functions for the terminal environment.

### USER REACTION

We contacted two users of Renex's RT51 and RT74 families of protocol converters. Both men rated the overall performance of Renex converters good, saying they would purchase the products again. Each was especially impressed with the reliability of the units.

The user of the RT51 products said he has utilized Renex's products since 1986, and found that the converters "seem to work like a champ" with his IBM System/36 host. He told us that his company first looked at some Local Data protocol converters, but found that they couldn't communicate with KSR printers. The company, therefore, purchased the Renex converters, which *could* support the printers, "and since then, we've been extremely happy." The user said he has a 24-hour turnaround time maintenance agreement with Renex, but the converters haven't needed any servicing. The only limitation he could point out was that Renex's documentation on the configuration of a host system is not detailed enough, but he added that when he called Renex, his questions were promptly and courteously answered.

The second person we interviewed works for a distributor of safety equipment and has used one RT74 protocol converter for over two years. The RT74 interfaces a dial-up line from several personal computers (PCs) to a System/36 ▶

▶ A Distributed Function Terminal (DFT) feature on the TMS-One unit, allows each attached device to have four host sessions and a printer session active at once. Access to each one of the sessions is password-protected. In addition, users can set parameters for inactivity disconnect timers, baud rate, parity, reset, and diagnostics checks for each TMS-One port. A network manager can access the system to reset configurations or perform maintenance without disrupting TMS-One operation. The unit offers online diagnostic capabilities, which can be invoked through any terminal attached to the system.

### OPTIONS

Renex RT converters can be equipped with a number of options. A color enhancement feature allows color terminals to act as IBM 3279's with seven-color support and extended highlighting. A KSR printer option allows hardcopy keyboard terminals full-screen edit capabilities, and an auxiliary printer option lets a terminal and printer share the same physical port while remaining separately addressable, allowing printing to occur while the terminal is active. An APL (a programming language) option adapts a terminal with a syntax and character set designed for mathematical applications and scientific computation. IBM PC support, available through a Renex's RLink and RAP packages, lets the personal computer receive and transfer files to a host, as well as act like a 3278 terminal. A graphics passthrough option allows the use of graphics packages, such as SAS/GRAPH and TELL-A-GRAPH.

### PRICING

Prices at which Renex converters can be purchased are shown in the following table. Renex provides service and maintenance on its equipment, as well as 24- to 48-hour parts replacement.

### EQUIPMENT PRICES

	Purchase Price (\$)
<b>RT74/RT51 Single-board System with—</b>	
5 asynchronous ports	2,900
7 asynchronous ports	3,200
9 asynchronous ports	3,400
11 asynchronous ports	3,600
<b>RT74/RT51 Multi-board System with—</b>	
16 asynchronous ports	5,200
<b>TMS-One Asynchronous Controller with—</b>	
8 asynchronous ports	7,495
16 asynchronous ports	9,995
24 asynchronous ports	11,995
32 asynchronous ports	13,745
<b>Bi-Path "Deconverter"</b>	
Emulates IBM 3101 or VT100	695
<b>RTC Miniverter System with—</b>	
1 asynchronous port	1,095
3 asynchronous ports	1,750

### OPTIONS

APL support	900
RLink software (single user)	150
RLink software (unlimited user)	1,500
RAP software (per port)	100

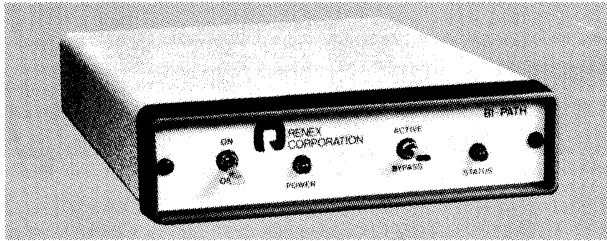
All port upgrades are calculated by taking the difference in list price plus \$500. A \$100 handling charge is added to enhancement orders. ■

