ITT Courier Virtual Terminal Line Controller (VTLC)

MANAGEMENT SUMMARY

When ITT acquired Courier Terminal Systems in 1978, both the Virtual Terminal Line Controller (VTLC) and Courier's 3270-compatible family of terminals had been successfully marketed for several years.

The VTLC permits the user to configure a network of 3270-type terminal devices with any IBM or compatible mainframe, without requiring a 270X/370X front end or even an Integrated Communications Adapter (ICA). It is directly attached to the byte multiplexer channel of the host, and essentially provides all the functionality of the 370X, at much less cost.

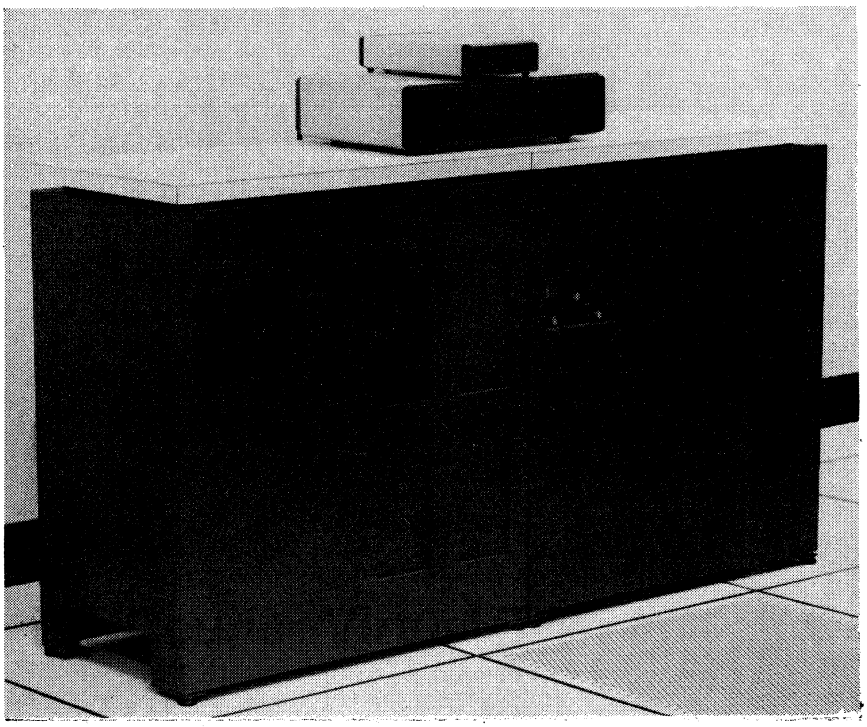
Unlike a 270X or ICA, the VTLC essentially off-loads communications processing from the host, and causes all attached terminal devices, both local and remote, to appear to the host as locally-attached devices. This can result in considerable savings of CPU memory space and processing time, because the portions of BTAM, TCAM, or any other telecommunications access method which control remote communications are not required in the host, as long as communications controllers other than the VTLC are not configured with the VTLC on the same host.

While the VTLC can control an impressive network of 3270-type terminal devices, there are several employment limitations which must be considered. The VTLC is indeed a specialized communications processor; it can support only terminals operating in 3270 emulation, and ➢

A specialized, programmable, front-end communications processor for IBM 360/370, 303X and compatible hosts. The VTLC supports terminal devices operating in IBM 3270 emulation mode, both local and remote. For users requiring 3270-type networks, the VTLC can replace the 370X front end. It completely off-loads remote communications processing from the host and performs independent polling, addressing, virtual call establishment and extensive network diagnostics.

The VTLC supports the physical attachment of up to 32 local terminal devices, and up to 128 remote terminal devices on up to four bisynchronous communications lines. Each line supports BSC transmission, either two- or four-wire, at up to 9600 bps. Either switched or leased facilities can be utilized. Terminal devices may be Courier 2700 series, IBM 3270 series or any 3270-compatible series. However, only 32 devices, both local and remote, can be active simultaneously.

The VTLC is provided as a turnkey system by Courier. A typical VTLC capable of supporting 16 local terminals and two remote lines can be purchased for $16,800, or rented on a one-year lease for $730 per month, including maintenance.



The Courier Virtual Terminal Line Controller (VTLC), is housed in the right cabinet. A cable-attached diskette controller and unit occupies the left cabinet. A Bell 4800 bps modem and line interface is pictured above the processor.

