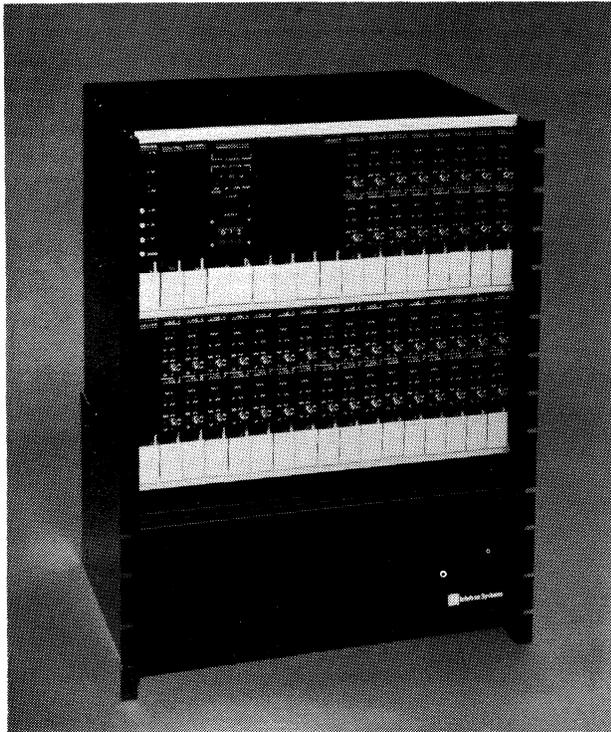


Infotron Timeline TL 450 Port Selector



The Infotron Systems Timeline 450 Port Selector, shown above, is a 32-line by 16-port configuration. The various controls and indicators pictured provide a comprehensive network control and diagnostic facility.

MANAGEMENT SUMMARY

The Infotron TL 450 Port Selector is effectively a "front end for a front-end processor." Installing a TL 450 delays, and often precludes, the necessity of expanding front-end hardware. Some advantages of using a 450 include: cost savings, as opposed to adding front-end ports; automatic resource selection (by specifying communications path) under control of the remote user; auto-speed/code detection support; coordinated test and diagnostic facilities; and flexible modular expansion.

The TL 450 is particularly suited for time sharing applications, both commercial and intra-company, but is certainly not limited to that market area. One ideal situation that would allow the equipment to be cost justifiable is when users of a computer system are geographically distributed over two or more time zones. This, of course, results in a staggering of peak work loads. Rather than dedicating ports to cities in different time zones, with the obvious under utilization during non-peak hours, the port selector is inserted between the incoming lines and the CPU hardware to allow contention and thus save the cost of additional front-end ports. An alternative to contention or dedicated ports would be manual switching. This is a costly proposition, because the status of each line is not known (e.g., condi-

A device that provides line-to-port contention in selectable ratios and also allows resource selection from the remote terminal site by keyboard entry.

Systems as small as 16 lines by 8 ports and as large as 254 lines by 124 ports are available. The 450 Port Selector accommodates asynchronous or synchronous transmission at up to 9600 bps in full- or half-duplex mode. The 450 can be partitioned into one to seven groups by data code, speed, desired application, operating mode, etc. Automatic speed detection is also supported at up to 1200 bps, asynchronous. Optional line finders are available that can identify the active line/port cross-connect points under automatic or manual control.

A minimum 16 x 8 rack-mount configuration sells for \$5,980 or rents, on a 2-year lease, for less than \$300 per month; a larger system of 254 lines by 124 ports can be purchased for \$15,000 or leased for \$720 per month. These prices include factory maintenance under a one-year warranty.

CHARACTERISTICS

VENDOR: Infotron Systems Corporation, Cherry Hill Industrial Center, Cherry Hill, New Jersey 08003. Telephone (609) 424-9400.

DATE OF ANNOUNCEMENT: 1972.

DATE OF FIRST DELIVERY: 1972.

NUMBER DELIVERED TO DATE: Over 400.

SERVICED BY: Infotron Systems Corporation.

CONFIGURATION

All central logic for the Timeline 450 (TL 450) is contained on three printed-circuit cards. The only other common electrical element is the power supply. A redundant power option is offered, which provides dual supplies that split the current drain under normal circumstances. Either supply is capable of carrying the entire load if the other fails; no mechanical switching or interruption of service occurs when one of the units fails because both supplies are on the line, and the failed supply is automatically isolated.

The TL 450 has a recirculating memory of LSI/MOS technology; all other printed-circuit card components are of TTL logic. The memory cycle time is 64 microseconds. The worst-case connect time for a line requesting service until a port-side device is located, if available, is 64 milliseconds. This timing applies equally to one or all 124 ports due to the addressing and confirmation methods employed. After connection, each line/port interface is scanned every 64 microseconds.

Infotron Timeline TL 450 Port Selector

▷ tioning, continuity, noise level, etc.) unless test equipment terminates, bridges, and monitors the lines that are not in use at the time. Although the one-hour time difference is enough to load-level peak traffic, it would create daily panics when the lines are manually switched, checked, and the system declared up-and-running for the next set of users.

The capability to select the communication path to reach a specific host computer, applications program, peripheral, or network extension is also a large plus for the port selector. Path selection is accomplished via an automatic device select feature that permits the user (terminal) to bid for a specific class of service. The user enters a set sequence of characters at the remote or local terminal keyboard. Up to seven different classes of service can be defined by firmware/hardware programming in the 450. These service classes are identified by a user-entered code that causes the port selector to "hunt" for an available connection to the desired service, be it local or remote. Local connections are normally accomplished via the host front-end; remote connections could be by way of time or frequency division multiplexers or through modems. The only requirement is that the ultimate terminus must have the ability to grant or deny service, generally by means of raising the Data Terminal Ready EIA lead. Another option is the Busy Message Generator, which is a separate card that generates the message "busy" asynchronously at 110, 150, 300, or 1200 bps ASCII or 134.5 bps BCD.

Once a connection is established, the TL 450 is completely transparent to data and EIA control signals. Asynchronous automatic speed and code detection are supported at up to 1200 bps. For port-side connected devices that also have auto-speed capability, the TL 450 will recognize the speed/code of the data on the incoming line, determine the requested class of service (port-side device), and pass the speed/code recognition character on.

