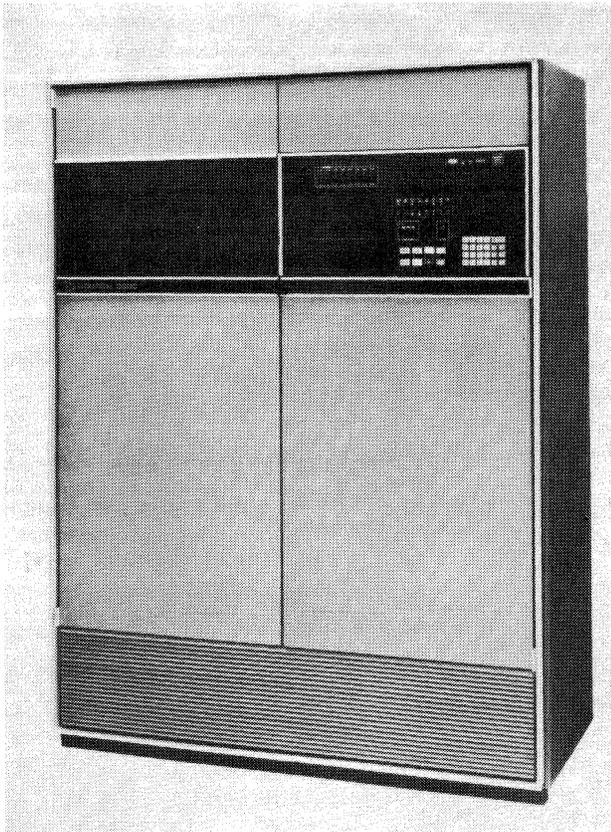


Comten 3650 II, 3670 II and 3690 Communications Processors



The Comten 3690, above, represents the top of the Comten IBM 3705-replacement line. Its basic 256K bytes of memory is expandable to over four megabytes and, unlike the 3705, peripherals such as disk and magnetic tape storage are supported.

MANAGEMENT SUMMARY

Comten delivered its first IBM plug-compatible communications processor shortly after the initial IBM 3705 announcement in 1972, and has since become one of the leading manufacturers of front-end and remote communications processors.

Comten's current IBM-compatible products (the 3650 II, the 3670 II, and the 3690) closely parallel the operation of IBM's 370X Communications Controllers, as does the Comten software. As a result, implementation of a Comten 36X0 running the Comten Emulation or CNS software requires no modification to the IBM host's telecommunications access method or application programs. When running Comten NCP, the 360/370 host's access method must be VTAM or TCAM, as required for IBM's NCP.

In response to IBM's entry into the distributed processing market, Comten announced and subsequently delivered Release 1 of its unbundled Data Switching System (DSS) software. This modular software package permits any Comten 36X0 to operate as a nodal processor in an SNA ➤

A family of communications processors which, while functioning as replacements for the IBM 3705, also support a variety of peripherals and stand-alone operation.

The high-end model supports up to 512 communications lines and up to eight channel attachments to IBM 360/370 or compatible hosts. Most common communications modes, facilities and protocols (including IBM BSC and SDLC) are supported. Numerous software packages provide varying degrees of support, and may include IBM 270X or 370X emulation, NCP operation, and SNA networking compatibility.

A low-end 3650 with 64K bytes of memory, and support for 16 asynchronous lines can be purchased for \$42,645, or leased on a two-year basis for \$1,362 per month, including maintenance. A high-end 3690 with 256K bytes of memory, and support for 32 mixed asynchronous and BSC lines can be purchased for \$136,580, or leased for \$4,279 per month, including maintenance.

CHARACTERISTICS

VENDOR: Comten, Inc., a subsidiary of NCR, 1950 West County Road B-2, St. Paul, Minnesota 55113. Telephone (612) 633-8130.

DATE OF ANNOUNCEMENT: 3650 I—March 1975; 3650 II—March 1976; 3670 I—January 1972; 3670 II—March 1976; 3690—July 1977.

DATE OF FIRST DELIVERY: 3650 I—September 1975; 3650 II—June 1976; 3670 I—April 1972; 3670 II—June 1976; 3690—June 1978.

NUMBER DELIVERED TO DATE: 3650—over 650; 3670—over 300; 3690—over 60.

SERVICED BY: Comten, Inc.

CONFIGURATION

The Comten 3670 II and the Comten 3650 II are based on the same hardwired processor with a memory cycle of 650 nanoseconds and a 16-bit word. The 3650 is a stripped-down version of the 3670 and supports a reduced number of direct host connections, communications lines, and memory capacity.