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▷ host in his network. Customers of the seven-state company dial into the host through their PCs to check inventory and pricing. The converter is used day and night, and has never needed servicing. Like the first user, this one also pointed out that Renex's documentation could stand some improvement. "It's a lot like IBM's documentation," he laughed. But he, too, added that once he called Renex's

service people, he was easily able to figure out what to do. As far as the reliability of the product, he rated it excellent and said Renex's protocol converter has no restrictions at all. Both he and the first user rated their converters good in all other categories, which include ease of installation, ease of operation, maintenance service, and technical support. □

# Renex Corporation Protocol Converters



*The Renex Bi-Path Deconverter allows IBM 3270 displays to access asynchronous hosts, public networks and databases. Bi-Path can be used with compatible BSC, SNA/SDLC, and Local Channel protocols.*

## MANAGEMENT SUMMARY

Renex Corporation introduced its first protocol converter in 1974. The company's original charter was to develop and manufacture products for companies that could not re-vamp their communications systems to accommodate IBM's SNA/SDLC architecture. When the protocol conversion market began to experience dramatic growth in the early 1980s, Renex was poised to reap the rewards of expansion. According to Renex, the company's protocol converters sales have quadrupled since 1981.

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**MODELS:** RT74 Family, RT51 Family, TMS-One, Bi-Path, RTC Miniverter (one- and three-port version of RT units).

**CONVERSION:** RT74—ASCII to 3270 BSC or 3270 SNA/SDLC; RT51 Family—ASCII to SNA/SDLC; TMS-One—ASCII to BSC and SNA/SDLC; Bi-Path—SNA/SDLC to ASCII.

**TRANSMISSION RATE:** Up to 9600 bps on synchronous lines and up to 19.2K bps on asynchronous lines.

**COMPETITION:** Protocol Computers Inc., Datastream, Local Data, Icot.

**PRICE:** From \$699 for a Bi-Path unit to \$13,745 for a 32-port TMS-One controller.

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Renex offers a number of options for its converters, as well as RLink and RAP software packages for IBM and compat-

➤ SNA/SDLC converters operate identically and differ only in the type of protocol supported. The units support both 1,920- and 3,168-character screens.

- **RT51 Family**—emulates an IBM 5251-12 controller and provides ASCII to SNA/SDLC conversion, allowing asynchronous ASCII CRTs and printers to appear to System 34/36/38 hosts as 5251-11 workstations. A single-board RTS version of the RT51 provides 3, 5, 7, or 9 asynchronous ports; an RTM multiboard version provides 8, 12, 16, 20, or 24 asynchronous ports. RT51 converters support only a 1,920-character screen.
- **TMS-One**—an asynchronous communications controller that allows asynchronous terminals and personal computers to operate as both interactive (3270, 3290, and 5250) and batch (3767, 3770) systems in a two-host environment in which one host may be running SNA/SDLC and the other running BSC. TMS-One emulates an IBM 3274 Model 41C, 51C, or 61C or an 3276-2 Model 12 cluster controller. The unit will operate with IBM 43XX, 308X, 303X, 360, 370, and plug-compatible hosts. It supports up to 32 physical and 128 logical ports. The unit supports all virtual screen sizes.
- **Bi-Path**—allows IBM 3270 display stations to emulate Digital Equipment Corporation VT100 or IBM 3101 asynchronous ASCII terminals. Bi-Path operates with a number of hosts, including IBM's 43XX and 30XX. On the host side, Bi-Path attaches to a 3274/76 controller. The unit has a communications port and a printer port.

In addition to the models described above, Renex offers an RTC converter, which is a compact version of the RT74 and RT51 units. It provides one or three ports.