An enhanced version of the 450 accommodates both synchronous and asynchronous data at mixed speeds of up to 9600 bps. In this configuration, up to 254 lines can contend for a maximum of 32 ports. The synchronous data is passed through up to 32 lines by 16 ports with the remaining lines and ports handling asynchronous traffic.

The 450 is available in standard 19-inch relay-rack mounting configuration or as a stand-alone table top unit. The smallest port selector offered consists of a base unit (power supply and one card cage capable of accommodating up to 16 lines and 8 ports, plus the common logic) and as many port and line cards as required. Each card can interface up to two lines or ports, respectively. For larger systems, expansion card cages can be added and populated as desired. Each expansion cage will hold up to 32 line or port interfaces (16 cards, not intermixed). The maximum configuration is 254 lines by 124 ports. Any contention ratio can be established by simply adding the necessary cards. ▷

▶ In the largest configuration, 254 lines by 124 ports (254 x 124), Infotron recommends a maximum speed of 2400 bps, although 4800 bps could normally be achieved with satisfactory results. When operating at 9600 bps, a maximum contention ratio of 254 x 32 is recommended. In the first case, the speed could be increased; in the second case, the number of port-side devices could be increased, but in either case a risk is involved. The risk is garbled data; the cumulative tolerance of the remote terminal and the interconnecting communications facilities may produce a distortion level that would result in an unacceptable error rate. Consequently, Infotron has published conservative specifications.

The TL 450 can be partitioned into seven different service classes defined by speed or the desired port-side connected device. For example, if a port selector is operating with mixed speeds and is connected to two ports of a 270X hard-wired controller, two ports of a co-located 3705, and two time division multiplexer channels that are routed to a remote computer, six different service classes are required. This permits another class of service for future use. Users specify service class as part of sign-on procedures. User specification, rather than factory-set combinations, permits more flexible operation, such as user-specified destinations.

The line-side cards of the port selector can recognize a request for service under any one of the following conditions:

- EIA Ring Indicator lead goes high, for dial-up applications;
- EIA Data Set Ready or Carrier Detect lead goes high, for dial-up or dedicated line applications;
- Transitions on the incoming data path, normally used for dedicated lines (particularly for 20/60 ma. current loop connections where there are no control signals).

When the condition for which the card was programmed occurs, a "bid" flag is raised and is recognized by central logic on its next scan. The actions following are dependent upon the port selector configuration. In a single-speed, straight contention system, central logic will immediately begin to search for an available port and, having found one, will make the connection. Thereafter, all data and control signals are passed in both directions transparently. Central logic will continue to search for an available port until successful or until the terminal end discontinues its request for service. In systems equipped with the Busy Message generator, a "busy" word is sent to the requesting terminal if a port is not found; in dial-up applications the call is usually then dropped.

In more complex systems having mixed speeds and/or service classes, the line card detects speed on receipt of the first character and class of service on receipt of the second character; it then raises the appropriate "bid" flag to initiate the search by central logic. The speed recognition character used for 110, 150, 300 and 1200 bps ASCII is Carriage Return (CR) and for 134.5 bps BCD it is the "circle D" character. Special cards are also available to interface to Memorex front ends. These cards recognize "S," "Y," "Q," and "circle D" set-up characters for speeds of 110, 150, 300, and 134.5 bps, respectively. In all cases, the speed recognition character can be passed on to the port-side connected device if it also has automatic speed recognition, or it can be dumped. The characters used to identify a specific service class are the digits 1 through 7.

A disconnect is initiated by loss of carrier, or loss of the Data Set Ready EIA control, or receipt of a long-space disconnect (break) signal. This selection is a hardware-programmed function, as is the time delay before the circuit is actually terminated. This delay may be set for zero, 6.3, ▶

Infotron Timeline TL 450 Port Selector

➤ Every line and port interface is equipped with Light Emitting Diode (LED) indicators that allow fast assurance of system operation. These are important network tools because they allow a fault to be pinpointed quickly. Due to the modular design of the hardware, the faulty component can then be replaced without disrupting service to the remainder of the system, in most cases. The LED's consume very little power and dissipate virtually no heat, consequently, they have a long life span.

Operating with a rather low profile in its early years, Infotron has increased its market share by careful allocation of resources. The firm did its homework with regard to product planning and has guarded its financial position carefully by not selling what it could not produce or service. Consequently, the company is held in high regard by its customer base, as indicated in the User Reaction section of this report.

In addition to the TL 450 Port Selector, Infotron manufactures intelligent statistical multiplexers, time division multiplexers, modems, intelligent data switches, and related test equipment. Noted for reliability, efficiency, cost effectiveness, and diagnostic capabilities, the product line has gained wide acceptance in a variety of applications.

USER REACTION

In August 1980, Datapro conducted a telephone survey of 6 TL 450 users who had a total of 13 TL 450s. The experience of these users ranged from 2 years to 5 years and averaged about 3 years. The largest configuration was 240 lines by 108 ports; the smallest was 9 lines by 6 ports. The contention ratio for three users was approximately 2:1; for the other three, approximately 1.5:1. The types of computer systems encountered varied widely and included Burroughs, Data General, Digital Equipment, Hewlett Packard, NCR, Prime, and Xerox. Two installations had five CPU's, and one each was equipped with 1, 2, and 4 CPU's. The remaining installation shared three TL 450's among 26 on-line mini-computer systems. All installations studied were passing asynchronous data through the 450; none had synchronous applications using the port selector. The vendor furnished the names of all six users that were contacted. These users' ratings are as follows:

	Excellent	Good	Fair	Poor	WA*
Overall satisfaction	4	2	0	0	3.7
Ease of installation	5	1	0	0	3.8
Hardware reliability	5	1	0	0	3.8
Promptness of maintenance	5	0	1	0	3.7
Quality of maintenance	5	0	1	0	3.7
Ease of expansion	4	1	0	0	3.8

*Weighted Average based on 4.0 for Excellent.

One user did not rate ease of expansion because he had not yet had occasion to expand.

The operating environments of the users surveyed differed. Maximum operating speed was 300 bps for one ➤

➤ or 12.6 seconds. There is also a separately programmed "pause" delay that inhibits the port-side equipment from being connected for a set time after its last connection. The "pause" delay can be set for 356 milliseconds or for 6.3 or 12.6 seconds. These apparently long "pause" delays are provided for security reasons when operating with some CPU/front end combinations to protect against an oncoming user gaining access to a previous user's files.

