

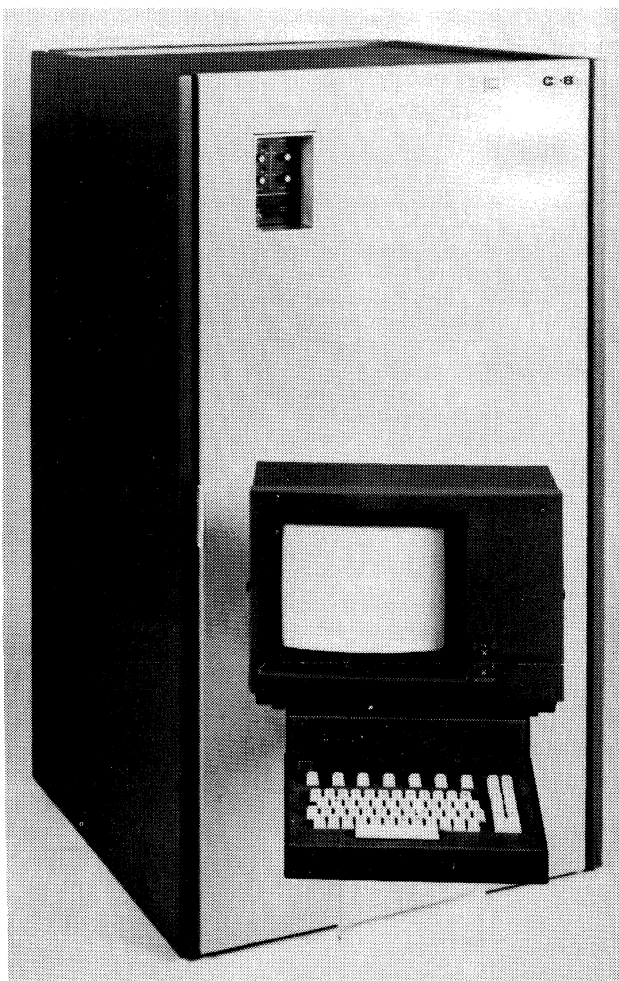
Computer Communications, Inc. (CCI) Communications Processors

MANAGEMENT SUMMARY

UPDATE: *This report is being updated to reflect changes that have occurred since this report was last updated. Information has been added on CCI's Communications Processing Systems (CPS) software. The 1985 user reaction for the CCI communications processors is also included in this report.*

Computer Communications, Inc. (CCI) produces and markets, in addition to its communications processors, remote cluster controllers, message switching systems, and electronic mail systems. In the communications processors area, CCI offers five models.

The company's mainstay is the CC-8 Enhanced Emulation Processor, a turnkey replacement for IBM 270X and 370X front-ends. The CC-80 Enhanced Communications Proces- ➤



CCI's CC-80 offers a wide range of capabilities, from IBM 270X/370X emulation to network controlling. The programmable CC-80 supports up to seven host computers and 240 lines (expandable to 1,232). Software support features include automatic polling and independent line control.

CCI offers, for the IBM and plug-compatible mainframe environments, a series of five communications processors. The series includes both front-end and remote models, ranging in size from the CC-6, which can support two host computers and 32 communications lines, to the CC-80/85, which can support seven host computers and 1,112 communications lines.

FUNCTION: Front-end or remote full-service communications processors; text and facsimile message switching in custom configurations.

HOST COMPUTERS SUPPORTED: IBM and plug-compatible mainframes.

ARCHITECTURE SUPPORTED: Proprietary SNA alternative.

OPERATING SOFTWARE: CCI Network Communications System (NCS) Version 1 or 4; Communications Processing Systems (CPS) software.

COMPETITION: IBM 3705 and 3725; Amdahl 4705; NCR Comten 3600 Series; Memorex; Codex.

PRICE: A CC-8 processor, configured as a front-end to serve 32 asynchronous communications lines plus 32 bisynchronous lines, costs approximately \$70,900.

CHARACTERISTICS

VENDOR: Computer Communications, Inc., 2610 Columbia Street, Torrance, CA 90503. Telephone (213) 320-9101; (800) 421-1178.

DATE OF ANNOUNCEMENT: CC-6—July 1981; CC-8—March 1975; CC-80—October 1974; CC-85—November 1978.

DATE OF FIRST DELIVERY: CC-6—September 1981; CC-8—May 1977; CC-80—May 1975; CC-85—January 1979.

NUMBER INSTALLED TO DATE: CC-6—15; CC-8—180; CC-80—340; CC-85—55.

SERVICED BY: Computer Communications, Inc.

CONFIGURATION

The CC-8 is CCI's base model; all other models in the CCI line are variations on the CC-8 architecture. Therefore, in this report, we will describe the CC-8's configuration in detail, and describe the other models as they differ from the CC-8.

The CC-8 uses a dual bus architecture. The memory bus handles data transfer between the Communications Control Processor (CCP) and main memory, and between memory and the CC-8's connections to host computers and to synchronous communications lines. The character I/O bus ➤

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➤ sor is fundamentally a software upgrade to the CC-8, and functions as a replacement for front-end or remote IBM 3704 or 3705 processors. The CC-85 Advanced Communications Processor is a CC-80 with a faster processor and correspondingly greater capacity. The CC-8R is a CC-8 configured without host attachments, running CC-80 software, and designed to serve as a remote node in networks controlled by CC-80 or CC-85 front-ends. The CC-6 Basic Emulation Processor is a stripped-down, low-end version of the CC-8 with fewer host attachments and without an operator's console. In custom systems, the CC-80 can be configured as a message switch for either text or facsimile transmissions.

CCI processors run under either of two versions of the vendor's Network Communications System. The emulation processors (CC-6 and CC-8) run under NCS-1, a front-end based package that emulates the functions of the IBM 270X/370X, but unlike the IBM counterparts, also performs network control functions that would otherwise require host participation. Options available under NCS-1 include network monitor and line trace functions, a network statistics database, dynamic application switching, IBM 2741 terminal emulation for ASCII terminals, host port selection, X.25 protocol support, and a VM Extension feature that allows users to multiplex a number of IBM 3270-type terminals on a single communications line in spite of the IBM VM operating system's restrictions. NCS-1 supports asynchronous, BSC, Sabre, and X.25 protocols.

CCI's high-end models (CC-80, CC-85, and CC-8R) run under NCS-4, which has all the features of NCS-1 and additionally supports CCI's Intercomputer Communications Protocol (ICP), the trunk protocol for CCI networks. Similar in concept to IBM's SDLC, ICP differs principally from the SNA data link protocol in that it allows the transmission of 15 frames without acknowledgement, and in certain configurations can allow up to 127 unacknowledged frames. SDLC allows seven unacknowledged frames. The larger the number of outstanding frames allowed, the more efficient the protocol for high-delay applications such as satellite transmission.

COMPETITIVE POSITION

Marketing plug-compatible equipment for the IBM environment is a risky business, as companies much larger than CCI have discovered. Any ripple from IBM, be it technical or commercial, can be an earthquake for the rest of the industry. With roughly 90 percent of the market for full-scale, IBM-compatible communications processors (270X/37XX equivalents) belonging to IBM, the other competitors such as NCR Comten, CCI, Amdahl, Memorex, and Codex share the remaining 10 percent.

Each of CCI's direct competitors is much larger than CCI, and most are actual giants. That CCI has established credibility against such competition, and that it indeed continues to sell in such a market, is of significant credit both to the company and to its product. CCI's communications processors have found their greatest acceptance in two ➤

▶ handles data transfer between the processor and the CC-8's connections to asynchronous communications lines.

On the network side, like most communications processors, the CC-8 uses a two-tiered hardware arrangement. A given communications line attaches to a one-line or two-line line interface unit (line set) on the CC-8. In turn, one or more line sets attach to a line interface base that controls communications between the line sets and the processor.

The BSC Line Interface Base, which supports lines with the binary synchronous communications protocol, can transfer data two characters at a time directly into memory through the memory bus without processor intervention. Another microprocessor-based DMA controller supports the Sabre line protocol (common in the airline industry), and an X.25 interface. Asynchronous devices can be attached via the Asynchronous Line Interface Base (Type 1 LIB), which connects to the character I/O bus. The character I/O bus, in turn, is connected to the CCP. Data presented to the character I/O bus is transferred to memory by way of the CCP under processor interrupt control. There are 32 interrupt levels; each level can be associated with eight of the character I/O bus addressable slots. Of the 256 addressable slots, 16 are used for internal attachments, such as the CCP leaving 240 slots for attachment of external devices, such as communications lines.

Each BSC Line Interface Base can support up to four two-line BSC line sets. Each Asynchronous Interface Base can support up to eight single-line asynchronous line sets. The entire CC-8 can support up to 30 Line Interface Bases.

The CC-8 system includes an operator's console with a color CRT, and can include up to 256K bytes of diskette storage and up to 40M bytes of hard disk storage.

The CC-6 is a low-end version of the CC-8. It can handle up to 32 synchronous or asynchronous communications lines. The CC-6 does not include either an operator's console or disk storage. It can attach to a maximum of two host computers.

The CC-80 is a larger, modified version of the CC-8. In its basic configuration, the CC-80 handles the same 240 lines as its smaller cousin. The CC-80, however, is expandable to multiprocessor configurations that can support up to 1,112 lines. It can attach to a maximum of seven host computers, and supports CCI's Intercomputer Communications Protocol, an SDLC-like discipline for CCI-to-CCI trunk communications.

The principal hardware difference between the CC-80 and the CC-8 is the Line Interface Processor, which provides another layer of control between the unit's central processor and the Line Interface Bases. The Line Interface Processor relieves the CC-80's central processor of many processing chores on the communications line side of its operation, allowing for the unit's greater capacity. Each Line Interface Processor in the CC-80 can handle up to 30 asynchronous Line Interface Bases, for a total of 240 lines. In its basic configuration, the CC-80 contains a single Line Interface Processor; a fully expanded CC-80 can support four additional Line Interface Processors.

The CC-8R is a CC-8 with no host connections, designed to run exclusively as a remote concentrator in CC-80- or CC-85-controlled networks. It comes in two configurations: the "A" configuration supports up to 8 BSC or ICP lines and up to 56 asynchronous lines; and the "B" configuration supports up to 16 BSC or ICP lines and up to 48 asynchronous lines.

▶ The CC-85 features the same basic configuration as the CC-80, but uses a central processor four times faster than ▶

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▷ sophisticated communications markets: the airline and securities industries.

CCI has weathered the financial problems it faced over the last few years and in August 1984, under an Interim Final Decree, the company was revested with all of its assets and was no longer under the supervision of the court. CCI continues to move ahead with new products such as its CCI 8400 Superband T1 processor.

ADVANTAGES AND RESTRICTIONS

The technical advantages of the CCI communications processors fall into three categories: host-independence, capacity, and reliability. The CCI processor, unlike its IBM counterpart, handles all network processing chores without involving the host. Among CCI's major competitors, only NCR Comten's 3600 Series also operates in this manner. Regarding capacity, a single CC-80 front-end can support up to seven hosts; only the IBM 3725 and the NCR Comten 3690, both much newer, more sophisticated, and more expensive, can support more (each supports eight hosts). The CCI machines can also support a larger number of communications lines than can comparable configurations of competing processors.

The CCI processors' maturity as a product line gives them an edge in reliability. The vendor had ironed the bugs out of these machines before many of their competitors' had left the laboratory.

CCI's excellent reputation for service represents a great advantage. The company is well-known for quick response and close attention to hardware and software problems. Thanks to such attention, CCI has enjoyed a large number of repeat sales. However, the company's staff reductions over the last three years, along with its shift in direction to newer products, leave legitimate cause for concern. One hopes that a company with such a reputation among its customers will work hard to keep it. CCI has reaffirmed its commitment to customer service, and has noted that none of its staff reductions affected this critical area. CCI has recently begun adding to staff.

The CCI processors do not support SNA. Users already committed to SNA configurations would likely not find a place for a CCI machine in their networks. CCI prefers to think of its strategy as an alternative to SNA, but as both users and other vendors adopt IBM's architecture in increasing numbers, CCI may have to join them to stay competitive.

USER REACTION

When Datapro conducted its 1985 Network User Survey, six users of CC-80/85 communications processors respond- ▷

▷ the CC-80's. Like the CC-80, the CC-85 base configuration can support up to 240 lines. The maximum configuration supports up to 864 lines.

CONNECTION TO HOST COMPUTER: The host channel adapter attaches to the host's I/O channel on the host side, and to the CCI processor's I/O processor on the front-end side. The CC-6 and CC-8 have one I/O processor apiece, and can attach only to the byte multiplexer channel of the IBM or plug-compatible host. The CC-80 and CC-85 can support two I/O processors, and can attach to the host's byte or block multiplexer channel or to the selector channel. Each I/O processor on the CC-80 or CC-85 is able to support up to seven host attachments, but in configurations with two I/O processors, only one can be active at a time; the second serves as a backup.

TRANSMISSION SPECIFICATIONS

CCI offers three Line Interface Bases for support of communications lines.

The Type 1 LIB, which attaches to the character I/O bus, will support up to eight asynchronous, full- or half-duplex, lines with speeds up to 9600 bps. Each Type 1 LIB services up to eight Type 1A Line Sets which, in turn, each accommodate one.

The BSC LIB, which attaches both to the character I/O bus and to the memory bus, will support up to eight binary synchronous, full- or half-duplex lines with speeds up to 230.4K bps. Two types of line sets are available for the BSC LIB. For speeds up to 9600 bps, the BSC Line Set can support up to two lines. For speeds up to 230.4K bps, the Wideband Line Set can support up to two lines. The BSC LIB requires four of either type of Line Set to implement the maximum eight lines. Although data is transferred directly from the BSC LIB to the memory bus, the BSC LIB is also attached to the character I/O bus. When a message is completely transferred, the LIB can trigger a processor interrupt via its character I/O bus attachment. The interrupt informs the processor that a message has been transferred.

The X.25 Sabre LIB operates similarly, supporting full-duplex X.25/Sabre protocols.

SOFTWARE

The Network Communications System (NCS) is the operating software that drives the CCI communications processors. NCS is a family of modular and compatible software systems that offer different modes of operation. NCS is compiled and generated on the user's host processor.

NCS-1, used on the CC-6 or CC-8, provides IBM 270X/370X emulation plus additional features including system control and monitoring, system diagnostics, utilities, and support for a wide variety of line protocols, line speeds, and terminal types. Also included are two terminal-initiated application selection programs (one for point-to-point terminal connections and the other for multidropped lines) which permit a terminal operator to access up to 16 different applications selectively in up to four different hosts.

NCS-4, the high-end CCI software, drives the CC-80, CC-8R, or CC-85 as an independent network node, although still in an IBM 270X emulation environment. The CC-80 or CC-85 may function as either a local controller or remote concentrator. The CC-8R may function only as a remote concentrator. NCS-4 is specially designed for intercommunication between CCI processors, and uses a special CCI Intercomputer Communication Protocol (ICP). ▷

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ed, with a total of 21 units among them. Their ratings were as follows:

	Excellent	Good	Fair	Poor	WA*
Overall performance	2	2	2	0	3.0
Ease of installation	1	4	1	0	3.0
Ease of operation	1	3	1	1	2.7
Ease of expansion	0	1	3	1	2.0
Hardware reliability	2	1	3	0	2.8
Quality of manufacturer's software/firmware	0	3	3	0	2.5
Ease of programming	0	1	3	0	2.3
Quality of manufacturer's maintenance service	0	3	2	1	2.3
Quality of manufacturer's technical support	0	3	2	1	2.3

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

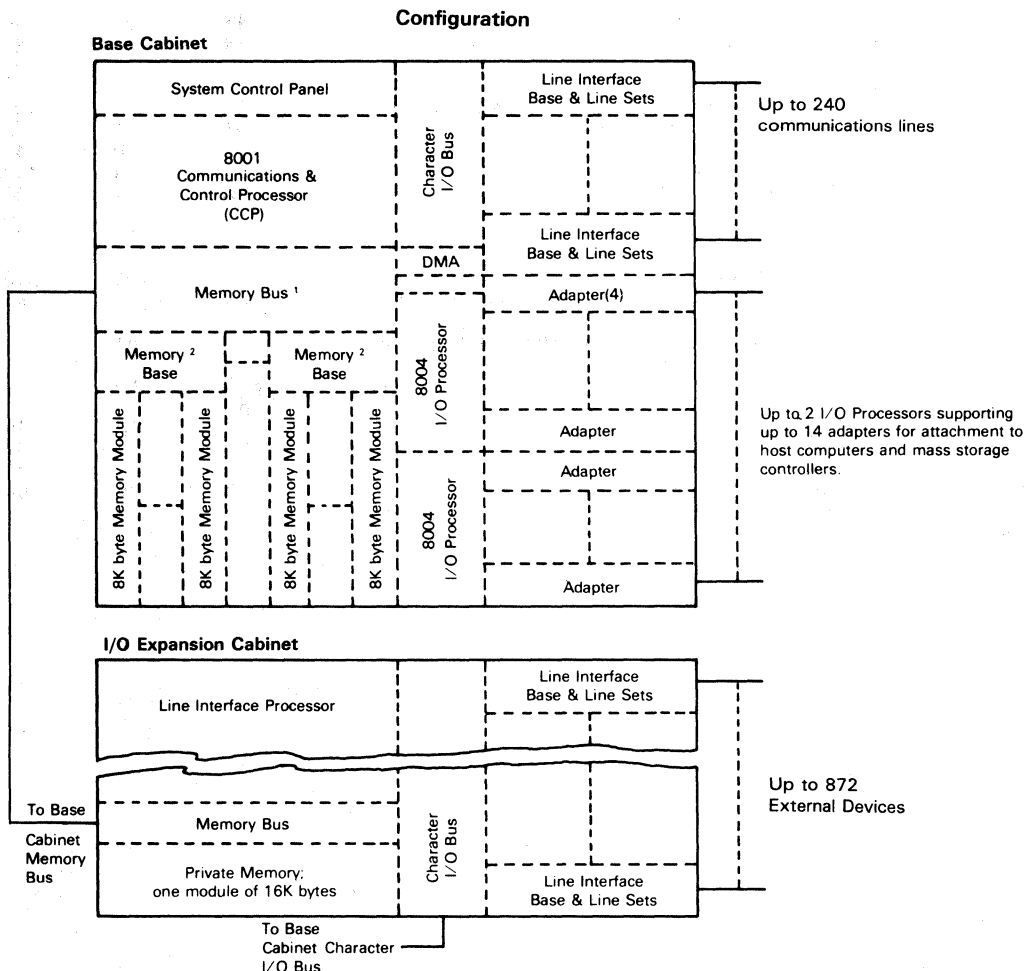
We were unable to contact individual users of CCI communications processors for additional comments. □

For customized message switching systems, CCI uses its Communications Processing Systems (CPS) Software. Driving the CC-80/85, CPS controls the transmission, validation, queuing, routing, reception, and accounting of message traffic between terminals located anywhere within a network. Standard features include multiple terminal and group addressing, message prioritizing, alternate routing, time and date stamping, message logging and retrieval, checkpoint/recovery, and a complete set of on-line supervisory control and monitoring features.

A full complement of system support programs is provided to permit system generation, assembly, and link editing of the packages.

PRICING

CCI communications processors are available for monthly rental, for purchase, or on a two-, three-, four-, or five-year lease. Lease and rental agreements include maintenance; a separate maintenance agreement is available for purchased systems. CCI provided us with pricing only on the front-end configuration of the CC-8.



(1) Memory Bus can support access for up to 16 direct access devices, including CCPs, IOPs, and BSC LIBs, extendable to 64.

(2) Up to 8 Memory Bases can be attached to the Memory Bus; each Memory Base supports 8 Memory Modules; each module contains 8192 bytes.