ITT Courier Virtual Terminal Line Controller (VTLC)

remote terminals only via bisynchronous communications lines.

The VTLC will best serve the medium-size system user whose information needs dictate interactive processing in an IBM environment. Many large system users have a hybrid mixture of terminals which use different character codes, line protocols, emulations, etc., and if a VTLC were brought into such an environment, conventional front-end processing equipment and software would also be required to accommodate the non-3270 and non-BSC terminals. Such a configuration probably would not be cost effective.

While data transfer between the VTLC and the host is accomplished at near-normal byte-multiplexer channel transfer rates, communications lines are supported only to a maximum of 9600 bps. If switched lines are used, terminals may automatically dial in to the VTLC, which supports auto-answer modems (Bell 801 and compatible). The VTLC, however, cannot automatically dial out to establish a host-generated link. This would have to be done manually. It should be noted that the VTLC was designed to operate with the ITT Courier 270 family of terminals, and while non-Courier 3270-compatible terminal devices are supported, the user may experience some loss of network diagnostic capability if other terminals are implemented. (See Report C25-547-101 in Volume 2 for more detailed information on Courier 270 Display Systems.)

A VTLC network does not support SNA/SDLC communications. A user who can foresee eventual migration to an SNA/SDLC environment would be incapable of expanding in this direction with the VTLC. Like SNA, the VTLC does permit each terminal operator to access multiple, different applications within the host, but unlike SNA, this capability cannot be expanded to include multiple hosts. The VTLC performs this multi-access function without host involvement. The host believes that the VTLC is controlling 32 dedicated terminals when, in reality, it is dynamically allocating application addresses to its terminals as requested by terminal operators.

Reconfiguration of the network, such as adding a line or terminal, requires a new system generation and IPL. While this is generally performed by ITT Courier personnel as a service call, it may alternately be performed by adequately-trained users. Many network control functions however, may be performed without a new system generation. These include suspension or resumption of communication with a certain application, suspension/resumption of polling and addressing of any network control unit or stand-alone terminal, or deactivation/reactivation of an entire line.

A diskette unit is standard with the VTLC, but is presently used only for IPL of the VTLC, and for recording of network status and error conditions.

CHARACTERISTICS

VENDOR: ITT Courier Terminal Systems, Inc., 1515 West 14th Street, Tempe, Arizona 85281. Telephone (602) 275-7555.

DATE OF ANNOUNCEMENT: June 1976.

DATE OF FIRST DELIVERY: July 1976.

NUMBER INSTALLED TO DATE: 500.

SERVICED BY: ITT Courier Terminal Systems, Inc.

CONFIGURATION

The VTLC main cabinet includes up to five microprocessors, each having 8K bytes of microcoded, dedicated RAM, and 32K bytes of common RAM which may be expanded with a 16K-byte module to 48K bytes. The additional memory module is not user installable, and is included, when required, by the vendor before installation. The microprocessors typically employed are Intel 8080, or similar, and feature a 0.5 microsecond cycle time. About a third of the VTLC memory is dedicated to the operating software; the balance is used for message processing, buffering and queuing.

The minimum VTLC is equipped with a single Local Device Adapter, which supports up to eight locally-attached terminal devices. Up to three additional Local Device Adapters can be added to the VTLC, expanding the local terminal capacity to a system maximum of 32. Local display and printer devices are connected to the VTLC by coaxial cable. Cables may vary in length from 8 to 2,000 feet according to user's requirements.

Two of the local ports may be optionally used for an operator console display and printer. These are used for diagnostics and status displays, and both may still be used for normal on-line operation. The console display can dynamically monitor the VTLC in on-line operation. The operator can call for a network configuration display which identifies terminal devices, control units and lines by real and virtual addresses.

Up to two optional remote line features can be configured per VTLC providing a maximum system capacity of four remote lines. A single remote line feature supports up to two line adapters.

A diskette controller and integrated drive, typically a Shugart unit, is standard with the VTLC. It is independently powered, mounted in a separate cabinet and connected to the VTLC via three ribbon cables. The diskette unit is used for IPL of the VTLC and for recording of status and error information.

A sysgen diskette is employed during the system generation procedure, which is performed with the VTLC in an off-line mode. During this procedure, the network structure and the control unit/device addresses are defined, as well as the parameters which manage message movement such as transmission timeouts and retries, and buffer utilization. Also prescribed at this time are the application accesses which are authorized to each terminal. This security feature limits each terminal to specifically-defined uses. Each terminal may be authorized access to up to eight host application programs.

