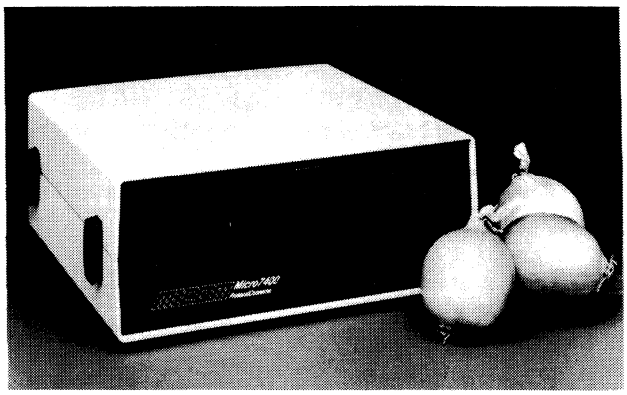
Micom Micro7400 Protocol Converter



The Micro7400 protocol converter emulates an IBM 3274 controller and allows asynchronous devices to function as 3270-type terminals and printers with an IBM-compatible host processor.

The five Micro7400 protocol converters in this report emulate IBM 3274 Model 61C Control Units, communicating in either BSC or SNA/SDLC protocol. They allow asynchronous devices to function as IBM 3278 display terminals or IBM 3287 printers.

MODELS: Five fully featured 2-, 4-, 8-, 12-, and 16-channel units.
CONVERSION: Asynchronous ASCII to IBM BSC or SNA/SDLC in EBCDIC.
TRANSMISSION RATES: Full-duplex, asynchronous transmission from 300 to 9600 bps; half-duplex, synchronous transmission up to 19.2K bps.
COMPETITION: Protocol Computers, Inc., Local Data.
PRICE: From $2,250 for the 2-channel unit to $5,650 for the 16-channel unit.

MANAGEMENT SUMMARY

UPDATE: *Since the last revision of this report, Micom has discontinued its budget-priced, two-channel LTD model that was available without non-volatile memory. No other changes have been made to the Micro7400 line.*

Micom entered the conversion and emulation market in November 1983 when it acquired Industrial Computer Controls, Inc. (ICCI), an experienced manufacturer of protocol converters for the IBM environment, and announced the Micro7400. The Micro7400 is actually a significantly enhanced version of ICCI's former CA20 unit, based on Micom's hardware design. With the advent of its protocol converter, Micom was able to offer an "IBM gateway" product to its traditional minicomputer-users' market. In addition, the company pledged to expand its marketing efforts to include products that would appeal to the huge IBM customer base.

Micom's Micro7400 emulates an IBM 3274 Model 61C control unit, communicating in either BSC or SNA/SDLC protocol. With the new converter, inexpensive, asynchronous terminals can access IBM mainframes and function as either IBM 3278 display stations or IBM 3287 printers. Special support allows keyboard/printer terminals to interact with programs originally developed for display stations.

There are five Micro7400 models—fully featured models with 2, 4, 8, 12, or 16 asynchronous input channels. All Micro7400 models can simultaneously support many different types of asynchronous devices, including terminals, printers, teleprinters, and personal computers. The user can preassign each channel to a different type of asynchronous device or dynamically select channel assignment from a menu through an individual terminal or command port. In addition, all of the basic units can be optionally equipped with a 2400, 4800, or 9600 bps modem.

CHARACTERISTICS

VENDOR: Micom Systems, Inc., 4100 Los Angeles Avenue, P.O. Box 8100, Simi Valley, CA 93062-8100. Telephone (805) 583-8600. In Canada: Signatel Ltd., 195 Riveria Drive, Markham, Ontario LCR2L6. Telephone (416) 477-9977.

DATE OF FIRST ANNOUNCEMENT: November 1983.

DATE OF FIRST DELIVERY: January 1984.

NUMBER INSTALLED TO DATE: Over 1,000.

SERVICED BY: Micom Systems, Inc.

MODELS

Micom's Micro7400 protocol converter emulates an IBM 3274 Model 61C controller communicating in either BSC or SNA/SDLC. The device allows connection of up to 16 asynchronous ASCII devices used as 3270-type terminals and printers. The Micro7400 also supports connection with two IBM hosts, or with an IBM host and up to eight asynchronous hosts. Users can order the Micro7400 converter in either a BSC or SNA/SDLC configuration.

Micom offers five Micro7400 models. Five full-featured models have either 2, 4, 8, 12, or 16 asynchronous input channels.

TRANSMISSION SPECIFICATIONS

The Micro7400 provides full-duplex, asynchronous transmission on the terminal side and half-duplex, synchronous transmission on the host side. Asynchronous transmission rates range from 300 to 9600 bps; maximum synchronous transmission speed is 19.2K bps. Synchronous transmission speeds are switch selectable; users can configure asynchronous transmission speeds through any attached terminal or through the Micro7400 command port.

Micom Micro7400 Protocol Converter

In February 1985, Micom announced the availability of a plug-in card version of the Micro7400 for the Micro600 data PABX. This unit, called the Micro7400i, offers all of the features of the standalone unit; it comes in 8- and 16-channel versions. The card plugs directly into the Micro600 backplane.

By treating an attached CRT terminal as an IBM 3278 Model 2 with a 1920-character screen, the Micro7400 duplicates standard 3278 keyboard functions and 3278 terminal display features. As an option, the Micro7400 supports IBM large-screen models (3, 4, and 5) of the 3278 terminal. Because the converter provides a special 3278 emulation for hardcopy terminals, a user with a keyboard/printer terminal can access CRT-oriented host applications. In addition, the Micro7400 allows an asynchronous printer to emulate an IBM 3287 printer; printer formatting and operator controls are almost identical to that of the 3287, with minor restrictions.

Located between the host and the asynchronous terminal, the Micro7400 performs the conversions necessary to having asynchronous, ASCII devices communicate with IBM BSC or SNA/SDLC hosts using an EBCDIC coding. Communication between the Micro7400 and the host is either in BSC or SDLC protocol in the EBCDIC character set. An ASCII BSC option allows the Micro7400 to support BSC protocol in the ASCII character set. Communication between the Micro7400 and the attached asynchronous device is in the ASCII character set.

To accomplish emulation, the Micro7400 maintains an internal screen buffer, called a Virtual Screen, which is updated by a Write Module in response to write commands and other orders from the host. A Read Module responding to read commands transmits data from the Virtual Screen to the hosts. These operations mimic those of an IBM 3274 control unit. A Screen Manager in the Micro7400 interprets the Virtual Screen in accordance with characteristics of the attached asynchronous terminal or printer to enable its own display. A Keyboard Parser examines data entered from the asynchronous terminal keyboard, updates the Virtual Screen accordingly, and tells the Read Module to transmit the data to the host if necessary. (See Figure 1 for a functional diagram of Micro7400 emulation.)

Although the Micro7400's primary function is to enable asynchronous terminals to access IBM mainframes, the converter also offers several capabilities that extend standard 3270-type functions. Through a dual synchronous host option, the device provides the ability to switch between two IBM hosts or between an IBM host and an ASCII minicomputer in response to commands entered at a user's keyboard. The four- or eight-port asynchronous host option supports a 3270 host link and up to four or eight asynchronous host connections. With the Micro7400 command port, users can alter operating parameters, such as line parameters, message reports, timing values, and priority assignments, and monitor, diagnose, and control network facilities. Two other features augment the command port: a Terminal Activated Channel Test (TACT), for troubleshooting from the user's terminal; and a Termi-

SDLC and BSC communication occurs between the Micro7400 and the host using EBCDIC, or optionally ASCII, transmission code. Between the Micro7400 and the attached terminal, asynchronous ASCII communication occurs. The Micro7400 supports an RS-232-C terminal interface; a current loop interface is optional.

DEVICE CONTROL

The Micro7400 operates with any combination of host and communications processor software and 3274 set-up parameters. This includes standard IBM operating systems, such as DOS, DOS/VS, and VM/370; systems software, such as CICS, TSO, CMS, and IMS; and standard access methods, including BTAM, TCAM, VTAM, and VTAM/E.

The Micro7400 handles the various translations and conversions necessary to the emulation process. Placed between the network host and the attached ASCII devices, the Micro7400 converts either the SNA/SDLC or BSC 3270 protocol to ASCII protocol, reformats data from the synchronous link to conform to the specifications of the ASCII device, converts EBCDIC to ASCII coding, and transforms all command and control codes of one device into those required by the other.

HOST COMMUNICATIONS: In communicating with the host, the Micro7400 appears to the host as an IBM 3274-61C control unit. The host sends 3270 commands to the Micro7400, either alone or as prefixes to data. The Micro7400 supports standard 3270 commands: Erase All Unprotected, Erase/Write, Erase/Write Alternate, Read Buffer, Read Modified, and Write. The device also supports standard 3270 Write and Read control characters that specify actions for the receiving terminals; AID characters that identify to the host the reason for a data transmission from the 3274 controller to the host; display order characters that tell the attached terminal how to display data; and printer order characters that tell an attached printer how the data transmitted from the host should be printed. Printer order information includes information about carriage returns, forms feeds, new lines, and so forth. The Micro7400 supports printing characters for BSC printing, or for DSC (Logical Unit (LU) Type 3) or SCS (LU Type 1) for SNA/SDLC printing.

The Micro7400 translates the field types, key functions, and status line features of a 3270 device into a format compatible with the receiving terminal, with some exceptions. For example, depressing a shift key on the asynchronous device cannot override the standard 3270 numeric lock feature because the Micro7400 cannot detect the depression. If an attached asynchronous terminal does not support local operator controls for Alternate Cursor and Cursor Blink functions, those capabilities are not available. Please see the Advantages and Restrictions section of this report for other device control limitations.

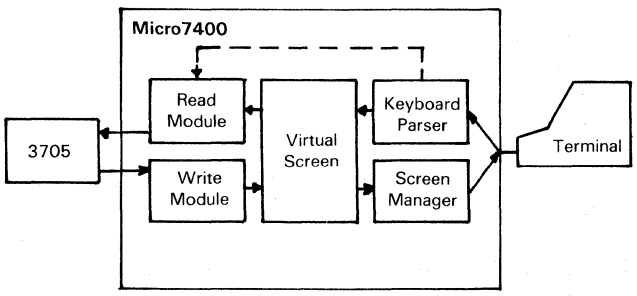


Figure 1. Micro7400 functional block diagram.

Micom Micro7400 Protocol Converter

nal Initiated Channel Configuration (TICC), for setting and altering terminal-related operating parameters.

Data security is a primary concern when protocol converters are used in dial-up applications, and Micom has incorporated into the Micro7400 a set of security measures, which are separately configurable via the unit's command port. The Micro7400 can be configured to require a password for system access. A "disconnect if unbound" feature will disconnect a user once he or she logs off from an initial session to prevent logging off one application to move to another. A timeout disconnect feature will automatically disconnect a line after a specified timeout period, and a logoff message can prevent someone from gaining access to a line recently in use by another party. A Micro7400 command port operator can protect the integrity of channel configurations by using TICC disabling to prevent inexperienced or unauthorzied users from reconfiguring parameters. In addition, the operator can set the Micro7400's XID data to be identified by the SNA host system as a valid dial-in control unit.

In addition to the above features, Micom also offers specialized software for the IBM PC that allows the microcomputer to operate with the Micro7400 to access a mainframe.