### TRANSMISSION SPECIFICATIONS

Renex converters support an RS-232-C interface on the host side and an RS-232-C or RS-449 interface on the terminal side. Converters with more than 17 ports use a 9-pin (DB9) connector; models with 17 or less ports use a 25-pin (DB25) connector. The maximum transmission speed on a synchronous line is 9600 bps and from 50 to 19.2K bps on an asynchronous line. The operating mode on the host line is half- or full-duplex; on the terminal line operation is in full-duplex mode only. The units support automatic baud rate detection, individual transmission rates on each line, internal or external clocking (for direct connection to a front-end processor), and automatic answer and disconnection. The TMS-One has a built-in asynchronous modem with call-back capability for verifying authorized connection to the system. This unit also supports an inactivity time-out feature on each port.

Renex converters communicate with a host system through leased (multipoint) lines or through direct connection to a front-end processor using an SNA/SDLC line operating at 9600 bps. Terminals may directly attach to the converter or attach remotely via leased or dialup lines. When a converter is directly connected to a front-end processor, a synchronous crossover cable must be attached to the synchronous port. An asynchronous crossover cable is necessary for the converter's direct attachment to a terminal or printer. The maximum distance for a direct connection between the converter and a front-end processor is 50 feet.

The TMS-One's 128 logical units may be distributed among up to five control units that are multidropped over one or two synchronous lines.

### DEVICE CONTROL

➤ For a Renex converter to function properly, the user must define its operating parameters through menu-driven ➤



## Renex Corporation Protocol Converters

ible microcomputers. An auxiliary printer feature allows a terminal and printer to share the same port; a KSR option allows hardcopy keyboard terminals full-screen editing capability; and a color enhancement feature allows color terminals to act as IBM 3279's with seven-color support and extended highlighting. RAP is a message-oriented protocol that allows the downloading of an entire 3270 datastream to a microcomputer. RLink is a microcomputer terminal emulation program that processes the 3270 datastream directly, eliminating the need to maintain an internal screen buffer for attached devices.

### COMPETITIVE POSITION

Renex Corporation has been in the protocol conversion business for 11 years, and like its major competitors—Protocol Computers, Datastream, Local Data, and Icot—the company has experienced significant growth during the past few years. However, recent developments in the protocol conversion marketplace have dampened the spectacular rise in sales figures for major vendors.

Most protocol conversion companies specialize in equipment that allows asynchronous ASCII equipment to access IBM hosts. Until recently, IBM did not offer conversion products because the company attempted to disregard the importance of the asynchronous environment while highlighting the benefits of the SNA world. However, in the past two years, IBM has announced two protocol converters, the 7171 and 7426, and two other conversion products, the 3710 controller and the 3708 Network Conversion Unit. In addition to protocol conversion, the 3708 and 3710 provide line concentration, ASCII passthrough support, and protocol enveloping, and the products operate with IBM's network management products. The pricing for IBM converters is very competitive, and all of the major protocol conversion vendors face serious competition from these products.

prompts displayed on any terminal attached to the converter. To begin a configuration sequence, an operator stops all communication between the host and the converter, presses a reset key on the converter's front panel, presses the Return key on the terminal, selects the proper terminal type, and presses the Escape key twice followed by a space. At this point, the terminal screen is cleared, and the first prompt appears.

The first set of prompts deals with connection between the synchronous port and the host front end. Subsequent menus provide the prompts to request a physical unit identification sequence, which is necessary in SDLC dial-up applications; enable a Terminate Self message (used only if sessions are not terminated via an Unbind command from the host); enter an inactivity disconnect value on systems using disconnect timers; coordinate the addition of a status line for asynchronous terminals that do not have a twenty-fifth line; select parity and baud rate; specify terminal type (including printers) used on each port; establish passwords, etc.

Upon exiting configuration mode, the terminal screen clears and configuration parameters are stored in battery backup or EEPROM memory, which protect parameters even during a power down. If battery backup should fail, the converter will return to default options in firmware.

RT74 and RT51 converters have two front-panel controls—one for power and the other for reset. Pressing the reset button stops communication with the host and terminals and initiates a self-test. Results of the test are either displayed on a terminal screen or available through a breakout box connected to the converter's synchronous port. (The RT51 unit also supports on-line diagnostics, invoked by depressing an Escape sequence at any attached terminal.)