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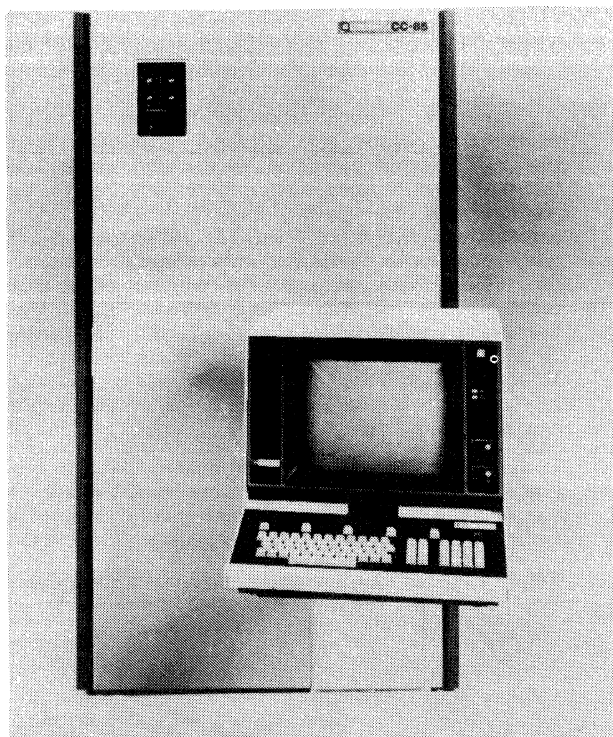
EQUIPMENT PRICES

		Monthly Charge				
		Rental (\$)	2-year Lease (\$)	5-year Lease (\$)	Purchase (\$)	Monthly Maint. (\$)
CC-8F	Basic Processor with 64K memory, channel adapter, 9600 bps async modification, 1 async line interface base, 1 async line set, diskette drive and controller, modem bypass adapter, cabinet, and color CRT operator's console	1,624	1,384	1,137	39,984	296
813	Channel adapter	285	243	200	6,900	60
813-2	High-speed channel adapter	285	243	200	6,900	60
813-2 BMO	Burst mode option	17	14	11	500	0
815	Line adapter chassis	61	52	43	1,520	11
816	Line adapter extender	73	62	56	1,300	33
817	Memory bus extender	276	235	193	7,110	43
817-1	Memory bus access	126	107	88	2,610	43
828	Buffered interface base, BSC	91	78	65	2,070	24
828-W	Buffered interface base, 230.4	91	78	65	2,070	24
829	Line set, BSC	32	27	22	625	12
830	Line set, wideband	125	107	89	2,760	36
831	Auto-dial adapter	105	89	73	2,640	19
831-1	Line set, ACU	4	4	4	125	0
835-M	Line set, 9600 bps async	22	19	16	600	3
835	Line interface base, async	100	86	74	2,400	22
836	Line set, async	8	7	6	180	3
838	Reverse Channel (4 lines)	43	38	35	963	12
839	Dual code for 829	39	33	27	840	12
840	Dual code for 830	39	33	27	840	12
867	Diskette & controller, single sided (256K bytes)	260	222	183	7,800	60
875	Master configuration switch	97	83	69	2,730	7
876	I/O processor switch	210	179	147	5,970	12
877A	Memory bus switch	210	179	147	5,970	12
878	Dual access controller	92	78	64	2,580	7
880	Modem bypass adapter	6	5	4	180	0
882	Two-channel switch	131	112	93	3,270	24
890-5	CC-8F expansion cabinet with power	313	267	219	7,750	60
891-3	Redundant power supply for CC-8F base processor cabinet	120	103	84	2,950	24
891-5	Redundant power supply for CC-8F expansion cabinet	78	67	55	1,690	24
892	CC-40 system console (color)	211	180	148	5,160	43
894	System alarm panel	94	81	68	2,480	12
894-1	System alarm panel access	22	20	18	327	12
9124	X.25 line controller	281	257	192	8,500	76
9125	X.25 line set	93	85	64	2,800	22
9134	CCITT 56K bps line set	79	76	64	3,000	36

*Includes maintenance.

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The CC-85 is CCI's top-of-the-line communications processor. It features a central processor four times faster than those found in other CCI models, and includes a color CRT operator's console.

MANAGEMENT SUMMARY

Computer Communications, Inc. (CCI) markets five models of communications processors. The company's mainstay is the CC-8 Enhanced Emulation Processor, a turnkey replacement for IBM 270X and 370X front-ends. The CC-80 Enhanced Communications Processor is fundamentally a software upgrade to the CC-8, and functions as a replacement for front-end or remote IBM 3704 or 3705 processors. The CC-85 Advanced Communications Processor is a CC-80 with a faster processor and correspondingly greater capacity. The CC-8R is a CC-8 configured without host attachments, running CC-80 software, and designed to serve as a remote node in networks controlled by CC-80 or CC-85 front-ends. The CC-6 Basic Emulation Processor is a stripped-down, low-end version of the CC-8 with fewer host attachments and without an operator's console. In custom systems, the CC-80 can be configured as a message switch for either text or facsimile transmissions.

CCI processors run under either of two versions of the vendor's Network Communications System. The emulation processors (CC-6 and CC-8) run under NCS-1, a front-end based package that emulates the functions of the IBM 270X/370X, but unlike the IBM counterparts, also performs network control functions that would otherwise require host participation. Options available under NCS-1

CCI produces a series of five communications processors for IBM and plug-compatible mainframe environments. The series includes both front-end and remote models, ranging in size from the CC-6, which can support two host computers and 32 communications lines, to the CC-80, which can support seven host computers and 1112 communications lines.

FUNCTION: Front-end or remote full-service communications processors; text and facsimile message switching in custom configurations.

HOST COMPUTERS SUPPORTED: IBM and plug-compatible mainframes.

ARCHITECTURE SUPPORTED: Proprietary SNA alternative.

OPERATING SOFTWARE: CCI Network Communications System (NCS) version 1 or 4.

COMPETITION: IBM 3705 and 3725; Amdahl 4705; NCR Comten 3600 Series; Memorex; Codex.

PRICE: A CC-8 processor, configured as a front-end to serve 32 asynchronous communications lines plus 32 bisynchronous lines costs approximately \$70,900.

CHARACTERISTICS

VENDOR: Computer Communications, Inc., 2610 Columbia Street, Torrance, CA 90503. Telephone (213) 320-9101.

DATE OF ANNOUNCEMENT: CC-6—July 1981; CC-8—March 1975; CC-80—October 1974; CC-85—November 1978.

DATE OF FIRST DELIVERY: CC-6—Info. not available; CC-8—May 1977; CC-80—May 1975; CC-85—January 1979.

NUMBER INSTALLED TO DATE: CC-6—12; CC-8—320; CC-80—170; CC-85—45.

CONFIGURATION

The CC-8 is CCI's base model; all other models in the CCI line are variations on the CC-8 architecture. Therefore, in this report, we will describe the CC-8's configuration in detail, and describe the other models as they differ from the CC-8.

The CC-8 uses a dual bus architecture. The memory bus handles data transfer between the communications control processor (CCP) and main memory, and between memory and the CC-8's connections to host computers and to synchronous communications lines. The character I/O bus handles data transfer between the processor and the CC-8's connections to asynchronous communications lines.

On the network side, like most communications processors, the CC-8 uses a two-tiered hardware arrangement. A given

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➤ include network monitor and line trace functions, a network statistics data base, dynamic application switching, IBM 2741 terminal emulation for ASCII terminals, host port selection, X.25 protocol support, and a VM Extension feature that allows users to multiplex a number of IBM 3270-type terminals on a single communications line in spite of the IBM VM operating system's restrictions. NCS-1 supports asynchronous, BSC, Sabre, and X.25 protocols.

CCI's high-end models (CC-80, CC-85, and CC-8R) run under NCS-4, which has all the features of NCS-1 and additionally supports CCI's Intercomputer Communications Protocol (ICP), the trunk protocol for CCI networks. Similar in concept to IBM's SDLC, ICP differs principally from the SNA data link protocol in that it allows the transmission of 15 frames without acknowledgement, and in certain configurations can allow up to 127 unacknowledged frames. SDLC allows seven unacknowledged frames. The larger the number of outstanding frames allowed, the more efficient the protocol for high-delay applications such as satellite transmission.

COMPETITIVE POSITION

Marketing plug-compatible equipment for the IBM environment is a risky business, as companies much larger than CCI have discovered. Any ripple from IBM, be it technical or commercial, can be an earthquake for the rest of the industry. According to the vendor-supplied installed base information gathered in Datapro's 1983 communications processor survey, roughly 90 percent of the market for full-scale, IBM-compatible communications processors (270X/37XX equivalents) belongs to IBM. NCR Comten, CCI, Amdahl, Memorex, and Codex share the remaining 10 percent.

Each of CCI's direct competitors is much larger than CCI, and most are actual giants. That CCI has established credibility against such competition, and that it indeed continues to sell in such a market, is of significant credit both to the company and to its product. CCI's communications processors have found their greatest acceptance in two sophisticated communications markets: the airline and securities industries.

The depressed course of those industries, especially the airlines, throughout the late 1970s contributed heavily to CCI's troubles. In November of 1980, faced with growing debt and slumping sales, the company entered Chapter 11.

Over the ensuing three years, CCI remained in business, and demonstrated a continuing commitment to stay in business despite its circumstances. CCI finally received court approval in August 1983, for a plan under which it would raise \$10 million through the sale of new shares. CCI will leave Chapter 11 in January 1984.

To weather its financial troubles, CCI instituted a number of policies that may affect its strategy in the marketplace, if not its survival in business. The company reduced its staff by roughly one half. At the same time, it has entered a new and less risky market—that for IBM-compatible terminal controllers.

➤ communications line attaches to a one-line or two-line line interface unit (line set) on the CC-8. In turn, one or more line sets attach to a line interface base that controls communications between the line sets and the processor.

The BSC Line Interface Base, which supports lines with the binary synchronous communications protocol, can transfer data two characters at a time directly into memory through the memory bus without processor intervention. Another microprocessor-based DMA controller supports the Sabre line protocol (common in the airline industry), and an X.25 interface. Asynchronous devices can be attached via the Asynchronous Line Interface Base (Type 1 LIB), which connects to the character I/O bus. The character I/O bus, in turn, is connected to the CCP. Data presented to the character I/O bus is transferred to memory by way of the CCP under processor interrupt control. There are 32 interrupt levels; each level can be associated with eight of the character I/O bus addressable slots. Of the 256 addressable slots, 16 are used for internal attachments, such as the CCP leaving 240 slots for attachment of external devices, such as communications lines.

Each BSC Line Interface Base can support up to four two-line BSC line sets. Each Asynchronous Interface Base can support up to eight single-line asynchronous line sets. The entire CC-8 can support up to 30 Line Interface Bases.

The CC-8 system includes an operator's console with a color CRT, and can include up to 256K bytes of diskette storage and up to 40M bytes of hard disk storage.

The CC-6 is a low-end version of the CC-8. It can handle up to 32 synchronous or asynchronous communications lines. The CC-6 does not include either an operator's console or disk storage. It can attach to a maximum of two host computers.

The CC-80 is a larger, modified version of the CC-8. In its basic configuration, the CC-80 handles the same 240 lines as its smaller cousin. The CC-80, however, is expandable to multiprocessor configurations that can support up to 1112 lines. It can attach to a maximum of seven host computers, and supports CCI's Intercomputer Communications Protocol, an SDLC-like discipline for CCI-to-CCI trunk communications.

The principal hardware difference between the CC-80 and the CC-8 is the Line Interface Processor, which provides another layer of control between the unit's central processor and the Line Interface Bases. The Line Interface Processor relieves the CC-80's central processor of many processing chores on the communications line side of its operation, allowing for the unit's greater capacity. Each Line Interface Processor in the CC-80 can handle up to 30 asynchronous Line Interface Bases, for a total of 240 lines. In its basic configuration, the CC-80 contains a single Line Interface Processor; a fully expanded CC-80 can support four additional Line Interface Processors.

The CC-8R is a CC-8 with no host connections, designed to run exclusively as a remote concentrator in CC-80- or CC-85-controlled networks. It comes in two configurations: the "A" configuration supports up to 8 BSC or ICP lines and up to 56 asynchronous lines; and the "B" configuration supports up to 16 BSC or ICP lines and up to 48 asynchronous lines.

The CC-85 features the same basic configuration as the CC-80, but uses a central processor four times faster than the CC-80s. Like the CC-80, the CC-85 base configuration can support up to 240 lines. The maximum configuration supports up to 864 lines.

➤ CONNECTION TO HOST COMPUTER: The host channel adapter attaches to the host's I/O channel on the host ➤

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➤ ADVANTAGES AND RESTRICTIONS

The technical advantages of the CCI communications processors fall into three categories: host-independence, capacity, and reliability. The CCI processor, unlike its IBM counterpart, handles all network processing chores without involving the host. Among CCI's major competitors, only NCR Comten's 3600 Series also operates in this manner. Regarding capacity, a single CC-80 front-end can support up to seven hosts; only the IBM 3725 and the NCR Comten 3690, both much newer, more sophisticated, and more expensive, can support more (each supports eight hosts). The CCI machines can also support a larger number of communications lines than can comparable configurations of competing processors.

The CCI processors' maturity as a product line gives them an edge in reliability. The vendor had ironed the bugs out of these machines before many of their competitors' had left the laboratory.

CCI's excellent reputation for service represents a great advantage. The company is well-known for quick response and close attention to hardware and software problems. Thanks to such attention, CCI has enjoyed a large number of repeat sales. However, the company's staff reductions over the last three years, along with its shift in direction to newer products, leave legitimate cause for concern. One hopes that a company with such a reputation among its customers will work hard to keep it. CCI has reaffirmed its commitment to customer service, and has noted that none of its staff reductions affected this critical area. CCI has recently begun adding to staff.

The CCI processors do not support SNA. Users already committed to SNA configurations would likely not find a place for a CCI machine in their networks. CCI prefers to think of its strategy as an alternative to SNA, but as both users and other vendors adopt IBM's architecture in increasing numbers, CCI may have to join them to stay competitive.

USER REACTION

When Datapro conducted its 1983 Network User Survey, three CC-80 users responded, with a total of 21 units among them. Their ratings were as follows:

	Excellent	Good	Fair	Poor	WA*
Overall performance	2	1	0	0	3.7
Ease of installation	1	2	0	0	3.3
Ease of operation	1	2	0	0	3.3
Ease of expansion	0	1	2	0	2.3
Hardware reliability	0	3	0	0	3.0
Quality of manufacturer's software/firmware	1	1	1	0	3.0
Ease of programming	0	2	1	0	2.7
Quality of manufacturer's maintenance service	0	3	0	0	3.0
Quality of manufacturer's technical support	0	0	3	0	2.0

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

➤ side, and to the CCI processor's I/O processor on the front-end side. The CC-6 and CC-8 have one I/O processor apiece, and can attach only to the byte multiplexer channel of the IBM or plug-compatible host. The CC-80 and CC-85 can support two I/O processors, and can attach to the host's byte or block multiplexer channel or to the selector channel. Each I/O processor on the CC-80 or CC-85 is able to support up to seven host attachments, but in configurations with two I/O processors, only one can be active at a time; the second serves as a backup.

TRANSMISSION SPECIFICATIONS

CCI offers three Line Interface Bases for support of communications lines.

The Type 1 LIB, which attaches to the character I/O bus, will support up to eight asynchronous, full- or half-duplex, lines with speeds up to 9600 bps. Each Type 1 LIB services up to eight Type 1A Line Sets which, in turn, each accommodate one.

The BSC LIB, which attaches both to the character I/O bus and to the memory bus, will support up to eight binary synchronous, full- or half-duplex lines with speeds up to 230.4K bps. Two types of line sets are available for the BSC LIB. For speeds up to 9600 bps, the BSC Line Set can support up to two lines. For speeds up to 230.4K bps, the Wideband Line Set can support up to two lines. The BSC LIB requires four of either type of Line Set to implement the maximum eight lines. Although data is transferred directly from the BSC LIB to the memory bus, the BSC LIB is also attached to the character I/O bus. When a message is completely transferred, the LIB can trigger a processor interrupt via its character I/O bus attachment. The interrupt informs the processor that a message has been transferred.

The X.25 Sabre LIB operates similarly, supporting full-duplex X.25/Sabre protocols.

SOFTWARE

The Network Communications System (NCS) is the operating software that drives the CCI communications processors. NCS is a family of modular and compatible software systems that offer different modes of operation. NCS is compiled and generated on the user's host processor.

NCS-1, used on the CC-6 or CC-8, provides IBM 270X/370X emulation plus additional features including system control and monitoring, system diagnostics, utilities, and support for a wide variety of line protocols, line speeds and terminal types. Also included are two terminal-initiated application selection programs (one for point-to-point terminal connections and the other for multidropped lines) which permit a terminal operator to access up to 16 different applications selectively in up to four different hosts.

NCS-4, the high-end CCI software, drives the CC-80, CC-8R, or CC-85 as an independent network node, although still in an IBM 270X emulation environment. The CC-80 or CC-85 may function as either a local controller or remote concentrator. The CC-8R may function only as a remote concentrator. NCS-4 is specially designed for intercommunication between CCI processors, and uses a special CCI Intercomputer Communication Protocol (ICP).

➤ A full complement of system support programs is provided to permit system generation, assembly, and link editing of the packages.

Computer Communications, Inc. (CCI) Communications Processors

➤ To supplement these ratings, we contacted two CC-80 users by phone. One was a corporate service bureau in the West, and the other was an information distributor on the East Coast. One used three CC-80s, with the first serving as a front-end for two IBM mainframes, the second serving as a dedicated, standalone message switch, and the third serving as a hot standby for the other two. The other used four CC-80s as front-end co-processors for a small IBM mainframe used in conjunction with a minicomputer.

Both were primarily BSC users, but one also supported some asynchronous transmission through the CC-80.

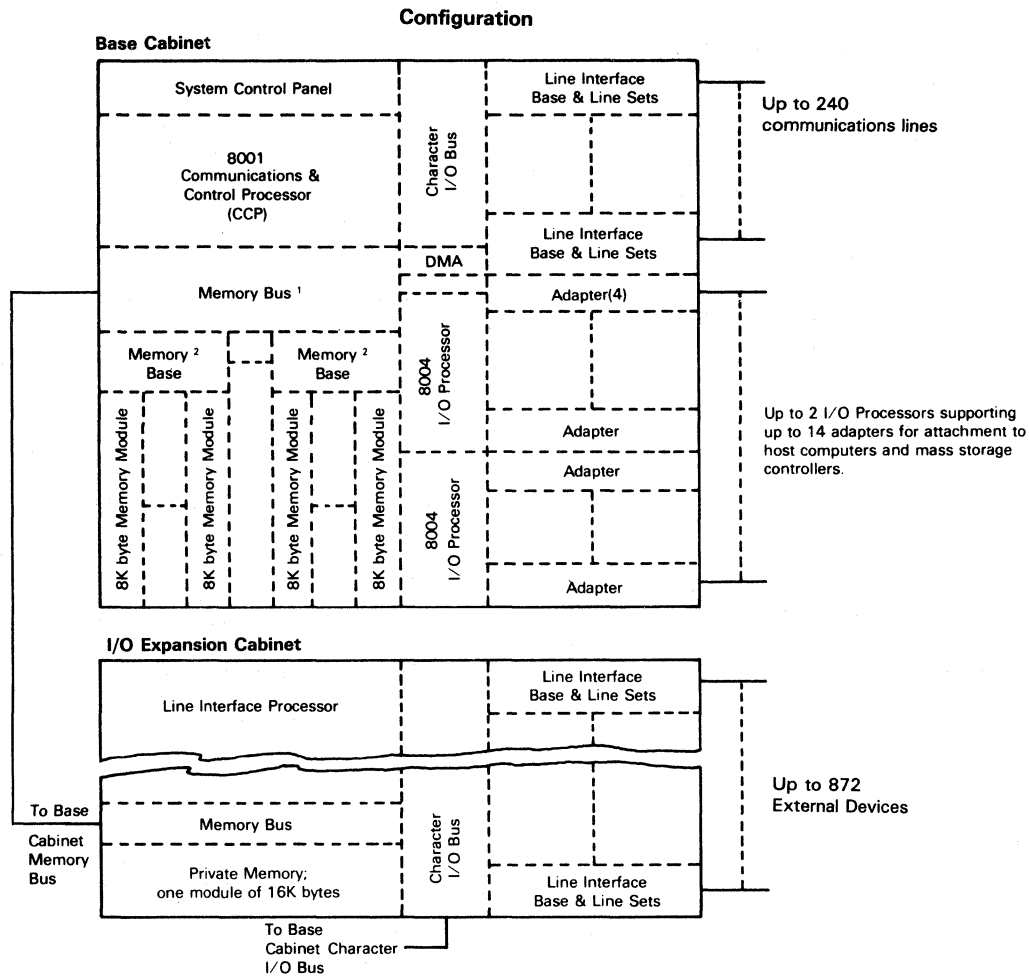
Both listed CCI's support personnel as the greatest advantage of owning the CC-80. They described these personnel as exceptionally cooperative and polite, and eager to do a good job. However, one user noted that CCI service personnel had been fewer and harder to reach during the company's recent troubles. That user recommended that any potential CC-80 buyers check carefully on the availability of service. Among other advantages, the users cited ease of installation and reliability.