COMPETITIVE POSITION

Clearly, there is much to gain by providing IBM gateway products in the present data communications environment, and Micom's ability to develop and successfully market a unit has been reflected in strong sales of the Micro7400 product. In just a short time, Micom has become one of the leading vendors of protocol converters designed to allow asynchronous terminals and printers to access IBM BSC or SNA/SDLC hosts.

The Micro7400 is a unique protocol converter because it offers the user far more centralized network control than is usually possible through such devices. The unit is also one of the few to offer a choice of either BSC or SNA/SDLC emulation in one model. Perhaps even more significant, however, is Micom's pricing for the new unit. The Micro7400 is priced at about 20 percent below similar products, and this is a deliberate strategy to capture a large market share as soon as possible.

At the present time, Local Data and Protocol Computers, Inc. are Micom's most prominent competitors. Both vendors have been delivering protocol converters for several years, and both have a solid, installed-customer base. Protocol Computers announces new models frequently. Last year, the company introduced "budget" versions of its major conversion product line. IBM now offers 3270 conversion in its 7171 unit, introduced in September 1984. With this offering IBM has legitimized protocol conversion in the marketplace, and the introduction has actually helped other vendors of the products.

The introduction of new protocol converters has cooled somewhat in recent months, and Micom has emerged one of the clear leaders in the marketplace for these products.

The Micro7400 provides status information for all terminals via a Status Inquiry function that is initiated by the terminal user.

Micom provides both mnemonic key maps for specific terminal keyboards and a generic map that is the same for all terminals. The generic map is a more general scheme that permits rapid transition among different terminals.

3278 EMULATION FOR DISPLAY TERMINALS: With the Micro7400, an attached asynchronous device appears as an IBM 3278 Model 2 display station with a 1920-character screen. The Micro7400 also converts standard 3278 keyboard functions for the ASCII device. A large-screen option supports IBM 3278 Model 3, 4, and 5 display stations.

The Micro7400 contains an internal screen buffer for each terminal. These buffers are maintained by Read and Write modules. The Read module controls communication from the Micro7400 to the host; the Write module updates the internal screen buffers in response to host commands. A Screen Manager in the Micro7400 interprets the contents of the internal buffer to display a 3278-type screen on an asynchronous terminal.

Keystrokes on an attached asynchronous terminal are interpreted by the Micro7400 to update the internal screen buffer to be displayed on the screen of the terminal by the Screen Manager, and, if required, to be transmitted to the host by the Read module.

3278 EMULATION FOR HARDCOPY TERMINALS: With the Micro7400, keyboard/printer asynchronous terminals can be used for 3270 display terminal applications. The asynchronous device can both print and transmit data formatted for a 3270 CRT screen. The Micro7400 provides three types of interactive hardcopy supports for 3278 emulation: Type 1 and Type 3 support are best suited to full-screen applications in which the operator must enter and modify data in more than one field; Type 2 support is suitable for simpler applications in which the operator enters data for only one or two fields.

In Type 1 support, the Micro7400 builds and stores a screen image from data sent by the host. When the image is complete, the Micro7400 transmits nonblank lines of the image, preceded by a scale line that shows column numbers and line numbers. Once the image is transmitted, the Micro7400 can accept operator input from the keyboard and prompt the operator for data one field at a time. The prompt identifies the field by its line and column numbers; the operator selects the desired input field through Tab and Home keys. Prompting continues until the operator requests transmission of the contents of the modified "screen" to the host. The Micro7400 erases data entered into its buffers from the keyboard through the Backspace, Erase Field, or Erase Input commands.

Type 2 hardcopy support provides output that does not include line or column numbers, but only the data content of each line modified by host action. Operators use host transmission keys and the Tab function, along with Backspace, Erase Field, and Erase Input commands, to input characters into fields. In Type 2 support, the Micro7400 does not issue prompts.

Type 3 hardcopy support is identical to Type 1 support with one exception: each printed line is truncated after 80 characters. This prevents the image from running off the paper of 80-column devices.

3287 PRINTER EMULATION: An asynchronous printer attached to the Micro7400 appears to the host as a 3287 printer with a 1920-character buffer, an EBCDIC character set, page-length control, and BSC or SNA/SDLC features.

Micom Micro7400 Protocol Converter

This is a significant achievement for a company that entered this particular business later than many of the competitors. The success of the Micro7400 product line reflects a much broader pattern of accomplishment for the company. Micom acquired Interlan, a local area network company, and introduced a new product that combines Interlan's Net/Plus Ethernet LAN and Micom's data PABX. To further increase market penetration of its products, Micom has formed a new sales division and expects to increase the field organization by fifty percent in fiscal 1986. These business plans, coupled with Micom's steady earnings record and the continued success of Black Box Catalog, the company's highly successful catalog sales division, point to a strong future for the company.

ADVANTAGES AND RESTRICTIONS

Using Micom's Micro7400 offers several advantages. In addition to providing protocol conversion, the Micro7400 serves as a cost-effective gateway for asynchronous devices to access the IBM environment. It can be used to replace a remote 3270 cluster in an IBM BSC or SNA network. The Micro7400 can also provide dial-up access to an IBM or compatible host allowing remote asynchronous devices to use less expensive asynchronous modems and dial-up lines, including inbound WATS. Micro7400s can be located on a multipoint line to connect a number of remote sites to a synchronous host over a single link. Since the host can address the Micro7400 in both BSC or SNA protocol, it can poll the Micro7400 for data on an as-needed basis. And despite the complexity of BSC and SNA protocols, no hardware or software changes in the host are necessary to accommodate the Micro7400.

The Micro7400 not only allows the user to have inexpensive asynchronous terminals emulate intelligent 3278s, but also allows those 3278s to operate well beyond the normal 3270 capability. Features like the command port, the asynchronous host support option, automatic log on, security options, priority-level settings, and message broadcasts increase network flexibility and provide users with greater control of the system.

Price-wise, the Micro7400 is very competitive with similar converters offered by other vendors. The basic units are about 20 percent less expensive than competing products, and Micom offers a "bare-bones" model for those who want conversion without all of the extras.

The Micro7400 has a few minor technical restrictions that involve the characteristics of the attached asynchronous device. Because display intensity is terminal-dependent, intensified display fields are brighter than normal only when the attached terminal supports two levels of video. Also, several key functions depend on the capabilities of the terminal. For example, Alternate Cursor and Cursor Blink keys are local functions of the terminal, and only terminals with the appropriate operator controls can perform them. Support for typamatic keys is also terminal-dependent. The Micro7400 does not provide a Backspace key separate from a Left Cursor key because these keys provide the same function. Also unsupported is a Test key or Test mode.

The Micro7400 supports three operating modes: BSC mode, SNA/SDLC DSC mode, and SNA/SDLC SCS mode. In DSC mode, 3270 command and printer order characters are accepted; in SCS mode, SNA character string codes are accepted.

For asynchronous keyboard printers, the Micro7400 provides many 3278 operator controls, including X-on/X-off, cancel print, form field, and index. In response to a key sequence, the Micro7400 provides a self-test message. Also supported is local copying of display images; as an enhancement, the Micro7400 allows the terminal user to determine the print destination of each display. Users can also specify the following: single and double spacing, page length, and lines per inch.

OTHER FEATURES: In addition to supplying 3278 display and 3287 printer emulation, the Micro7400 offers many features that extend the capabilities of the IBM 3270 family. One of these features is a command port, through which users can configure, control, monitor, and test the operation of the 3270 system and the selected emulations. This command port does not supersede the ability to configure operating parameters through any attached terminal, but offers, instead, more flexible network control.

The user can select a desired operation from a displayed menu that exhibits four sets of functions: three sets of Terminal Initiated Channel Configuration (TICC) functions (Configuration, Configuration Display, and Status/Statistics Display) and Terminal-Activated Channel Tests (TACT).

- ***Configuration*—Under the Configuration menu, a choice of two types of operations can be performed. One allows the operator to configure per-channel characteristics, such as terminal or print emulation, transmission rate, stop bits, parity, busy-out status, inbound priority, default terminal type, printer assignment, and optional command-level prompts. The other allows the operator to specify system-wide parameters and features: NRZI or non-NRZI encoding, control-unit address, printer line-sharing, carriage delays, short-break length, and so forth. Also included in the system-wide menu are customized terminal-type definitions and international character code sets.**

- ***Configuration Display*—By specifying various configuration display menus, the operator can view summaries of line, controller, or channel configurations.**

- ***Status/Statistics Display*—The operator can choose to display channel-specific or system-side status and statistical information. Channel-specific displays show the status of each channel connection. Also shown are terminal type selected, keyboard map, keyboard lock, insert mode, output held by X-off, and active, bound, and LU status for SNA applications. Additional status/statistics display menus monitor asynchronous and synchronous lines.**

- ***Terminal-Activated Channel Test (TACT)*—There are local and terminal TACT modes. In local mode, the Micro7400 echoes any character received from the attached asynchronous device back to that device. In terminal mode, the Micro7400 sends a continuous "fox" message to the attached asynchronous device. TACT modes initiated through the command port test any designated channel, including the command port.**

Other features that extend the capabilities of the IBM 3270 include auto log on from a message stored in nonvolatile memory and transmitted upon request from the keyboard; banner, broadcast, and disconnect messages; inbound priority assignments for asynchronous channels; and security options which include password protection, timeout disconnection, automatic log off, and SNA session control.

Micom Micro7400 Protocol Converter

The Micro7400 may be equipped with several options, but with the exception of an Asymmetrical Channel Speed Option, no two options can be put on the same unit. Users should note this fact when ordering Micro7400s

USER REACTION

Eight users of Micom's Micro7400 protocol converter rated the products in five categories in Datapro's 1986 user survey. These users had a total of 34 units installed. Their ratings are shown in the following table.

	Excellent	Good	Fair	Poor	WA*
Overall performance	2	4	2	0	3.0
Ease of installation	2	4	2	0	3.0
Hardware reliability	4	3	1	0	3.4
Ease of operation	4	2	2	0	3.3
Maintenance service/ technical support	1	1	4	2	2.1
Ease of operation	4	2	2	0	3.3

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

Options

Options on the Micro7400 include the following:

- **Asynchronous Host Option (available on 4, 8, or 12-channel units): adds four asynchronous host channels and permits individual terminals to switch between 3270 emulation and any four asynchronous hosts. Users must specify four-channel addition. Also available is an eight-channel addition for the eight-channel unit only.**
- **ASCII BSC Option: provides support for BSC protocol in the ASCII character set.**
- **Asymmetrical Channel Speed Option: allows transmission at one speed and reception at another for Viewdata and similar applications.**

With the exception of the asymmetrical option, no option may be combined with another option.

PRICING

Micom ships the Micro7400 within 30 days after receipt of order. The two-channel full-feature model sells for $2,250. The 4-channel basic unit costs $2,950, the 8-channel unit is $3,850, the 12-channel unit is $4,750, and the 16-channel unit sells for $5,650. The new M7000/IBMPC, a software diskette that provides VT-100 emultaion and allows an IBM PC to work with the Micro7400, is priced at $175. ■

Micom Micro7400 Protocol Converter

MANAGEMENT SUMMARY

UPDATE: *We have updated this report to reflect changes in the Micro7400 product. Micom has announced a 16-channel unit and the availability of a plug-in version, the Micro7400i, for the Micro600 data PABX. Micom also has a new address and telephone number.*

In November 1983, Micom acquired Industrial Computer Controls, Inc. (ICCI), an experienced manufacturer of protocol converters for the IBM environment. At the same time, Micom announced the Micro7400, a significantly enhanced version of ICCI's former CA20 unit, based on Micom's hardware design. With the introduction of the new product, Micom not only entered the conversion and emulation market but also offered an "IBM gateway" product to its traditional minicomputer-users' market. In addition, the company pledged to expand its marketing efforts to include products that would appeal to the huge IBM customer base.