CONNECTION TO HOST COMPUTER

There is no true host computer for the port selector, as connection is possible to multiple devices and no single unit has control. The only control a connected device has is granting, denying, and terminating service by use of the Data Terminal Ready EIA lead. EIA cables are used to connect all devices to the port selector.

TRANSMISSION SPECIFICATIONS

Once a connection is made, the port selector is completely transparent to data and controls except for a negligible time delay. The machine can be operated at up to 9600 bps asynchronous and 2400 bps synchronous. Standard operating speeds are 110, 134.5, 150, 300, 1200, 2400, 4800, and 9600 bps.

SOFTWARE

The port selector is not equipped with true software. Programming is accomplished using firmware/hardware consisting of a variety of program plugs and strap options. These items are discussed under the individual card descriptions in the Components section of this report.

COMPONENTS

The components of the TL 450 consist of the common equipment (including power); driver boards; the port and line side boards (which are firmware/hardware programmed for the desired application); and the cabinetry (including the card cages required to achieve the desired contention ratio).

The common equipment consists of three plug-in cards termed as timing, control, and memory. The timing card has three Light Emitting Diode (LED) indicators that light to indicate the presence of the +5 and +12 volt outputs of the power supply. Test points are also on the timing card to facilitate checking these voltages.

Each group of 32 line or port interfaces (16 cards) requires a driver board that is located at the extreme left of the nest. The one-nest 16 x 8 configuration of course has the line driver and the port driver in the same nest. Each standard line and port card is equipped with a series of LED's that indicate the status of the lines and ports and a "busy" switch. The LED's respond to signals on the RS-232-C interface leads, including DATA in and out (each flashes with transitions from connected devices); Data Terminal Ready, Ring Indicator, Data Set Ready, and Request To Send (light when the associated EIA signal is presented from the line- or port-side connected device); and Carrier Detect (lights when audio power is detected on the telephone line associated with the line-side connected modem). The Busy switch, when activated, causes the interface and all connected devices to be "busied" out. This feature is ordinarily used in maintenance routines.

The CACS and CASM versions of the line-side channel adapters have the same indicators except that Request to Send, Ring Indicator and Data Terminal Ready are eliminated in favor of an SD indicator (lights when the line adapter determines the speed of the device requesting ser- ➤

Infotron Timeline TL 450 Port Selector

➤ user, 1200 bps for three users, 4800 bps for one user, and 9600 bps for one user. The types of incoming lines also varied, but all sites reported some percentage of direct-connect or leased lines. About one-half of those surveyed used a portion of the port selector lines to connect to time division multiplexer channels; one used some frequency division; and most used a number of local dial-up data sets.

As the ratings show, the TL 450 has achieved a high level of success, as has the rest of the Infotron product line. All users but one were enthusiastic concerning the firm's cooperation and response time. The expertise of Infotron's technical help and promptness in returning repaired parts was frequently mentioned. (The one user felt that his minor problems could have been resolved faster.) Among other advantages cited by these users were: reliability, ease of expansion, modularity/flexibility, system redundancy, data transparency, and short delivery lead times. Most users said that once the unit was installed and running, it simply "does its thing" without problems, failure, or need for any special attention.

There were no truly negative comments on the performance of the equipment or the firm. However, several users felt that as a product the TL 450 is beginning to show its age. The lack of certain state-of-the-art features available on newer port selectors (including Infotron's TL 460 Data Switch), such as the ability to handle more selection classes, programmability of the message system, and a download capability for automatic system back-up, was mentioned as a disadvantage by several users. In fact, several of these users are already looking towards the TL 460 as their next Infotron purchase. □

➤ vice), an REQ indicator (lights when a port-side device has been "bid" for), and an ACK indicator (lights when a line/port connection has actually been established).

The LED indicators are important network tools in that they permit a fault to be pinpointed quickly. Thereafter, in most cases, the faulty card can be swapped out without powering the system down or interrupting other service. The LED's consume very little power and dissipate virtually no heat; consequently, they have a long life span. The indicators are repeated on both cards to provide assurance that the signals are being passed through common logic. The CACS and CASM cards are used almost exclusively in dial-up applications. On the port side, the Ring Indicator LED is "faked" by Central Logic to provide a 2-second or 4-second off cycle; the Request To Send indicator will follow the EIA input from the port-side device, which is normally not used in dial-up situations.

Line and Port Adapters

The *CA 450/Line Adapter* has two independent interfaces, each of which can pass three separate EIA controls in both directions simultaneously. Each interface can be connected to any RS-232-C compatible device. Hardware programming in central logic establishes the disconnect timing and response for all cards of this type in the system. Connect timing and method of bidding for service can vary from card to card. These cards are limited to asynchronous data only.

The *CA 450/Port Adapter* is similar to its line adapter counterpart except that it services port-side connected devices.

The *CA 450/Line5 Adapter* also has two independent EIA interfaces, each of which is capable of passing five control signals in both directions simultaneously. This card can handle asynchronous or synchronous data; synchronous applications utilize the EIA control leads to pass transmit and/or receive clock.

The *CA 450/Port5 Adapter* has the same features as its line side sister except that it is connected to port-side equipment.

The *CA 450/ACS-CM Line Adapter* is an automatic speed recognizing card with two independent EIA interfaces. The Carriage Return is used as the set-up character for 110, 150, 300 and 1200 bps ASCII; the "circle D" character is used to set up 134.5 bps BCD code. This card is also capable of device selection by keyboard entry. Up to seven different port-side devices can be selected by entering the digits 1 through 7 from the remote terminal keyboard. The card can also be hardware programmed to respond to the Memorex front end code/speed recognition pattern. The characters "S," "Y," "O," and "circle D" are decoded as 110, 150, 300, and 134.5 bps, respectively. These cards can be individually programmed for connect/disconnect responses and timings. The cards can be intermixed in the same nest regardless of their individual programmed features.

The *CA 450/Curr Line Adapter* is a 20/60 milliampere loop interface card with two current interfaces. Connection can only be made to neutral loops.

The *CA 450/CACS-M Line Adapter* is a dual 20/60 mA loop interface card that is equipped with Memorex compatible code for speed detection. The unit is also capable of device selection by entering a character from the remote terminal keyboard.

The *CA 450/CACS-C Line Adapter* is identical with the CACS-M except that speed is detected using the Carriage Return character.