System generation is typically performed by Courier personnel, but may be subsequently performed by the user. The system tables and network definitions are constructed by assembling a set of system generation macros with appropriately coded parameters. A set of generation programs including an interactive text editor, an assembler, and a file

ITT Courier Virtual Terminal Line Controller (VTLC)

USER REACTION

From the 1978 Datapro user survey of communications processors, and from a list of customers supplied by the vendor, seven users of the Courier VTLC were identified and interviewed. A total of ten VTLC's were represented. All were interfacing IBM mainframes; two IBM 360, and the rest IBM 370, models 135 to 158. The average time that each VTLC had been in use was 14 months.

The majority of these users were utilizing the full, four-line remote capacity of the VTLC, and each was controlling an average of 30 remote terminals. The remote terminals were both multidropped, stand-alone devices, and clusters with remote terminal line controllers. Each VTLC was additionally controlling an average of ten locally-attached terminal devices. The ratings provided by these users were as follows:

	Excellent	Good	Fair	Poor	WA*
Overall satisfaction	4	3	0	0	3.6
Ease of installation	4	3	0	0	3.6
Throughput	4	3	0	0	3.6
Hardware reliability	3	3	1	0	3.3
Promptness of maintenance	1	4	1	1	2.7
Quality of maintenance	2	3	2	0	3.0
Manufacturer's software	2	4	0	0	3.3
Mfr.'s technical support	3	3	1	0	3.3

*Weighted Average on a scale of 4.0 for Excellent.

The ratings indicate an overall satisfaction with the VTLC of from good to excellent. The 3.6 weighted average rates slightly higher than the 3.4 overall satisfaction average obtained from the 1978 Datapro survey of all communications processors users. Ease of installation and throughput of the VTLC was likewise rated highly. Hardware reliability, and manufacturer's software and technical support were rated slightly lower. Promptness and quality of maintenance fared about average.

All of the users had exclusively Courier terminal devices, although the system supports any 3270-compatible devices. All of the users, except two, stated that the VTLC was handling all of their host communications. One user was also employing an ICA, and the other had an IBM 3704. The 3704 user stated that he was gradually phasing out the IBM front end, and planned to eliminate it with no anticipated loss of communications handling capability.

The users offered varied explanations when asked why they had implemented the VTLC. The most frequently cited reasons were, in order of frequency: cost savings over IBM front-end hardware, off-loading of communications processing from the host, and better vendor support. No major difficulties were reported with the VTLC.□

handler compile the operating system network configuration and load it on to the run-time diskette.

IPL is accomplished by simply loading the run-time diskette and pressing a button. A microcoded program automatically clears memory and reads the IPL program and operating network configuration from the diskette. The operator may elect to perform a diagnostic test of each system component at this time, or at any subsequent time. If a failure is detected, the IPL aborts, and a failure report is sent to the console display.

TRANSMISSION SPECIFICATIONS

The VTLC can be configured with none, or up to four remote communications line adapters. Each adapter supports either two- or four-wire, synchronous transmission, and uses the IBM Binary Synchronous (BSC) communications protocol. The EIA RS-232C interface is standard. The character code used is EBCDIC, and transmission speeds of from 2000 to 9600 bps are supported.

If a switched, or dial-in line is used, the VTLC uses a controlled poll and select protocol. An auto-answer feature is optional; call establishment from the VTLC is done manually. For non-switched, or leased lines, communications to remote stand-alone terminals or cluster controllers may be either point-to-point or multipoint.

The line protocol used for remote communications is IBM 3270 BSC, which limits the number of multidropped devices (control units and stand-alone terminals) to 32 per line. With all four lines operating in this mode, a network maximum of 128 remote addressable devices is configurable. This is in addition to the locally-attached device maximum of 32. It should be noted, however, that no more than 32 local and remote devices total can be in communication with host applications at the same time.

The remote network control logic performs polling, to elicit status and input messages, translate commands into valid BSC protocol sequences and execute the same. Transmission errors result in a number of retries; the number is normally seven, but may be varied at system generation time. If the retry count expires, then this persistent failure is recorded on the diskette. Valid input messages are queued for subsequent presentation to the host computer, whereas input from a display terminal not allocated an application address (not defined at system generation time or the terminal is not logged on) results in an appropriate response being transmitted to the terminal.