Micom's Micro7400 emulates an IBM 3274 Model 61C control unit, communicating in either BSC or SNA/SDLC protocol. With the new converter, inexpensive, asynchronous terminals can access IBM mainframes and function as either IBM 3278 display stations or IBM 3287 printers. Special support allows keyboard/printer terminals to interact with programs originally developed for display stations.

There are six Micro7400 models—five fully featured models with 2, 4, 8, 12, or 16 asynchronous input channels and one budget-priced, two-channel "LTD" model. The LTD model does not have the nonvolatile memory that supports the additional capabilities of the full-featured models, such as message broadcasts, security options, settings for priority levels, and automatic log on. All Micro7400 models can simultaneously support many different types of

The Micro7400 protocol converter emulates an IBM 3274 Model 61C Control Unit, communicating in either BSC or SNA/SDLC protocol. It allows asynchronous devices to function as IBM 3278 display terminals or IBM 3287 printers.

MODELS: Six models including a 2-channel "budget" unit and fully featured 2-, 4-, 8-, 12-, and 16-channel units.
CONVERSION: Asynchronous ASCII to IBM BSC or SNA/SDLC in EBCDIC.
TRANSMISSION RATES: Full-duplex, asynchronous transmission from 300 to 9600 bps; half-duplex, synchronous transmission up to 19.2K bps.
COMPETITION: Protocol Computers, Inc., Local Data.
PRICE: From $1,650 for the 2-channel budget unit to $5,650 for the 16-channel unit.

CHARACTERISTICS

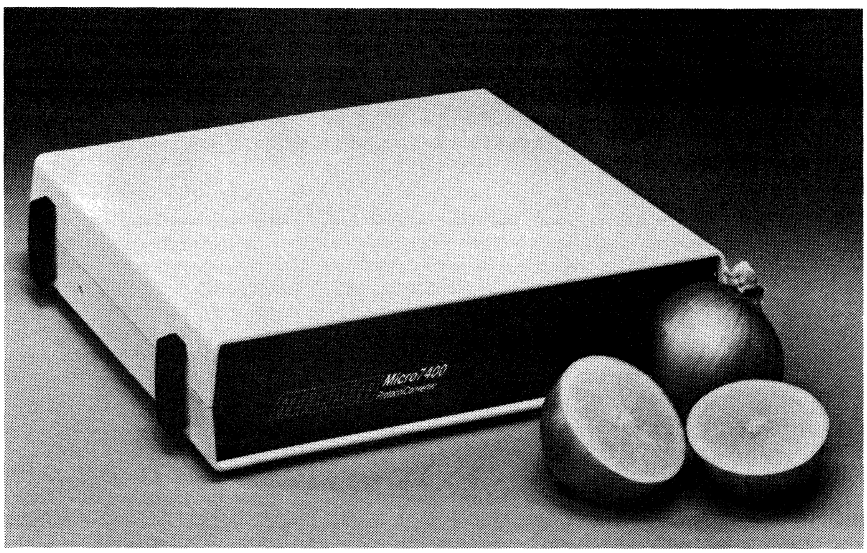
VENDOR: Micom Systems, Inc., 4100 Los Angeles Avenue, P.O. Box 8100, Simi Valley, CA 93062-8100. Telephone (805) 583-8600. In Canada: Signatel Ltd., 195 Riveria Drive, Markham, Ontario LCR2L6. Telephone (416) 477-9977.

DATE OF FIRST ANNOUNCEMENT: November 1983.

DATE OF FIRST DELIVERY: January 1984.

NUMBER INSTALLED TO DATE: Over 1,000.

SERVICED BY: Micom Systems, Inc.



Micom's Micro7400 protocol converter emulates an IBM 3274 controller, allowing asynchronous devices to function as 3270-type terminals and printers with an IBM or IBM-compatible host processor.

Micom Micro7400 Protocol Converter

asynchronous devices, including terminals, printers, teleprinters, and personal computers. The user can preassign each channel to a different type of asynchronous device or dynamically select channel assignment from a menu through an individual terminal or command port. In addition, all of the basic units can be optionally equipped with a 2400, 4800, or 9600 bps modem. The LTD unit can have an optional 2400 bps modem only.

In February 1985, Micom announced the availability of a plug-in card version of the Micro7400 for the Micro600 data PABX. This unit, called the Micro7400i, offers all of the features of the standalone unit; it comes in 8- and 16-channel versions. The card plugs directly into the Micro600 backplane.

By treating an attached CRT terminal as an IBM 3278 Model 2 with a 1920-character screen, the Micro7400 duplicates standard 3278 keyboard functions and 3278 terminal display features. As an option, the Micro7400 supports IBM large-screen models (3, 4, and 5) of the 3278 terminal. Because the converter provides a special 3278 emulation for hardcopy terminals, a user with a keyboard/printer terminal can access CRT-oriented host applications. In addition, the Micro7400 allows an asynchronous printer to emulate an IBM 3287 printer; printer formatting and operator controls are almost identical to that of the 3287, with minor restrictions.

Located between the host and the asynchronous terminal, the Micro7400 performs the conversions necessary to having asynchronous, ASCII devices communicate with IBM BSC or SNA/SDLC hosts using an EBCDIC coding. Communication between the Micro7400 and the host is either in BSC or SDLC protocol in the EBCDIC character set. An ASCII BSC option allows the Micro7400 to support BSC protocol in the ASCII character set. Communication between the Micro7400 and the attached asynchronous device is in the ASCII character set.

To accomplish emulation, the Micro7400 maintains an internal screen buffer, called a Virtual Screen, which is updated by a Write Module in response to write commands and other orders from the host. A Read Module responding to read commands transmits data from the Virtual Screen to the hosts. These operations mimic those of an IBM 3274 control unit. A Screen Manager in the Micro7400 interprets the Virtual Screen in accordance with characteristics of the attached asynchronous terminal or printer to enable its own display. A Keyboard Parser examines data entered from the asynchronous terminal keyboard, updates the Virtual Screen accordingly, and tells the Read Module to transmit the data to the host if necessary. (See Figure 1 for a functional diagram of Micro7400 emulation.)

Although the Micro7400's primary function is to enable asynchronous terminals to access IBM mainframes, the converter also offers several capabilities that extend standard 3270-type functions. Through a dual synchronous host option, the device provides the ability to switch between two IBM hosts or between an IBM host and an

MODELS

Micom's Micro7400 protocol converter emulates an IBM 3274 Model 61C controller communicating in either BSC or SNA/SDLC. The device allows connection of up to 16 asynchronous ASCII devices used as 3270-type terminals and printers. The Micro7400 also supports connection with two IBM hosts, or with an IBM host and up to eight asynchronous hosts. Users can order the Micro7400 converter in either a BSC or SNA/SDLC configuration.

Micom offers six Micro7400 models. Five full-featured models have either 2, 4, 8, 12, or 16 asynchronous input channels. A budget-priced, two-channel "LTD" model is also available. The "LTD" model differs from the other models in one respect: it does not have nonvolatile memory, which supports options like message broadcasts, settings for priority levels, security options, and automatic log on.

TRANSMISSION SPECIFICATIONS

The Micro7400 provides full-duplex, asynchronous transmission on the terminal side and half-duplex, synchronous transmission on the host side. Asynchronous transmission rates range from 300 to 9600 bps; maximum synchronous transmission speed is 19.2K bps. Synchronous transmission speeds are switch selectable; users can configure asynchronous transmission speeds through any attached terminal or through the Micro7400 command port.

SDLC and BSC communication occurs between the Micro7400 and the host using EBCDIC, or optionally ASCII, transmission code. Between the Micro7400 and the attached terminal, asynchronous ASCII communication occurs. The Micro7400 supports an RS-232-C terminal interface; a current loop interface is optional.

DEVICE CONTROL

The Micro7400 operates with any combination of host and communications processor software and 3274 set-up parameters. This includes standard IBM operating systems, such as DOS, DOS/VS, and VM/370; systems software, such as CICS, TSO, CMS, and IMS; and standard access methods, including BTAM, TCAM, VTAM, and VTAM/E.

The Micro7400 handles the various translations and conversions necessary to the emulation process. Placed between the network host and the attached ASCII devices, the Micro7400 converts either the SNA/SDLC or BSC 3270 protocol to ASCII protocol, reformats data from the synchronous link to conform to the specifications of the ASCII device, converts EBCDIC to ASCII coding, and transforms all command and control codes of one device into those required by the other.

HOST COMMUNICATIONS: In communicating with the host, the Micro7400 appears to the host as an IBM 3274-61C control unit. The host sends 3270 commands to the

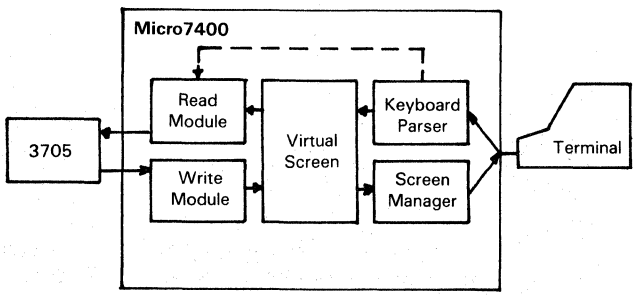


Figure 1. Micro7400 functional block diagram.

Micom Micro7400 Protocol Converter

ASCII minicomputer in response to commands entered at a user's keyboard. The four- or eight-port asynchronous host option supports a 3270 host link and up to four or eight asynchronous host connections. With the Micro7400 command port, users can alter operating parameters, such as line parameters, message reports, timing values, and priority assignments, and monitor, diagnose, and control network facilities. Two other features augment the command port: a Terminal Activated Channel Test (TACT), for troubleshooting from the user's terminal; and a Terminal Initiated Channel Configuration (TICC), for setting and altering terminal-related operating parameters.

Data security is a primary concern when protocol converters are used in dial-up applications, and Micom has incorporated into the Micro7400 a set of security measures, which are separately configurable via the unit's command port. The Micro7400 can be configured to require a password for system access. A "disconnect if unbound" feature will disconnect a user once he or she logs off from an initial session to prevent logging off one application to move to another. A timeout disconnect feature will automatically disconnect a line after a specified timeout period, and a logoff message can prevent someone from gaining access to a line recently in use by another party. A Micro7400 command port operator can protect the integrity of channel configurations by using TICC disabling to prevent inexperienced or unauthorzied users from reconfiguring parameters. In addition, the operator can set the Micro7400's XID data to be identified by the SNA host system as a valid dial-in control unit.

In addition to the above features, Micom also offers specialized software for the IBM PC that allows the microcomputer to operate with the Micro7400 to access a mainframe.

COMPETITIVE POSITION

Clearly, there is much to gain by providing IBM gateway products in the present data communications environment, and Micom's ability to develop and successfully market a unit has been reflected in strong sales of the Micro7400 product. In just a short time, Micom has become one of the leading vendors of protocol converters designed to allow asynchronous terminals and printers to access IBM BSC or SNA/SDLC hosts.