Both users were dissatisfied with the CC-80's ease of programming. For special applications, customers must use a special, CCI-proprietary assembler language that both users found troublesome to learn. One user also complained about the reliability of replacement parts for the CC-80.

Overall, however, both users gave the CC-80 average-to-high marks. Both would recommend the device to other potential buyers. Datapro was unable to contact any users of models other than the CC-80, so no user reaction for those machines appears in this report. □

➤ PRICING

CCI communications processors are available for monthly rental, for purchase, or on two-, three-, four-, or five-year lease. Lease and rental agreements include maintenance; a separate maintenance agreement is available for purchased systems. CCI provided us with pricing only on the front-end configuration of the CC-8.



(1) Memory Bus can support access for up to 16 direct access devices, including CCPs, IOPs, and BSC LIBs, extendable to 64.

(2) Up to 8 Memory Bases can be attached to the Memory Bus; each Memory Base supports 8 Memory Modules; each module contains 8192 bytes.

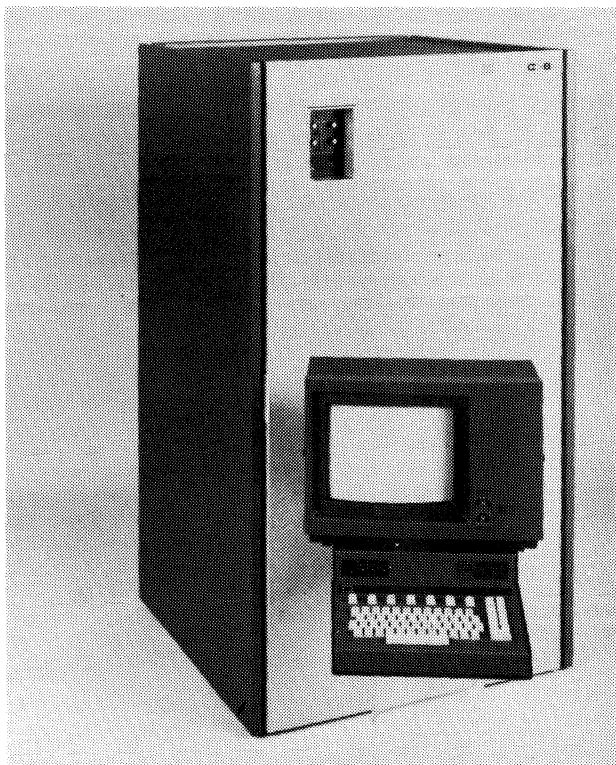
Computer Communications, Inc. (CCI) Communications Processors

		<u>Monthly Charge</u>				
		<u>Rental</u>	<u>2-year Lease</u>	<u>5-year Lease</u>	<u>Purchase</u>	<u>Monthly Maint.</u>
CC-8F	Basic Processor with 64K memory, channel adapter, 9600 bps async modification, 1 async line interface base, 1 async line set, diskette drive and controller, modem bypass adapter, cabinet, and color CRT operator's console	\$ 1,624	\$ 1,384	\$ 1,137	\$ 39,984	\$ 296
813	Channel adapter	285	243	200	6,900	60
813-2	High-speed channel adapter	285	243	200	6,900	60
813-2 BMO	Burst mode option	17	14	11	500	0
815	Line adapter chassis	61	52	43	1,520	11
816	Line adapter extender	73	62	56	1,300	33
817	Memory bus extender	276	235	193	7,110	43
817-1	Memory bus access	126	107	88	2,610	43
828	Buffered interface base, BSC	91	78	65	2,070	24
828-W	Buffered interface base, 230.4	91	78	65	2,070	24
829	Line set, BSC	32	27	22	625	12
830	Line set, wideband	125	107	89	2,760	36
831	Auto-dial adapter	105	89	73	2,640	19
831-1	Line set, ACU	4	4	4	125	0
835-M	Line set, 9600 bps async	22	19	16	600	3
835	Line interface base, async	100	86	74	2,400	22
836	Line set, async	8	7	6	180	3
838	Reverse Channel (4 lines)	43	38	35	963	12
839	Dual code for 829	39	33	27	840	12
840	Dual code for 830	39	33	27	840	12
867	Diskette & controller, single sided (256K bytes)	260	222	183	7,800	60
875	Master configuration switch	97	83	69	2,730	7
876	I/O processor switch	210	179	147	5,970	12
877A	Memory bus switch	210	179	147	5,970	12
878	Dual access controller	92	78	64	2,580	7
880	Modem bypass adapter	6	5	4	180	0
882	Two channel switch	131	112	93	3,270	24
890-5	CC-8F expansion cabinet with power	313	267	219	7,750	60
891-3	Redundant power supply for CC-8F base processor cabinet	120	103	84	2,950	24
891-5	Redundant power supply for CC-8F expansion cabinet	78	67	55	1,690	24
892	CC-40 system console (color)	211	180	148	5,160	43
894	System alarm panel	94	81	68	2,480	12
894-1	System alarm panel access	22	20	18	327	12
9124	X.25 line controller	281	257	192	8,500	76
9125	X.25 line set	93	85	64	2,800	22
9134	CCITT 56K bps line set	79	76	64	3,000	36

* Includes maintenance. ■



Computer Communications, Inc. (CCI) CC-80 and CC-8 Communications Processors



The CC-80 Enhanced Communications Processor offers capabilities ranging from IBM 270X/370X emulation to network controlling. A four-color CRT serves as the system supervisor/monitor console.

MANAGEMENT SUMMARY

Computer Communications, Inc. (CCI) has been involved in the data communications industry since the company's formation in 1966. The current senior member of the CCI line of communications processors is the CC-80 Enhanced Communications Processor. The CC-80, which was first delivered to customers in 1975, is an upgraded successor to the now-defunct CC-70 controller, which was introduced in 1970. The CC-8 Enhanced Emulation Processor, also covered in this report, is a simplified low-end version of the CC-80. The CC-85 Advanced Communications Processor (see Report C13-170-201) is CCI's top-of-the-line product.

The software operating system of all CCI processors is the Network Communications System (NCS). All major communications applications performed by the CCI processors—including IBM 270X/370X front-end emulation, networking, concentration, and message switching—are controlled via the NCS. The operator interfaces with the CCI system through CCI's four-color CRT control console.

The CC-80 can perform a variety of functions, from basic 270X/370X emulation to complex communications network controlling. The CC-80 can accommodate up to

A programmable replacement for the IBM 370X. Vendor-supplied software is available to drive the CC-80 in 270X emulation, enhanced 370X emulation, remote concentration, or stand-alone message switching (including electronic mail).

A CC-80 front end can support up to 1,232 communications lines, and up to 14 host computer channel attachments. IBM BSC, X.25, and SABRE protocols are supported, as well as asynchronous transmission. A simplified version of the CC-80, the CC-8, can support up to 240 communications lines.

A CC-8 with 64K bytes of memory, a flexible disk unit, a 4-color CRT control console, and line attachments/interfaces for 32 asynchronous lines can be purchased for \$58,740, or leased for \$2,355 per month, including maintenance. CCI markets its processors as turnkey systems.

CHARACTERISTICS

VENDOR: Computer Communications, Inc., 2610 Columbia Street, Torrance, California 90503. Telephone (213) 320-9101.

DATE OF ANNOUNCEMENT: CC-80—October 1974; CC-8—March 1975.

DATE OF FIRST DELIVERY: CC-80—May 1975; CC-8—May 1977.

NUMBER DELIVERED TO DATE: CC-80—185; CC-8—205.

CONFIGURATION

The CC-80 communications processor with vendor-supplied software will provide front-end processing for up to 1,232 communications lines attached to as many as 14 host computers. The system is especially adapted to operate as a front-end IBM 360/370 and compatible mainframes. Synchronous lines, with speeds up to 230.4K bps and using either Binary Synchronous Communications (BSC) or SABRE protocols, and asynchronous lines, with speeds up to 9600 bps using start/stop protocol, are supported. When handling BSC transmissions, the CC-80 offers a sustained throughput rate of over 200,000 characters per second, with peaks of up to 500,000 characters per second.

With CCI-supplied software, the CC-80 can emulate an IBM 270X or an IBM 370X. Combining two or more CC-80s and using a CCI-supplied software package, a front-end/message switching system is created that is referred to as the CCI-8000 system. Such systems can share memory and mass storage. Up to eight CC-80s can share the same memory or mass storage.

The CC-8 is a simplified, emulation version of the CC-80.

**Computer Communications, Inc. (CCI)
CC-80 and CC-8 Communications Processors**

➤ 240 communications lines (expandable to 1,232 lines) in a mixture of line speeds and protocols. Up to seven host computers can be supported simultaneously. Other system features allow for a single terminal to selectively access up to 16 different application programs in up to 4 different hosts, for independent front-end processing, and for automatic polling for multipoint lines. Mass storage support from 40 to 320 million bytes is supported.

The CC-8, a simplified version of the CC-80, is designed for operation as a front-end to one or more IBM mainframes. The CC-8 offers 270X/370X emulation, and can accommodate up to 240 lines in a mixture of speeds and protocols with a sustained synchronous throughput of over 200,000 characters per second. Other features include concurrent multiple host support, automatic transmission rate detection, diagnostics, polling, terminal emulation, and dynamic application selection. CCI also supplies an upgraded version of the CC-8, the CC-8R, for remote concentration applications.

CCI has recently added electronic mail capabilities to their Message Switching System software. The Electronic Mail System (EMS) provides for both private and public electronic mailbox service. EMS provides for both short-term and long-term message retention, and allows users to edit, send, read, answer, reroute, and purge messages, as well as to obtain a summary of messages contained in a particular mailbox.

In September 1981, CCI announced that its X.25 interface had been certified for use on Tymnet and Telenet packet-switching data networks. This X.25 support allows a user to attach an existing asynchronous terminal population to Telenet and Tymnet networks.

USER REACTION

In the 1981 survey of communications controller/processor users, Datapro received responses from 10 CCI users, five of whom reported on the CC-80, and five on the CC-8. To supplement these responses, telephone interviews were conducted with one user of each model during December 1981. Each model is rated separately in the following tables.

CC-80:

	Excellent	Good	Fair	Poor	WA*
Overall satisfaction	1	5	0	0	3.2
Ease of installation	1	3	0	2	2.5
Throughput	2	3	0	0	3.4
Hardware reliability	4	1	1	0	3.5
Promptness of maintenance	2	2	1	0	3.2
Quality of maintenance	2	2	1	0	3.2
Software	1	2	3	0	2.7
Technical support	0	0	4	2	1.7

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

One user had had his CC-80 since 1974, two users since 1977, and three since 1978. A total of 19 processors were ➤

➤ **CC-80 ARCHITECTURE**

The fundamental elements resident in the basic cabinet of the CC-80 include a Communications Control Processor (CCP), a Character I/O Bus, a Memory Bus, an I/O Processor, and a System Control Panel.

Central to the CC-80 architecture is the Memory Bus that accommodates attachment of 16 direct access controllers, expandable to 64. In a single CC-80 system, the Communications and Control Processor, one or two I/O Processors, and one or more of direct access type Base Line interfaces can be attached to the Memory Bus. Additionally, up to eight Memory Buses can be attached, each supporting up to eight Memory Modules. Each Memory Module contains 8,192 bytes of memory to yield a maximum of 524,288 bytes within the cabinet. Each of the two I/O Processors can be attached to a host computer or to a mass storage controller. Data received through the adapters can be built up into blocks by the I/O Processor and transferred directly into memory via the Memory Bus without processor intervention.

The BSC Line Interface Base, which supports lines with binary synchronous communications protocol, can transfer data two characters at a time directly into memory via the Memory Bus without processor intervention. Another DMA microprocessor-based controller supports SABRE line protocol, and services up to 64 full-duplex lines in a manner similar to the BSC LIB. Other external devices are attached to asynchronous Line Interface Bases that are connected to the Character I/O Bus instead of the Memory Bus. The Character I/O Bus, in turn, is connected to the CCP. Data presented to the Character I/O Bus is transferred to memory by way of the CCP under processor interrupt control. There are 32 interrupt levels; each level can be associated with 8 of the Character I/O Bus addressable slots. Of the 256 addressable slots, 16 are used for internal attachments, such as the CCP leaving 240 slots for attachment of external devices, such as communications lines.

Line Interface Processors (LIP) are also an important part of the CC-80 architecture. A dedicated CPU, the LIP is capable of supporting 248 asynchronous lines in a mixture of speeds. A CC-80 is capable of supporting four LIPs extending its total line handling capacity to over 1200 lines.

The I/O Expansion Cabinet permits expansion of the number of external devices that can be physically attached up to a total of 832. The same cabinet can accommodate 16K bytes of memory; memory in this cabinet is called Private Memory because it can be accessed only by one processor in a multiple CC-80 system.

CONNECTION TO HOST COMPUTER

A Channel Adapter is required for attachment of each host computer line to the I/O Processor. Since each I/O Processor can accommodate seven adapters, the Two I/O Processors permitted in one CC-80 system can physically support 14 host attachments. However, only one adapter per I/O Processor can be active at any given instant.

TRANSMISSION SPECIFICATIONS

Three Line Interface Bases are offered for support of communications lines.

The Type 1 LIB, attached to the Character I/O Bus, will support up to eight asynchronous, full- or half-duplex, lines with speeds up to 9600 bps. Eight Type 1A Line Sets can be serviced; each Line Set accommodates one of the eight lines.

The BSC LIB, attached both to the Character I/O Bus and to the Memory Bus, will support up to 8 synchronous, full- ➤

Computer Communications, Inc. (CCI) CC-80 and CC-8 Communications Processors

reported on, and all but one user's processor access multiple hosts. All of the CC-80s are being used as front-end processors. Host systems identified included IBM 370X, 303X, and Amdahl V6 and V7. All of the users reported that their CC-80s were running under NCS 1.3 or 1.4. Each of the CC-80s were handling an average of 85 lines.

CC-8:

	Excellent	Good	Fair	Poor	WA*
Overall satisfaction	3	2	1	0	3.3
Ease of installation	2	1	2	1	2.7
Throughput	3	3	0	0	3.5
Hardware reliability	4	1	1	0	3.5
Promptness of maintenance	4	0	1	1	3.2
Quality of maintenance	3	0	3	0	3.0
Software	2	2	2	0	3.0
Technical support	1	1	2	2	2.2

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

Two of the users had had their CC-8s since 1979, while the remainder of the CC-8s had been installed in 1980. A total of nine processors were reported (five of the users had a single CC-8, while one user had four). All but two of the user's processors access a single host. As with the CC-80s, the principal application for the CC-8s is front-end processing. Host systems identified included IBM 370X, 303X, and Amdahl V7. NCS 1.4 was mentioned most frequently as the operating system. The average number of communications lines handled by each processor was 27.

As was mentioned previously, Datapro conducted telephone interviews with two of the users. The first user contacted was a large eastern university using two CC-80s. The university had been using them since 1978. The host system is an IBM 370/158. Each processor handles approximately 50 lines each. The user praised the hardware itself, but reported some software problems. "The software runs well," he stated, "but when changes or updates are needed, we have trouble getting ahold of people." He added that the software updates which they received from CCI were sometimes "vague."

The second user interviewed was a southeastern retailer. This user had nothing but praise for his CC-8, which has been installed for about a year. The processor accesses multiple hosts, including an IBM 360/65 and a 370/148. The CC-8 handles 8 lines, and services a large number of POS terminals. The user mentioned in particular the high degree of reliability that his company had experienced with the CC-8, stating that in a year the CC-8 had only been down "for about an hour." □

or half-duplex, binary synchronous lines with speeds up to 230.4K bps. Two types of Line Sets are available for the BSC Line Interface Base. For speeds up to 9600 bps, the BSC Line Set can be utilized to support up to 2 lines. For speeds up to 230.4K bps, the WB Line Set can be utilized to support up to 2 lines. The BSC LIB requires four of either type of Line Set to implement the maximum eight lines. Although data is transferred directly from the BSC LIB to the Memory

Bus, the BSC LIB is also attached to the Character I/O Bus. When a message is completely transferred, the LIB can trigger a processor interrupt via its Character I/O Bus attachment. The interrupt informs the processor that a message requiring handling has been transferred.

The X.25/SABRE LIB operates in a comparable manner, servicing full-duplex X.25/SABRE protocols.

SOFTWARE

The Network Communications System (NCS) is the disk-based operating software that drives the CCI communications processors. NCS is actually a family of modular and compatible software systems which offer very different modes of operations. NCS is compiled and generated on the users host processor.

NCS-1 provides IBM 270X/370X emulation with additional features including system controlling and monitoring, system diagnostics, utilities, and support for a wide variety of line protocols, line speeds and terminal types. Also included are two terminal-initiated application selection programs (one for point-to-point terminal connections and the other for multidropped lines) which permit a terminal operator to selectively access up to 16 different applications in up to four different hosts.

NCS-2, the next version, causes the CC-80 to perform as a true, independent front-end processor. The IBM (or compatible) host is essentially relieved of network control and management, which is moved to the network itself. NCS-2 also serves as a base for a comprehensive message-switching system. NCS-2 enhanced the CC-80's line handling capacity to over 1,000 lines, and features increased multiprocessor support.

NCS-4, the high-end of the CCI software, drives the CC-80 as an independent network node, although still in an IBM 270X emulation environment. The CC-80 may function as either a local controller or remote concentrator. NCS-4 is specially designed for intercommunication between CCI processors, and uses a special CCI intercomputer communication protocol.

A full complement of system support programs are provided to permit system generation, assembly, and link editing of the packages.