On the Bi-Path front panel are an on/off switch, an active/bypass switch, and two LEDs to monitor system status and power. The active/bypass switch sets operation in either 3270 or ASCII mode.

The TMS-One front panel contains a power push button, select buttons to display the transmission status of asynchronous ports, and LEDs to monitor transmission status on the two connected hosts and each asynchronous port.

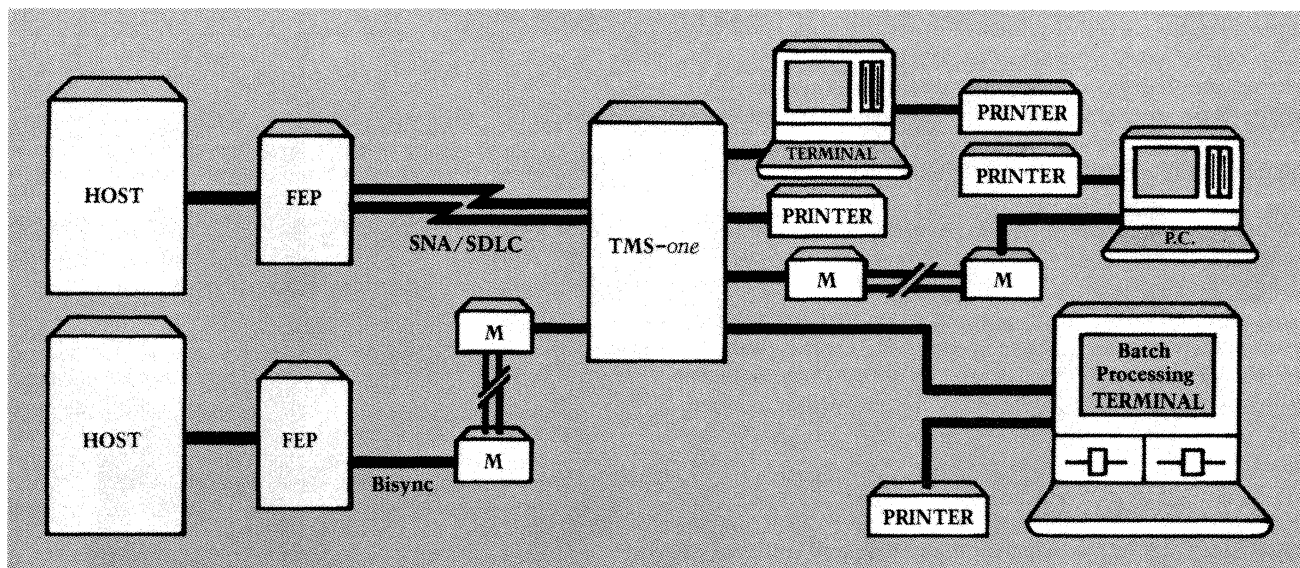


Figure 1. This TMS-One Asynchronous Controller offers two ports to support both interactive and batch hosts. The unit supports up to 32 asynchronous ports and 128 logical units, and each port can have 4 sessions and printing running at one time

## Renex Corporation Protocol Converters

While prices for protocol converters have begun to erode in a more competitive marketplace, vendors have had to maintain large investments in research and development projects to make their equipment more attractive to the end user. This has occurred during a general slump in the computer industry, and most protocol conversion vendors, including Renex, have felt the pinch of a sagging market.

### ADVANTAGES AND RESTRICTIONS

Renex converters offer users flexibility in using various types of terminals and personal computers in environments in which they may be incompatible. The products help a user protect investments in existing equipment and allow an organization to purchase inexpensive peripherals to access an IBM host. Renex also offers a product that will allow users of IBM 3270 terminals to access asynchronous hosts, thus providing access to public data bases, packet networks, and other types of private networks. Renex products offering ASCII to SNA/SDLC conversion support from one to 24 asynchronous ports; the company's TMS-One controller supports up to 32 asynchronous ports and 128 logical units, allowing a user to place up to five sessions onto a single port. TMS-One and RT51 offer online diagnostics for easy system monitoring. Most of the converters can be equipped with several options that increase their functionality. An auxiliary printer port option is particularly attractive because it allows a terminal and printer to share the same port.