The Micro7400 is a unique protocol converter because it offers the user far more centralized network control than is usually possible through such devices. The unit is also one of the few to offer a choice of either BSC or SNA/SDLC emulation in one model. Perhaps even more significant, however, is Micom's pricing for the new unit. The Micro7400 is priced at about 20 percent below similar products, and this is a deliberate strategy to capture a large market share as soon as possible.

At the present time, Local Data and Protocol Computers, Inc. are Micom's most prominent competitors. Both vendors have been delivering protocol converters for several years, and both have a solid, installed-customer base. Pro-

Micro7400, either alone or as prefixes to data. The Micro7400 supports standard 3270 commands: Erase All Unprotected, Erase/Write, Erase/Write Alternate, Read Buffer, Read Modified, and Write. The device also supports standard 3270 Write and Read control characters that specify actions for the receiving terminals; AID characters that identify to the host the reason for a data transmission from the 3274 controller to the host; display order characters that tell the attached terminal how to display data; and printer order characters that tell an attached printer how the data transmitted from the host should be printed. Printer order information includes information about carriage returns, forms feeds, new lines, and so forth. The Micro7400 supports printing characters for BSC printing, or for DSC (Logical Unit (LU) Type 3) or SCS (LU Type 1) for SNA/SDLC printing.

The Micro7400 translates the field types, key functions, and status line features of a 3270 device into a format compatible with the receiving terminal, with some exceptions. For example, depressing a shift key on the asynchronous device cannot override the standard 3270 numeric lock feature because the Micro7400 cannot detect the depression. If an attached asynchronous terminal does not support local operator controls for Alternate Cursor and Cursor Blink functions, those capabilities are not available. Please see the Advantages and Restrictions section of this report for other device control limitations.

The Micro7400 provides status information for all terminals via a Status Inquiry function that is initiated by the terminal user.

Micom provides both mnemonic key maps for specific terminal keyboards and a generic map that is the same for all terminals. The generic map is a more general scheme that permits rapid transition among different terminals.

3278 EMULATION FOR DISPLAY TERMINALS: With the Micro7400, an attached asynchronous device appears as an IBM 3278 Model 2 display station with a 1920-character screen. The Micro7400 also converts standard 3278 keyboard functions for the ASCII device. A large-screen option supports IBM 3278 Model 3, 4, and 5 display stations.

The Micro7400 contains an internal screen buffer for each terminal. These buffers are maintained by Read and Write modules. The Read module controls communication from the Micro7400 to the host; the Write module updates the internal screen buffers in response to host commands. A Screen Manager in the Micro7400 interprets the contents of the internal buffer to display a 3278-type screen on an asynchronous terminal.

Keystrokes on an attached asynchronous terminal are interpreted by the Micro7400 to update the internal screen buffer to be displayed on the screen of the terminal by the Screen Manager, and, if required, to be transmitted to the host by the Read module.

3278 EMULATION FOR HARDCOPY TERMINALS: With the Micro7400, keyboard/printer asynchronous terminals can be used for 3270 display terminal applications. The asynchronous device can both print and transmit data formatted for a 3270 CRT screen. The Micro7400 provides three types of interactive hardcopy supports for 3278 emulation: Type 1 and Type 3 support are best suited to full-screen applications in which the operator must enter and modify data in more than one field; Type 2 support is suitable for simpler applications in which the operator enters data for only one or two fields.

In Type 1 support, the Micro7400 builds and stores a screen image from data sent by the host. When the image is complete, the Micro7400 transmits nonblank lines of the

Micom Micro7400 Protocol Converter

tocol Computers announces new models frequently. Last year, the company introduced "budget" versions of its major conversion product line. IBM now offers 3270 conversion in its 7171 unit, introduced in September 1984. With this offering IBM has legitimized protocol conversion in the marketplace, and the introduction has actually helped other vendors of the products.

The introduction of new protocol converters has cooled somewhat in recent months, and Micom has emerged one of the clear leaders in the marketplace for these products. This is a significant achievement for a company that entered this particular business later than many of the competitors. The success of the Micro7400 product line reflects a much broader pattern of accomplishment for the company. Micom recently acquired Interlan, a local area network company, and introduced a new product that combines Interlan's Net/Plus Ethernet LAN and Micom's data PABX. To further increase market penetration of its products, Micom has formed a new sales division and expects to increase the field organization by fifty percent in fiscal 1986. These business plans, coupled with Micom's steady earnings record and the continued success of Black Box Catalog, the company's highly successful catalog sales division, point to a strong future for the company.

ADVANTAGES AND RESTRICTIONS

Using Micom's Micro7400 offers several advantages. In addition to providing protocol conversion, the Micro7400 serves as a cost-effective gateway for asynchronous devices to access the IBM environment. It can be used to replace a remote 3270 cluster in an IBM BSC or SNA network. The Micro7400 can also provide dial-up access to an IBM or compatible host allowing remote asynchronous devices to use less expensive asynchronous modems and dial-up lines, including inbound WATS. Micro7400s can be located on a multipoint line to connect a number of remote sites to a synchronous host over a single link. Since the host can address the Micro7400 in both BSC or SNA protocol, it can poll the Micro7400 for data on an as-needed basis. And despite the complexity of BSC and SNA protocols, no hardware or software changes in the host are necessary to accommodate the Micro7400.

The Micro7400 not only allows the user to have inexpensive asynchronous terminals emulate intelligent 3278s, but also allows those 3278s to operate well beyond the normal 3270 capability. Features like the command port, the asynchronous host support option, automatic log on, security options, priority-level settings, and message broadcasts increase network flexibility and provide users with greater control of the system.

Price-wise, the Micro7400 is very competitive with similar converters offered by other vendors. The basic units are about 20 percent less expensive than competing products, and Micom offers a "bare-bones" model for those who want conversion without all of the extras.

The Micro7400 has a few minor technical restrictions that involve the characteristics of the attached asynchronous

image, preceded by a scale line that shows column numbers and line numbers. Once the image is transmitted, the Micro7400 can accept operator input from the keyboard and prompt the operator for data one field at a time. The prompt identifies the field by its line and column numbers; the operator selects the desired input field through Tab and Home keys. Prompting continues until the operator requests transmission of the contents of the modified "screen" to the host. The Micro7400 erases data entered into its buffers from the keyboard through the Backspace, Erase Field, or Erase Input commands.

Type 2 hardcopy support provides output that does not include line or column numbers, but only the data content of each line modified by host action. Operators use host transmission keys and the Tab function, along with Backspace, Erase Field, and Erase Input commands, to input characters into fields. In Type 2 support, the Micro7400 does not issue prompts.

Type 3 hardcopy support is identical to Type 1 support with one exception: each printed line is truncated after 80 characters. This prevents the image from running off the paper of 80-column devices.

3287 PRINTER EMULATION: An asynchronous printer attached to the Micro7400 appears to the host as a 3287 printer with a 1920-character buffer, an EBCDIC character set, page-length control, and BSC or SNA/SDLC features. The Micro7400 supports three operating modes: BSC mode, SNA/SDLC DSC mode, and SNA/SDLC SCS mode. In DSC mode, 3270 command and printer order characters are accepted; in SCS mode, SNA character string codes are accepted.

For asynchronous keyboard printers, the Micro7400 provides many 3278 operator controls, including X-on/X-off, cancel print, form field, and index. In response to a key sequence, the Micro7400 provides a self-test message. Also supported is local copying of display images; as an enhancement, the Micro7400 allows the terminal user to determine the print destination of each display. Users can also specify the following: single and double spacing, page length, and lines per inch.

OTHER FEATURES: In addition to supplying 3278 display and 3287 printer emulation, the Micro7400 offers many features that extend the capabilities of the IBM 3270 family. One of these features is a command port, through which users can configure, control, monitor, and test the operation of the 3270 system and the selected emulations. This command port does not supersede the ability to configure operating parameters through any attached terminal, but offers, instead, more flexible network control.

The user can select a desired operation from a displayed menu that exhibits four sets of functions: three sets of Terminal Initiated Channel Configuration (TICC) functions (Configuration, Configuration Display, and Status/Statistics Display) and Terminal-Activated Channel Tests (TACT).

- ***Configuration*—Under the Configuration menu, a choice of two types of operations can be performed. One allows the operator to configure per-channel characteristics, such as terminal or print emulation, transmission rate, stop bits, parity, busy-out status, inbound priority, default terminal type, printer assignment, and optional command-level prompts. The other allows the operator to specify system-wide parameters and features: NRZI or non-NRZI encoding, control-unit address, printer line-sharing, carriage delays, short-break length, and so forth. Also included in the system-wide menu are customized terminal-type definitions and international character code sets.**

Micom Micro7400 Protocol Converter

device. Because display intensity is terminal-dependent, intensified display fields are brighter than normal only when the attached terminal supports two levels of video. Also, several key functions depend on the capabilities of the terminal. For example, Alternate Cursor and Cursor Blink keys are local functions of the terminal, and only terminals with the appropriate operator controls can perform them. Support for typamatic keys is also terminal-dependent. The Micro7400 does not provide a Backspace key separate from a Left Cursor key because these keys provide the same function. Also unsupported is a Test key or Test mode.

The Micro7400 may be equipped with several options, but with the exception of an Asymmetrical Channel Speed Option, no two options can be put on the same unit. Users should note this fact when ordering Micro7400s

We should mention one last advantage of the Micro7400 system: you can test it out before buying. Micom offers a Dial-In Demonstration System, whereby users can test the operation of a Micro7400 under real-world conditions. To use the demo for asynchronous applications, users must have at least one asynchronous terminal at the dial-in site and a modem. For synchronous demonstrations, users need a Micro7400 at the dial-in site, and Micom will supply this unit upon request. Prospective customers interested in using the demonstration facility must contact a Micom sales representative to arrange the test.

USER REACTION

In Datapro's 1985 terminal users's survey, thirteen respondents rated Micom's Micro7400 protocol converter in five categories. These users had a total of 72 units installed. Their ratings are shown in the following table.

	Excellent	Good	Fair	Poor	WA*
Overall performance	7	5	1	0	3.5
Ease of installation	7	3	3	0	3.1
Hardware reliability	5	7	1	0	3.3
Ease of operation	6	4	3	0	3.2
Maintenance service/ technical support	4	4	5	0	2.9
Ease of operation	6	4	3	0	3.2

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

- ***Configuration Display***—**By specifying various configuration display menus, the operator can view summaries of line, controller, or channel configurations.**

- ***Status/Statistics Display***—**The operator can choose to display channel-specific or system-side status and statistical information. Channel-specific displays show the status of each channel connection. Also shown are terminal type selected, keyboard map, keyboard lock, insert mode, output held by X-off, and active, bound, and LU status for SNA applications. Additional status/statistics display menus monitor asynchronous and synchronous lines.**

- ***Terminal-Activated Channel Test (TACT)***—**There are local and terminal TACT modes. In local mode, the Micro7400 echoes any character received from the attached asynchronous device back to that device. In terminal mode, the Micro7400 sends a continuous "fox" message to the attached asynchronous device. TACT modes initiated through the command port test any designated channel, including the command port.**

Other features that extend the capabilities of the IBM 3270 include auto log on from a message stored in nonvolatile memory and transmitted upon request from the keyboard; banner, broadcast, and disconnect messages; inbound priority assignments for asynchronous channels; and security options which include password protection, timeout disconnection, automatic log off, and SNA session control.