Options

The *ABR Busy Message Generator* is an option that occupies the last port adapter positions in the nest. When service is requested by the terminal and there are no ports of that class available, the BMG will generate the message "busy" in the proper speed and code for that terminal. This card incorporates automatic speed recognition and can be programmed to sense Carriage Return or the Memorex coding. It can operate automatically at speeds of 110, 134.5, 150, and 300 bps. In fixed speed systems, it can be programmed to respond at 600, 1200, or 1800 bps.

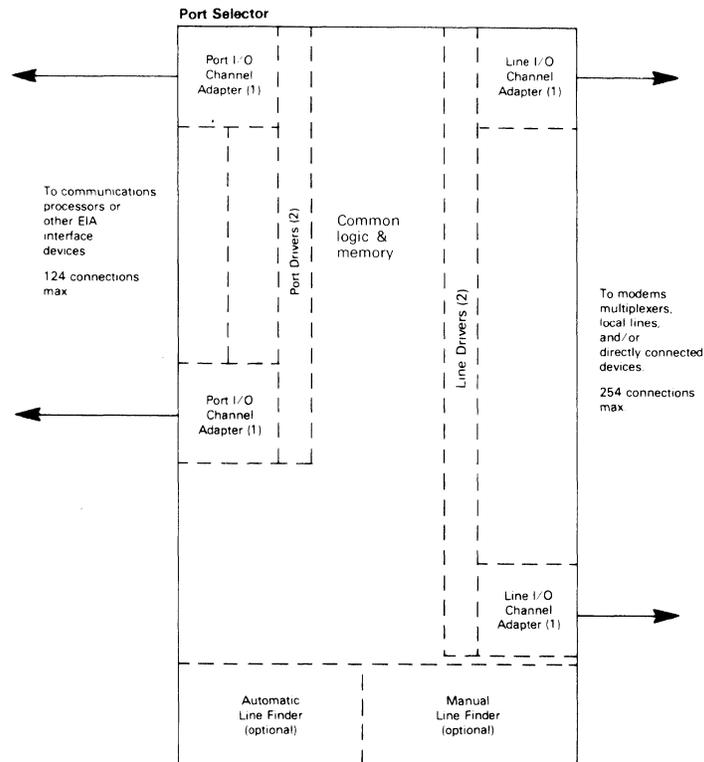
The "busy" message can be generated in ASCII, BCD, correspondence codes, or BCD followed by correspondence, by firmware/hardware programming.

The *DM 450/LF Line Finder* is a manually controlled diagnostic card that allows the operator to determine the port connected to a particular line and to monitor the EIA control and data leads associated with the connection. The unit is operated by setting thumb-wheel switches to the address of the port; the corresponding line side address is then displayed by LED's. In addition to the status of the EIA controls, the connected function is shown with a CONN LED and the "pause" time out is displayed on another LED.

The *DM 450/LFA Line Finder* is similar in function to the DM 450/LF except it operates under command of the CPU or other port-side connected device. The port address is

Infotron Timeline TL 450 Port Selector

Configuration



(1) One adapter per connection, two adapters per logic card.
(2) Driver services 32 adapters (16 cards).

► issued in serial binary coded sequence and the line finder returns to line-side address in similar fashion.

PRICING

The TL 450 can be obtained by purchase, full-pay-out lease (generally 24-months), or short-term rental. The accompanying price list shows purchase prices. Contact Infotron for rental and lease prices.

Leased equipment remains the property of Infotron; conversion to purchase entails the fulfillment of the lease contract plus the payment of 10 percent of the total lease value.

Short-term (monthly) rentals are available at a cost of approximately 8 percent of the purchase price per month; this plan allows for 50 percent of all rental payments made to be accrued toward purchase.

Service is usually accomplished by the customer using his own spares. Faulty boards are returned to the factory for repair at no charge, if within the standard one-year warranty; boards out of warranty are repaired for a flat \$40 per board. On-call and contract maintenance services are also available.

PRICING

		Purchase Price*
Base Equipment		
TL450/1608R	16 x 8 capacity; includes drivers, central logic, and power	\$3,100
TL450/3216R	32 x 16 capacity; includes drivers, central logic, and power	4,000
XN450/32PR	Expansion nest for 32 port interfaces, includes driver	1,000
XN450/32LR	Expansion nest for 32 line interfaces, includes driver	1,000
Channel Adapters		
CA450/Line	Two EIA interfaces with three bi-directional control signals per interface	240
CA450/Port	Two EIA interfaces with three bi-directional control signals per interface	240
CA450/Line5	Two EIA interfaces with five bi-directional control signals per interface	300
CA450/Port5	Two EIA interfaces with five bi-directional control signals per interface	300
CA450/ACS-CM	Two EIA interfaces with automatic speed recognition capability, three EIA controls	350
CA450/Curr	Two 20/60 mA interfaces, neutral loops	400
CA450/CACS-C	Two 20/60 mA interfaces, neutral loops, with automatic speed recognition capability on receipt of Carriage Return	400
CA450/CACS-M	Two 20/60 mA interfaces, neutral loops, with automatic speed recognition capability on receipt of Memorex compatible codes	400

*All prices are for 19-inch relay-rack configurations; contact vendor for prices of enclosures.

Infotron Timeline TL 450 Port Selector

Purchase
Price*

► **PRICING**

Spares

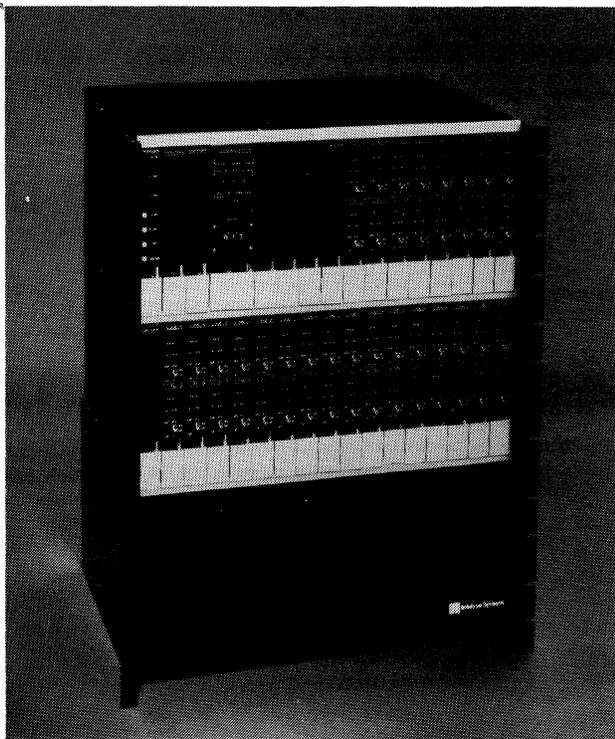
CL450/1608	Central logic for TL450/1608R-2400 bps	500
CL450/3216	Central logic for TL450/3216R-2400 bps	500
CL450/1608HS	Central logic for TL450/1608R-9600 bps	500
CL450/3216HS	Central logic for TL450/3216R-9600 bps	500
PS450/5040R	Power supply; +5 vdc at 50 amp., ±12 vdc at 4 amp.	925
PS450/5040AR	Power supply with load sharing capability, same voltages and current capability	1,075