The Comten 3690 has a microprogrammed processor with a memory cycle time of 520 nanoseconds. Architectural sophistication enables the 3690 to operate from three to six times faster than the 3650/3670.

The most notable architectural changes that contribute to the speed enhancement of the 3690 are: the processor logic ➤

Comten 3650 II, 3670 II and 3690 Communications Processors

▷ network of distributed systems. DSS supports SNA/SDLC capabilities similar to those developed by IBM for its 3705 II under ACF/NCP.

With over 1,000 36X0's already delivered and operating, Comten's customer following has grown substantially. Comten offers several features which are not presently available to IBM 3705 users. These include support for a variety of peripherals, and stand-alone operation.

The 3670 and 3690 offer proportionately increased memory capacity, line handling capability, and support for more channel-attached hosts than the 3650. Comten estimates that the 3690 operates from three to six times faster than a comparably configured 3650 II and 3670 II. Additionally, Comten machines reportedly offer a memory cycle time which is 40 percent faster than that of the 3705.

The version II models of the 3650 and 3670 were first delivered in 1976 and offer enhanced semiconductor memory and line handling capacity over their predecessor models.

In June 1979, Comten was acquired by NCR, Inc. following several months of heated negotiations during which Amdahl quickly entered, and exited, the bidding. Much industry speculation has been devoted to how the acquisition will affect future Comten product development. The new NCR subsidiary (which incidentally grossed about \$50 million in 1978) will undoubtedly continue in its IBM-compatible pursuits (which have been extremely lucrative), but may also now focus some of its development effort towards NCR-compatible communications equipment.

USER REACTION

From the DATAPRO Survey of Communications Processor users conducted in the fall of 1978, 52 Comten users were identified. It is noteworthy that the group of Comten users comprised the second largest group of respondents to this survey (next to the group of IBM 3704/3705 users). The Comten ratings represented a total of 101 processors in operation, or roughly two per respondent.

Of the 52 users, 36 had Comten 3650 processors. The balance (16) were 3670 users. Each 3650 was handling an average of 75 communications lines. The ratings given by these users were as follows:

Comten 3650	Excellent	Good	Fair	Poor	WA*
Overall satisfaction	22	10	3	0	3.5
Ease of installation	9	17	4	4	2.9
Throughput	18	15	2	0	3.5
Hardware reliability	23	10	2	0	3.6
Promptness of maintenance	18	15	2	0	3.5
Quality of maintenance	17	12	6	0	3.3
Software	11	15	7	2	3.0
Technical support	14	9	6	4	3.0

*Weighted Average on a scale of 4.0 for Excellent.

► control is microprogrammed; data transfers to and from memory are via an odd/even dual access; the word size is 64 bits; and instruction execution includes look-ahead instruction execution.

All 36X0 models support direct attachment to the IBM System/360, 370; Control Data Omega systems, Amdahl systems, and Intel systems. Comten will also produce custom interfaces for other host systems, as required. Table 2, The Comten 36X0 at a Glance, distinguishes the characteristics of each 36X0.

Software to operate the 36X0's as front-ends, remote concentrators, and as stand-alone communications processors is included with the equipment. The Emulation package permits the 36X0 to function as an IBM 370X or as an IBM 370X emulating an IBM 270X.

The Communications Networking System (CNS) package has all of the capabilities of the Emulation package plus the ability for multiple Comten processors within a network to communicate with each other.

The Network Control Program (NCP) relieves the host processor of the bulk of network control functions and is comparable to IBM's NCP. The host access method, when operating NCP in the Comten processor, must be IBM's TCAM or VTAM.

The Data Switching System (DSS) augments NCP and CNS to enable the Comten processor to efficiently operate as a distributed network nodal processor, conforming to the rules established by IBM's System Network Architecture (SNA).

Asynchronous lines up to 19.2K bps, and synchronous lines up to 56K bps are supported in either half- or full-duplex mode. Major protocols supported including Teletype, BSC, CNS trunkline (Comten's internal, BSC-like protocol), and SDLC.

Comten 3650 II

The 3650 II is offered in four basic models. Two of the models are intended for use as a front-end processor and two of the models are intended for use as a remote concentrator. All models include the base cabinet with the 650-nanosecond processor, 64K bytes of memory, the Integral Program Load Device and two Direct Storage Access channels. The two front-end processor models, the 3650-C3 and the 3650-D3, include one IBM Channel Interface Adapter, which provides a direct storage access connection with the host computer system. An optional second channel is available for attachment of either peripherals requiring a direct channel interface or a second IBM Channel Interface Adapter. The latter can be attached to the same host or to another host computer. The C3 and D3 models also include a Communications Interface Module that will permit the attachment of up to eight Modem Interface Modules (MIM) to the system. Each Modem Interface Module will support up to 16 communications lines.