Options

Options on the Micro7400 include the following:

- **Asynchronous Host Option (available only on eight-channel units): adds four or eight asynchronous host channels and permits individual terminals to switch between 3270 emulation and any of four or eight asynchronous hosts. Users must specify four- or eight-channel addition.**

- **ASCII BSC Option: provides support for BSC protocol in the ASCII character set.**

- **Asymmetrical Channel Speed Option: allows transmission at one speed and reception at another for Viewdata and similar applications.**

- **Dual Synchronous Host Option: substitutes a synchronous 3270 host channel for one asynchronous channel. In applications, both links must use the same protocol (BSC or SNA/SDLC); individual terminals may switch between the two synchronous lines.**

- **Large Screen Monitor Option: allows the Micro7400 to emulate IBM model 3, 4, and 5 3278 large-screen terminals with 2562, 3440, and 3564 characters. With this option, Micro7400 will support up to six terminals.**

With the exception of the asymmetrical option, no option may be combined with another option.

PRICING

Micom ships the Micro7400 within 30 days after receipt of order. The two-channel "LTD" budget model sells for $1,650; the two-channel full-feature model sells for $2,250. The 4-channel basic unit costs $2,950, the 8-channel unit is $3,850, the 12-channel unit is $4,750, and the 16-channel unit sells for $5,650. The software diskette that allows an IBM PC to work with the Micro7400 is priced at $90.■

Micom Micro7400 Protocol Converter

MANAGEMENT SUMMARY

In November 1983, Micom acquired Industrial Computer Controls, Inc. (ICCI), an experienced manufacturer of protocol converters for the IBM environment. At the same time, Micom announced the Micro7400, a significantly enhanced version of ICCI's former CA20 unit. With the introduction of the new product, Micom not only entered the conversion and emulation market but also offered an "IBM gateway" product to its traditional minicomputer-users' market. In addition, the company pledged to expand its marketing efforts to include products that would appeal to the huge IBM customer base.

Micom's Micro7400 emulates an IBM 3274 Model 51C cluster controller, communicating in either BSC or SDLC protocol. With the new converter, inexpensive, asynchronous terminals can access IBM mainframes and function as either IBM 3278 display terminals or IBM 3287 printers. Special support allows keyboard/printer terminals to interact with programs originally developed for display terminals.

There are five Micro7400 models—four fully featured models with 2, 4, 8, or 12 asynchronous input channels and one budget-priced, two-channel "LTD" model. The LTD model does not have the nonvolatile memory that supports the additional capabilities of the full-featured models, such as message broadcasts, security options, settings for priority levels, and automatic log on. All Micro7400 models can simultaneously support many different types of asynchronous devices, including terminals, printers, teleprinters, and personal computers. The user can preassign each channel to a different type of asynchronous device or dynamically select channel assignment from a menu through an individual terminal or command port.

The Micro7400 protocol converter emulates an IBM 3274 Model 51C Cluster Controller, communicating in either BSC or SNA/SDLC protocol. It allows asynchronous devices to function as IBM 3278 display terminals or IBM 3287 printers.

MODELS: Five models including a 2-channel "budget" unit and fully featured 2-, 4-, 8-, and 12-channel units.
CONVERSION: Asynchronous ASCII to IBM BSC or SNA/SDLC in EBCDIC.
TRANSMISSION RATES: Full-duplex, asynchronous transmission from 300 to 9600 bps; half-duplex, synchronous transmission up to 19.2K bps.
COMPETITION: Protocol Computers, Inc., Datastream.
PRICE: From $1,650 for the 2-channel budget unit to $4,750 for the 12-channel unit.

CHARACTERISTICS

VENDOR: Micom Systems, Inc., 20151 Nordhoff Street, Chatsworth, CA 91311. Telephone (213) 998-8844. In Canada: Atelco, 3400 Pharmacy Avenue, Unit 1, Scarborough, Ontario M1W 3J8. Telephone (416) 497-2208.

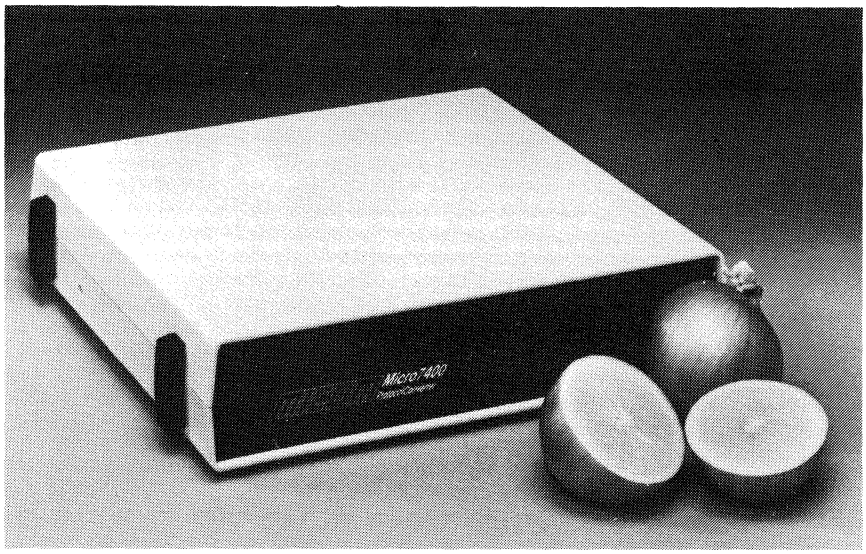
DATE OF FIRST ANNOUNCEMENT: November 1983.

DATE OF FIRST DELIVERY: January 1984.

SERVICED BY: Micom Systems, Inc.

MODELS

Micom's Micro7400 protocol converter emulates an IBM 3274 Model 51C controller communicating in either BSC or



Micom's Micro7400 protocol converter emulates an IBM 3274 controller, allowing asynchronous devices to function as 3270-type terminals and printers with an IBM or IBM-compatible host processor.

Micom Micro7400 Protocol Converter

By treating an attached CRT terminal as an IBM 3278 Model 2 with a 1920-character screen, the Micro7400 duplicates standard 3278 keyboard functions and 3278 terminal display features. As an option, the Micro7400 supports IBM large-screen models (3, 4, and 5) of the 3278 terminal. Because the converter provides a special 3278 emulation for hardcopy terminals, a user with a keyboard/printer terminal can access CRT-oriented host applications. In addition, the Micro7400 allows an asynchronous printer to emulate an IBM 3287 printer; printer formatting and operator controls are almost identical to that of the 3287, with minor restrictions.

Located between the host and the asynchronous terminal, the Micro7400 performs the conversions necessary to having asynchronous, ASCII devices communicate with IBM BSC or SNA/SDLC hosts using an EBCDIC coding. Communication between the Micro7400 and the host is either in BSC or SDLC protocol in the EBCDIC character set. An ASCII BSC option allows the Micro7400 to support BSC protocol in the ASCII character set. Communication between the Micro7400 and the attached asynchronous device is in the ASCII character set. The Micro7400 performs screen formatting functions in response to commands from the host, reformats the data so that it is compatible with the attached asynchronous device, and passes it to the terminal.

Although the Micro7400's primary function is to enable asynchronous terminals to access IBM mainframes, the converter also offers several capabilities that extend standard 3270-type functions. Through a dual synchronous host option, the device provides the ability to switch between two IBM hosts or between an IBM host and an ASCII minicomputer in response to commands entered at a user's keyboard. The four- or eight-port asynchronous host option supports a 3270 host link and up to four or eight asynchronous host connections. With the Micro7400 command port, users can alter operating parameters, such as line parameters, message reports, timing values, and priority assignments, and monitor, diagnose, and control network facilities. Two other features augment the command port: a Terminal Activated Channel Test (TACT), for troubleshooting from the user's terminal; and a Terminal Initiated Channel Configuration (TICC), for setting and altering terminal-related operating parameters.

In addition to the above features, Micom also offers specialized software for the IBM PC that allows the microcomputer to operate with the Micro7400 to access a mainframe.

COMPETITIVE POSITION

By acquiring ICCI, a company with a solid knowledge of protocol conversion as it applies to the IBM environment, Micom has made an aggressive move toward capturing business in a huge market that clamors for IBM compatibility. With the introduction of the Micro7400 and the intention to develop more IBM-oriented products, Micom has embarked upon a new marketing venture that could prove very successful.

SDLC. The device allows connection of up to 12 asynchronous ASCII devices used as 3270-type terminals and printers. The Micro7400 also supports connection with two IBM hosts, or with an IBM host and up to eight asynchronous hosts. Users can order the Micro7400 converter in either a BSC or SNA/SDLC configuration.

Micom offers five Micro7400 models. Four full-featured models have either 2, 4, 8, or 12 asynchronous input channels. A budget-priced, two-channel "LTD" model is also available. The "LTD" model differs from the other models in one respect: it does not have nonvolatile memory, which supports options like message broadcasts, settings for priority levels, security options, and automatic log on.

TRANSMISSION SPECIFICATIONS

The Micro7400 provides full-duplex, asynchronous transmission on the terminal side and half-duplex, synchronous transmission on the host side. Asynchronous transmission rates range from 300 to 9600 bps; maximum synchronous transmission speed is 19.2K bps. Synchronous transmission speeds are switch selectable; users can configure asynchronous transmission speeds through any attached terminal or through the Micro7400 command port.

SDLC and BSC communication occurs between the Micro7400 and the host using EBCDIC, or optionally ASCII, transmission code. Between the Micro7400 and the attached terminal, asynchronous ASCII communication occurs. The Micro7400 supports an RS-232-C terminal interface; a current loop interface is optional.

DEVICE CONTROL

The Micro7400 operates with any combination of host and communications processor software and 3274 set-up parameters. This includes standard IBM operating systems, such as DOS, DOS/VS, and VM/370; systems software, such as CICS, TSO, CMS, and IMS; and standard access methods, including BTAM, TCAM, VTAM, and VTAM/E.

The Micro7400 handles the various translations and conversions necessary to the emulation process. Placed between the network host and the attached ASCII devices, the Micro7400 converts either the SDLC or BSC protocol to ASCII protocol, reformats data from the synchronous link to conform to the specifications of the ASCII device, converts EBCDIC to ASCII coding, and transforms all command and control codes of one device into those required by the other.

HOST COMMUNICATIONS: In communicating with the host, the Micro7400 appears to the host as an IBM 3274-51C terminal controller. The host sends 3270 commands to the Micro7400, either alone or as prefixes to data. The Micro7400 supports standard 3270 commands: Erase All Unprotected, Erase/Write, Erase/Write Alternate, Read Buffer, Read Modified, and Write. The device also supports standard 3270 Write and Read control characters that specify actions for the receiving terminals; AID characters that identify to the host the reason for a data transmission from the 3274 controller to the host; display order characters that tell the attached terminal how to display data; and printer order characters that tell an attached printer how the data transmitted from the host should be printed. Printer order information includes information about carriage returns, forms feeds, new lines, and so forth. The Micro7400 supports printing characters for BSC printing, or for DSC (Logical Unit (LU) Type 3) or SCS (LU Type 1) for SNA/SDLC printing.