Options

DM450/LF	Manual line finder	500
DM450/LFA	Automatic line finder, 300 bps	500
MG450/ACSBMG	Busy message generator, automatic speed	350

*All prices are for 19-inch relay-rack configurations; contact vendor for prices of enclosures.■

Infotron Timeline TL 450 Port Selector



The Infotron Systems Timeline 450 Port Selector, shown above, is a 32-line by 16-port configuration. The unit provides line-to-port contention in selectable ratios and also allows resource selection from the remote terminal site by keyboard entry. The various controls and indicators pictured provide a comprehensive network control and diagnostic facility.

MANAGEMENT SUMMARY

Infotron was formed in 1968 and has since established itself as a highly respected supplier of digital data communications products. The firm grossed over \$7 million in fiscal 1977 and has recently relocated its headquarters to a larger facility because order input had exceeded production capacity.

The TL 450 Port Selector is effectively a "front end for a front-end processor." Installing a TL 450 delays, and often precludes, the necessity of expanding front-end hardware. Some advantages of using a 450 include: cost savings, as opposed to adding front-end ports; automatic resource selection (by specifying communications path) under control of the remote user; auto-speed/code detection support; coordinated test and diagnostic facilities; and flexible modular expansion.

The TL 450 is particularly suited for time sharing applications, both commercial and intra-company, but is certainly not limited to that market area. One ideal situation that would allow the equipment to be cost justifiable is when users of a computer system are geographically distributed over two or more time zones. ➤

A cost effective electronic "switch" that promotes efficiency by forcing incoming lines to contend for available front-end ports, or other connected devices, rather than dedicating ports to lines that may not be in use.

Systems as small as 16 lines by 8 ports and as large as 254 lines by 124 ports are available. The 450 Port Selector accommodates asynchronous or synchronous transmission at up to 9600 bps in full- or half-duplex mode. The 450 can be partitioned into one to seven groups by data code, speed, desired application, operating mode, etc. Automatic speed detection is also supported at up to 1200 bps, asynchronous. Optional line finders are available that can identify the active line/port cross-connect points under automatic or manual control.

A minimum 16 x 8 rack-mount configuration sells for \$5,980 or rents, on a 2-year lease, for less than \$300 per month; a larger system of 254 lines by 124 ports can be purchased for \$15,000 or leased for \$720 per month. These prices include factory maintenance under a two-year warranty.

CHARACTERISTICS

VENDOR: Infotron Systems Corporation, Cherry Hill Industrial Center, Cherry Hill, New Jersey 08003. Telephone (609) 424-9400.

DATE OF ANNOUNCEMENT: 1972.

DATE OF FIRST DELIVERY: 1972.

NUMBER DELIVERED TO DATE: Over 200.

SERVICED BY: Infotron Systems Corporation.

CONFIGURATION

All central logic for the Timeline 450 (TL 450) is contained on three printed-circuit cards. The only other common electrical element is the power supply. A redundant power option is offered, which provides dual supplies that split the current drain under normal circumstances. Either supply is capable of carrying the entire load if the other fails; no mechanical switching or interruption of service occurs when one of the units fails because both supplies are on the line, and the failed supply is automatically isolated.

The TL 450 has a recirculating memory of LSI/MOS technology; all other printed-circuit card components are of TTL logic. The memory cycle time is 64 microseconds. The worst-case connect time for a line requesting service until a port-side device is located, if available, is 64 milliseconds. This timing applies equally to one or all 124 ports due to the addressing and confirmation methods employed. ➤

Infotron Timeline TL 450 Port Selector

▷ This, of course, results in a staggering of peak work loads. Rather than dedicating ports to cities in different time zones, with the obvious under utilization during non-peak hours, the port selector is inserted between the incoming lines and the CPU hardware to allow contention and thus save the cost of additional front-end ports. An alternative to contention or dedicated ports would be manual switching. This is a costly proposition, because the status of each line is not known (e.g., conditioning, continuity, noise level, etc.) unless test equipment terminates, bridges, and monitors the lines that are not in use at the time. Although the one-hour time difference is enough to load-level peak traffic, it would create daily panics when the lines are manually switched, checked, and the system declared up-and-running for the next set of users.

The capability to select the communication path to reach a specific host computer, applications program, peripheral, or network extension is also a large plus for the port selector. One user contacted in the preparation of this report had a 1:1 contention ratio, which on the surface seems odd for a port selector application, but this user is applying the device-select switching capability to allow his users to obtain the resources they require in what is to them virtually a transparent mode.

Path selection is accomplished via an automatic device select feature that permits the user (terminal) to bid for a specific class of service. The user enters a set sequence of characters at the remote or local terminal keyboard. Up to seven different classes of service can be defined by firmware/hardware programming in the 450. These service classes are identified by a user-entered code that causes the port selector to "hunt" for an available connection to the desired service, be it local or remote. Local connections are normally accomplished via the host front-end; remote connections could be by way of time or frequency division multiplexers or through modems. The only requirement is that the ultimate terminus must have the ability to grant or deny service, generally by means of raising the Data Terminal Ready EIA lead. Another option is the Busy Message Generator, which is a separate card that generates the message "busy" asynchronously at 110, 150, 300, or 1200 bps ASCII or 134.5 bps BCD.

Once a connection is established, the TL 450 is completely transparent to data and EIA control signals. Asynchronous automatic speed and code detection are supported at up to 1200 bps. For port-side connected devices that also have auto-speed capability, the TL 450 will recognize the speed/code of the data on the incoming line, determine the requested class of service (port-side device), and pass the speed/code recognition character on.