Although protocol converters offer several important advantages, they do have some disadvantages, and Renex has developed two software products that address major weaknesses inherent in hardware conversion systems. Protocol converters, whether manufactured by Renex or any other vendor, cannot offer an error-free asynchronous data transmission; therefore, the user must detect and correct any transmission errors by checking the integrity of data on the terminal screen. While the lack of error correction methods may not be a problem in some applications, it can be a serious problem during the transmission of financial data. While error correction modems and intelligent network PADs can alleviate the problem, they add significantly to the cost of the network.

Another problem concerns the asynchronous, full-duplex world of the protocol converter, in which keystroke data are echoed back to attached terminals for display. Problems arise when this data must be transmitted through an X.25 packet switched network because ASCII data must be transported not only through the packet network, but also the asynchronous environment of the protocol converter, and the echo response time for keystroke data on dial-up lines can be very long.

Renex has developed two microcomputer software products, RAP and RLink, which address problems inherent in "black box" protocol converters. RAP, a message-oriented protocol, can download an entire 3270 datastream to a microcomputer. RLink, a terminal emulation program for the microcomputer, processes that datastream directly. By

Renex converters perform all of the functions related to the screen handling of an IBM device. They maintain an internal image of the screen of any attached terminal, and when a connection is made between the terminal and the converter, the terminal's screen is cleared as is its internal image in the converter. As a new screen is received from the host, it is compared with the previous internal image from the terminal, and only those characters which have changed are transmitted from the converter's buffer to the terminal screen. If the terminal supports dual-intensity characters, the converter determines the characters necessary to display highlighted fields, and nondisplay fields are transmitted to the terminal's screen as blanks.

Characters entered at a keyboard go immediately to the Renex converter and do not affect the terminal's screen. When the converter receives a display character, it checks the terminal's cursor location against the internal screen image, and if the cursor is within an unprotected field, the converter transmits the character to the terminal screen, and the internal image is updated. However, should the cursor be in an unprotected field, a "bell" code is transmitted to sound a tone on the terminal. Subsequent keystrokes also sound the tone until the operator hits a Reset key.

In addition to character keys, IBM 327X displays have Program Function (PF), Program Attention (PA), and other special keys, which are usually not available on asynchronous terminals. To allow these terminal to operate like IBM display stations, the Renex converter recognizes a set of multiple key sequences for special keys, and some keys are replaced by control sequences (pressing a control key as another key is pressed simultaneously) while others are replaced by escape sequences (pressing the Escape key as another key is pressed simultaneously). If an operator enters a PF, PA, or Enter key, the converter performs the appropriate read function and sends a code to identify the pressed key. Like the IBM 327X display station, the converter then refuses further keyboard input until the host sends a response.

The Bi-Path converter supports SNA, BSC, and Local Channel protocols. This device allows IBM 3270 display terminals to access ASCII hosts, including a variety of minicomputers and mainframes, public data bases, packet networks, and microcomputers. Through the Bi-Path's front-panel active/bypass switch, users can allow an attached display station to switch between 3270 and asynchronous ASCII operation. A 3270 device attached to Bi-Path emulates a DEC VT100 with printer option or an IBM 3101 terminal. All VT100 keys and keyboard modes are emulated; keyboard LEDs are displayed on the 3270's status line. When operating in 3270 mode, the Bi-Path converter is transparent to an IBM host, and when switched to ASCII mode, a 3270 display station appears to be powered off to the host. The Bi-Path maintains an ASCII screen buffer, and data is continuously received from the ASCII host.