COMPONENTS

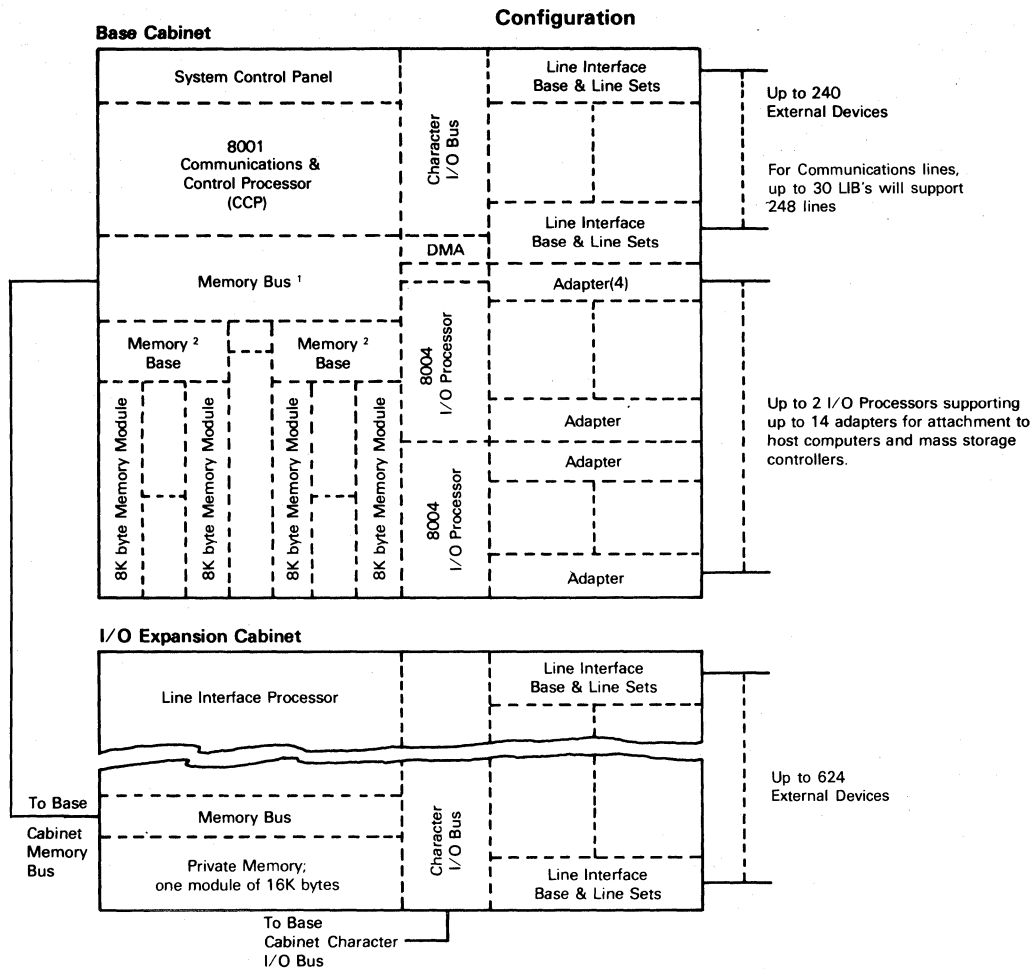
COMMUNICATIONS AND CONTROL PROCESSOR: A 16-bit (2-byte) word processor with a cycle time of 360 nanoseconds. Each I/O Processor features a data transfer rate of approximately one million characters per second. Memory in the basic cabinet has a cycle time of 520 nanoseconds. Private Memory has a cycle time of 180 nanoseconds. The maximum memory capacity in the basic cabinet is 512K bytes; the Private Memory is 16K bytes.

PERIPHERALS: CCI provides various peripherals, including a 40 megabyte disk unit with an 850K byte per second transfer rate, a 300-lpm printer, a 120-cps paper tape reader, a 300-cpm card reader, a magnetic tape unit, a flexible disk unit, and a color display monitor.

PRICING

CCI communications processor systems are available for purchase or on a two, three, four, or five-year lease, which includes maintenance. A separate maintenance contract is available for purchased systems. CC-8 systems are additionally available on a month to month rental basis. ▶

Computer Communications, Inc. (CCI) CC-80 and CC-8 Communications Processors



- (1) Memory Bus can support access for up to 16 direct access devices, including CCP's, IOP's, and BSC LIB's, extendable to 64.
- (2) Up to 8 Memory Bases can be attached to the Memory Bus; each Memory Base supports 8 Memory Modules; each module contains 8192 bytes.
- (3) Each I/O Processor accommodates 7 Adapters for a system total of 14. Adapters support attachment of CPU's and random access mass storage. Throughput considerations limit the number of CPU's attachable to 11. Only one device per I/O processor can be active at a time.

		Monthly Charge*	Purchase	Monthly Maint.
		3-year lease		
CC-80	Basic Processor with 32K of memory	\$1,345	\$68,000	\$226
8004	I/O Processor	124	5,200	44
CC-8	Basic Processor with 32K of memory	1,224	39,840	272
Memory				
8006A	Memory Base, Single Access	165	7,425	55
8008A	Memory Module, Single Access, 8K bytes	23	1,250	9
8017	Memory Bus Extender	175	7,000	39
8010**	Memory Module, Private, 16K bytes	360	11,280	50
Host Interfaces				
8013	Channel Adapter for IBM 360/370	190	8,500	55
8081-1	Two-by-one IBM 360/370 Multiplexer Channel Switch	178	5,400	33
8081-2	Two-by-two IBM 360/370 Multiplexer Channel Switch	260	8,000	50
8082	Two Channel Switch	80	3,750	22

*Includes monthly maintenance.
**Not applicable to CC-8.

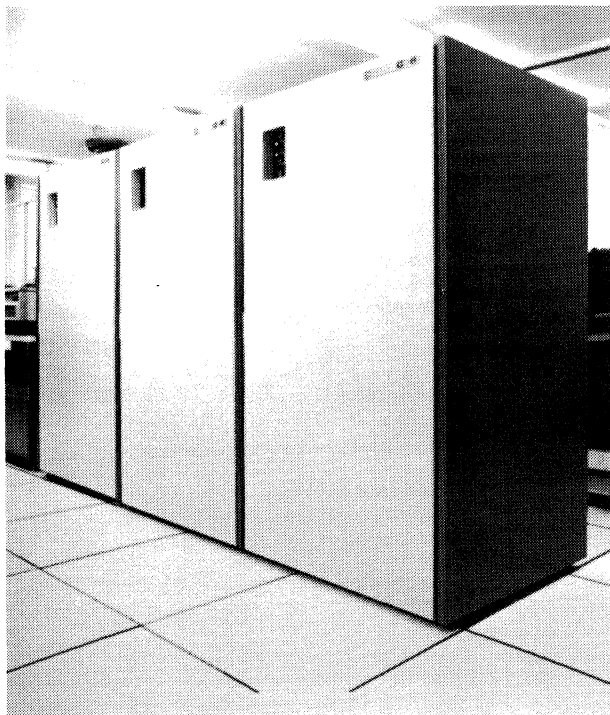
Computer Communications, Inc. (CCI)
CC-80 and CC-8 Communications Processors

		<u>Monthly Rental*</u> <u>3-year lease</u>	<u>Purchase</u>	<u>Monthly</u> <u>Maint.</u>
Communications Interfaces				
8028	Buffered Interface Base, Synchronous	75	3,200	22
8029	Line Set, Synchronous	25	1,800	11
8030	Line Set, WB	65	3,000	33
8035	Line Interface Base, Type 1A	69	1,650	20
8036	Line Set, Asynchronous	5	200	2
8037	Line Set, Synchronous	10	320	2
8038	Line Set, Reverse Channel	20	800	11
8031	Auto Dial Adapter Base	65	3,000	17
8031n	ACU adapter	2	75	—
Peripherals				
8050	Line Printer Controller	150	5,000	39
8051	Line Printer; 300 lpm	300	10,500	105
8053	Paper Tape Reader Controller	90	3,450	17
8054	Paper Tape Reader, 120 cps	50	950	11
8056	Card Reader Controller	60	2,850	28
8057	Card Reader, 300 cpm	125	5,500	83
8059	Magnetic Tape Unit Controller	345	13,500	45
8060	Magnetic TApe Unit	305	8,500	65
8071	Floating Head Disk Controller	390	15,500	132
8072	Floating Disk Drive and Access	315	12,500	94
8067	Flexible Disk Unit and Controller	235	7,800	50
8092	CC40M System Monitor (Color Display)	125	3,800	39
Features				
8075	Master Configuration Switch	69	2,100	6
8090	Expansion Cabinet	180	5,400	55
8091	Redundant Power Option for Expansion Cabinet	100	3,800	22
8076	IOP Switch	150	5,000	11
8077	Memory Bus Switch	150	5,000	11
8078	Dual Access I/O Controller Switch	65	2,500	6
8080	Modem ByPass Adapter	5	150	—
8094	System Alarm Panel	62	2,480	11

*Includes monthly maintenance.

**Not applicable to CC-8.■

Computer Communications, Inc. (CCI) CC-80 Family Communications Processors



Multiple CC-80's may be combined to form a communications system with shared memory and mass storage. Such combined systems, which offer enormous throughput and backup redundancy, run on tailored CCI software and are offered as turnkey systems.

MANAGEMENT SUMMARY

Computer Communications, Inc. (CCI), an established and profitable manufacturer of communications processors, owes its success to the CC-80 line of IBM-compatible front ends. The CC-80, first delivered in May 1975, was an upgraded successor to the CC-70 controller, which was first introduced in June 1970.

While directed entirely at the IBM 270X/370X replacement market, CCI elected to widen the scope of the CC-80 by also offering the CC-8, a simplified low-end version of the CC-80, and the high-end CCI-8000, which is typically a multiple CC-80 configuration dedicated to applications such as message switching. Not one to rest on its laurels, CCI introduced the CC-85 in January 1979, a high-performance upgrade of the CC-80 which offers increased capacity and speed (and may be field-upgraded from an existing CC-80).

While the CC-80 can accommodate over 1,000 communications lines (depending, of course, on speed, protocol mix, etc.), the low-end CC-8 can support up to 240 lines. An upgraded version of the CC-8 has also been announced. Designated the CC-8R, it is designed primarily for remote concentration applications, in environments where a CC-80/85 front end is operating at the host site.

A programmable replacement for the IBM 370X with added functions and capabilities. Vendor-supplied software is available to drive the CC-80 in 270X emulation, NCP emulation, remote concentration or stand-alone message switching.

A CC-80 front end can support up to 1,232 communications lines, and up to 14 host computer channel attachments. IBM BSC and SDLC protocols are supported, as well as asynchronous transmission. A simplified version of the CC-80, the CC-8, can support up to 240 communications lines.

A CC-8 with 48K bytes of memory and line attachments/interfaces for 32 asynchronous lines can be purchased for \$52,750, or leased for \$1,014 per month, including maintenance. CCI markets its processors as turnkey systems.

CHARACTERISTICS

VENDOR: Computer Communications, Inc., 2610 Columbia Street, Torrance, California 90503. Telephone (213) 320-9101.

DATE OF ANNOUNCEMENT: CC-80—October 1974; CC-8—March 1975; CCI-8000—October 1974.

DATE OF FIRST DELIVERY: CC-80—May 1975; CC-8—May 1975; CCI-8000—July 1976.

NUMBER DELIVERED TO DATE: CC-80—120; CC-8—50, CCI-8000—15.

CONFIGURATION

The CC-80 communications processor with vendor-supplied software will provide front-end processing for up to 1,232 communications lines attached to as many as 14 host computers. The system is especially adapted to operate as a front-end IBM 360/370 and compatible mainframes. Synchronous lines, with speeds up to 230.4K bps and using either Binary Synchronous Communications (BSC) or SDLC protocols, and asynchronous lines, with speeds up to 9600 bps using start/stop protocol, are supported. When handling BSC transmissions, the CC-80 offers a sustained throughput rate of over 200,000 characters per second, with peaks of up to 500,000 characters per second.

With CCI-supplied software, the CC-80 can emulate an IBM 270X or an IBM 370X. Combining two or more CC-80's and using a CCI-supplied software package, a front-end/message switching system is created that is referred to as the CCI-8000 system. Such systems can share memory and mass storage. Up to eight CC-80's can share the same memory or mass storage.

The CC-8 is a simplified, emulation version of the CC-80.

**Computer Communications, Inc. (CCI)
CC-80 Family Communications Processors**

➤ The CC-8 and CC-8R (as well as the CC-80 and C-85) support most common IBM terminal devices including the 1030, 1950, 2260/2848, 2265/2845, 2740, 2741, 2770, 2780, 3270, 3735, 3770, 3780 and 3790. Support is also provided for remote Systems/3, /7, /32, 1130, Teletype Models 28, 32, 33 and 35, as well as CCI's CC-40 display terminals. Support includes polling on multidropped lines, and auto-dial/auto-answer capabilities.

In the ongoing debate on the master/slave approach versus the distributed approach to network design, CCI's CC-80 casts a solid vote for a master/slave network. In the master/slave approach, relegating the communications line handling to a front-end processor offers dramatic throughput capabilities. Substantiating this capability of the master/slave approach is the clear-cut reaction users surveyed had to the CC-80's throughput capabilities.

USER REACTION

From the Datapro Survey of Communications Processors conducted in the fall of 1978, three users of the CC-80 were identified. All had multiple systems; a total of ten CC-80's were represented in the ratings below. Each had been in operation an average of 21 months.

All of the CC-80 users indicated that their processors were employed as channel-attached front ends, and all were running under CCI's NCS version 1.3, the 270X emulation package. The mainframes were IBM System/370, models 155 and larger, and one Amdahl V6. The hosts were operating with a wide variety of telecommunications access methods, ranging from VM/CMS to T/CAM. Each of the CC-80's was handling an average of 148.5 lines, with each line supporting an average of 2.1 attached terminals/devices. The ratings were as follows:

	Excellent	Good	Fair	Poor	WA*
Overall satisfaction	1	2	0	0	3.3
Ease of installation	1	1	1	0	3.0
Throughput	2	1	0	0	3.7
Hardware reliability	2	1	0	0	3.7
Promptness of mlt's. maint.	0	2	1	0	2.7
Quality of mfr's. maint.	1	1	1	0	3.0
Mfr's. software	1	0	2	0	2.7
Mfr's technical support	0	2	1	0	2.7

*Weighted Average based on 4.0 for Excellent.

Some of the users were also contacted by phone in order to determine their reasons for acquiring CCI processors. Primary reasons given were; functional advantages over the 3705 such as dynamic reconfiguration and increased throughput for emulation mode operation, and general dissatisfaction with their existing communications processing equipment. All of the interviewed users stated that their networks were predominately made up of voice grade BSC and asynchronous lines, but indicated that upward migration including the introduction of SDLC lines and terminals was anticipated.

➤ **CC-80 ARCHITECTURE**

The fundamental elements resident in the basic cabinet of the CC-80 include a Communications Control Processor (CCP), a Character I/O Bus, a Memory Bus, an I/O Processor, and a System Control Panel.

Central to the CC-80 architecture is the Memory Bus that accommodates attachment of 16 direct access controllers, expandable to 64. In a single CC-80 system, the Communications and Control Processor, one or two I/O Processors, and one or more of direct access type Base Line interfaces can be attached to the Memory Bus. Additionally, up to eight Memory Bases can be attached, each supporting up to eight Memory Modules. Each Memory Module contains 8,192 bytes of memory to yield a maximum of 524,288 bytes within the cabinet. Each of the two I/O Processors can support up to seven Adapters. Each Adapter can be attached to a host computer or to a mass storage controller. Data received through the adapters can be built up into blocks by the I/O Processor and transferred directly into memory via the Memory Bus without processor intervention.

The BSC Line Interface Base, which supports lines with binary synchronous communications protocol, can transfer data two characters at a time directly into memory via the Memory Bus without processor intervention. Another DMA, microprocessor-based controller supports SDLC/SABRE line protocols, and services up to 64 full-duplex lines in a manner similar to the BSC LIB. Other external devices are attached to asynchronous Line Interface Bases that are connected to the Character I/O Bus instead of the Memory Bus. The Character I/O Bus, in turn, is connected to the CCP. Data presented to the Character I/O Bus is transferred to memory by way of the CCP under processor interrupt control. There are 32 interrupt levels; each level can be associated with 8 of the Character I/O Bus addressable slots. Of the 256 addressable slots, 16 are used for internal attachments, such as the CCP leaving 240 slots for attachment of external devices, such as communications lines.

Line Interface Processors (LIP) are also an important part of the CC-80 architecture. A dedicated CPU, the LIP is capable of supporting 248 asynchronous lines in a mixture of speeds. A CC-80 is capable of supporting four LIPs extending its total line handling capacity to over 1200 lines.

The I/O Expansion Cabinet permits expansion of the number of external devices that can be physically attached up to a total of 832. The same cabinet can accommodate 16K bytes of memory; memory in this cabinet is called Private Memory because it can be accessed only by one processor in a multiple CC-80 system.

CONNECTION TO HOST COMPUTER

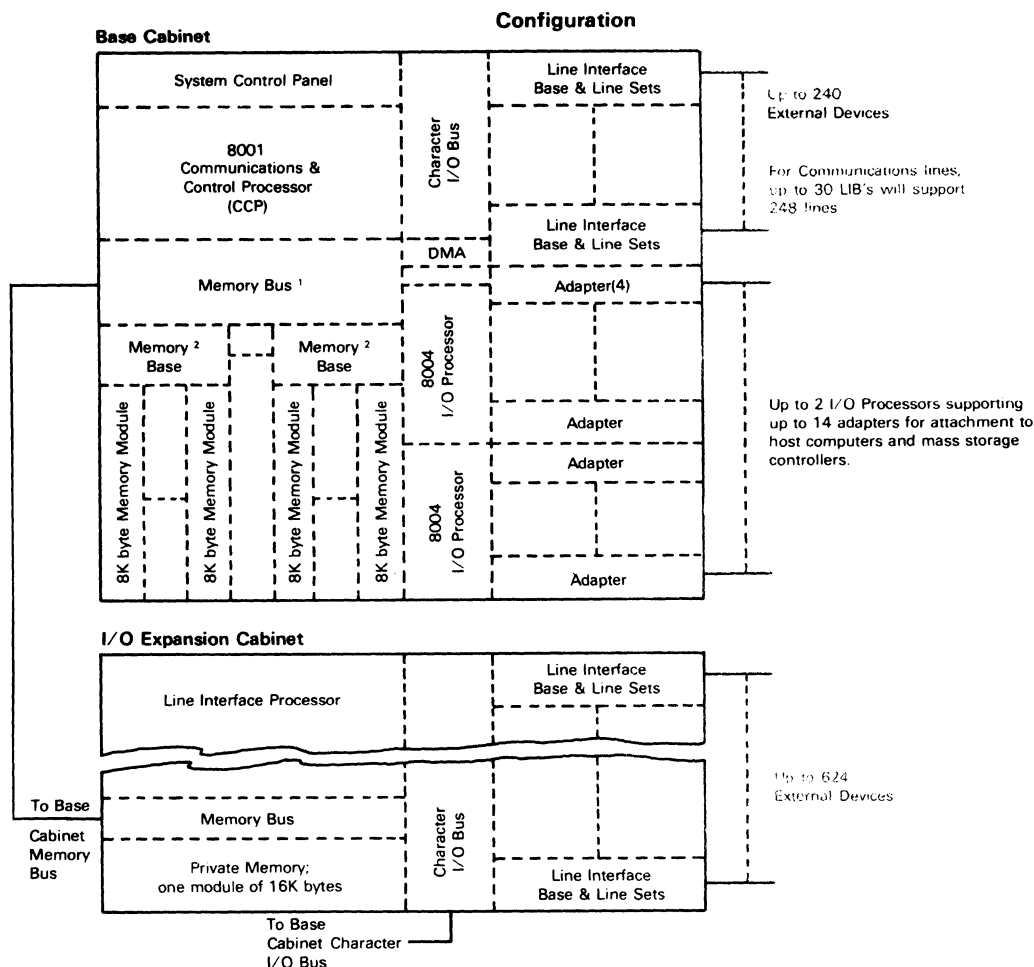
A Channel Adapter is required for attachment of each host computer line to the I/O Processor. Since each I/O Processor can accommodate seven adapters, the two I/O Processors permitted in one CC-80 system can physically support 14 host attachments. However, only one adapter per I/O Processor can be active at any given instant.

TRANSMISSION SPECIFICATIONS

Three Line Interface Buses are offered for support of communications lines.

The Type 1 LIB, attached to the Character I/O Bus, will support up to eight asynchronous, full- or half-duplex, lines with speeds up to 9600 bps. Eight Type 1A Line Sets can be serviced; each Line Set accommodates one of the eight lines.

Computer Communications, Inc. (CCI) CC-80 Family Communications Processors



(1) Memory Bus can support access for up to 16 direct access devices, including CCP's, IOP's, and BSC LIB's, extendable to 64.