A new model of the 450 has recently been announced that accommodates both synchronous and asynchronous data at mixed speeds of up to 9600 bps. In this configuration, up to 254 lines can contend for a maximum of 32 ports. The synchronous data is passed through up to 32 lines ▷

▶ After connection, each line/port interface is scanned every 64 microseconds.

In the largest configuration, 254 lines by 124 ports (254 x 124), Infotron recommends a maximum speed of 2400 bps, although 4800 bps could normally be achieved with satisfactory results. When operating at 9600 bps, a maximum contention ratio of 254 x 32 is recommended. In the first case, the speed could be increased; in the second case, the number of port-side devices could be increased, but in either case a risk is involved. The risk is garbled data; the cumulative tolerance of the remote terminal and the interconnecting communications facilities may produce a distortion level that would result in an unacceptable error rate. Consequently, Infotron has published conservative specifications.

The TL 450 can be partitioned into seven different service classes defined by speed or the desired port-side connected device. For example, if a port selector is operating with mixed speeds and is connected to two ports of a 270X hard-wired controller, two ports of a co-located 3705, and two time division multiplexer channels that are routed to a remote computer, six different service classes are required. This permits another class of service for future use. Users specify service class as part of sign-on procedures. User specification, rather than factory-set combinations, permits more flexible operation, such as user specified destinations.

The line-side cards of the port selector can recognize a request for service under any one of the following conditions:

- EIA Ring Indicator lead goes high, for dial-up applications;
- EIA Data Set Ready or Carrier Detect lead goes high, for dial-up or dedicated line applications;
- Transitions on the incoming data path, normally used for dedicated lines (particularly for 20/60 ma. current loop connections where there are no control signals).

When the condition for which the card was programmed occurs, a "bid" flag is raised and is recognized by central logic on its next scan. The actions following are dependent upon the port selector configuration. In a single-speed, straight contention system, central logic will immediately begin to search for an available port and, having found one, will make the connection. Thereafter, all data and control signals are passed in both directions transparently. Central logic will continue to search for an available port until successful or until the terminal end discontinues its request for service. In systems equipped with the Busy Message generator, a "busy" word is sent to the requesting terminal if a port is not found; in dial-up applications the call is usually then dropped.

In more complex systems having mixed speeds and/or service classes, the line card detects speed on receipt of the first character and class of service on receipt of the second character; it then raises the appropriate "bid" flag to initiate the search by central logic. The speed recognition character used for 110, 150, 300 and 1200 bps ASCII is Carriage Return (CR) and for 134.5 bps BCD it is the "circle D" character. Special cards are also available to interface to Memorex front ends. These cards recognize "S", "Y", "O", and "circle D" set-up characters for speeds of 110, 150, 300, and 134.5 bps, respectively. In all cases, the speed recognition character can be passed on to the port-side connected device if it also has automatic speed recognition, or it can be dumped. The characters used to identify a specific service class are the digits 1 through 7.

A disconnect is initiated by loss of carrier, or loss of the Data Set Ready EIA control, or receipt of a long-space disconnect (break) signal. This selection is a hardware-▶

Infotron Timeline TL 450 Port Selector

- by 16 ports with the remaining lines and ports handling asynchronous traffic.

The 450 is available in standard 19-inch relay-rack mounting configuration or as a stand-alone table top unit. The smallest port selector offered consists of a base unit (power supply and one card cage capable of accommodating up to 16 lines and 8 ports, plus the common logic) and as many port and line cards as required. Each card can interface up to two lines or ports, respectively. For larger systems, expansion card cages can be added and populated as desired. Each expansion cage will hold up to 32 line or port interfaces (16 cards, not intermixed). The maximum configuration is 254 lines by 124 ports. Any contention ratio can be established by simply adding the necessary cards.

Every line and port interface is equipped with Light Emitting Diode (LED) indicators that allow fast assurance of system operation. These are important network tools because they allow a fault to be pinpointed quickly. Due to the modular design of the hardware, the faulty component can then be replaced without disrupting service to the remainder of the system, in most cases. The LED's consume very little power and dissipate virtually no heat, consequently, they have a long life span.

Operating with a rather low profile in its early years, Infotron has increased its market share by careful allocation of resources. The firm did its homework with regard to product planning and has guarded its financial position carefully by not selling what it could not produce or service. Consequently, the company is held in high regard by its customer base, as indicated in the User Reaction section of this report.

In addition to the TL 450 Port Selector, Infotron manufactures a line of four different asynchronous, synchronous and statistical time division multiplexers (see Multiplexers in Volume 3) and a complimentary test set. Noted for reliability, efficiency, cost effectiveness, and diagnostic capabilities, the product line has gained wide acceptance in a variety of applications.

USER REACTION

In May 1978, Datapro conducted a telephone survey of 10 TL 450 users who had a total of 11 machines installed. The experience of these users ranged from 3 months to 4 years and averaged 22 months. The largest configuration was 168 lines by 64 ports; the smallest was 8 lines by 8 ports. Contention ratios ranged from 2:1 to 1:1, with approximately 1.5:1 being the most prevalent. The types of computer systems encountered varied widely and included Amdahl, Digital Equipment, Hewlett Packard, Honeywell, IBM, NCR, Univac, and Xerox. Two installations had three CPU's, four were equipped with two CPU's, and the remaining four sites had one CPU. The installations studied were passing asynchronous data (through the 450) almost exclusively, although a small number of synchronous applications were found. The vendor furnished the names of eight users that were ➤

- programmed function, as is the time delay before the circuit is actually terminated. This delay may be set for zero, 6.3, or 12.6 seconds. There is also a separately programmed "pause" delay that inhibits the port-side equipment from being connected for a set time after its last connection. The "pause" delay can be set for 356 milliseconds or for 6.3 or 12.6 seconds. These apparently long "pause" delays are provided for security reasons when operating with some CPU/front end combinations to protect against an on-coming user gaining access to a previous user's files.

CONNECTION TO HOST COMPUTER

There is no true host computer for the port selector, as connection is possible to multiple devices and no single unit has control. The only control a connected device has is granting, denying, and terminating service by use of the Data Terminal Ready EIA lead. EIA cables are used to connect all devices to the port selector.

TRANSMISSION SPECIFICATIONS

Once a connection is made, the port selector is completely transparent to data and controls except for a negligible time delay. The machine can be operated at up to 9600 bps asynchronous and 2400 bps synchronous. Standard operating speeds are 110, 134.5, 150, 300, 1200, 2400, 4800, and 9600 bps.