The base cabinet of the 3650-C3 has space and electrical interfaces to accommodate three Logic Modules. (A Logic Module is a deck of up to 70 circuit boards occupying about 23 x 6 x 9 inches of space within the cabinet.) Three of the four types of attachable MIM's require the space of one Logic Module. Three of these MIM's, in any combination, can be installed on the 3650-C3 models with each MIM supporting up to 16 lines. A fourth type of MIM, the DLC-MIM, occupies one-half of two adjacent Logic Modules. The basic 3650-C3 therefore can accommodate only two of the DLC-MIM's. Physical considerations prevent the third Logic Module from being used when two DLC-MIM's are attached. An alternate configuration permits one DLC-MIM and one of the other three types of MIM's to be

Comten 3650 II, 3670 II and 3690 Communications Processors

TABLE 1. THE COMTEN 36X0 AT A GLANCE

	<u>Comten 3650 II</u>	<u>Comten 3670 II</u>	<u>Comten 3690</u>
Processor—			
Main memory cycle time, nanoseconds	650	650	520*
Main memory word size, bits	16	16	64
Basic main memory capacity, bytes	64K	64K	256K
Maximum main memory capacity, bytes	512K	512K	4096K
Logic Control	Hardwired	Hardwired	Microprogrammed
Network—			
Maximum number of communications lines physically attachable	128	384	512
Maximum number of direct host attachments	2	4	8
Host systems supported			
	IBM 360/370, CDC Omega, Amdahl, ITEL, Custom	IBM 360/370, CDC Omega, Amdahl, ITEL, Custom	IBM 360/370, CDC Omega, Amdahl, ITEL, Custom

*Architectural features such as the look-ahead instruction execution, dual storage access, and a 64-bit word results in the 3690 operating 3 to 6 times faster than the other two models.

➤ It should be noted that, except for ease of installation, all of the other ratings for the 3650 were above the average for all other processors in the same survey. The highest rated characteristics of the 3650 were: hardware reliability, overall satisfaction, throughput, and promptness of maintenance. It could not be readily determined what percentage of these processors were Model I or Model II, but judging from the period of time that they had been operational, it would appear to be about half and half. Most of the respondents were using the 3650 to front-end IBM and compatible mainframes, and most were operating in IBM 270X emulation mode. About a third of the processors were operating in NCP mode. Only two of the users indicated that they were employing a 3650 in a remote concentration capacity.

The ratings given by the 16 3670 users were roughly similar to those given for the 3650, although some of the ratings were slightly higher or lower. Incidentally, the average number of lines being handled by each of the 3670's was 148.5, *the highest average capacity for all of the communications processors rated in the survey, including IBM.* The 3670 user ratings were as follows:

Comten 3670	<u>Excellent</u>	<u>Good</u>	<u>Fair</u>	<u>Poor</u>	<u>WA*</u>
Overall satisfaction	9	7	0	0	3.6
Ease of installation	4	11	1	0	3.2
Throughput	8	8	0	0	3.5
Hardware reliability	11	4	1	0	3.6
Promptness of maintenance	5	9	2	0	3.2
Quality of maintenance	4	7	5	0	2.9
Software	4	10	2	0	3.1
Technical support	3	7	4	1	2.8

*Weighted Average on a scale of 4.0 for Excellent.

While overall satisfaction was rated slightly higher for the 3670, vendor maintenance and technical support were rated slightly lower. Ratings for hardware reliability and throughput were the same for both machines; 3.6 and 3.5, respectively.

➤ attached. Expansion cabinets (Module Controllers) must be employed to add more MIM's to reach the system maximum of eight MIM's. The Module Controllers are available in two models. One model supplies space to accommodate six Logic Modules; the other model supplies space to accommodate 12 Logic Modules. Two additional models, a 6 LM and a 12 LM size, provide for two 3650's to have access to the same Module Controller. One use for the dual access Module Controller is for fall-back. When the primary 3650 front-end is not operative, the secondary 3650 can assume the prime function in handling the lines. The basic 3650-D3 includes capacity for housing 11 Logic Modules. When more Logic Modules are required, Module Controllers are employed.

The basic 3650-E3 and the 3650-F3 remote concentrators do not include a Channel Interface Adapter; however, up to two adapters can be optionally attached to each system. Included in the basic 3650-E3 and the 3650-F3 are a BSC-MIM and a Line Interface that will support eight full-duplex communications lines. The two features are used to support Comten's CNS trunkline protocol and can transmit data at speeds up to 56K bps.