The Micro7400 translates the field types, key functions, and status line features of a 3270 device into a format compatible

Micom Micro7400 Protocol Converter

Micom has traditionally developed products for and marketed products to the minicomputer user. But as microcomputers become increasingly prolific in business and industry, vendors like Micom have begun to re-evaluate their traditional marketing strategies and to develop plans to capitalize upon new trends. Clearly, there is much to gain by providing IBM gateway products in the present data communications environment.

The Micro7400 is a unique protocol converter because it offers the user far more centralized network control than is usually possible through such devices. The unit is also one of the few to offer a choice of either BSC and SDLC emulation in one model. Perhaps even more significant, however, is Micom's pricing for the new unit. The Micro7400 is priced at 30 to 40 percent below similar products now on the market, and this is a deliberate strategy to capture a large market share as soon as possible.

At the present time, Datastream and Protocol Computers, Inc. are Micom's most prominent competitors. Both vendors have been delivering protocol converters for several years, and both have a solid, installed-customer base. In fact, Protocol Computers has recently announced many new models to its existing product line. With new protocol converter manufacturers rapidly entering the market and older data communications vendors beginning to include converters among their offerings, Micom will undoubtedly soon find itself competing in a market that is far more diverse and competitive than the one we have today.

ADVANTAGES AND RESTRICTIONS

Micom's Micro7400 has two distinct advantages. First, it is about 30 percent less expensive than most competing products. The 2-channel, "budget-priced" LTD model sells for only $1,650; the 12-channel unit sells for $4,750. Prices for other protocol converters generally start at $3,000 and reach a maximum price of about $8,500. Even ICCI's old CA20 unit, which had fewer functions than the current Micro7400, sold for $8,600 for an eight-channel unit.

Second, the Micro7400 not only allows the user to have inexpensive asynchronous terminals emulate intelligent 3278s, but also allows those 3278s to operate well beyond the normal 3270 capability. Features like the command port, the asynchronous host support option, automatic log on, security options, priority-level settings, and message broadcasts increase network flexibility and provide users with greater control of the system.

The Micro7400 has a few minor technical restrictions that involve the characteristics of the attached asynchronous device. Because display intensity is terminal-dependent, intensified display fields are brighter than normal only when the attached terminal supports two levels of video. Also, several key functions depend on the capabilities of the terminal. For example, Alternate Cursor and Cursor Blink keys are local functions of the terminal, and only terminals with the appropriate operator controls can perform them. Support for typamatic keys is also terminal-dependent. The Micro7400 does not provide a Backspace with the receiving terminal, with some exceptions. For example, depressing a shift key on the asynchronous device cannot override the standard 3270 numeric lock feature because the Micro7400 cannot detect the depression. If an attached asynchronous terminal does not support local operator controls for Alternate Cursor and Cursor Blink functions, those capabilities are not available. Please see the Advantages and Restrictions section of this report for other device control limitations.

The Micro7400 provides status information for all terminals via a Status Inquiry function that is initiated by the terminal user.

Micom provides both mnemonic key maps for specific terminal keyboards and a standard map that is the same for all terminals. The standard map is a more general scheme that permits rapid transition among different terminals.

3278 EMULATION FOR DISPLAY TERMINALS: With the Micro7400, an attached asynchronous device appears as an IBM 3278 Model 2 terminal with a 1920-character screen. The Micro7400 also converts standard 3278 keyboard functions for the ASCII device. A large-screen option supports IBM 3278 Model 3, 4, and 5 terminals.

The Micro7400 contains an internal screen buffer for each terminal. These buffers are maintained by Read and Write modules. The Read module controls communication from the Micro7400 to the host; the Write module updates the internal screen buffers in response to host commands. A Screen Manager in the Micro7400 interprets the contents of the internal buffer to display a 3278-type screen on an asynchronous terminal.

Keystrokes on an attached asynchronous terminal are interpreted by the Micro7400 to update the internal screen buffer to be displayed on the screen of the terminal by the Screen Manager, and, if required, to be transmitted to the host by the Read module.

3278 EMULATION FOR HARDCOPY TERMINALS: With the Micro7400, keyboard/printer asynchronous terminals can be used for 3270 display terminal applications. The asynchronous device can both print and transmit data formatted for a 3270 CRT screen. The Micro7400 provides three types of interactive hardcopy supports for 3278 emulation: Type 1 and Type 3 support are best suited to full-screen applications in which the operator must enter and modify data in more than one field; Type 2 support is suitable for simpler applications in which the operator enters data for only one or two fields.

In Type 1 support, the Micro7400 builds and stores a screen image from data sent by the host. When the image is complete, the Micro7400 transmits nonblank lines of the image, preceded by a scale line that shows column numbers and line numbers. Once the image is transmitted, the Micro7400 can accept operator input from the keyboard and prompt the operator for data one field at a time. The prompt identifies the field by its line and column numbers; the operator selects the desired input field through Tab and Home keys. Prompting continues until the operator requests transmission of the contents of the modified "screen" to the host. The Micro7400 erases data entered into its buffers from the keyboard through the Backspace, Erase Field, or Erase Input commands.

Type 2 hardcopy support provides output that does not include line or column numbers, but only the data content of each line modified by host action. Operators use host transmission keys and the Tab function, along with Backspace, Erase Field, and Erase Input commands, to input characters into fields. In Type 2 support, the Micro7400 does not issue prompts.

Micom Micro7400 Protocol Converter

key separate from a Left Cursor key because these keys provide the same function. Also unsupported is a Test key or Test mode.

USER REACTION

Because the Micro7400 was introduced only a few weeks before we wrote this report, we did not conduct a user reaction survey for the product. □

Type 3 hardcopy support is identical to Type 1 support with one exception: each printed line is truncated after 80 characters. This prevents the image from running off the paper of 80-column devices.

3287 PRINTER EMULATION: An asynchronous printer attached to the Micro7400 appears to the host as a 3287 printer with a 1920-character buffer, an EBCDIC character set, page-length control, and BSC or SDLC features. The Micro7400 supports three operating modes: BSC mode, SNA/SDLC DSC mode, and SNA/SDLC SCS mode. In DSC mode, 3270 command and printer order characters are accepted; in SCS mode, SNA character string codes are accepted.

For asynchronous keyboard printers, the Micro7400 provides many 3278 operator controls, including X-on, X-off, cancel print, form field, and index. In response to a key sequence, the Micro7400 provides a self-test message. Also supported is local copying of display images; as an enhancement, the Micro7400 allows the terminal user to determine the print destination of each display. Users can also specify the following: single and double spacing, page length, and lines per inch.

OTHER FEATURES: In addition to supplying 3278 display and 3287 printer emulation, the Micro7400 offers many features that extend the capabilities of the IBM 3270 family. One of these features is a command port, through which users can configure, control, monitor, and test the operation of the 3270 system and the selected emulations. This command port does not supersede the ability to configure operating parameters through any attached terminal, but offers, instead, more flexible network control.

The user can select a desired operation from a displayed menu that exhibits four sets of functions: three sets of Terminal Initiated Channel Configuration (TICC) functions (Configuration, Configuration Display, and Status/Statistics Display) and Terminal-Activated Channel Tests (TACT).

- ***Configuration*—Under the Configuration menu, a choice of two types of operations can be performed. One allows the operator to configure per-channel characteristics, such as terminal or print emulation, transmission rate, stop bits, parity, busy-out status, inbound priority, default terminal type, printer assignment, and optional command-level prompts. The other allows the operator to specify system-wide parameters and features: NRZI or non-NRZI encoding, control-unit address, printer line-sharing, carriage delays, short-break length, and so forth. Also included in the system-wide menu are customized terminal-type definitions and international character code sets.**

- ***Configuration Display*—By specifying various configuration display menus, the operator can view summaries of line, controller, or channel configurations.**

- ***Status/Statistics Display*—The operator can choose to display channel-specific or system-side status and statistical information. Channel-specific displays show the status of each channel connection. Also shown are terminal type selected, keyboard map, keyboard lock, insert mode, output held by X-off, and active, bound, and LU status for SNA applications. Additional status/statistics display menus monitor asynchronous and synchronous lines.**

- ***Terminal-Activated Channel Test (TACT)*—There are local and terminal TACT modes. In local mode, the Micro7400 echoes any character received from the attached asynchronous device back to that device. In terminal mode, the Micro7400 sends a continuous "fox" message to the attached asynchronous device. TACT modes initiated through the command port test any designated channel, including the command port.**

Other features that extend the capabilities of the IBM 3270 include auto log on from a message stored in nonvolatile memory and transmitted upon request from the keyboard; banner, broadcast, and disconnect messages; inbound priority assignments for asynchronous channels; and security options which include password protection, timeout disconnection, automatic log off, and SNA session control.

Options on the Micro7400 include asynchronous host support and dual synchronous host support. With asynchronous host support, any attached terminal can switch from 3270 emulation to communicate with one of up to eight asynchronous ports. Port assignment is based upon specific request or "round-robin" allocation; if an immediate connection is not possible, the Micro7400 notifies the terminal users and returns the terminal to its previous state. With dual synchronous host support, each terminal attached to the Micro7400 can select one of two separate 3270 emulations—each on a separate line to one of two hosts. These hosts can be two IBM mainframes or two applications programs on the same mainframe. A terminal communicating with one host appears powered off to the other.

PRICING

Micom ships the Micro7400 within 90 days after receipt of order. The two-channel "LTD" budget model sells for $1,650; the two-channel full-feature model sells for $2,250. The 4-channel unit costs $2,950, the 8-channel unit is $3,850, and the 12-channel unit is $4,750. The software diskette that allows an IBM PC to work with the Micro7400 is priced at $175. ■

Micom Micro7400 Protocol Converter

MANAGEMENT SUMMARY

UPDATE: *We have updated this report to reflect changes in the Micro7400 product. Micom has announced a 16-channel unit and the availability of a plug-in version, the Micro7400i, for the Micro600 data PABX. Micom also has a new address and telephone number.*

In November 1983, Micom acquired Industrial Computer Controls, Inc. (ICCI), an experienced manufacturer of protocol converters for the IBM environment. At the same time, Micom announced the Micro7400, a significantly enhanced version of ICCI's former CA20 unit, based on Micom's hardware design. With the introduction of the new product, Micom not only entered the conversion and emulation market but also offered an "IBM gateway" product to its traditional minicomputer-users' market. In addition, the company pledged to expand its marketing efforts to include products that would appeal to the huge IBM customer base.

Micom's Micro7400 emulates an IBM 3274 Model 61C control unit, communicating in either BSC or SNA/SDLC protocol. With the new converter, inexpensive, asynchronous terminals can access IBM mainframes and function as either IBM 3278 display stations or IBM 3287 printers. Special support allows keyboard/printer terminals to interact with programs originally developed for display stations.

There are six Micro7400 models—five fully featured models with 2, 4, 8, 12, or 16 asynchronous input channels and one budget-priced, two-channel "LTD" model. The LTD model does not have the nonvolatile memory that supports the additional capabilities of the full-featured models, such as message broadcasts, security options, settings for priority levels, and automatic log on. All Micro7400 models can simultaneously support many different types of

The Micro7400 protocol converter emulates an IBM 3274 Model 61C Control Unit, communicating in either BSC or SNA/SDLC protocol. It allows asynchronous devices to function as IBM 3278 display terminals or IBM 3287 printers.