(2) Up to 8 Memory Bases can be attached to the Memory Bus; each Memory Base supports 8 Memory Modules; each module contains 8192 bytes.

(3) Each I/O Processor accommodates 7 Adapters for a system total of 14. Adapters support attachment of CPU's and random access mass storage. Throughput considerations limit the number of CPU's attachable to 11. Only one device per I/O processor can be active at a time.

➤ Regard for the CCI hardware, reliability and throughput was exceptionally high, as the ratings indicate, although several problems concerning software were specifically noted. One user summarized by saying that the software, while reliable, does not offer some features that are provided by other IBM-compatible front-end manufacturers. □

➤ The BSC LIB, attached both to the Character I/O Bus and to the Memory Bus, will support up to 8 synchronous, full- or half-duplex, binary synchronous lines with speeds up to 230.4K bps. Two types of Line Sets are available for the BSC Line Interface Base. For speeds up to 9600 bps, the BSC Line Set can be utilized to support up to 2 lines. For speeds up to 230.4K bps, the WB Line Set can be utilized to support up to 2 lines. The BSC LIB requires four of either type of Line Set to implement the maximum eight lines. Although data is transferred directly from the BSC LIB to the Memory Bus, the BSC LIB is also attached to the Character I/O Bus. When a message is completely transferred, the LIB can trigger a processor interrupt via its Character I/O Bus attachment. The interrupt informs the processor that a message requiring handling has been transferred.

The SDLC/SABRE LIB operates in a comparable manner, servicing full-duplex SDLC/SABRE protocols.

SOFTWARE

The Network Communications System (NCS) is the disk-based operating software that drives the CCI communications processors. NCS is actually a family of modular and compatible software systems which offer very different modes of operation. NCS is compiled and generated on the users host processor.

Basic NCS provides IBM 270X/370X emulation with additional features including system controlling and monitoring, system diagnostics, utilities, and support for a wide variety of line protocols, line speeds and terminal types. Also included are two terminal-initiated application selection programs (one for point-to-point terminal connections and the other for multidropped lines) which permit a terminal operator to selectively access up to 16 different applications in up to four different hosts.

NCS-2, the next version, causes the CC-80 to perform as a true, independent front-end processor. The IBM (or compatible) host is essentially relieved of network control and management, which is moved to the network itself. NCS-2 also serves as a base for a comprehensive message-switching system. NCS-2 enhanced the CC-80's line handling capacity to over 1,000 lines, and features increased multiprocessor support. ➤

Computer Communications, Inc. (CCI) CC-80 Family Communications Processors

► **NCS-4**, the high-end of the CCI software, drives the CC-80 as an independent network node, although still in an IBM 270X emulation environment. The CC-80 may function as either a local controller or remote concentrator. NCS-4 is specially designed for intercommunication between CCI processors, and uses a special CCI intercomputer communication protocol.

A full complement of system support programs are provided to permit system generation, assembly, and link editing of the packages.

COMPONENTS

COMMUNICATIONS AND CONTROL PROCESSOR: A 16-bit (2-byte) word processor with a cycle time of 360 nanoseconds. Each I/O Processor features a data transfer rate of approximately one million characters per second.

Memory in the basic cabinet has a cycle time of 520 nanoseconds. Private Memory has a cycle time of 180 nanoseconds. The maximum memory capacity in the basic cabinet is 512K bytes; the Private Memory is 16K bytes.

PERIPHERALS: CCI provides various peripherals, including a 40 megabyte disk unit with an 850K byte per second transfer rate, a 300-lpm printer, a 120-cps paper tape reader, a 300-cpm card reader, a magnetic tape unit, a flexible disk unit, and a color display monitor.

PRICING

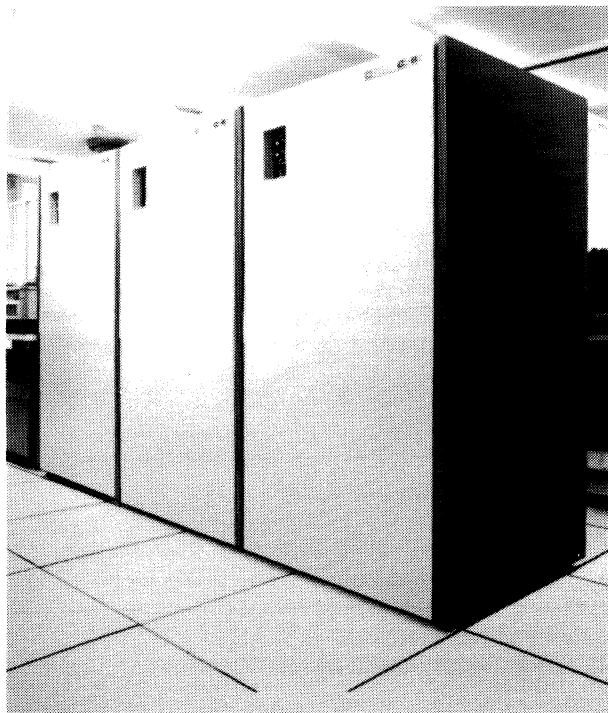
CCI communications processor systems are available for purchase or on a two, three, four, or five-year lease, which includes maintenance. A separate maintenance contract is available for purchased systems. CC-8 systems are additionally available on a month-to-month rental basis.

		Monthly Rental 3-year lease**	Purchase	Monthly Maint.
CC-80	Basic Processor with 32K of memory	\$1,550	\$68,000	\$205
8004	I/O Processor	164	5,200	40
CC-8	Basic Processor with 32K of memory	554	35,000	190
Memory				
8006A	Memory Base, Single Access	215	7,425	50
8508A	Memory Module, Single Access, 8K bytes	37	1,600	9
8017	Memory Bus Extender	210	7,000	35
8010**	Memory Module, Private, 16K bytes	360	11,280	50
Host Interfaces				
8013	Channel Adapter for IBM 360/370	240	8,500	50
8081-1	Two-by-one IBM 360/370 Multiplexer Channel Switch	208	5,400	30
8081-2	Two-by-two IBM 360/370 Multiplexer Channel Switch	305	8,000	45
8082	Two Channel Switch	100	3,750	20
Communications Interfaces				
8028	Buffered Interface Base, Synchronous	95	3,200	20
8029	Line Set, Synchronous	35	1,800	10
8030	Line Set, WB	95	3,000	30
8035	Line Interface Base, Type 1A	20	650	4
8036	Line Set, Asynchronous	6	200	1
8037	Line Set, Synchronous	10	320	2
8038	Line Set, Reverse Channel	30	800	10
8031	Auto Dial Adapter Base	80	3,000	15
8031n	ACU adapter	2	75	—
Peripherals				
8050	Line Printer Controller	185	5,000	35
8051	Line Printer; 300 lpm	395	10,500	95
8053	Paper Tape Reader Controller	105	3,450	15
8054	Paper Tape Reader, 120 cps	60	950	10
8056	Card Reader Controller	70	2,850	10
8057	Card Reader, 300 cpm	170	4,500	45
8059	Magnetic Tape Unit Controller	345	13,500	45
8060	Magnetic Tape Unit	305	8,500	65
8071	Floating Head Disk Controller	510	15,500	120
8072	Floating Disk Drive and Access	400	12,500	85
8067	Flexible Disk Unit and Controller	235	7,800	50
8092	CC40M System Monitor (Color Display)	160	3,800	35
8093	CC40S System Supervisor (Black and White Display)	151	3,500	35
Features				
8075	Master Configuration Switch	75	2,100	5
8090	Expansion Cabinet	230	5,400	50
8091	Redundant Power Option for Expansion Cabinet	120	3,800	20
8076	IOP Switch	160	5,000	10
8077	Memory Bus Switch	160	5,000	10
8078	Dual Access I/O Controller Switch	70	2,500	5
8079	Modem Communications Switch	84	2,100	15
8080	Modem ByPass Adapter	5	150	—
8094	System Alarm Panel	35	1,500	5

*Includes monthly maintenance.

**Not applicable to CC-8.■

Computer Communications, Inc. (CCI) CC-80 (CC-8, CCI-8000) Communications Processor



The CC-80 front-end processor is functionally similar to the IBM 370X and can emulate the 270X. The system is vendor-programmed and can support up to 832 communications lines and up to 11 host computer attachments. BSC and SDLC protocols are supported, along with an adapter for IBM System 360/370 host attachment.

The CCI-8000 consists of vendor-supplied software to support message switching functions using one or more CC-80's.

The CC-8 supports up to 240 communications lines under NCS-1, CCI's network software that provides IBM 270X/370X emulation only.

A typical CC-8 with 48K bytes of memory that supports 32 asynchronous communications lines operating at up to 9600 bps can be purchased for \$47,700 or leased for \$1,468 per month, including maintenance.

MANAGEMENT SUMMARY

Aside from the use of the CC-80 as a replacement for a 270X multi-line controller or a 370X front-end, the CC-80 is especially suited for the user that requires a turnkey system. The combining of multiple CC-80's produces a system with shared memory and mass storage. Such combined systems which are called CCI-8000's, include tailored CCI software and are offered as turnkey systems.

The CC-80 is the architectural successor of the CC-70 that was introduced in June 1970. In addition to technological advantages, the CC-80 received packaging enhancements.

A stripped-down version of the CC-80, the CC-8, can handle up to 240 lines. Both models support IBM 1030, 1050, 2260/2848, 2265/2845, 2740, 2741, 2770, 2780, 3270, 3735, 3770, 3780, and 3790 terminals; CCI CC-40 displays; Teletype 28, 32, 33, and 35 typewriters and remote S/3, S/32, S/7, and 1130 systems. Support includes polling on multi-point lines and auto-dial/auto-answer capabilities.

In the ongoing debate on the master/slave approach versus the distributed approach to network design, CCI's CC-80 casts a solid vote for a master/slave network. In the master/slave approach, relegating the communications line handling to a front-end processor offers dramatic throughput capabilities. Substantiating this capability of the master/slave approach is the clear-cut reaction users surveyed had to the CC-80's throughput capabilities. All surveyed users unanimously rated the CC-80 throughput as excellent.

CHARACTERISTICS

VENDOR: Computer Communications, Inc., 2610 Columbia Street, Torrance, California 90503. Telephone (213) 320-9101.

DATE OF ANNOUNCEMENT: CC-80—October 1974; CC-8—March 1975; CCI-8000—October 1974.

DATE OF FIRST DELIVERY: CC-80—May 1975; CC-8—May 1975; CCI-8000—July 1976

NUMBER INSTALLED TO DATE: CC-80—68; CC-8—35; CCI-8000—10.

CONFIGURATION

The CC-80 communications processor with vendor-supplied software will provide front-end processing for up to 832 communications lines attached to as many as 11 host computers. The system is especially adapted to operate as a front-end to IBM Systems/360, 370. Synchronous lines, with speeds up to 230.4K bps and using either Binary Synchronous Communications (BSC) or SDLC protocols, and synchronous lines, with speeds up to 9600 bps using start/stop protocol, are supported. When handling BSC transmissions, the CC-80 can sustain a throughput rate of over 200,000 characters per second, with peaks of up to 500,000 characters per second.

With CCI-supplied software, the CC-80 can emulate an IBM 270X or an IBM 370X. Combining two or more CC-80's and using a CCI-supplied software package, a front-end/message switching system is created that is referred to as the CCI-8000 system. Such systems can share memory and mass storage. Up to eight CC-80's can share the same memory or mass storage.



The CC-8, currently, is a stripped down version of the CC-80. ➤

Computer Communications, Inc. (CCI) CC-80 (CC-8, CCI-8000) Communications Processor

➤ USER REACTION

The April 1977 Reader Survey on Communications Controllers/Processors included four responses from users of CC-80 systems representing a total of 8 installations. The number of communications lines handled averaged 170 per system, with 250 being the largest number of lines handled by one system. The systems are attached to IBM System/370 and Amdahl 470 hosts. The ratings are presented in the following table.

	Excellent	Good	Fair	Poor	WA*
Overall satisfaction	1	3	0	0	3.3
Ease of installation	1	3	0	0	3.3
Throughput	4	0	0	0	4.0
Hardware reliability	0	2	2	0	2.5
Promptness of mft's. maint.	3	1	0	0	3.8
Quality of mfr's. maint.	2	2	0	0	3.5
Mfr's software	1	3	0	0	3.3
Mfr's technical support	1	1	2	0	2.8

*Weighted Average based on 4.0 for Excellent.

Overall, the ratings are close to our August 1976 survey. All ratings, except two, improved slightly. The two exceptions, hardware reliability and technical support, slipped slightly. □

➤ CC-80 ARCHITECTURE

The fundamental elements resident in the basic cabinet of the CC-80 include a Communications Control Processor (CCP), a Character I/O Bus, a Memory Bus, an I/O Processor, and a System Control Panel.

Central to the CC-80 architecture is the Memory Bus that accommodates attachment of up to 16 direct access devices. In a single CC-80 system, the Communications and Control Processor, one or two I/O Processors, and one or more of direct access type Base Line interfaces can be attached to the Memory Bus. Additionally, up to eight Memory Bases can be attached, each supporting up to eight Memory Modules. Each Memory Module contains 8,192 bytes of memory to yield a maximum of 524,288 bytes within the cabinet. Each of the two I/O Processors can support up to seven Adapters. Each Adapter can be attached to a host computer or to a mass storage controller. Data received through the adapters can be built up into blocks by the I/O Processor and transferred directly into memory via the Memory Bus without processor intervention.

The BSC Line Interface Base, which supports lines with binary synchronous communications protocol, can transfer data two characters at a time directly into memory via the Memory Bus without processor intervention. All other external devices are attached to Line Interface Bases that are connected to the Character I/O Bus instead of the Memory Bus. The Character I/O Bus, in turn, is connected to the CCP. Data presented to the Character I/O Bus is transferred to memory by way of the CCP under processor interrupt control. There are 32 interrupt levels; each level can be associated with 8 of the Character I/O Bus addressable slots. Of the 256 addressable slots, 16 are used for internal attachments, such as the CCP leaving 240 slots for attachment of external devices, such as communications lines.

The I/O Expansion Cabinet permits expansion of the number of external devices that can be physically attached up to a total of 832. The same cabinet can accommodate 16K bytes of memory; memory in this cabinet is called Private Memory

because it can be accessed only by one processor in a multiple CC-80 system.

The Dual Memory Cabinet contains memory to be accessed by two or more CCP's. The multiple access memory for two or more accesses is called MAMory.

CONNECTION TO HOST COMPUTER

A Channel Adapter is required for attachment of each host computer line to the I/O Processor. Since each I/O Processor can accommodate seven adapters, the two I/O Processors permitted in one CC-80 system can physically support 14 host attachments. Throughput considerations limits to 11 the number of hosts supportable by the system. Only one adapter per I/O Processor can be active at any given instant.

TRANSMISSION SPECIFICATIONS

Three Line Interface Bases are offered for support of communications lines. The Low-Speed LIB attached to the Character I/O Bus will support up to 8 asynchronous, full-duplex lines with speeds up to 300 bps. No Line Set is needed. With 30 Low-speed LIB's, 240 such lines will be supported without resorting to an I/O Expansion Cabinet.

The Type 1 LIB, attached to the Character I/O Bus, will support up to 16 asynchronous, full- of half-duplex, lines with speeds up to 9600 bps. Eight Type 1A Line Sets are required; each Line Set accommodates 2 of the 16 lines.

The BSC LIB, attached both to the Character I/O Bus and to the Memory Bus, will support up to 8 synchronous, full- or half-duplex, binary synchronous lines with speeds up to 230.2K bps. Two types of Line Sets are available for the BSC Line Interface Base. For speeds up to 9600 bps, the BSC Line Set can be utilized to support up to 2 lines. For speeds up to 230.4K bps, the WB Line Set can be utilized to support up to 2 lines. The BSC LIB requires four of either type of Line Set to implement the maximum eight lines. Although data is transferred directly from the BSC LIB to the Memory Bus, the BSC LIB is also attached to the Character I/O Bus. When a message is completely transferred, the LIB can trigger a processor interrupt via its Character I/O Bus attachment. The interrupt informs the processor that a message requiring handling has been transferred.

SOFTWARE

The Network Communications System (NCS) is the software package that drives a CCI communications processor. NCS is composed of four modules.

NCS-1 provides line handling functions, including polling and error handling. A virtual-mode, disk-based operating system is included in this module.

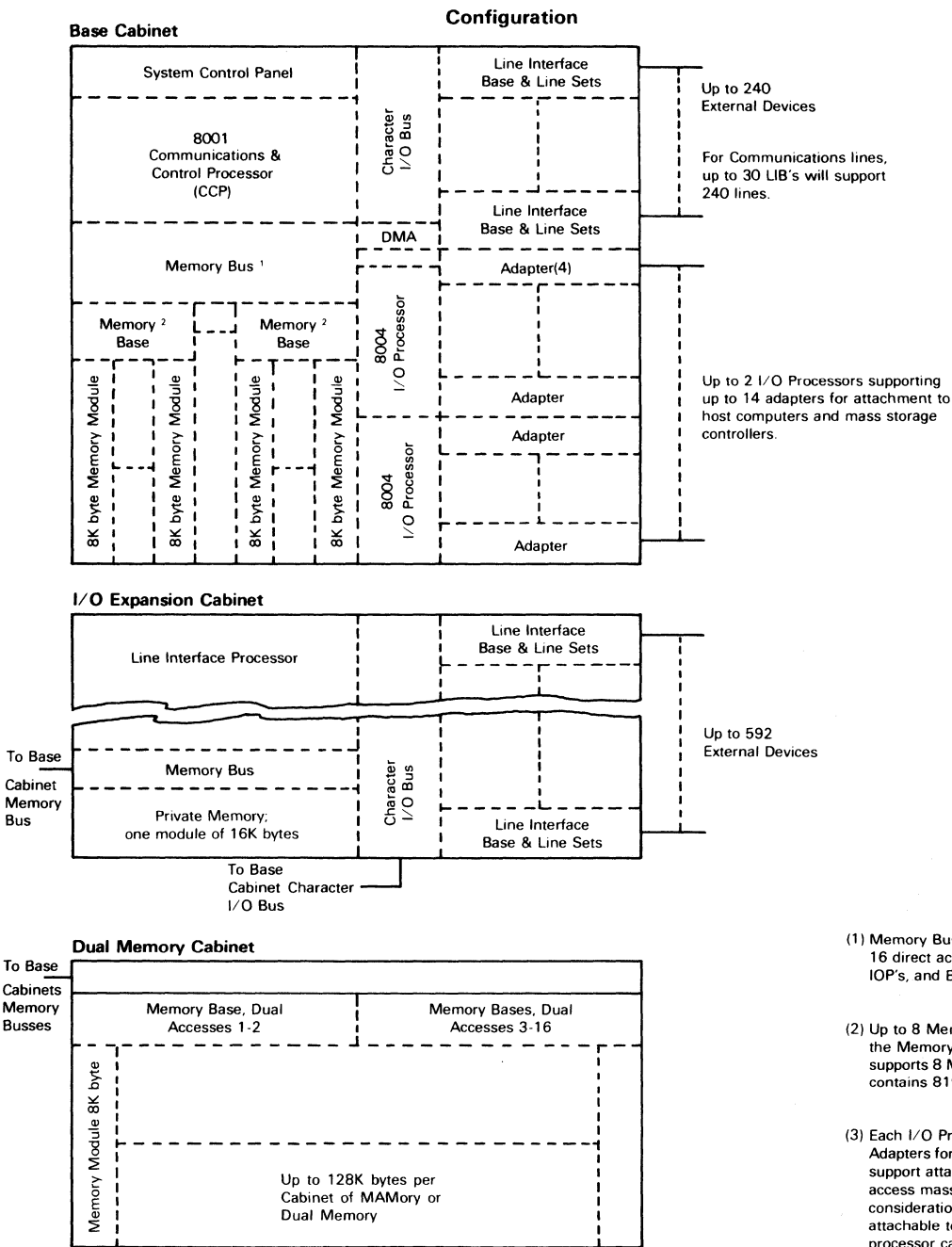
NCS-2, when added to NCS-1, supplies line handling control for specific devices, independent of any host computer. Devices supported include IBM 1050, 2741, 3270, 2260, and 1030 terminals, as well as Teletype terminals.