Comten 3670 II

The Comten 3670 is offered in five basic models. Two models, the Comten 3670-H1 and J1, are intended as remote concentrator processors. The remaining three, the Comten 3670-E1, F1, and G1, are intended for use as front-end processors. All models include the basic cabinet with the 650-nanosecond processor, 64K bytes of memory, an Integral Program Load Device, two Direct Storage Access Channels, and one Communications Interface Module (CIM). The CIM can accommodate up to eight Modem Interface Modules (MIM). Each MIM can support Line Interfaces for up to 16 communications lines.

The three front-end basic systems (E1, F1, G1) include one IBM Channel Interface Adapter. Up to three additional adapters, along with up to eight direct access peripheral controllers, can be optionally attached. A Block Multiplexer feature is required to attach the peripheral controllers. The Block Multiplexer attaches to the Direct Storage Access Channel. Alternatively, an Integrated File Adapter (IFA) can be attached to the Direct Storage Access Channel, to support up to four disk drives. Two additional Communications Interface Modules can be optionally added to the basic CIM for all models, permitting attachment of a total of 24 MIM's or up to 384 communications lines.

**Comten 3650 II, 3670 II and 3690
Communications Processors**

TABLE 2. COMMUNICATIONS LINE INTERFACES & MODEM INTERFACE MODULES

Line Interface		Half- or Timing Full-Duplex	Speed, bps	Line Interface Feature	Lines per Interface	No. of Interfaces per MIM	MIM Feature	
EIA RS 232C	Bell 113B, 103A, 202	Async.	Half	Up to 1800	F2072-A1	2	8	T2016-A2**
	Unwired, for special applications	Async.	Half	Up to 1800	F2072-A2	2	8	T2016-A2**
	BSC	Sync.	Half	Up to 20K	F2053-A1	2	8	T2018-A2
	CNS trunkline	Sync.	Full	Up to 20K	F2053-B1	1	8	T2018-A2
	IBM 2848/2260, 2845/2265	Async.	Half	Up to 20K	F2053-C1	2	8	T2018-A2
	SDLC	Sync.	Both	Up to 20K	F2083	2	8	T2020-A2
Current loop, 20 ma or 60 ma		Async.	Half	Up to 75	F2074*	2	8	T2016-A2**
Wideband	Bell 300 Series	Sync.	Half	Up to 50K	F2064-A1	1	4	T2018-A2
	CNS trunkline	Sync.	Full	Up to 50K	F2064-B1	1	4	T2018-A2
DDS	BSC	Sync.	Half	Up to 56K	F2092-A1	2	2	T2018-A2
	CNS trunkline	Sync.	Full	Up to 56K	F2092-B1	1	2	T2018-A2
	Bell System Data Service Unit	Sync.	Both	Up to 56K	F2085	1	2	T2020-A2
Wideband	BSC	Sync.	Both	Up to 230K	F2026-A1	2	2	T2017-A1 ***
	BSC	Sync.	Both	Up to 230K	F2026-B1	2	2	T2017-A1 ***
	BSC	Sync.	Both	Up to 230K	F2026-C1	2	2	T2017-A1 ***
	Bell 300 Series	Sync.	Both	Up to 50K	F2084	1	2	T2020-A2
Auto call Adapter	#T2014-XX 1	—	—	—	F2033-XX	1	16	T2016-A2
	#T2014-XX	—	—	—	F2033-XX	1	16	T2018-A2

*Requires Telegraph Interface Base Feature #F2068.

**F2028 or F2077-XX required for each T2016. F2028 (no charge) allows only single speed. F2027-XX permits program selection of a different speed for each line.

***Requires F2040 when more than one F2026 is attached.

➤ As with the 3650 processors, about half of the 3670's appeared to be Model 1, and half Model 2. Almost all were operating in IBM 270X emulation mode. About a quarter of the respondents indicated that they were using at least one of their processors in a remote concentration capacity.

Many of the Comten users indicated that they had experienced major difficulty with communications lines and modems, but it could not be determined whether or not this was related to the processor operation. Several of the users stated they had encountered problems with the Comten software, but based on the ratings, 3.0 and 3.1, these problems were apparently either minor, or had been resolved with subsequent software releases.

Based on the overall ratings, Comten enjoys a satisfied user base. Both machines rated well above the average in almost all criteria. □

➤ The three front-end base models, the 3670-E1, F1, and G1, have 11, 19, and 27 Logic Modules, respectively. A Logic Module is the space available to mount one rack of PC boards. When more MIM's are required than can be contained in the base configuration, expansion cabinets (Module Controllers) are necessary. Module Controllers are available in 4 models containing 6, 12, 18, and 24 Logic Modules. Each controller comes in a single processor version and a dual processor version. The dual processor version permits two 3670's to be attached to the controller. The net effect is that two front-end processors can have access to the communications lines that are attached to the controller.