MODELS: Six models including a 2-channel "budget" unit and fully featured 2-, 4-, 8-, 12-, and 16-channel units.
CONVERSION: Asynchronous ASCII to IBM BSC or SNA/SDLC in EBCDIC.
TRANSMISSION RATES: Full-duplex, asynchronous transmission from 300 to 9600 bps; half-duplex, synchronous transmission up to 19.2K bps.
COMPETITION: Protocol Computers, Inc., Local Data.
PRICE: From $1,650 for the 2-channel budget unit to $5,650 for the 16-channel unit.

CHARACTERISTICS

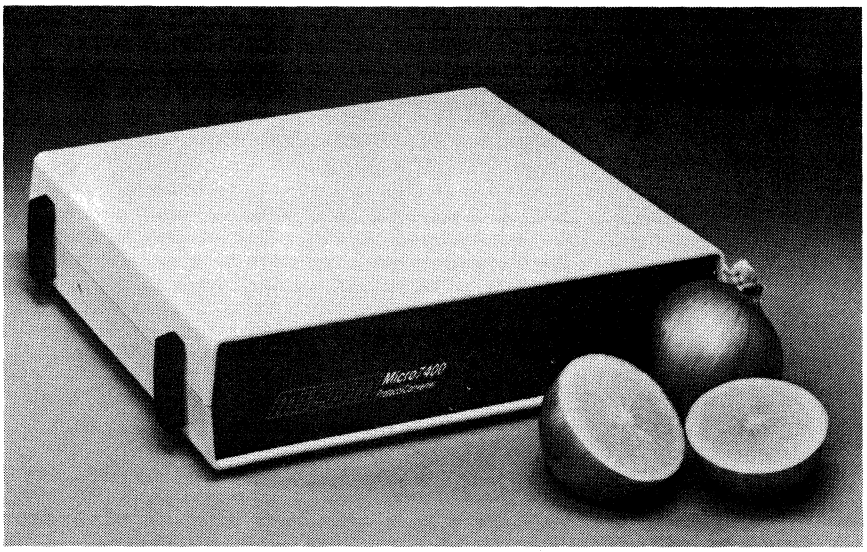
VENDOR: Micom Systems, Inc., 4100 Los Angeles Avenue, P.O. Box 8100, Simi Valley, CA 93062-8100. Telephone (805) 583-8600. In Canada: Signatel Ltd., 195 Riveria Drive, Markham, Ontario LCR2L6. Telephone (416) 477-9977.

DATE OF FIRST ANNOUNCEMENT: November 1983.

DATE OF FIRST DELIVERY: January 1984.

NUMBER INSTALLED TO DATE: Over 1,000.

SERVICED BY: Micom Systems, Inc.



Micom's Micro7400 protocol converter emulates an IBM 3274 controller, allowing asynchronous devices to function as 3270-type terminals and printers with an IBM or IBM-compatible host processor.

Micom Micro7400 Protocol Converter

asynchronous devices, including terminals, printers, teleprinters, and personal computers. The user can preassign each channel to a different type of asynchronous device or dynamically select channel assignment from a menu through an individual terminal or command port. In addition, all of the basic units can be optionally equipped with a 2400, 4800, or 9600 bps modem. The LTD unit can have an optional 2400 bps modem only.

In February 1985, Micom announced the availability of a plug-in card version of the Micro7400 for the Micro600 data PABX. This unit, called the Micro7400i, offers all of the features of the standalone unit; it comes in 8- and 16-channel versions. The card plugs directly into the Micro600 backplane.

By treating an attached CRT terminal as an IBM 3278 Model 2 with a 1920-character screen, the Micro7400 duplicates standard 3278 keyboard functions and 3278 terminal display features. As an option, the Micro7400 supports IBM large-screen models (3, 4, and 5) of the 3278 terminal. Because the converter provides a special 3278 emulation for hardcopy terminals, a user with a keyboard/printer terminal can access CRT-oriented host applications. In addition, the Micro7400 allows an asynchronous printer to emulate an IBM 3287 printer; printer formatting and operator controls are almost identical to that of the 3287, with minor restrictions.

Located between the host and the asynchronous terminal, the Micro7400 performs the conversions necessary to having asynchronous, ASCII devices communicate with IBM BSC or SNA/SDLC hosts using an EBCDIC coding. Communication between the Micro7400 and the host is either in BSC or SDLC protocol in the EBCDIC character set. An ASCII BSC option allows the Micro7400 to support BSC protocol in the ASCII character set. Communication between the Micro7400 and the attached asynchronous device is in the ASCII character set.

To accomplish emulation, the Micro7400 maintains an internal screen buffer, called a Virtual Screen, which is updated by a Write Module in response to write commands and other orders from the host. A Read Module responding to read commands transmits data from the Virtual Screen to the hosts. These operations mimic those of an IBM 3274 control unit. A Screen Manager in the Micro7400 interprets the Virtual Screen in accordance with characteristics of the attached asynchronous terminal or printer to enable its own display. A Keyboard Parser examines data entered from the asynchronous terminal keyboard, updates the Virtual Screen accordingly, and tells the Read Module to transmit the data to the host if necessary. (See Figure 1 for a functional diagram of Micro7400 emulation.)

Although the Micro7400's primary function is to enable asynchronous terminals to access IBM mainframes, the converter also offers several capabilities that extend standard 3270-type functions. Through a dual synchronous host option, the device provides the ability to switch between two IBM hosts or between an IBM host and an

MODELS

Micom's Micro7400 protocol converter emulates an IBM 3274 Model 61C controller communicating in either BSC or SNA/SDLC. The device allows connection of up to 16 asynchronous ASCII devices used as 3270-type terminals and printers. The Micro7400 also supports connection with two IBM hosts, or with an IBM host and up to eight asynchronous hosts. Users can order the Micro7400 converter in either a BSC or SNA/SDLC configuration.

Micom offers six Micro7400 models. Five full-featured models have either 2, 4, 8, 12, or 16 asynchronous input channels. A budget-priced, two-channel "LTD" model is also available. The "LTD" model differs from the other models in one respect: it does not have nonvolatile memory, which supports options like message broadcasts, settings for priority levels, security options, and automatic log on.

TRANSMISSION SPECIFICATIONS

The Micro7400 provides full-duplex, asynchronous transmission on the terminal side and half-duplex, synchronous transmission on the host side. Asynchronous transmission rates range from 300 to 9600 bps; maximum synchronous transmission speed is 19.2K bps. Synchronous transmission speeds are switch selectable; users can configure asynchronous transmission speeds through any attached terminal or through the Micro7400 command port.

SDLC and BSC communication occurs between the Micro7400 and the host using EBCDIC, or optionally ASCII, transmission code. Between the Micro7400 and the attached terminal, asynchronous ASCII communication occurs. The Micro7400 supports an RS-232-C terminal interface; a current loop interface is optional.

DEVICE CONTROL

The Micro7400 operates with any combination of host and communications processor software and 3274 set-up parameters. This includes standard IBM operating systems, such as DOS, DOS/VS, and VM/370; systems software, such as CICS, TSO, CMS, and IMS; and standard access methods, including BTAM, TCAM, VTAM, and VTAM/E.

The Micro7400 handles the various translations and conversions necessary to the emulation process. Placed between the network host and the attached ASCII devices, the Micro7400 converts either the SNA/SDLC or BSC 3270 protocol to ASCII protocol, reformats data from the synchronous link to conform to the specifications of the ASCII device, converts EBCDIC to ASCII coding, and transforms all command and control codes of one device into those required by the other.

HOST COMMUNICATIONS: In communicating with the host, the Micro7400 appears to the host as an IBM 3274-61C control unit. The host sends 3270 commands to the

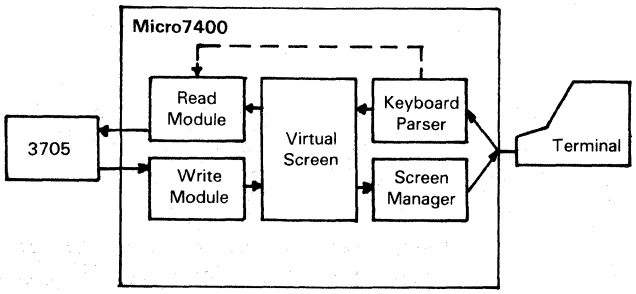


Figure 1. Micro7400 functional block diagram.

Micom Micro7400 Protocol Converter

ASCII minicomputer in response to commands entered at a user's keyboard. The four- or eight-port asynchronous host option supports a 3270 host link and up to four or eight asynchronous host connections. With the Micro7400 command port, users can alter operating parameters, such as line parameters, message reports, timing values, and priority assignments, and monitor, diagnose, and control network facilities. Two other features augment the command port: a Terminal Activated Channel Test (TACT), for troubleshooting from the user's terminal; and a Terminal Initiated Channel Configuration (TICC), for setting and altering terminal-related operating parameters.

Data security is a primary concern when protocol converters are used in dial-up applications, and Micom has incorporated into the Micro7400 a set of security measures, which are separately configurable via the unit's command port. The Micro7400 can be configured to require a password for system access. A "disconnect if unbound" feature will disconnect a user once he or she logs off from an initial session to prevent logging off one application to move to another. A timeout disconnect feature will automatically disconnect a line after a specified timeout period, and a logoff message can prevent someone from gaining access to a line recently in use by another party. A Micro7400 command port operator can protect the integrity of channel configurations by using TICC disabling to prevent inexperienced or unauthorzied users from reconfiguring parameters. In addition, the operator can set the Micro7400's XID data to be identified by the SNA host system as a valid dial-in control unit.

In addition to the above features, Micom also offers specialized software for the IBM PC that allows the microcomputer to operate with the Micro7400 to access a mainframe.

COMPETITIVE POSITION

Clearly, there is much to gain by providing IBM gateway products in the present data communications environment, and Micom's ability to develop and successfully market a unit has been reflected in strong sales of the Micro7400 product. In just a short time, Micom has become one of the leading vendors of protocol converters designed to allow asynchronous terminals and printers to access IBM BSC or SNA/SDLC hosts.

The Micro7400 is a unique protocol converter because it offers the user far more centralized network control than is usually possible through such devices. The unit is also one of the few to offer a choice of either BSC or SNA/SDLC emulation in one model. Perhaps even more significant, however, is Micom's pricing for the new unit. The Micro7400 is priced at about 20 percent below similar products, and this is a deliberate strategy to capture a large market share as soon as possible.

At the present time, Local Data and Protocol Computers, Inc. are Micom's most prominent competitors. Both vendors have been delivering protocol converters for several years, and both have a solid, installed-customer base. Pro-

Micro7400, either alone or as prefixes to data. The Micro7400 supports standard 3270 commands: Erase All Unprotected, Erase/Write, Erase/Write Alternate, Read Buffer, Read Modified, and Write. The device also supports standard 3270 Write and Read control characters that specify actions for the receiving terminals; AID characters that identify to the host the reason for a data transmission from the 3274 controller to the host; display order characters that tell the attached terminal how to display data; and printer order characters that tell an attached printer how the data transmitted from the host should be printed. Printer order information includes information about carriage returns, forms feeds, new lines, and so forth. The Micro7400 supports printing characters for BSC printing, or for DSC (Logical Unit (LU) Type 3) or SCS (LU Type 1) for SNA/SDLC printing.