HOST CONNECTION

The VTLC supports a single connection to the byte multiplexer channel of an IBM 360/370 or compatible processor which is programmed to support IBM 3270 local terminals. Standard connection cables which conform to IBM specifications are available from Courier at no extra charge for leased systems, or as an additional expense with purchased systems.

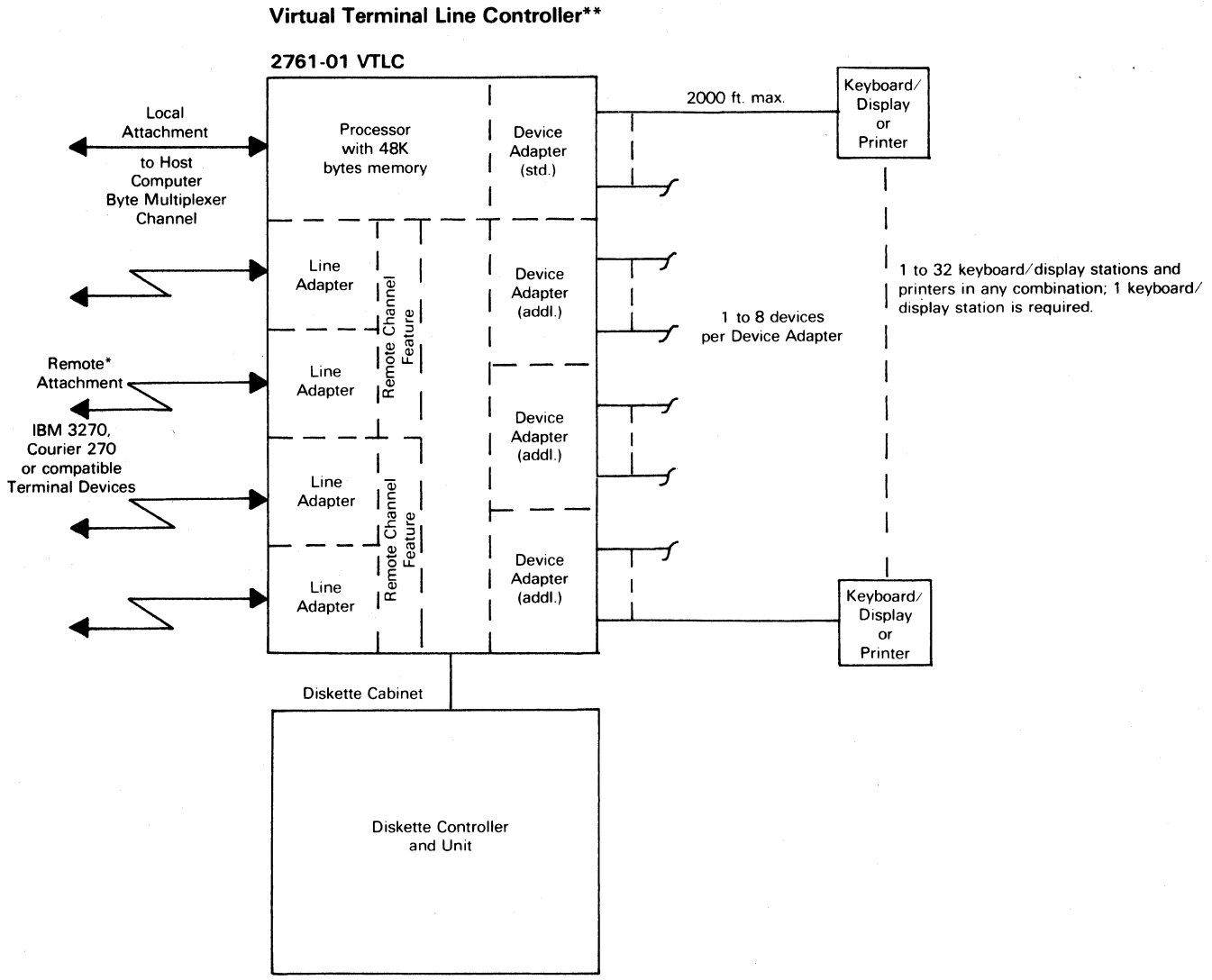
Essentially, interaction between the VTLC and host utilizes the same command sequences as between a host and a local IBM 3270 control unit.