The two remote concentrator systems (H1, J1) include one BSC-MIM with one trunk line interface that accommodates up to 8 full-duplex lines at speeds up to 56K bps. One addi-

tional Communications Interface Module can be optionally added, permitting a total of 24 MIM's or up to 384 communications lines. Two Direct Storage Access Channels are available on the remote system for attachment of up to 16 direct access peripheral controllers when a Block Multiplexer is attached to each Direct Storage Access Channel. The basic 3670-H1 has 12 Logic Modules. When adding more MIM's than can be contained in the base configuration, the Module Controllers, as described above, are used.

Comten 3690

The Comten 3690 is offered in five basic models. All models include a microprogrammed processor with dual-odd/even storage access, an Integral Program Load Device, 256K bytes of 520-nanosecond memory, and one Communications Adapter (CA). The CA accommodates up to 8 Modem Interface Modules and associated Line Interfaces to support up to 128 communications lines. Up to three additional CA's can be optionally attached permitting physically attaching up to 512 communications lines per 3690 system. Since the basic models include space for two, three, or seven Logic Modules, Module Controller expansion cabinets are provided to accommodate the attachment of MIM's and Line Interface. The Module Controllers are available to handle Logic Module requirements of 6, 12, 18, 24, 30 or 36 Logic Modules. Each of the controller sizes has a version that permits dual 3690's to access the controller and the lines attached to that controller.

The basic 256K bytes of memory can be expanded to 4096K bytes by the attachment of up to 15 Memory Modules; each module contains 256K bytes of memory.

The five 3690 basic models differ in the number of Direct Storage Access Channels (DSAC) provided and the device that can be attached to the DSAC's.

The 3690-A4 is intended to operate as a stand-alone data switching system configured to support a variety of peripheral attachments. Therefore, the 3690-A4 provides

Comten 3650 II, 3670 II and 3690 Communications Processors

four DSACs with one of the DSACs having a Block Multiplexer Channel attached. The Block Multiplexer has the capacity to accommodate up to eight peripheral controllers. The remaining three DSACs can optionally receive Block Multiplexer Channels or Integrated File Adapters (for multiple disk attachment). This model includes space for three Logic Modules in the base cabinet.

The 3690-B4 is intended to function as a remote communications processor and does not include any Direct Storage Access Channels. This model includes space for three Logic Modules in the base cabinet.

The 3690-C4, D4, and E4 are intended to function as front-end processors. All three models include four Direct Storage Access Channels. The 3690-C4 also includes one Channel Interface Adapter for direct attachment to the host. The three remaining DSACs can be used to attach up to three additional Channel Interface Adapters, up to three Block Multiplexer Channels, up to three Integrated File Adapters, or any combination of the three feature attachments.

The 3690-D4 has a Channel Interface Adapter Base attachment to one of the DSACs. This CIA Base can support attachment of up to four Channel Interface Adapters, still leaving three DSACs available. The three DSACs are restricted to attachment of Block Multiplexers or Integrated File Adapters. The basic 3690-D4 includes one IBM Channel Interface Adapter.

The 3690-E4 includes two CIA Bases, each able to accommodate up to four host attachments or a system total of eight. One of the CIA Bases includes an IBM Channel Interface Adapter as part of the basic configuration. The two remaining DSACs can be used for Block Multiplexer or Integrated File Adapter attachment.

CONNECTION TO HOST COMPUTER

The 3650 supports up to two direct host connections; the 3670, up to four; and the 3690, up to eight. The Channel Interface Adapter controls byte transfers between the Comten processors and the multiplexer channel on an IBM host computer. Subchannel addresses from 1 to 256 are supported. When the Comten processor is emulating an IBM 270X, an Emulator Identifier feature is required along with the Channel Interface Adapter.

TRANSMISSION SPECIFICATIONS

Asynchronous lines up to 19.2K bps, and synchronous lines up to 56K bps are supported. EIA RS 232C, current loop, wideband, and DDS interfaces are supported in either full- or half-duplex mode. Notable among the protocols supported are binary synchronous communication (BSC), SDLC, and CNS trunkline. The latter is a BSC-like protocol used internally on Comten networks.

Each type of line interface requires specific Modem Interface Module and Line Interface features. These features are attached to the system Communications Interface Module. Table 2, Communications Line Interfaces and Modem Interface Modules, lists the features required to support the various types of communications lines. Throughput limitations are noted by the number of lines each MIM will support for a given type of interface, despite the physical capability of attaching 16 lines per MIM.