NCS-3 includes the device support capabilities of NCS-2 and adds a program for emulating the IBM Network Control program (NCP) for the host interfaces on the system.

NCS-4 provides for communication with remote CCI systems that are operating with NCS software.

A full complement of system support programs are provided to permit system generation, assembly, and link editing of the packages.

Computer Communications, Inc. (CCI)
CC-80 (CC-8, CCI-8000) Communications Processor



► **COMPONENTS**

COMMUNICATIONS AND CONTROL PROCESSOR: A 16-bit (2-byte) word processor with a microprocessor cycle time of 360 nanoseconds. Each I/O Processor can handle a maximum data transfer rate of approximately one million characters per second. Memory in the basic cabinet has a cycle time of 520 nanoseconds, Private Memory has a cycle time of 180 nanoseconds, and Dual Access memory has a cycle time of 135 nanoseconds. The maximum memory capacity in the basic cabinet is 512K bytes; the Private Memory is 16K bytes; the Dual Access memory is 32K bytes.

PERIPHERALS: CCI provides various peripherals, including a 40 megabyte disk unit with an 850K byte per second transfer rate, a 300-lpm printer, a 120-cps paper tape reader, a 300-cpm card reader, a magnetic tape unit, a flexible disk unit, and a display monitor.

PRICING

CCI communications processor systems are available for purchase or on a three-year lease, which includes maintenance. A separate maintenance contract is available for purchased systems. ►

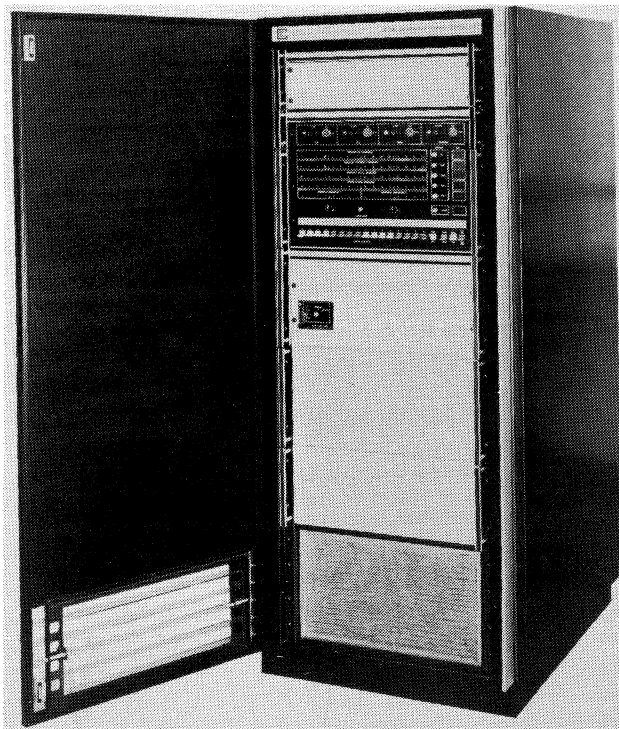
Computer Communications, Inc. (CCI)
CC-80 (CC-8, CCI-8000) Communications Processor

		<u>Monthly Rental</u> <u>3-year lease**</u>	<u>Purchase</u>	<u>Monthly</u> <u>Maint.</u>
CC-80	Basic Processor with 32K of memory	\$1,550	\$68,000	\$205
8004	I/O Processor	164	5,200	40
CC-8	Basic Processor with 32K of memory	950	35,000	190
MEMORY				
8006A	Memory Base, Single Access	215	7,425	50
8008A	Memory Module, Single Access, 8K bytes	30	1,250	7
8007	Memory Base, Dual Access	145	5,000	35
8009*	Memory Module, Dual Access, 8K bytes	185	7,500	45
8068*	MAMory, Multi Access Mass Memory Base and Cabinet (dual access)	550	21,000	105
8068-X*	Additional Access	100	3,750	20
8069*	MAMory, Redundant Base (dual access)	260	9,900	50
8069-X*	Additional Access	100	3,750	20
8070*	MAMory, 8K bytes	205	7,500	65
8010*	Memory Module, Private, 16K bytes	360	11,280	50
HOST INTERFACES				
8012	Channel Adapter for IBM 360/370	240	8,500	50
8081-1	Two-by-one IBM 360/370 Multiplexer Channel Switch	208	5,400	30
8081-2	Two-by-two IBM 360/370 Multiplexer Channel Switch	305	8,000	45
8082	Two Channel Switch	100	3,750	20
COMMUNICATIONS INTERFACE				
8026	Line Interface Base, Low Speed (TTY, ASCII)	55	2,000	10
8026n	Line Set, Low Speed	2	75	—
8027	Line Interface Base, Low Speed (IBM Type 1-EBCDIC)	55	2,000	10
8027n	Line Set, Low Speed	2	75	—
8028	Buffered Interface Base, BSC	95	3,200	20
8029	Line Set, BSC	35	1,800	10
8030	Line Set, WB	95	3,000	30
8032	Line Interface Base, Type 1	45	1,500	10
8033	Line Set, Type 1A	25	1,000	5
8035	Line Interface Base, Type 1A	20	650	4
8036	Line Set, ASC	6	200	1
8037	Line Set, BSC	10	320	2
8031	Auto Dial Adapter Base	80	3,000	15
8031n	ACU adapter	2	75	—
PERIPHERALS				
8050	Line Printer Controller	185	5,000	35
8051	Line Printer Controller	395	10,500	95
8053	Paper Tape Reader Controller	105	3,450	15
8054	Paper Tape Reader, 120 cps	60	950	10
8056	Card Reader Controller	70	2,850	10
8057	Card Reader, 300 cpm	170	4,500	45
8059	Magnetic Tape Unit Controller	345	13,500	45
8060	Magnetic Tape Unit	305	8,500	65
8071	Floating Head Disk Controller	510	15,500	120
8072	Floating Head Disk Drive and Access	460	14,400	95
8067	Flexible Disk Unit and Controller	235	7,800	50
8092	CC40M System Monitor (Color Display)	160	3,800	35
8093	CC40S System Supervisor (Black and White Display)	151	3,500	35
FEATURES				
8090	Expansion Cabinet	230	5,400	50
8091	Redundant Power Option for Expansion Cabinet	120	3,800	20
8076	IOP Switch	160	5,000	10
8077	Memory Bus Switch	160	5,000	10
8078	Dual Access I/O Controller Switch	70	2,500	5
8079	Modem Communications Switch	84	2,100	15
8080	Modem ByPass Adapter	5	150	—
8094	System Alarm Panel	35	1,500	5

*Not applicable to CC-8.

**Includes monthly maintenance.■

Computer Communications, Inc. (CCI) CC-8, CC-80, and CC-8000 Processors



MANAGEMENT SUMMARY

Computer Communications began in the data communications business by producing and marketing display terminals, multiplexors, and channel adapters. Using its gained expertise, CCI introduced its first communications processor, the CC-70 (essentially an IBM 270X emulator) in June 1970. The next year, the company expanded the system to include multiprocessing capability; it announced a store and forward message system, the CC-7000, in March 1971. Aided by a few large OEM and system contracts, CCI is now producing a family of programmable communications processors for front-end processing, networking, message switching, remote concentration, and IBM 270X and 370X emulation.

CCI's current product line which evolved from the CC-70 and CC-7000 consists of three compatible processor systems that range from a small, single processor to a large multiprocessor system capable of handling up to 840 communications lines.

At the small end is the CC-8 which is a single processor system that can handle up to 64 communications lines. The CC-8 was announced by CCI in March 1975 and first delivery was made in May 1975.

The mainstay of the product line is the CC-80, a larger but compatible system similar to the older CC-70 system, but with many enhancements. The CC-80 can be a single or multiple processor system and is capable of handling up to 240 communication lines. The CC-80 was announced in ➤

A family of programmable processors for IBM 270X and 370X emulation as well as custom front-end, message-switching and communications control applications.

Three models are available supporting from 128 to 840 communications lines and from 8K to 512K bytes of memory. The units can communicate independently with up to 7 host computers.

Options include a variety of line interface bases and associated line sets with speeds ranging from 50 bps to 230K bps.

Systems are modular in configuration; possible configurations include multiple, task oriented processors sharing common memory. Full software is supplied including operating system, applications programs, and diagnostics.

A CC-8 with 8K bytes of memory handling 8 communications lines rents for approximately \$1,150 per month, including maintenance, on a 3-year lease.

A larger CC-80 with 16K bytes of memory supporting 64 communications lines rents for approximately \$3,175 per month, including maintenance, on a 3-year lease.

The CC-8000 is available from CCI on a standard hardware basis plus RPO for a turnkey system.

CHARACTERISTICS

VENDOR: Computer Communications, Inc., 2610 Columbia Street, Torrance, California 90503. Telephone (213) 320-9101.

DATE OF ANNOUNCEMENT: See System Characteristics chart.

DATE OF FIRST DELIVERY: See System Characteristics chart.

NUMBER DELIVERED TO DATE: See System Characteristics chart.

SERVICED BY: Computer Communications, Inc. ➤

Computer Communications, Inc. (CCI)
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CCI System Characteristics

	CC-8	CC-80	CC-8000
Computer Systems Interfaced	IBM 360/370	IBM 360/370	IBM 360/370, custom
Supported Applications:	Yes	Yes	Yes
IBM 270X	Yes	Yes	Yes
IBM 370X W NCP	Yes	Yes	Yes
IBM 370X W/O NCP	Yes	Yes	Yes
Front-End Processing	Yes	Yes	Yes
Message Switching	Yes	Yes	Yes
Remote Concentration	Yes	Yes	Yes
Communications Lines:			
Max. number supported (half-duplex)	64	240	840
Line Discipline	Asynch, Sync, SDLC	Asynch, Sync, SDLC	Asynch, Synch, SDLC
Processor:			
Cycle time (nanoseconds)	540	540	540
Memory capacity (bytes)	8K to 128K	8K to 512K	8K to 512K
Software:			
Oper. System	Yes	Yes	Yes
Message Control	Yes	Yes	Yes
Assembly	No	No	No
Cross Assembly	Yes-IBM 360/370	Yes-IBM 360/370	Yes-IBM 360/370
Terminals Supported	IBM, TTY, other	IBM, TTY, other	IBM, TTY, other
Pricing (basic purchase)	\$43,000	\$69,000	\$120,000
Date of Announcement	3/75	10/74	10/74
Date of First Delivery	5/75	5/75	7/76
Number installed to Date	4	59	6

➤ October 1974, and the first system was delivered in May 1975.

The top of the product line is the CC-8000, which is a modular build-up of the CC-80 system, utilizing one or more CC-80 processors in a multiprocessing mode with memory and I/O sharing. The CC-8000 is an enhanced version of the older CC-7000 with faster throughput and capability of handling up to 840 communications lines. The CC-8000 was announced at the same time as the CC-80, and first delivery was made in July 1976.

The accompanying chart gives system characteristics of the various models and allows for comparison between them.

As with other independent manufacturers of communication processor systems, CCI offers cost as the major advantage over the IBM 270X and 370X processors. A CC-80 with 16K bytes of memory supporting 64 communications lines can be leased for approximately \$3,300. An equivalent IBM 3705 system leases for approximately \$3,700 or about 12 percent more. The CCI units also enjoy a number of other advantages over the IBM 3705. Memory cycle time is 1000 nanoseconds for the 3705 as compared to 540 nanoseconds for the CCI systems. Combining this faster memory cycle time with greater maximum communication line capability (840 lines for the CC-8000 versus 352 lines of the IBM 3705) can produce significantly increased throughput rates for the CCI user. Other advantages include compatibility ➤

➤ MODELS

CC-8 – A minicomputer based system, which operates as a front-end to one or more IBM System 360/370 computers. It is a compatible replacement for the IBM 270X or 370X and handles up to 64 communications lines.

CC-80 – A larger front-end system, which can be used with all IBM System 360/370 models. It is a compatible replacement for the IBM 270X or 370X and handles up to 240 communications lines. It is available with up to 512K bytes of memory.

CC-8000 – The largest system of the CCI product line. It is available in multiprocessor configuration (CC-80 processors) and handles up to 840 communications lines; it is available with up to 512K bytes of memory. It is primarily used as a message switching system for controlling messages among terminals or between terminals and computers.

CONFIGURATION

The basic CC-8 system consists of a communications control processor, an I/O processor for handling communications to the host computer, up to 128K bytes of 540 nanosecond memory in 8K byte increments, channel adapters, real time clock, and control console. A maximum of two channel adapters can be installed in a CC-8 for communication with up to two host computers. A full range of low to high speed communication lines can be connected to the CC-80 through a variety of line interface bases and line sets. A maximum of 64 lines are allowed per system.

The CC-80 is a modular system which can be configured to handle a wide range of teleprocessing networks and applications. A basic CC-80 consists of a communications processor, an I/O processor for handling communications ➤

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Communication Lines Handled by the CC-8, CC-80 and CC-8000

LIB*	Line Set	Lines/Line Set	Speed
826-Low Speed (TTY ASCII)	826-M	8	up to 300 bps
827-Low Speed (IBM Type 1, EBCDIC)	827-M	8	up to 300 bps
828-Buffered, BSC	829-BSC	2	1200 bps to 9600 bps 19.2K bps to 230.4K bps
	830-Wide Band	2	
831-Auto Dial	831-M	8	—
832-Type 1	833-Type 1A	16	55 bps to 9600 bps

*Maximum number of LIB's are dependent on module size, number of lines, and line speeds subject to the following line restrictions:

	CC-8	CC-80	CC-8000
Maximum total lines	64	240	840
Maximum lines—			
Wide Band (56K bps to 230.4K bps)	2	64	**
Wide Band (9600 bps to 56K bps)	4	64	**
Medium Speed Async (up to 9600 bps)	16	120	**
Medium Speed BSC (up to 9600 bps)	16	120	**
Low Speed (up to 300 bps)	64	240	**

**Complex inter-relationships depending on other configuration parameters, such as memory size and number of processors.

▷ between models (the CC-8 is field upgradable to a CC-80) and the availability of a multiple console and monitor terminals on the CCI systems. Additionally, the systems are compatible with all IBM host computer software, requiring no host modifications. Finally, all CCI models can emulate both the IBM 270X and 370X systems with or without NCP and can also function as custom front-end processors, as remote concentrators, or as message switching systems.

In August, 1976, Datapro talked with six users of CCI equipment, representing a total of nine systems, concerning their experience with these systems. Included in these installations were the CC-8 and CC-80. In the majority of cases, the systems were being used as IBM 370X emulators with 20 to 60 communication lines. The user ratings are presented in the following table.

	Excellent	Good	Fair	Poor	WA*
Overall satisfaction	2	2	2	0	3.0
Ease of operation	0	4	2	0	2.7
Throughput	3	3	0	0	3.5
Hardware reliability	1	4	1	0	3.0
Maintenance service:					
Promptness	0	3	3	0	2.5
Quality	1	4	1	0	3.0
Software	2	3	1	0	3.2
Technical support	2	3	1	0	3.2

*Weighted Average on a scale of 4.0 for Excellent.

The advantages of the CCI systems most often cited by the users as a whole were reduced cost and higher throughput. Other advantages mentioned were ability to interface with multiple host computers and expansion capabilities of the system configuration.

On the negative side, a number of users complained that they experienced a significant amount of delay and ▷

▶ with the host computer, a channel adapter, a memory base for memory expansion, 16K bytes of 540 nanosecond memory, a line interface base and two line sets. Up to seven channel adapters can be installed for communication with up to seven host computers via a maximum of ten I/O processors. Memory is expandable to 512K bytes in 8K increments. Up to 240 low- to high-speed communication lines can be connected to the CC-80 using a variety of line interface bases and associated line sets through the use of common memory and I/O bus bars. Memory sharing in single or multiple access mode is available.

The CC-8000 is a multiprocessing configuration utilizing CC-80 processors and associated hardware with tailored software for message switching applications. Each processor is task oriented. Up to 16 processors can be configured with up to 512K bytes of 540 nanosecond memory in 8K byte increments. Up to 840 low to high speed communication lines can be connected through the CC-80 line interface bases and line sets.

For additional configuration detail on the CC-8, CC-80 and CC-8000, please refer to the accompanying configuration charts.

TRANSMISSION SPECIFICATIONS

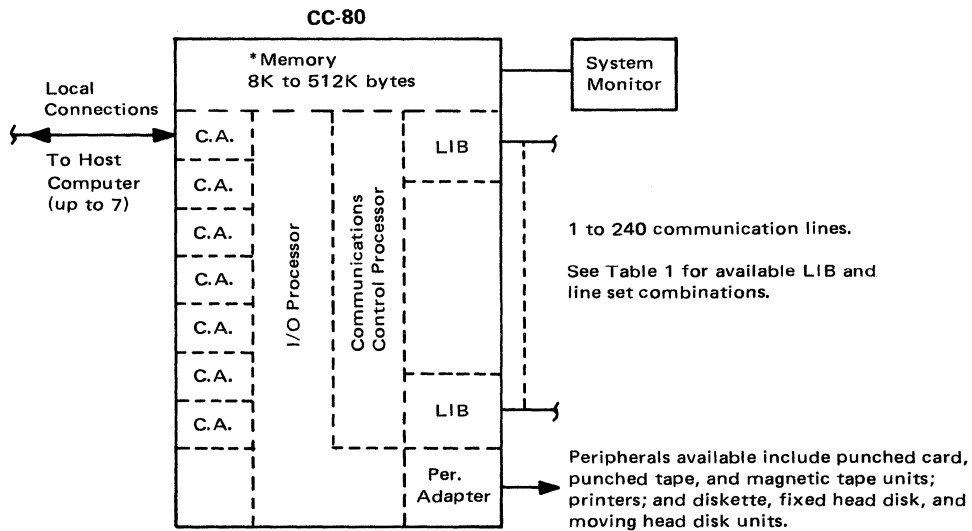
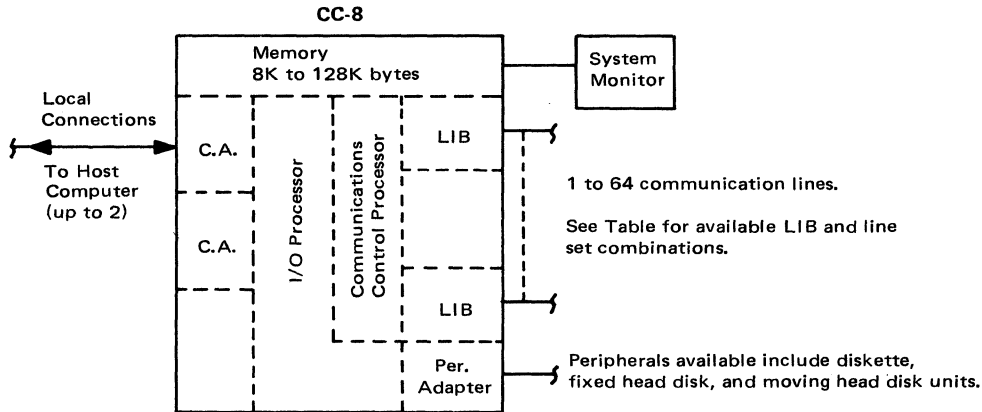
The accompanying table summarizes the capabilities of the CCI-8, CC-80 and CC-8000 for accommodating various types of line interface bases, line sets and communication lines.