Messages destined for the host are received by the VTLC through either its local or remote terminal control units, edited, and placed in a common queue. Unlike a 3270, however, the VTLC collects, edits and queues messages before issuing an attention status to the host. Therefore, message retrieval time in the VTLC network is transparent to the host.

After receiving and processing the data, the host issues a write command and data stream to the terminal; the VTLC accepts the message and indicates to the host normal completion (i.e., indicates that the message has been successfully transferred to the terminal). Subsequently, the VTLC transmits the message to the terminal. In the event of a trans-

ITT Courier Virtual Terminal Line Controller (VTLC)

Configuration



*Each remote line may support up to 32 stand-alone terminals or cluster control units on leased, multipoint lines; total remote device capacity of 128 per VTLC system.

**No more than 32 devices, local and remote, can be active or logged on to host applications simultaneously.

mission failure, the VTLC takes complete responsibility for attempted recovery and the recording of persistent failures.

SOFTWARE

The VTLC operating software is modular in nature and supports a multi-processing, table-driven system. It is composed of a Channel Interface Program, a Local Network Control Program, Remote Network Control Program and Utility Program. While the user designs and defines the network, and re-sysgens the VTLC to change the network configuration, he does not alter the basic system software. There is, in addition to the above programs, a Monitor Program which is used by Courier servicing personnel to isolate processor malfunctions and effect minor and temporary program changes, but this is generally not accessible to the user except that it is also used for initial system generation.

The Channel Interface Program handles all channel operation and data transfer between the VTLC queues and the host. It is responsible for alerting the host of incoming message traffic, executing valid commands from the host, and presenting initial and ending status.

The Local Network Control Program performs regular polls of the local devices. If an attention message is received from a locally-attached device, the program causes the device's buffer contents to be brought into common memory, where it is edited into a 3270 readability format, and queued. Output messages are taken from queue, expanded into a full size buffer message and transmitted to the appropriate terminal.

The Remote Network Control Program uses the IBM 3270 BSC multipoint data link control to move messages to and from remote terminals/cluster controllers and the VTLC queues.

The Utility Program permits predefined terminals to call for and display error statistics, system utilization and network configuration status. It also provides the functionality wherein terminals log on and log off different host applications. This is done by dynamically allocating constant application addresses to terminals which have variable addresses.

ITT Courier Virtual Terminal Line Controller (VTLC)

Other modules of the Utility Program permit terminals to broadcast messages to certain or all of the other network terminals. Terminal operators may also put in or take out of operation, applications, control units and lines through the Utility Program, as well as perform diagnostic routines and retrieve statistical data from the diskette.

PRICING

The VTLC is available for purchase or on a variable-term lease plan which includes maintenance. A separate maintenance contract is available for purchased systems. The VTLC may be procured as part of a complete system from Courier, which includes terminal devices, necessary interfaces and cables, software programming and technical support. Alternately, the VTLC may be implemented in an existing user network of 3270 or compatible terminal devices.

There are no installation charges. Courier would not provide separate component prices, but did supply the following typical VTLC prices, along with several complete configuration system costs. The configuration prices do not include modems or transmission facilities charges.

	Monthly* Lease	Purchase*** Price	Monthly Maintenance Charge
Basic VTLC; includes interface for eight local terminals, cabinets, diskette controller and unit, cable connections, power supply, logic and software load; no remote line capacity.	$ 370	$ 7,900	$ 89
Same as above, except with two remote lines interface capacity.	700	16,350	120
VTLC, as above, except with interface for 16 local terminals; two remote lines.	730	16,800	120
VTLC, as above, except with interface for 32 local terminals, and four remote lines.	1,150	26,150	151
Small Network Configuration** VTLC, as above, with five local terminals and one remote line supporting a cluster of three remote terminals. Total configuration.	1,240	31,600	270
Medium Network Configuration** VTLC, as above, with 16 local terminals, and two remote lines; one supporting a control unit with three terminals, the other supporting three stand-alone terminals. Total configuration.	1,470	34,500	289
Large Network Configuration** VTLC, as above, with 26 local terminals, and four remote lines. Controller and three terminals on line 1. Three stand-alone terminals on line 2. Controller with six terminals and two stand-alone terminals on line 3. Cluster with six terminals on line 4. Total configuration.	5,350	135,350	840

*Includes maintenance. Based on a one-year lease.

**Does not include modems or communications facilities; includes Courier terminal devices.

***An additional expense of about $100 is incurred for host channel attachment cables, if required. Applies to purchased systems only.■