SOFTWARE

Currently, four major software packages are available, for operating Comten 36X0 systems. The Comten Emulation, Communications Networking System (CNS), and Network Control Program (NCP) packages are available at no additional charge. The Data Switching System (DSS) is available on an unbundled basis.

Emulation

Comten Emulation permits the 36X0 to operate as an IBM 3704/3705 controller, including the capability to emulate an IBM 270X. In addition to permitting one Comten 36X0 to replace multiple 270X/370X devices attached to one host, the 36X0 can be connected to multiple hosts. Emulation also supports terminals that are not compatible with the 270X and 370X.

Emulation consists of a module for each terminal-type requiring support and a string of special purpose programs such as TILS, ABRD, MAF, and DIAL. TILS, Terminal-Initiated Line Switching, assigns the appropriate host subchannel address that is associated with a particular application. The assignment is based upon the terminal operator's description of the linkage required. TILS includes a feature that will automatically reroute transactions to a backup host when the primary host is unavailable. ABRD, Automatic Baud Rate Detection, enables multiple start/stop terminals with different speeds and data-link control procedures to share the same line to a Comten front-end processor. ABRD is used in conjunction with TILS. When a terminal operator initiates a linkage under TILS, it is ABRD that determines the terminal's speed and data-link control. SILS, Site-Initiated Line Switching, under the control of the front-end processor's operator, performs the TILS function for dedicated lines. MAF, Multiple Access Facility, relieves the host of the polling function for IBM 3270 systems and permits the terminals to select applications in any host computer attached to the Comten front-end processor. DIAL, Automatic Dialing, handles up to 16 phone lines for host-originated calls.

Emulation also provides utility programs for monitoring and maintenance, on-line terminal testing, console I/O, and on-line system generation.

Communications Network System (CNS)

When there is a need for two or more Comten processors to communicate with each other, within a network, the Emulation software package is replaced with the Communications Networking System (CNS). While performing all of the functions of Emulation, CNS also enables a Comten processor functioning as a remote concentrator to transmit to and receive from a Comten processor functioning as a front-end processor. Terminals using start/stop or BSC protocols are supported by the remote concentrator through the CNS interface modules ASWX and BSWX. While these modules perform the data-link function, the Transparent Concentrator (TCON) module performs the function of multiplexing/demultiplexing of the data from each terminal. The module that handles the network's internal protocol (CNS Trunk Handler) is the TCTH module. This internal protocol is transparent to the terminals and the host processors. CNS emulator modules, comparable to the Emulation modules above, are resident in the front-end processor for each terminal-type sending and receiving data. An optional module, STAR, performs trunk monitoring and reporting. Information on trunk utilization, current circuit status, and error statistics are provided by STAR, along with automatic notification of circuit failures. Other CNS features support alternate routing, node reconfiguration, satellite links, remote auto-dial, and multiple-circuit trunks.

Network Control Program (NCP)

Both the CNS and the Emulation packages require a separate subchannel address for each terminal communicating with the host. Controlling multiple accesses consumes significant host processor time. NCP provides for all data between the host and the front-end processor to be multiplexed over a single subchannel, significantly reducing the host control

Comten 3650 II, 3670 II and 3690 Communications Processors

► function. Comten NCP is compatible with IBM NCP in performing the line handling and communications control functions. While the access method in the host is transparent to Emulation and CNS, NCP requires that the host access method be either IBM TCAM or VTAM. Comten NCP provides concurrent support for multiple IBM host processors.

When the Comten NCP system is used to emulate in a mode comparable to IBM's NCP Partitioned Emulation Processing (PEP) mode, Comten NCP is operated concurrently with Emulation and CNS. This capability is generally needed to ease application program conversion from the 270X multi-access mode to NCP single-access mode.

System Generation

Parameter setting for tailoring either Emulation, CNS, or NCP for a given system is done in CODEL, a Comten source language. System generation is performed on the host computer and is loaded into the front-end processor, or down-line to remote nodes.

Data Switching System (DSS)

The Comten processor can be operated as a nodal processor on a distributed network by the use of the Data Switching System. Operated under the control of the Communications Operating System (COS), DSS operates coresident with NCP and CNS. DSS adds to the capabilities of NCP file-level host interface, basic message handling and queuing, message switching, network security, and network control functions. In effect, DSS can independently drive a communications network.

DSS is composed of four modules: the Communications Access Method (CAM), the Data Switch Message Control Program (DS/MCP), the Network Manager, and the File Access Method (FAM).