SOFTWARE

The port selector is not equipped with true software. Programming is accomplished using firmware/hardware consisting of a variety of program plugs and strap options. These items are discussed under the individual card descriptions in the Components section of this report.

COMPONENTS

The components of the TL 450 consist of the common equipment (including power); driver boards; the port and line side boards (which are firmware/hardware programmed for the desired application); and the cabinetry (including the card cages required to achieve the desired contention ratio).

The common equipment consists of three plug-in cards termed as timing, control, and memory. The timing card has three Light Emitting Diode (LED) indicators that light to indicate the presence of the +5 and +12 volt outputs of the power supply. Test points are also on the timing card to facilitate checking these voltages.

Each group of 32 line or port interfaces (16 cards) requires a driver board that is located at the extreme left of the nest. The one-nest 16 x 8 configuration of course has the line driver and the port driver in the same nest. Each standard line and port card is equipped with a series of LED's that indicate the status of the lines and ports and a "busy" switch. The LED's respond to signals on the RS 232 interface leads, including DATA in and out (each flashes with transitions from connected devices); Data Terminal Ready, Ring Indicator, Data Set Ready, and Request To Send (light when the associated EIA signal is presented from the line- or port-side connected device); and Carrier Detect (lights when audio power is detected on the telephone line associated with the line-side connected modem). The Busy switch, when activated, causes the interface and all connected devices to be "busied" out. This feature is ordinarily used in maintenance routines.

The CACS and CASM versions of the line-side channel adapters have the same indicators except that Request to Send, Ring Indicator and Data Terminal Ready are eliminated in favor of an SD indicator (lights when the line ➤

Infotron Timeline TL 450 Port Selector

▷ contacted; the other two were found by Datapro. These users' ratings are as follows:

	Excellent	Good	Fair	Poor	WA*
Overall satisfaction	9	1	0	0	3.9
Ease of installation	7	2	0	0	3.8
Hardware reliability	9	1	0	0	3.9
Promptness of maintenance	6	1	0	0	3.9
Quality of maintenance	6	1	0	0	3.9
Ease of expansion	9	0	0	0	4.0

* Weighted Average based on 4.0 for Excellent.

One user didn't rate ease of installation because he had not been involved. Three users declined to rate the maintenance categories, claiming that they performed their own maintenance. They were quick to point out, however, that support from the factory was excellent with regard to remote telephone trouble shooting, the solving of novel interface problems, and the turnaround of repair parts. One user did not rate ease of expansion because he had just recently installed the machine and had not yet had occasion to expand.

The operating environments of the users surveyed differed, but one fact became obvious; the most common operating speed in all systems was 0 to 300 bps asynchronous. A small amount of 1200 bps activity was reported, even less at 2400 bps, and only one case of 9600 bps. The types of incoming lines also varied, but all sites reported some percentage of direct-connect or leased lines. About one-half of those surveyed used a portion of the port selector lines to connect to time division multiplexer channels; one used some frequency division; and most used a number of local dial-up data sets.

As the ratings show, the TL 450 has achieved a high level of success, as has the rest of the Infotron product line. All users were enthusiastic concerning the firm's cooperation and response time. The detailed records kept by the firm were also mentioned in glowing terms. One user said "They know exactly what they have in the field. When I get in trouble, all I do is call and tell them who I am and what the problem is. Then I know that I'll get the right board, with all my options on it; and I'll get it fast." Considering that this level of record keeping for over 200 installations is expensive, Infotron is to be commended.

There were no truly negative comments on the performance of the equipment or the firm. One user did mention that it would be nice to have a "camp on" queuing feature, and Datapro understands that this may be on the drawing boards. There were two references to the Manual Line Finder feature as not being as valuable as the user thought it would be, but there were many more users that had nothing but praise for this feature. There was one user that said that the Busy Message Generator was "weak" and that it only generated a busy message (but then, what else is a Busy Message Generator supposed to do). On the whole, Infotron has a lot to be proud of. □

▷ adapter determines the speed of the device requesting service), an REQ indicator (lights when a port-side device has been "bid" for), and an ACK indicator (lights when a line/port connection has actually been established).

The LED indicators are important network tools in that they permit a fault to be pinpointed quickly. Thereafter, in most cases, the faulty card can be swapped out without powering the system down or interrupting other service. The LED's consume very little power and dissipate virtually no heat; consequently, they have a long life span. The indicators are repeated on both cards to provide assurance that the signals are being passed through common logic. The CACS and CASM cards are used almost exclusively in dial-up applications. On the port side, the Ring Indicator LED is "faked" by Central Logic to provide a 2-second or 4-second off cycle; the Request To Send indicator will follow the EIA input from the port-side device, which is normally not used in dial-up situations.

Line and Port Adapters

The *CA 450/Line Adapter* has two independent interfaces, each of which can pass three separate EIA controls in both directions simultaneously. Each interface can be connected to any RS 232C compatible device. Hardware programming in central logic establishes the disconnect timing and response for all cards of this type in the system. Connect timing and method of bidding for service can vary from card to card. These cards are limited to asynchronous data only.

The *CA 450/Port Adapter* is similar to its line adapter counterpart except that it services port-side connected devices.

The *CA 450/Line5 Adapter* also has two independent EIA interfaces, each of which is capable of passing five control signals in both directions simultaneously. This card can handle asynchronous or synchronous data; synchronous applications utilize the EIA control leads to pass transmit and/or receive clock.

The *CA 450/Port5 Adapter* has the same features as its line side sister except that it is connected to port-side equipment.

The *CA 450/ACS-CM Line Adapter* is an automatic speed recognizing card with two independent EIA interfaces. The Carriage Return is used as the set-up character for 110, 150, 300 and 1200 bps ASCII; the "circle D" character is used to set up 134.5 bps BCD code. This card is also capable of device selection by keyboard entry. Up to seven different port-side devices can be selected by entering the digits 1 through 7 from the remote terminal keyboard. The card can also be hardware programmed to respond to the Memorex front end code/speed recognition pattern. The characters "S", "Y", "O", and "circle D" are decoded as 110, 150, 300, and 134.5 bps, respectively. These cards can be individually programmed for connect/disconnect responses and timings. The cards can be intermixed in the same nest regardless of their individual programmed features.