The Micro7400 translates the field types, key functions, and status line features of a 3270 device into a format compatible with the receiving terminal, with some exceptions. For example, depressing a shift key on the asynchronous device cannot override the standard 3270 numeric lock feature because the Micro7400 cannot detect the depression. If an attached asynchronous terminal does not support local operator controls for Alternate Cursor and Cursor Blink functions, those capabilities are not available. Please see the Advantages and Restrictions section of this report for other device control limitations.

The Micro7400 provides status information for all terminals via a Status Inquiry function that is initiated by the terminal user.

Micom provides both mnemonic key maps for specific terminal keyboards and a generic map that is the same for all terminals. The generic map is a more general scheme that permits rapid transition among different terminals.

3278 EMULATION FOR DISPLAY TERMINALS: With the Micro7400, an attached asynchronous device appears as an IBM 3278 Model 2 display station with a 1920-character screen. The Micro7400 also converts standard 3278 keyboard functions for the ASCII device. A large-screen option supports IBM 3278 Model 3, 4, and 5 display stations.

The Micro7400 contains an internal screen buffer for each terminal. These buffers are maintained by Read and Write modules. The Read module controls communication from the Micro7400 to the host; the Write module updates the internal screen buffers in response to host commands. A Screen Manager in the Micro7400 interprets the contents of the internal buffer to display a 3278-type screen on an asynchronous terminal.

Keystrokes on an attached asynchronous terminal are interpreted by the Micro7400 to update the internal screen buffer to be displayed on the screen of the terminal by the Screen Manager, and, if required, to be transmitted to the host by the Read module.

3278 EMULATION FOR HARDCOPY TERMINALS: With the Micro7400, keyboard/printer asynchronous terminals can be used for 3270 display terminal applications. The asynchronous device can both print and transmit data formatted for a 3270 CRT screen. The Micro7400 provides three types of interactive hardcopy supports for 3278 emulation: Type 1 and Type 3 support are best suited to full-screen applications in which the operator must enter and modify data in more than one field; Type 2 support is suitable for simpler applications in which the operator enters data for only one or two fields.

In Type 1 support, the Micro7400 builds and stores a screen image from data sent by the host. When the image is complete, the Micro7400 transmits nonblank lines of the

Micom Micro7400 Protocol Converter

tocol Computers announces new models frequently. Last year, the company introduced "budget" versions of its major conversion product line. IBM now offers 3270 conversion in its 7171 unit, introduced in September 1984. With this offering IBM has legitimized protocol conversion in the marketplace, and the introduction has actually helped other vendors of the products.

The introduction of new protocol converters has cooled somewhat in recent months, and Micom has emerged one of the clear leaders in the marketplace for these products. This is a significant achievement for a company that entered this particular business later than many of the competitors. The success of the Micro7400 product line reflects a much broader pattern of accomplishment for the company. Micom recently acquired Interlan, a local area network company, and introduced a new product that combines Interlan's Net/Plus Ethernet LAN and Micom's data PABX. To further increase market penetration of its products, Micom has formed a new sales division and expects to increase the field organization by fifty percent in fiscal 1986. These business plans, coupled with Micom's steady earnings record and the continued success of Black Box Catalog, the company's highly successful catalog sales division, point to a strong future for the company.

ADVANTAGES AND RESTRICTIONS

Using Micom's Micro7400 offers several advantages. In addition to providing protocol conversion, the Micro7400 serves as a cost-effective gateway for asynchronous devices to access the IBM environment. It can be used to replace a remote 3270 cluster in an IBM BSC or SNA network. The Micro7400 can also provide dial-up access to an IBM or compatible host allowing remote asynchronous devices to use less expensive asynchronous modems and dial-up lines, including inbound WATS. Micro7400s can be located on a multipoint line to connect a number of remote sites to a synchronous host over a single link. Since the host can address the Micro7400 in both BSC or SNA protocol, it can poll the Micro7400 for data on an as-needed basis. And despite the complexity of BSC and SNA protocols, no hardware or software changes in the host are necessary to accommodate the Micro7400.

The Micro7400 not only allows the user to have inexpensive asynchronous terminals emulate intelligent 3278s, but also allows those 3278s to operate well beyond the normal 3270 capability. Features like the command port, the asynchronous host support option, automatic log on, security options, priority-level settings, and message broadcasts increase network flexibility and provide users with greater control of the system.

Price-wise, the Micro7400 is very competitive with similar converters offered by other vendors. The basic units are about 20 percent less expensive than competing products, and Micom offers a "bare-bones" model for those who want conversion without all of the extras.

The Micro7400 has a few minor technical restrictions that involve the characteristics of the attached asynchronous

image, preceded by a scale line that shows column numbers and line numbers. Once the image is transmitted, the Micro7400 can accept operator input from the keyboard and prompt the operator for data one field at a time. The prompt identifies the field by its line and column numbers; the operator selects the desired input field through Tab and Home keys. Prompting continues until the operator requests transmission of the contents of the modified "screen" to the host. The Micro7400 erases data entered into its buffers from the keyboard through the Backspace, Erase Field, or Erase Input commands.

Type 2 hardcopy support provides output that does not include line or column numbers, but only the data content of each line modified by host action. Operators use host transmission keys and the Tab function, along with Backspace, Erase Field, and Erase Input commands, to input characters into fields. In Type 2 support, the Micro7400 does not issue prompts.

Type 3 hardcopy support is identical to Type 1 support with one exception: each printed line is truncated after 80 characters. This prevents the image from running off the paper of 80-column devices.

3287 PRINTER EMULATION: An asynchronous printer attached to the Micro7400 appears to the host as a 3287 printer with a 1920-character buffer, an EBCDIC character set, page-length control, and BSC or SNA/SDLC features. The Micro7400 supports three operating modes: BSC mode, SNA/SDLC DSC mode, and SNA/SDLC SCS mode. In DSC mode, 3270 command and printer order characters are accepted; in SCS mode, SNA character string codes are accepted.

For asynchronous keyboard printers, the Micro7400 provides many 3278 operator controls, including X-on/X-off, cancel print, form field, and index. In response to a key sequence, the Micro7400 provides a self-test message. Also supported is local copying of display images; as an enhancement, the Micro7400 allows the terminal user to determine the print destination of each display. Users can also specify the following: single and double spacing, page length, and lines per inch.

OTHER FEATURES: In addition to supplying 3278 display and 3287 printer emulation, the Micro7400 offers many features that extend the capabilities of the IBM 3270 family. One of these features is a command port, through which users can configure, control, monitor, and test the operation of the 3270 system and the selected emulations. This command port does not supersede the ability to configure operating parameters through any attached terminal, but offers, instead, more flexible network control.

The user can select a desired operation from a displayed menu that exhibits four sets of functions: three sets of Terminal Initiated Channel Configuration (TICC) functions (Configuration, Configuration Display, and Status/Statistics Display) and Terminal-Activated Channel Tests (TACT).

- ***Configuration*—Under the Configuration menu, a choice of two types of operations can be performed. One allows the operator to configure per-channel characteristics, such as terminal or print emulation, transmission rate, stop bits, parity, busy-out status, inbound priority, default terminal type, printer assignment, and optional command-level prompts. The other allows the operator to specify system-wide parameters and features: NRZI or non-NRZI encoding, control-unit address, printer line-sharing, carriage delays, short-break length, and so forth. Also included in the system-wide menu are customized terminal-type definitions and international character code sets.**

Micom Micro7400 Protocol Converter

device. Because display intensity is terminal-dependent, intensified display fields are brighter than normal only when the attached terminal supports two levels of video. Also, several key functions depend on the capabilities of the terminal. For example, Alternate Cursor and Cursor Blink keys are local functions of the terminal, and only terminals with the appropriate operator controls can perform them. Support for typamatic keys is also terminal-dependent. The Micro7400 does not provide a Backspace key separate from a Left Cursor key because these keys provide the same function. Also unsupported is a Test key or Test mode.

The Micro7400 may be equipped with several options, but with the exception of an Asymmetrical Channel Speed Option, no two options can be put on the same unit. Users should note this fact when ordering Micro7400s

We should mention one last advantage of the Micro7400 system: you can test it out before buying. Micom offers a Dial-In Demonstration System, whereby users can test the operation of a Micro7400 under real-world conditions. To use the demo for asynchronous applications, users must have at least one asynchronous terminal at the dial-in site and a modem. For synchronous demonstrations, users need a Micro7400 at the dial-in site, and Micom will supply this unit upon request. Prospective customers interested in using the demonstration facility must contact a Micom sales representative to arrange the test.

USER REACTION

In Datapro's 1985 terminal users's survey, thirteen respondents rated Micom's Micro7400 protocol converter in five categories. These users had a total of 72 units installed. Their ratings are shown in the following table.

	Excellent	Good	Fair	Poor	WA*
Overall performance	7	5	1	0	3.5
Ease of installation	7	3	3	0	3.1
Hardware reliability	5	7	1	0	3.3
Ease of operation	6	4	3	0	3.2
Maintenance service/ technical support	4	4	5	0	2.9
Ease of operation	6	4	3	0	3.2

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

- ***Configuration Display*—By specifying various configuration display menus, the operator can view summaries of line, controller, or channel configurations.**

- ***Status/Statistics Display*—The operator can choose to display channel-specific or system-side status and statistical information. Channel-specific displays show the status of each channel connection. Also shown are terminal type selected, keyboard map, keyboard lock, insert mode, output held by X-off, and active, bound, and LU status for SNA applications. Additional status/statistics display menus monitor asynchronous and synchronous lines.**

- ***Terminal-Activated Channel Test (TACT)*—There are local and terminal TACT modes. In local mode, the Micro7400 echoes any character received from the attached asynchronous device back to that device. In terminal mode, the Micro7400 sends a continuous "fox" message to the attached asynchronous device. TACT modes initiated through the command port test any designated channel, including the command port.**

Other features that extend the capabilities of the IBM 3270 include auto log on from a message stored in nonvolatile memory and transmitted upon request from the keyboard; banner, broadcast, and disconnect messages; inbound priority assignments for asynchronous channels; and security options which include password protection, timeout disconnection, automatic log off, and SNA session control.

Options

Options on the Micro7400 include the following:

- **Asynchronous Host Option (available only on eight-channel units): adds four or eight asynchronous host channels and permits individual terminals to switch between 3270 emulation and any of four or eight asynchronous hosts. Users must specify four- or eight-channel addition.**

- **ASCII BSC Option: provides support for BSC protocol in the ASCII character set.**

- **Asymmetrical Channel Speed Option: allows transmission at one speed and reception at another for Viewdata and similar applications.**

- **Dual Synchronous Host Option: substitutes a synchronous 3270 host channel for one asynchronous channel. In applications, both links must use the same protocol (BSC or SNA/SDLC); individual terminals may switch between the two synchronous lines.**

- **Large Screen Monitor Option: allows the Micro7400 to emulate IBM model 3, 4, and 5 3278 large-screen terminals with 2562, 3440, and 3564 characters. With this option, Micro7400 will support up to six terminals.**

With the exception of the asymmetrical option, no option may be combined with another option.

PRICING

Micom ships the Micro7400 within 30 days after receipt of order. The two-channel "LTD" budget model sells for $1,650; the two-channel full-feature model sells for $2,250. The 4-channel basic unit costs $2,950, the 8-channel unit is $3,850, the 12-channel unit is $4,750, and the 16-channel unit sells for $5,650. The software diskette that allows an IBM PC to work with the Micro7400 is priced at $90.■