The Communications Access Method controls the access to all lines assigned to CAM, whether to a terminal, to another node processor, or to a host processor. Four sub-modules of CAM provide a standard interface with the remainder of the CAM module and each of the four separate protocols. The sub-modules are called Transmission Subsystem Elements (TSE). The Basic Mode SNA TSE provides the interface between CAM and data received (from terminals) by the processor via NCP. The Communications Networking System TSE provides the interface between CAM and data received (from terminals and other Comten processors) by the processor via CNS. The 3270 Emulation TSE provides the interface between CAM and up to four IBM 360/370 hosts. The hosts, operating BTAM or TCAM applications programs, view the interface between CAM and IBM 360/370 systems executing "read/write" queries to DDS through the host's Basic Sequential Access Method (BSAM).

The Data Switch/Message Control Program performs the message handling function for data it receives from CAM. Messages are analyzed, edited, routed, queued, and logged. Error recovery is controlled by this DSS module.

The Network Manager portion of DSS is responsible for network configuration, startup, shutdown, session establishment, and other related functions.

The File Access Method module of DSS provides the access interface between locally attached disk drives, card readers, and printers and the Data Switch/Message Control Program.

Application programs in the Comten processor have interfaces with the File Access Method, the Data Switch/Message Control Program, and the Network Manager through a module of the operating system (COS) called Application Program Support.

An updated version of DSS is presently under development. Release 2 of DSS will be available in 1980, and reportedly will support, in addition to all Release 1 functions, user file access, disk queues, multiple priority for queues, detailed statistics files, and extended support for any start/stop and BSC devices of NCP.

Comten Telecommunications Access Method (CTAM)

CTAM is a message switching software package originally written for Comten's 476 Communications Processor but since adapted to run on the 3690. The package performs twice as fast on the 3690 as on the 476.

CTAM provides the communications control functions and interfaces for the different types of lines and terminal devices. The software system consists of two modules: the Communications Control Package, which runs on the Comten processor, and the Computer Interface Package, which runs in the IBM 360/370 host. The Communications Control Package provides for stand-alone message switching and, when used in conjunction with the Computer Interface Package, provides support as a front end.

The Communications Control Package (the Comten processor-resident portion of CTAM) controls the communications lines and terminal devices, validates message header information, performs line error processing, and queues messages. The Computer Interface Package (the host-resident portion of CTAM) controls the channel, and serves to replace the IBM telecommunications access method (TCAM, BTAM, etc.).

Peripherals

Flexible disk storage arrangements are provided including removable pack and fixed head units, as well as the capability to support IBM 3330-style drives from IBM and some independents.

The 7214 Controller attaches to one position on the Block Multiplexer channel and supports up to nine double-density 2314-style drives; if the full complement of nine drives is installed, one is a spare. Two drive models are available; the 6214 single spindle and the 6224 dual spindle. Any combination of models is supported that does not exceed nine spindles. Each spindle accepts a 2316 disk pack organized in two sets of 200 interleaved cylinders; each spindle is two logical units. The capacity supported by each spindle is 58.352 megabytes. Average head positioning time is 35 milliseconds. Rotational delay averages 12.5 milliseconds. The transfer rate is 312K bytes per second.

Fixed disk drives and 3330-11-style removable pack drives can be attached to the Block Multiplexer or Integrated File Adapter. Either a T7060 or a T7065 Storage Control Unit is required to attach to a 3640 either via an IFA or to one position on a block multiplexer. The Storage Control Unit accommodates up to four drives in any combination of 24-megabyte (T6124-A1) or 48-megabyte (T6148-A1) fixed disk drives and 150-megabyte (T6215-A1) or 300-megabyte (T6230-A1) removable pack drives that accept IBM 3336-11 style disk packs. The fixed disk drives also include 97K bytes of storage under fixed heads (no head positioning delay). The data transfer rate for all models is 1,209K bytes per second. The rotational delay for all models is 8.4 milliseconds. The average head positioning time for the fixed disk models is 40 milliseconds; for the removable pack drives, it is 30 milliseconds.

The Block Multiplexer Channel is certified for use with IBM 3830-2/3330-11/3333-11 200-megabyte Controller/Drive subsystems. The Control Data 38302/33332/33301/33302 100- and 200-megabyte Controller/Drive subsystems are

Comten 3650 II, 3670 II and 3690 Communications Processors

also certified. Products from other plug compatible vendors are certifiable on an individual basis.

A 75-ips magnetic tape drive, a 600-cpm card reader, and a 600-lpm line printer are offered, along with a HASP Workstation. The latter is available with or without a console.