SOFTWARE

All CCI systems are supplied with operating systems and application software. The CCI processors are functional replacements for the IBM 3704 and 3705 systems providing emulation mode, NCP mode, or native mode. In NCP mode the CCI system provides a compatible interface to System/370 computers operating with TCAM and VTAM. In all modes of operation the CCI system is software transparent to the IBM 360 or 370 computer, requiring no modification to the host system programming. The software offered by CCI is modular in design and can be ▶

Computer Communications, Inc. (CCI)
CC-8, CC-80, and CC-8000 Processors

Configurations



CC-8000

Configured rpm request from CCI using modular build up of CC-80 processors and features plus additional software. Maximum configuration is 16 processors sharing 512K bytes of memory in 8K increments.

LIB — Line Interface Base
C.A. — Channel Adapter

*Memory available in single or dual access

subsequent down time during installation and that learning to operate the system was difficult. However, technical support from CCI was reported as good, and these problems were generally resolved. Other disadvantages cited included a degree of dissatisfaction with some of the software packages, and at times maintenance service was not as prompt as some users expected. □

progressively added to expand a basic CC-8 system up to a complex CC-8000 message switching system. The software can also be customized for a particular user's teleprocessing needs.

The operating system supplied by CCI is called the Network Communications System (NCS). This system can be used with all major terminals handled by the IBM 270X and 370X controllers as well as additional IBM terminals and non-IBM units such as UNIVAC's line. NCS is based on a real time executive that provides for handling of standard communication tasks as well as special communications applications. CCI also offers a Telecommunications Communications System (TECOS) for 270X emulation that is particularly suited for installations experiencing memory shortage.

Supporting the basic NCS operating system is a family of four software packages tailored for specific applications. The system resides on diskette, fixed head disk, or moving

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head disk units available from CCI in sizes from 325K bytes to 40M bytes.

NCS-1 is used to provide IBM 270X and 370X emulation, and limited message switching as well as additional features not supplied by IBM. NCS-1 also provides an orderly progression to more advanced communication functions provided by other NCS packages.

NCS-2 provides line/terminal control of supported devices independent of any host computer. It allows for extensive message processing independent of host computer intervention and enables implementation of applications such as message switching.

NCS-3 includes all the features of NCS-2 in addition to the capability of supporting multiple IBM NCP host interfaces.

NCS-4 is a package designed to add to the capabilities of NCS-2 the capability for network communications concentration.

In addition to TECOS and NCS, CCI also provides support programs, which include an assembler, application packages, and diagnostics.

PRICING

The CCI processor systems are available for purchase or on a three year lease, which includes maintenance. A separate maintenance contract is available for purchased systems.

		Monthly Rental* 3-year lease	Purchase	Monthly Maint.
CC-8 System				
CC-8	Basic Processor	\$771	\$43,000	\$194
806	Memory Base	165	7,425	50
808A	Memory Module, Single Access, 8K Bytes	23	1,250	7
812	Channel Adapter for IBM 360/370	225	10,000	50
826	Line Interface Base, LS (Teletype - ASCII)	**	**	10
826-n	Line Set, LS	**	**	-
827	Line Interface Base, LS (IBM Type I-EBCDIC)	85	4,000	20
827-n	Line Set, LS	3	95	-
828	Buffered Interface Base, BSC	150	5,800	30
829	Line Set, BSC	75	4,200	15
830	Line Set, WB	130	6,200	40
831	Auto Dial Adapter Base	85	4,000	25
831-n	ACU	3	95	-
832	Line Interface Base, Type 1	65	2,800	20
833	Line Set, Type 1A	65	2,600	10
834	Line Set, MDML with RPL	65	2,600	10
879	Modem Communications Switch	69	2,100	15
880	Modem Bypass Adapter	5	150	-
IBM 360/370 Multiplexer Channel Switch				
881-1	Two by One	178	5,400	30
881-2	Two by Two	260	8,000	45
891	Redundant Power Option	171	6,900	65
892	CC40M System Monitor (color display)	125	3,800	35
893	CC40S System Supervisor (black & white display)	116	3,500	35
894	System Alarm Panel	30	1,500	5
CC-80 System				
CC-80	Basic Processor	1,376	69,000	179
8004	I/O Processor	124	5,200	40
8006	Memory Base, Single Access	165	7,425	50
8007	Memory Base, Dual Access	110	5,000	35
8008A	Memory Module, Single Access, 8K Bytes	23	1,250	7
8009	Memory Module, Dual Access, 8K Bytes	140	7,500	45
8010	Memory Module, Private, 16K Bytes	310	11,280	50
8012	Channel Adapter for IBM 360/370	190	8,500	50
8026	Line Interface Base, LS (Teletype - ASCII)	45	2,000	10
8026-n	Line Set, LS	2	75	-
8027	Line Interface Base, LS (IBM Type I-EBCDIC)	45	2,000	10
8027-n	Line Set, LS	2	75	-
8028	Buffered Interface Base, BSC	75	3,200	20
8029	Line Set, BSC	25	1,800	10
8030	Line Set, WB	65	3,000	30
8031	Auto Dial Adapter Base	65	3,000	15
8031-n	Per ACU	2	75	-
8032	Line Interface Base, Type 1	35	1,500	10
8033	Line Set, Type 1A	20	1,000	5
8034	Line Set, MDML with RPL	20	1,000	5

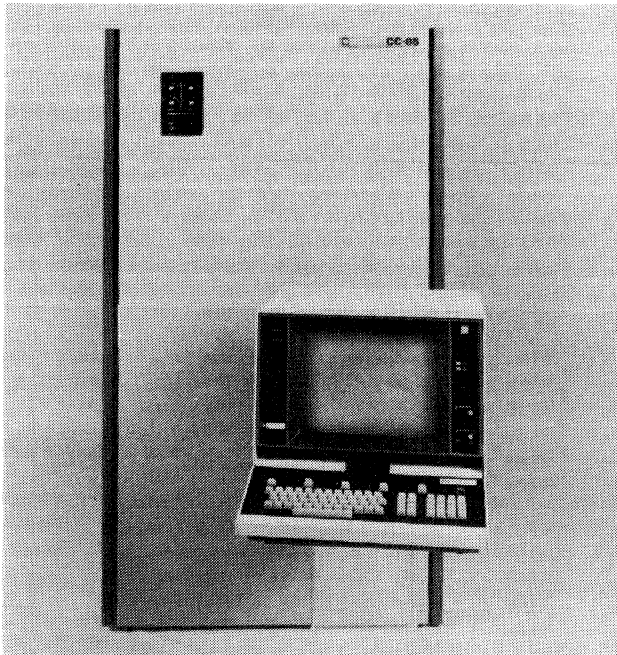
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		Monthly Rental* 3-year lease	Purchase	Monthly Maint.
8068	MAMory, Multi Access Mass Memory Base & Cabinet (2 accesses)	445	21,000	105
	Additional Accesses (each)	80	3,750	20
8069	MAMory, Redundant Base (2 accesses)	210	9,900	50
8069-	Additional Accesses (each)	80	3,750	20
8070	MAMory, 8K bytes	140	7,500	65
8075	Configuration Switch	69	2,100	5
8076	IOP Switch	150	5,000	10
8077	Memory Bus Switch	150	5,000	10
8078	Dual Access I/O Controller Switch	65	2,500	5
8079	Modem Communications Switch	69	2,100	15
8080	Modem ByPass Adapter	5	150	0
	IBM 360/370 Multiplexer Channel Switch			
8081-1	Two by One	178	5,400	30
8081-2	Two by Two	260	8,000	45
8082	Two Channel Switch	80	3,750	20
8090	Expansion Cabinet	180	5,400	50
8091	Redundant Power Option	171	6,900	65
8092	CC40M System Monitor (Color Display)	125	3,800	35
8093	CC40S System Supervisor (Black & White Display)	116	3,500	35
8094	System Alarm Panel	30	1,500	5

* Includes monthly maintenance.

**Standard with processor. ■

Computer Communications, Inc. (CCI) CC-85 Communications Processor



MANAGEMENT SUMMARY

The CC-85 communications processor is an enhancement of the CC-80, which CCI has marketed since 1975. The CC-85 is actually a CC-80 which has been upgraded to include a wider memory bus, some microprocessors, a color CRT operator console, and minor software additions. The net result, however, is a communications processor with over twice the throughput capacity of its predecessor at only about a 25 percent increase in cost.

The introduction of microprocessors permits a reduced internal cycle time for the central processing unit. The new memory bus, some three times the bandwidth of the CC-80's, permits a 0.27 microsecond memory cycle time compared to 0.54 microsecond for the CC-80. Additional enhancements to the CC-85 include an "instruction look-ahead" cache memory and the capability to connect up to 1600 megabytes of disk storage.

CCI markets the CC-85 as an attractive alternative to the IBM 3704/3705—and justifiably so. The CC-85 offers more line connections, higher throughput, support for a larger number of attached hosts, and more flexible software than the IBM communications processors. It can, in addition, perform the same network control functions as the ACF/NCP-driven 3705-II. The CC-85 supports all standard IBM telecommunications access methods and operating systems, and offers the same byte/block multiplexer and selector channel interface capability as the 270X/370X.

CCI has stated that it intends to limit front-end compatibility of the CC-85 to IBM and IBM-compatible ➤

A high-throughput communications front end for IBM 360/370, 303X, and compatible mainframes; it can also serve as a remote concentrator, stand-alone communications processor, message switcher, or any combination simultaneously.

A functional replacement for the IBM 3705, the CC-85 offers a sustained throughput capacity of 400K bytes per second, with a peak throughput capacity of nearly one megabyte per second. The CC-85 can be alternately configured as a local and remote communications node, facilitating automatic backup in the event of host failure.

The CC-85 can support up to seven channel-attached host computers, which may be a mix of IBM and compatible mainframes, and up to 1112 communications lines of mixed speeds and protocols. Async and BSC communications can be accommodated at up to 230K bps; CCI also offers an X.25 interface capability.

A typical CC-85 configuration consisting of 176 bytes of memory and adapters for 240 mixed speed and protocol communications lines can be leased, based on a three-year lease, for \$9,046 per month, including maintenance, or purchased for \$341,250.

CHARACTERISTICS

VENDOR: Computer Communications, Inc., 2610 Columbia Street, Torrance, California 90503. Telephone (213) 320-9101.

DATE OF ANNOUNCEMENT: November 1978.

DATE OF FIRST DELIVERY: January 1979.

NUMBER INSTALLED TO DATE: 27.

SERVICED BY: Computer Communications, Inc.

CONFIGURATION

The CC-85 communications processor is, as are other CCI communications systems, available as a turnkey system; modular software is tailored to accommodate specific applications.

Basic to each CC-85 is the main cabinet, which contains the Communications Processing Unit ("CPU"). Character I/O Bus, Memory, Memory Bus, Memory Interface Controller (MIC), I/O processor, and the peripherally-connected CRT control console. The CPU is a 16-bit processor composed of high-speed microprocessors.

The Memory Bus interfaces main memory, the CPU, MIC, I/O Processors, and certain Line Interface Bases which ➤

**Computer Communications, Inc. (CCI)
CC-85 Communications Processor**

▷ mainframes. CCI states that the CC-85 can support connection, either local or remote, to mainframes from most other major vendors by emulating terminals.

One CC-85 enhancement to system operation is the System Monitor mode for the console, which includes a microprocessor-controlled color CRT monitor. This feature, according to CCI, permits detailed statistical reporting of internal buffer, register, and cycle use, and the presentation of operational status of all lines. In addition to monitor and tracing functions, the console, and its related control software, permit a high degree of user control over the system's teleprocessing activity.

Although 1112 mixed communications lines are physically attachable, the actual number supported concurrently, as with any front-end or communications processor, may be significantly decreased depending on how many lines are being operated in full-duplex mode, at high speed, and with protocols requiring a high degree of processor overhead. System throughput may likewise be decreased depending on message handling overhead required.

USER REACTION

During December 1980, Data spoke to three users of the CC-85 whose names had been supplied by the vendor. These users had a total of 22 CC-85 systems installed for periods ranging from 14 months to two years. All of the CC-85 units were upgrades of either CC-8 or CC-80 systems. Host systems included IBM 3033, 370/168, and Amdahl 470 V/8. Ratings provided by these users are summarized below.

	Excellent	Good	Fair	Poor	WA*
Overall satisfaction	2	1	0	0	3.6
Ease of installation	0	2	1	0	2.6
Throughput	3	0	0	0	4.0
Hardware reliability	1	2	0	0	3.3
Maintenance promptness	1	1	1	0	3.0
Maintenance effectiveness	1	2	0	0	3.3
Manufacturers software	1	1	0	0	**
Technical support	1	2	0	0	3.3

*Weighted Average based on a scale of 4.0 for Excellent.
**Weighted Average is considered invalid if based on fewer than three responses.

One user declined the comment on the vendors software because much of what he was using had been written specifically for him. The user who provided the excellent comments under maintenance, has 24/hr. 7 day per week maintenance service on site. The others utilize outside maintenance technicians.

All of the users said that they would recommend CCI hardware to other users with similar applications. □

▷ feature direct memory access. Up to eight memory bases can be attached to the Memory Bus. The memory bases can each support up to eight memory modules, each containing 8,192 bytes of main memory, yielding a maximum of 524,288 bytes within the main cabinet.

The main cabinet can contain up to two I/O processors, each of which can support up to seven adapters for connection to host computers, mass storage controllers, other communications processors and peripheral devices. Data received through these adapters can be assembled into blocks by the I/O processor and transferred directly into memory via the Memory Bus without processor intervention. Each I/O processor can handle a maximum data transfer rate of about one megabyte per second.

With the exception of certain Line Interface Bases that can directly access memory via the Memory Bus, all other Line Interface Bases are connected to the Character I/O Bus, which is connected to the CPU. There are 32 interrupt levels associated with each of eight addressable slots of the Character I/O Bus, which yields 256 addressable units. However, 16 of these addresses are required for internal use, and the remaining 240 can support communications.

An expansion cabinet may be required for large numbers of communications lines. For large systems (over 240 lines), a Line Interface Processor, which is essentially another CPU, must be added. A Line Interface Processor contains its own Character I/O Bus and Memory Bus, each of which is connected to its respective bus in the main CPU. Up to four Line Interface Processors may be added to the CC-85 CPU with each capable of supporting 248 lines, yielding a system maximum of 1232 (asynchronous only) or 1112 (mixed) attachable lines. Also contained in the Line Interface Processor is a 16K-byte module of private memory (with a cycle time of 0.18 microseconds), accessible to the CPU located in the main cabinet.

TRANSMISSION SPECIFICATIONS

For support of communications lines, two Line Interface Bases (LIB) are offered. The Type 1 LIB is attached to the Character I/O Bus, and will support eight asynchronous, full- or half-duplex lines at up to 9600 bps. The Type 1 LIB supports up to eight Type 1A line sets, each of which interfaces a single line.

The Synchronous Line Interface Base, for BSC lines, is attached to both the Memory Bus and the Character I/O Bus. Each synchronous LIB will support up to eight half- or full-duplex synchronous lines at up to 230.4K bps. Messages are transferred directly from the LIB to the Memory Bus; when the message is complete, the LIB can trigger a processor interrupt via its Character I/O Bus attachment to inform the processor that there is a message requiring handling. Two types of line sets are supported by these LIB's, and each of the line sets supports the attachment of two synchronous lines. One line set will handle transmission at up to 9600 bps, and the other, the Wideband line set, will support transmission at up to 230.4K bps.

CONNECTION TO HOST

Each I/O processor can accommodate seven adapters for connection of hosts to the CC-85. Since two I/O processors can be contained in a CC-85, up to 14 adapters can be accommodated. Consequently, up to 14 host computers can be supported, however, only one adapter per I/O processor can be active at any given time.

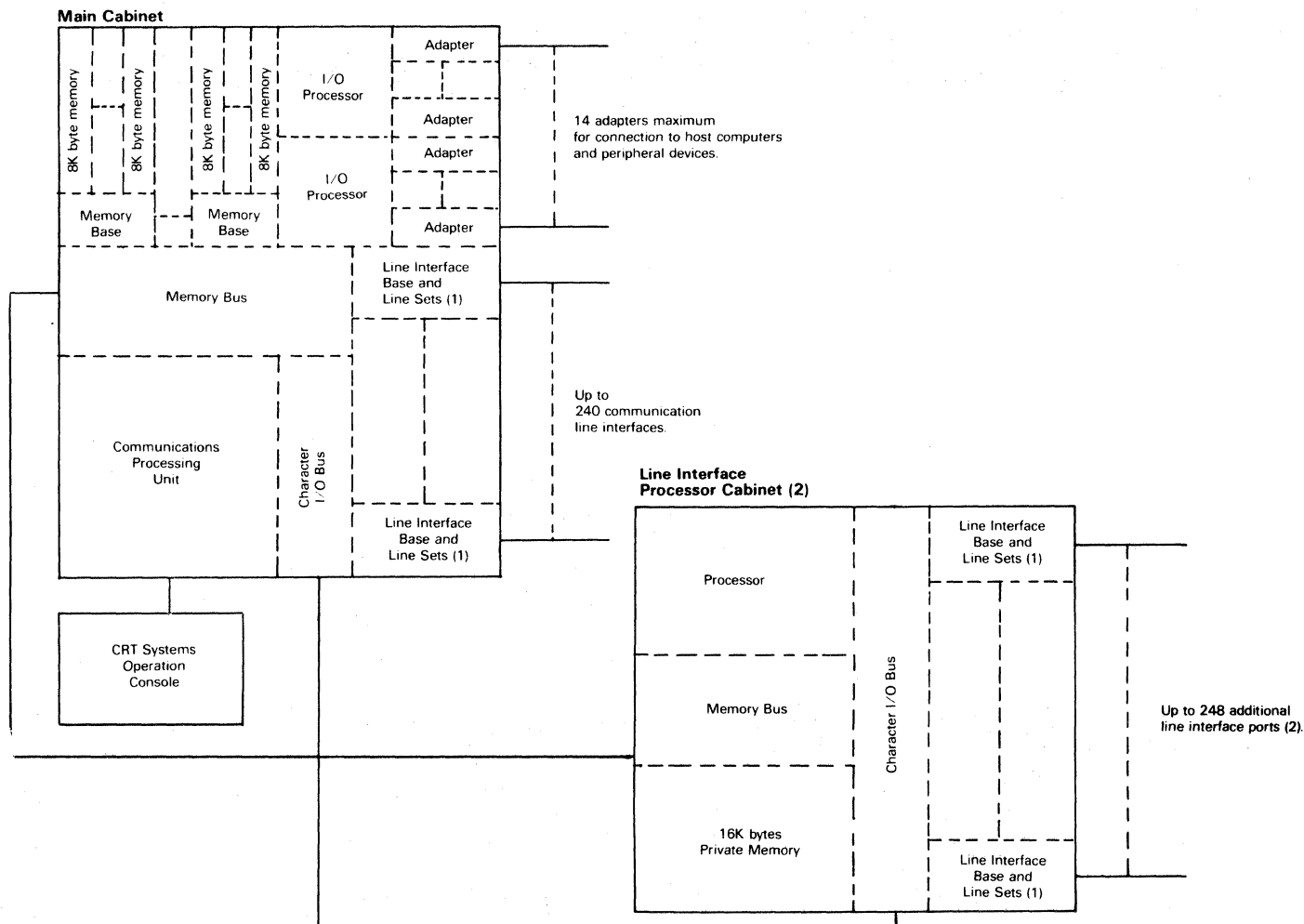
Adapters permit the cable attachment of IBM 360/370 and 303X mainframes and IBM-compatible mainframes such as NAS and Amdahl. The hosts that may be attached need not all be from the same vendor. Software modifications can be made, according to CCI, so that the CC-85 can communicate with other vendor's host CPU's by emulating supported terminals.

PERIPHERALS

I/O adapters are also available for connection of numerous peripheral control units to a CC-85. These peripherals include ▷

Computer Communications, Inc. (CCI) CC-85 Communications Processor

Configuration



- (1) Each Line Interface Base can support up to eight Line Sets, each of which supports one communications line.
 (2) Up to four Line Interface Processors can be configured per CC-85 system, yielding ports for the attachment of 1112 mixed lines.