A Distributed Function Terminal (DFT) feature on the TMS-One unit, allows each attached device to have four host sessions and a printer session active at once. Access to each one of the sessions is password-protected. In addition, users can set parameters for inactivity disconnect timers, baud rate, parity, reset, and diagnostics checks for each TMS-One port. A network manager can access the system to reset configurations or perform maintenance without disrupting TMS-One operation. The unit offers online diagnostic capabilities, which can be invoked through any terminal attached to the system.

### OPTIONS

Renex RT converters can be equipped with a number of options. A color enhancement feature allows color terminals

## Renex Corporation Protocol Converters

processing the host datastream at the microcomputer, performance problems associated with protocol converters can be eliminated because the converter need no longer maintain an internal screen buffer for attached devices. The software, rather than a protocol converter, handles screen editing and data-entry functions; data is no longer echoed across the network because it is processed by the terminal emulation program. Therefore, problems with echo delay are eliminated. In addition, data integrity is ensured by a CRC error detection method in which RAP breaks down a 3270 datastream into smaller blocks to which a sequence number is appended. This number is used at the receiving end of the communications line to reassemble packets into the original block sequence in the datastream.

Users with a large number of microcomputers should investigate the advantages of using a software-based solution to protocol conversion rather than "black box" products. Those with a large number of asynchronous terminals, on the other hand, will have to use a hardware product, and Renex converters offer all of the basic protocol conversion functions for the terminal environment.

### USER REACTION

In Datapro's 1985 Terminal User's Survey, 10 users reported their experiences with 24 Renex converters. The users rated the products in five categories. Results of this evaluation are shown in the following table:

	Excellent	Good	Fair	Poor	WA*
Overall performance	4	3	2	1	3.0
Ease of installation	4	3	1	1	3.1
Ease of operation	2	5	1	1	2.9
Hardware reliability	3	5	0	1	3.1
Maintenance service/ technical support	2	2	2	1	2.7

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

to act as IBM 3279's with seven-color support and extended highlighting. A KSR printer option allows hardcopy keyboard terminals full-screen edit capabilities, and an auxiliary printer option lets a terminal and printer share the same physical port while remaining separately addressable, allowing printing to occur while the terminal is active. An APL (a programming language) option adapts a terminal with a syntax and character set designed for mathematical applications and scientific computation. IBM PC support, available through a Renex's RLink and RAP packages, lets the

personal computer receive and transfer files to a host, as well as act like a 3278 terminal. A graphics passthrough option allows the use of graphics packages, such as SAS/GRAPH and TELL-A-GRAPH.

### PRICING

Renex converters are available for purchase. The company provides service and maintenance on its equipment, as well as 24- to 48-hour parts replacement. Prices for the Renex products discussed in this report are show in the following table.

### EQUIPMENT PRICES

	Purchase Price (\$)
<b>RT74/RT51 Single-board System with—</b>	
5 asynchronous ports	2,900
7 asynchronous ports	3,600
9 asynchronous ports	4,200
11 asynchronous ports	4,800
<b>RT74/RT51 Multi-board System with—</b>	
8 asynchronous ports	5,990
12 asynchronous ports	6,990
16 asynchronous ports	8,990
20 asynchronous ports	10,990
24 asynchronous ports	12,990
<b>TMS-One Asynchronous Controller with—</b>	
8 asynchronous ports	7,495
16 asynchronous ports	9,995
24 asynchronous ports	11,995
32 asynchronous ports	13,745
<b>Bi-Path "Deconverter"</b>	
Emulates IBM 3101 or VT100	699
<b>RTC Miniverter System with—</b>	
1 asynchronous port	995
3 asynchronous ports	1,595

### OPTIONS

Auxiliary printer support	100/port
Color/extended highlighting	500
APL support	900
RLink software (single user)	150
RLink software (unlimited user)	1,500
RAP software (single user)	225
RAP software (unlimited user)	2,500

All port upgrades are calculated by taking the difference in list price plus \$500. A \$100 handling charge is added to enhancement orders. ■