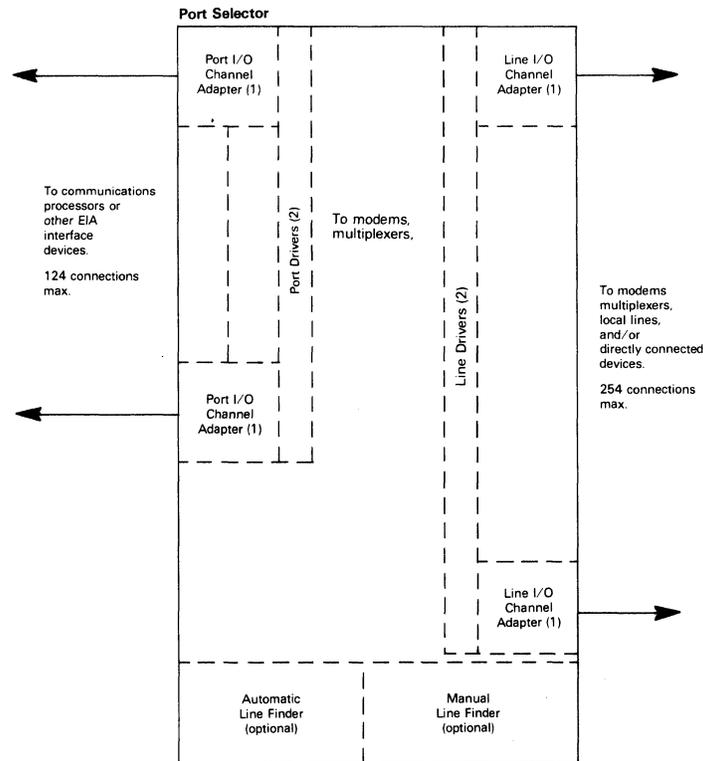
The *CA 450/Curr Line Adapter* is a 20/60 milliampere loop interface card with two current interfaces. Connection can only be made to neutral loops.

The *CA 450/CACS-M Line Adapter* is a dual 20/60 ma. loop interface card that is equipped with Memorex compatible code for speed detection. The unit is also capable of device selection by entering a character from the remote terminal keyboard.

The *CA 450/CACS-C Line Adapter* is identical with the CACS-M except that speed is detected using the Carriage Return character. ▶

Infotron Timeline TL 450 Port Selector

Configuration



- (1) One adapter per connection; two adapters per logic card.
(2) Driver services 32 adapters (16 cards).

► Options

The *ABR Busy Message Generator* is an option that occupies the last port adapter positions in the nest. When service is requested by the terminal and there are no ports of that class available, the BMG will generate the message "busy" in the proper speed and code for that terminal. This card incorporates automatic speed recognition and can be programmed to sense Carriage Return or the Memorex coding. It can operate automatically at speeds of 110, 134.5, 150, and 300 bps. In fixed speed systems, it can be programmed to respond at 600, 1200, or 1800 bps.

The "busy" message can be generated in ASCII, BCD, correspondence codes, or BCD followed by correspondence, by firmware/hardware programming.

The *DM 450/LF Line Finder* is a manually controlled diagnostic card that allows the operator to determine the port connected to a particular line and to monitor the EIA control and data leads associated with the connection. The unit is operated by setting thumb-wheel switches to the address of the port; the corresponding line side address is then displayed by LED's. In addition to the status of the EIA controls, the connected function is shown with a CONN LED and the "pause" time out is displayed on another LED.

The *DM 450/LFA Line Finder* is similar in function to the DM 450/LF except it operates under command of the CPU or other port-side connected device. The port address is issued in serial binary coded sequence and the line finder returns to line-side address in similar fashion.

PRICING

The TL 450 can be obtained by purchase, full-pay-out lease (generally 24-months), or short-term rental. The accompanying price list shows purchase prices.

A 24-month lease would cost approximately \$48 per month per \$1,000 of the total purchase price. Leased equipment remains the property of Infotron; conversion to purchase entails the fulfillment of the lease contract plus the payment of 10 percent of the total lease value.

Short-term (monthly) rentals are available at a cost of approximately 8 percent of the purchase price per month; this plan allows for 50 percent of all rental payments made to be accrued toward purchase.

Service is usually accomplished by the customer using his own spares. Faulty boards are returned to the factory for repair at no charge, if within the standard two-year warranty; boards out of warranty are repaired for a flat \$25 per board. On-call and contract maintenance services are also available. ►

Infotron Timeline TL 450 Port Selector

Purchase
Price*

► **PRICING**

Base Equipment

TL450/1608R	16x8 capacity; includes drivers, central logic, and power	\$3,100
TL450/3216R	32x16 capacity; includes drivers, central logic, and power	4,000
XN450/32PR	Expansion nest for 32 port interfaces, includes driver	1,000
XN450/32LR	Expansion nest for 32 line interfaces, includes driver	1,000

Channel Adapters

CA450/Line	Two EIA interfaces with three bi-directional control signals per interface	240
CA450/Port	Two EIA interfaces with three bi-directional control signals per interface	240
CA450/Line5	Two EIA interfaces with five bi-directional control signals per interface	300
CA450/Port5	Two EIA interfaces with five bi-directional control signals per interface	300
CA450/ACS-CM	Two EIA interfaces with automatic speed recognition capability, three EIA controls	350
CA450/Curr	Two 20/60 ma. interfaces, neutral loops	400
CA450/CACS-C	Two 20/60 ma. interfaces, neutral loops, with automatic speed recognition capability on receipt of Carriage Return	400
CA450/CACS-M	Two 20/60 ma. interfaces, neutral loops, with automatic speed recognition capability on receipt of Memorex compatible codes	400

Spares

CL450/1608	Central logic for TL450/1608R-2400 bps	500
CL450/3216	Central logic for TL450/3216R-2400 bps	500
CL450/1608HS	Central logic for TL450/1608R-9600 bps	500
CL450/3216HS	Central logic for TL450/3216R-9600 bps	500
PS450/5040R	Power supply; +5 vdc at 50 amp., ±12 vdc at 4 amp.	925
PS450/5040AR	Power supply with load sharing capability, same voltages and current capability	1,075

Options

DM450/LF	Manual line finder	500
DM450/LFA	Automatic line finder, 300 bps	500
MG450/ACSBMG	Busy message generator, automatic speed	350

*All prices are for 19-inch relay-rack configurations; contact vendor for prices of enclosures. ■