➤ disk storage controllers which permit up to 1600 megabytes of disk storage to be accessed by a CC-85, a 300-lpm printer, a 120-cps paper tape reader, a 300-cpm card reader, a magnetic tape unit, and a flexible disk control unit.

Directly connected to the CPU is the color CRT Systems Operations Console, a significant enhancement over the optional system monitor available with previous CCI communications processors. Microprocessor-controlled, the CRT console can operate in several control modes which include System Supervisor, System Monitor or Engineering Console. The System Supervisor mode permits dynamic system reconfiguration and real-time assignment of lines and terminals. In the System Monitor mode, the console allows for individual line trace and color read-out of system line status, alarms, error messages, and statistics. A software module loaded in the CPU permits the console to perform engineering diagnostics, information displays, and performance analysis. The console is basic to the CC-85, unlike previous CCI processors in which the control console was optional.

MODEL CC-80 UPGRADE

Any existing CC-80 communications processor can be field-upgraded to a CC-85. The conversion, according to CCI,

takes about a day and a half, and carries appropriate upgrade and technical service costs. Actual conversion includes some software modifications and the introduction of microprocessing components, as well as the installation of a new processor, memory, Memory Bus, and operator console.

SOFTWARE

As with the CC-80, the Network Communications System (NCS) is the software package that drives the CC-85 processor. The NCS is divided into two modules, the utilization of which will vary depending on the specific configuration.

NCS 1 provides line handling functions, including polling and error handling under host control. A virtual-mode, disk-based operating system is included in this module, which essentially drives the CC-85 in 270X/370X operation. Specific terminal support is provided for Teletype teleprinters along with IBM 1050, 2741, 3270, 2260, and RJE/HASP workstations.

NCS 4 provides the CC-85 with networking capability and permits communication with remote CCI systems that are operating with NCS. ➤

Computer Communications, Inc. (CCI) CC-85 Communications Processor

► A full complement of system support programs are provided in addition to NCS for system generation and for assembly and the link editing of programs. Unique to the CC-85 is the software module which drives the CRT Systems Operation Console in its many modes of operation.

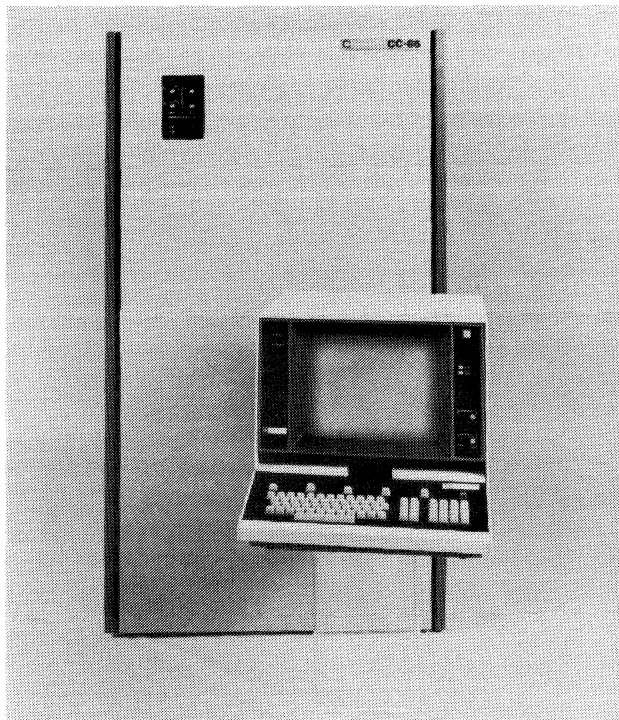
PRICING

CC-85 communications processor systems are available for purchase or on a three-, four- or five-year lease, which includes maintenance. A separate maintenance contract is available for purchased systems.

		Monthly Rental 3-year lease*	Purchase	Monthly Maint.
CC-85	Basic Processor with 64K of memory and CRT Operations Console	\$2,227	\$98,000	350
8004	I/O Processor	164	5,200	40
Memory				
8506	Memory Base, Single Access	215	7,425	50
8508	Memory Module, Single Access, 8K bytes	37	1,600	9
8017	Memory Bus Extender	210	7,000	35
8010	Memory Module, Private, 16K bytes	360	11,280	50
Host Interfaces				
8013	Channel Adapter for IBM 360/370	240	8,500	50
8081-1	Two-by-one IBM 360/370 Multiplexer Channel Switch	208	5,400	30
8081-2	Two-by-two IBM 360/370 Multiplexer Channel Switch	305	8,000	45
8082	Two Channel Switch	100	3,750	20
Communications Interfaces				
8028	Buffered Interface Base, Synchronous	95	3,200	20
8029	Line Set, Synchronous	35	1,800	10
8030	Line Set, WB	95	3,000	30
8035	Line Interface Base, Type 1A	20	650	4
8036	Line Set, Asynchronous	6	200	1
8037	Line Set, Synchronous	10	320	2
3038	Line Set, Reverse Channel	30	800	10
8031	Auto Dial Adapter Base	80	3,000	15
8031n	ACU adapter	2	75	—
Peripherals				
8050	Line Printer Controller	185	5,000	35
8051	Line Printer, 300 lpm	395	10,500	95
8053	Paper Tape Reader Controller	105	3,450	15
8054	Paper Tape Reader, 120 cps	60	950	10
8056	Card Reader Controller	70	2,850	10
8057	Card Reader, 300 cpm	170	4,500	45
8059	Magnetic Tape Unit Controller	345	13,500	45
8060	Magnetic Tape Unit	305	8,500	65
8071	Floating Head Disk Controller	510	15,500	120
8072	Floating Head Disk Drive and Access	460	14,400	95
8067	Flexible Disk Unit and Controller	235	7,800	50
8092	CC40M System Monitor (Color Display)	160	3,800	35
8093	CC40S System Supervisor (Black and White Display)	151	3,500	35
Features				
8075	Master Configuration Switch	74	2,100	5
8090	Expansion Cabinet	230	5,400	50
8091	Redundant Power Option for Expansion Cabinet	120	3,800	20
8076	IOP Switch	160	5,000	10
8077	Memory Bus Switch	160	5,000	10
8078	Dual Access I/O Controller Switch	70	2,500	5
8079	Modem Communications Switch	84	2,100	15
8080	Modem ByPass Adapter	5	150	—
8094	System Alarm Panel	35	1,500	5

*Includes monthly maintenance. ■

Computer Communications, Inc. (CCI) CC-85 Communications Processor



The CC-85, depicted above with its color CRT Systems operation console, is designed for controlling a high-volume data communications network of IBM and IBM-compatible mainframes.

MANAGEMENT SUMMARY

The CC-85 communications processor is the successor to the CC-80, which CCI has marketed since 1975. The CC-85 is actually a CC-80 which has been upgraded to include a wider memory bus, some microprocessors, a color CRT operator console, and minor software additions. The net result, however, is a communications processor with over twice the throughput capacity of its predecessor at only about a 25 percent increase in cost.

The introduction of microprocessors permits a reduced internal cycle time for the central processing unit. The new memory bus, some three times the bandwidth of the CC-80's, permits a 0.27 microsecond memory cycle time compared to 0.54 microsecond for the CC-80. Additional enhancements to the CC-85 include an "instruction look-ahead" cache memory and the capability to connect up to 1600 megabytes of disk storage.

CCI markets the CC-85 as an attractive alternative to the IBM 3704/3705—and justifiably so. The CC-85 offers more line connections, higher throughput, support for a larger number of attached hosts, and more flexible software than the IBM communications processors. It can, in addition, perform the same network control functions as the ACF/NCP-driven 3705-II. The CC-85 supports all standard IBM telecommunications access methods and operating systems, and offers the same byte/block multi- ➤

A high-throughput communications front end for IBM 360/370, 303X, and compatible mainframes; it can also serve as a remote concentrator, stand-alone communications processor, message switcher, or any combination simultaneously.

A functional replacement for the IBM 3705, the CC-85 offers a sustained throughput capacity of 400K bytes per second, with a peak throughput capacity of nearly one megabyte per second. The CC-85 can be alternately configured as a local and remote communications node, facilitating automatic backup in the event of host failure. The modular Network Control System (NCS) operating software is tailored for specific applications, and is included in the rental or purchase price.

The CC-85 can support up to seven channel-attached host computers, which may be a mix of IBM and compatible mainframes, and up to 1112 communications lines of mixed speeds and protocols. Async, BSC, and SDLC communications can be accommodated at up to 230K bps; CCI is talking about an X.25 interface capability later in 1979.

A typical CC-85 configuration consisting of 176 bytes of memory and adapters for 240 mixed speed and protocol communications lines can be leased, based on a three-year lease, for \$9,046 per month, including maintenance, or purchased for \$341,250.

CHARACTERISTICS

VENDOR: Computer Communications, Inc., 2610 Columbus Street, Torrance, California 90503. Telephone (213) 320-9101.

DATE OF ANNOUNCEMENT: November 1978.

DATE OF FIRST DELIVERY: January 1979.

NUMBER INSTALLED TO DATE: 3.

SERVICED BY: Computer Communications, Inc.

CONFIGURATION

The CC-85 communications processor is, as are other CCI communications systems, available as a turnkey system; modular software is tailored to accommodate specific applications.

Basic to each CC-85 is the main cabinet, which contains the Communications Processing Unit ("CPU"). Character I/O Bus, Memory, Memory Bus, Memory Interface Controller (MIC), I/O processor, and the peripherally-connected CRT ➤

Computer Communications, Inc. (CCI) CC-85 Communications Processor

▷ plexer and selector channel interface capability as the 270X/370X.

CCI has stated that it intends to limit front-end compatibility of the CC-85 to IBM and IBM-compatible mainframes. CCI states that the CC-85 can support connection, either local or remote, to mainframes from most other major vendors by emulating terminals.

One CC-85 enhancement to system operation is the System Monitor mode for the console, which includes a microprocessor-controlled color CRT monitor. This feature, according to CCI, permits detailed statistical reporting of internal buffer, register, and cycle use, and the presentation of operational status of all lines. In addition to monitor and tracing functions, the console, and its related control software, permit a high degree of user control over the system's teleprocessing activity.

Although 1112 communications lines are physically attachable, the actual number supported concurrently, as with any front-end or communications processor, may be significantly decreased depending on how many lines are being operated in full-duplex mode, at high speed, and with protocols requiring a high degree of processor overhead. System throughput may likewise be decreased depending on message handling overhead required.

Previous user reaction surveys by Datapro have shown users to be impressed with the predecessor CC-80. It will take several months of user experience before it can be determined whether the CC-85 is as favorably acclaimed. □

▶ control console. The CPU is a 16-bit processor composed of high-speed microprocessors.

The Memory Bus interfaces main memory, the CPU, MIC, I/O Processors, and certain Line Interface Bases which feature direct memory access. Up to eight memory bases can be attached to the Memory Bus. The memory bases can each support up to eight memory modules, each containing 8,192 bytes of main memory, yielding a maximum of 524,288 bytes within the main cabinet.

The main cabinet can contain up to two I/O processors, each of which can support up to seven adapters for connection to host computers, mass storage controllers, other communications processors and peripheral devices. Data received through these adapters can be assembled into blocks by the I/O processor and transferred directly into memory via the Memory Bus without processor intervention. Each I/O processor can handle a maximum data transfer rate of about one megabyte per second.

With the exception of certain Line Interface Bases that can directly access memory via the Memory Bus, all other Line Interface Bases are connected to the Character I/O Bus, which is connected to the CPU. There are 32 interrupt levels associated with each of eight addressable slots of the Character I/O Bus, which yields 256 addressable units. However, 16 of these addresses are required for internal use, and the remaining 240 can support communications.

An expansion cabinet may be required for large numbers of communications lines. For large systems (over 240 lines), a Line Interface Processor, which is essentially another CPU, must be added. A Line Interface Processor contains its own Character I/O Bus and Memory Bus, each of which is con-

nected to its respective bus in the main CPU. Up to four Line Interface Processors may be added to the CC-85 CPU with each capable of supporting 248 lines, yielding a system maximum of 1112 attachable lines. Also contained in the Line Interface Processor is a 16K-byte module of private memory (with a cycle time of 0.18 microseconds), accessible to the CPU located in the main cabinet.

TRANSMISSION SPECIFICATIONS

For support of communications lines, two Line Interface Bases (LIB) are offered. The Type 1 LIB is attached to the Character I/O Bus, and will support eight asynchronous, full- or half-duplex lines at up to 9600 bps. The Type 1 LIB supports up to eight Type 1A line sets, each of which interfaces a single line.

The Synchronous Line Interface Base, for BSC and SDLC lines, is attached to both the Memory Bus and the Character I/O Bus. Each synchronous LIB will support up to eight half- or full-duplex synchronous lines at up to 230.4K bps. Messages are transferred directly from the LIB to the Memory Bus; when the message is complete, the LIB can trigger a processor interrupt via its Character I/O Bus attachment to inform the processor that there is a message requiring handling. Two types of line sets are supported by these LIB's, and each of the line sets supports the attachment of two synchronous lines. One line set will handle transmission at up to 9600 bps, and the other, the Wideband line set, will support transmission at up to 230.4K bps.

CONNECTION TO HOST

Each I/O processor can accommodate seven adapters for connection of hosts to the CC-85. Since two I/O processors can be contained in a CC-85, up to 14 adapters can be accommodated. However, software considerations limit the number of hosts currently supported by the system to seven. Only one adapter per I/O processor can be active at any given time.

Adapters permit the cable attachment of IBM 360/370 and 303X mainframes and IBM-compatible mainframes such as ITEL and AMDAHL. The seven hosts that may be attached need not all be from the same vendor. Software modifications can be made, according to CCI, so that the CC-85 can communicate with other vendor's host CPU's by emulating supported terminals.

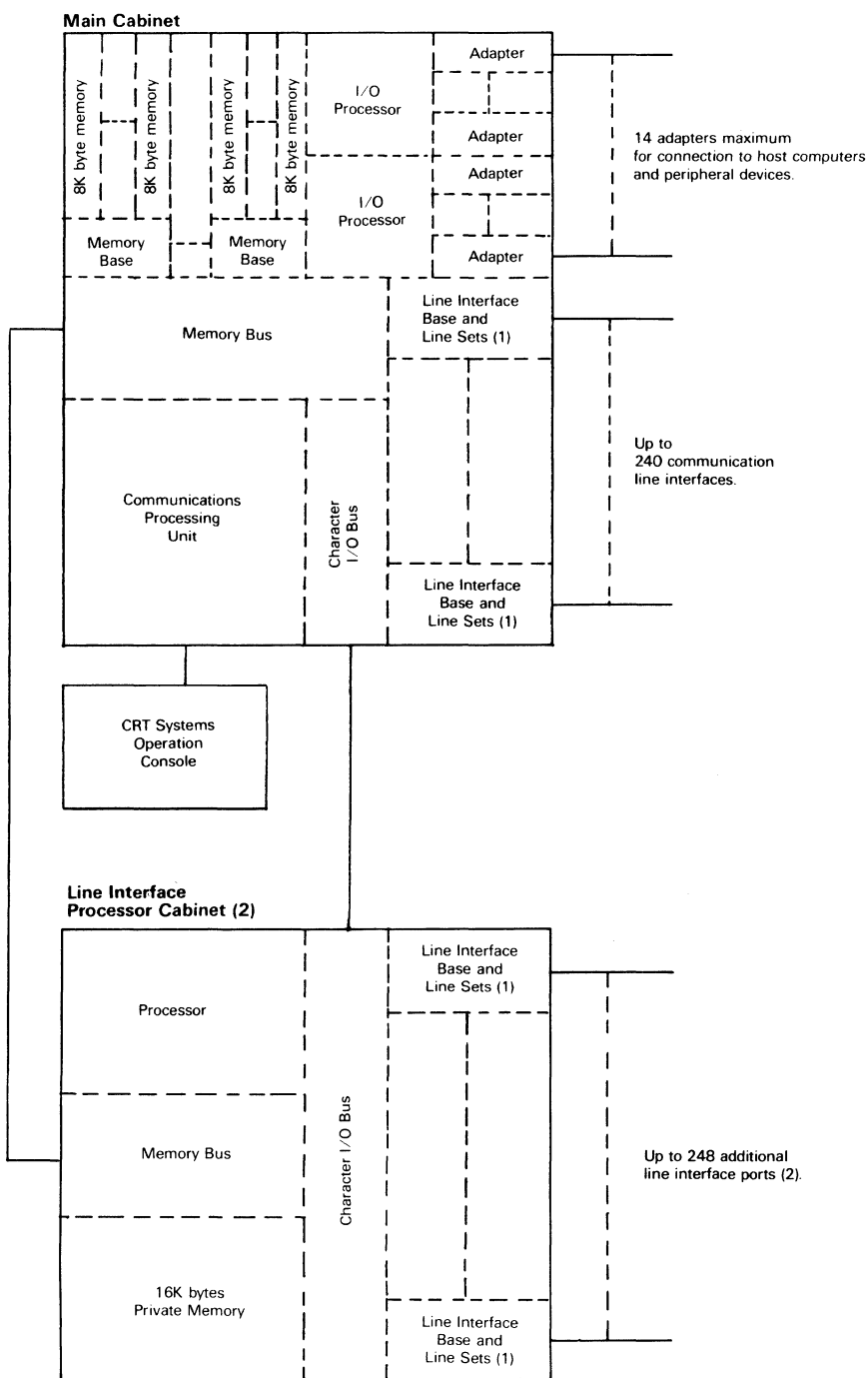
PERIPHERALS

I/O adapters are also available for connection of numerous peripheral control units to a CC-85. These peripherals include disk storage controllers which permit up to 1600 megabytes of disk storage to be accessed by a CC-85, a 300-lpm printer, a 120-cps paper tape reader, a 300-cpm card reader, a magnetic tape unit, and a flexible disk control unit.

Directly connected to the CPU is the color CRT Systems Operations Console, a significant enhancement over the optional system monitor available with previous CCI communications processors. Microprocessor-controlled, the CRT console can operate in several control modes which include System Supervisor, System Monitor or Engineering Console. The System Supervisor mode permits dynamic system reconfiguration and real-time assignment of lines and terminals. In the System Monitor mode, the console allows for individual line trace and color read-out of system line status, alarms, error messages, and statistics. A software module loaded in the CPU permits the console to perform engineering diagnostics, information displays, and performance analysis. The console is basic to the CC-85, unlike previous CCI processors in which the control console was optional. ▶

Computer Communications, Inc. (CCI) CC-85 Communications Processor

Configuration



- (1) Each Line Interface Base can support up to eight Line Sets, each of which supports one communications line.
 (2) Up to four Line Interface Processors can be configured per CC-85 system, yielding ports for the attachment of 1112 lines.

► MODEL CC-80 UPGRADE

Any existing CC-80 communications processor can be field-upgraded to a CC-85. The conversion, according to CCI, takes about a day and a half, and carries appropriate upgrade and technical service costs. Actual conversion includes some software modifications and the introduction of microprocessing components, as well as the installation of a new processor, memory, Memory Bus, and operator console.

SOFTWARE

As with the CC-80, the Network Communications System (NCS) is the software package that drives the CC-85 proc-

essor. The NCS is divided into four modules, the utilization of which will vary depending on the specific configuration.

NCS 1 provides line handling functions, including polling and error handling under host control. A virtual-mode, disk-based operating system is included in this module, which essentially drives the CC-85 in emulation operation.

NCS 2 supplies line handling control for specific devices independent of a host computer. Specific terminal support is provided for Teletype teleprinters along with IBM 1050, 2741, 3270, 2260, and RJE/HASP workstations. NCS 2 essentially drives a CC-85 as an independent front-end processor. ►

Computer Communications, Inc. (CCI)
CC-85 Communications Processor

▶ NCS 3 incorporates IBM's Advanced Communications Functions into the CC-85, which emulates IBM's Network Control Program for the host interfaces of the CC-85 and works with the VTAM.

NCS 4 provides the CC-85 with networking capability and permits communication with remote CCI systems that are operating with NCS.

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