PRICING

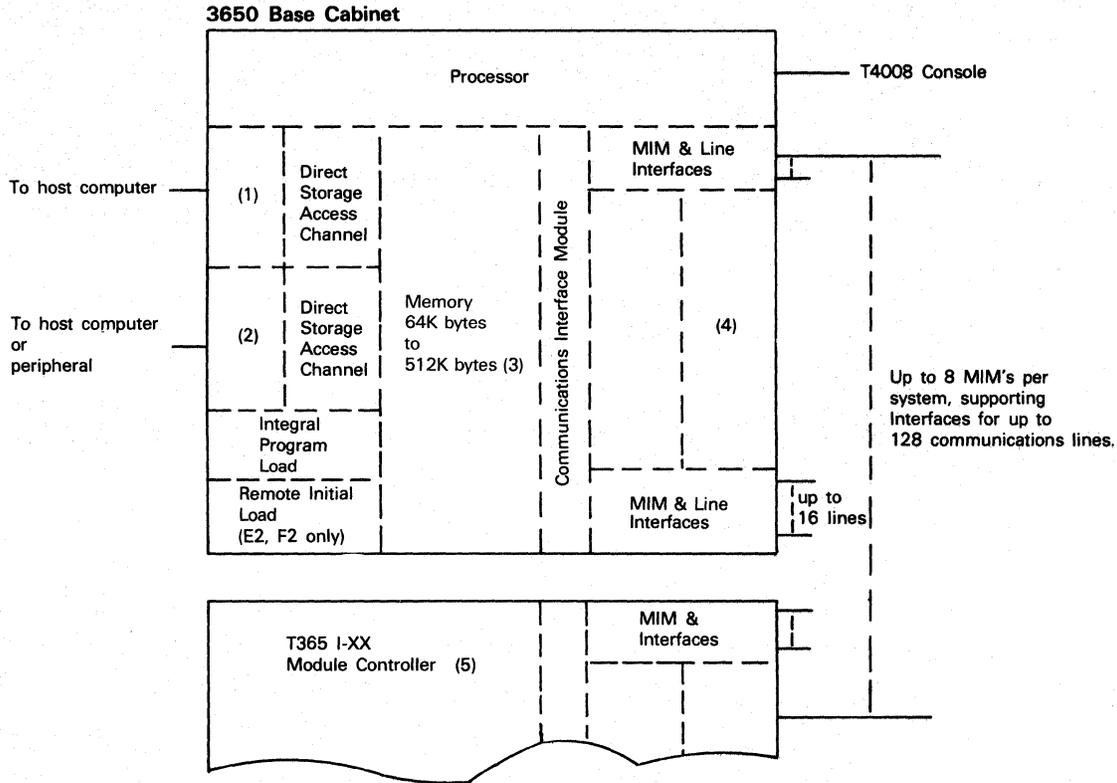
The Comten processors are available for purchase or on a 30-day, 2-year, 3-year, or 4-year lease. All system software is included in the price of the equipment, except for DDS which is offered for a monthly license fee. A separate monthly maintenance contract is available.

		Monthly Charges*					
		Monthly Lease	2-Year Lease	3-Year Lease	4-Year Lease	Purchase Price	Monthly Maint.
3650 II Systems							
T3650-C3	FEP; 3650II-C3, 64K bytes, 3LM	\$1,350	\$1,190	\$1,095	\$1,046	\$ 37,525	\$230
T3650-D3	FEP; 3650II-D3, 64K bytes, 11LM	1,740	1,525	1,398	1,334	48,025	250
T3650-E3	RCP; 3650II-E3, 64K bytes, 3LM	1,435	1,270	1,171	1,120	39,025	270
T3650-F3	RCP; 3650II-E3, 64K bytes, 11LM	1,825	1,605	1,474	1,408	49,525	290
F3605-A1	Storage Expansion; 128K bytes	514	450	413	394	13,875	75
F1034-A1	IBM Channel Program Loader	57	50	46	44	1,265	10
F2200	Remote Initial Load	30	26	24	23	665	5
T3019	IBM Channel I/F Adapter	285	245	222	210	7,420	10
T4008	Comten Console	166	145	133	126	3,500	20
F4002	System Select Switch	6	5	5	4	125	1
F4003	RS232C Interface	7	6	6	5	75	1
F1044	Peripheral Power Sequencer	62	54	50	47	1,800	8
F2205-A1	3650 Extended Distance I/F Adapter	5	4	4	3	100	1
T3651-A1	Module Controller; 6LM	420	365	350	330	10,500	40
T3651-A2	Module Controller; 6LM, 2 CPU	495	430	415	390	12,000	60
T3651-B1	Module Controller; 12LM	825	715	685	645	20,600	80
T3651-B2	Module Controller; 12LM, 2 CPU	975	850	815	770	23,600	120
3670 II Systems							
T3670-E1	FEP; 3670 II-E1, 64K bytes, 11LM	2,580	2,255	2,063	1,966	73,500	330
T3670-F1	FEP; 3670 II-F1, 64K bytes, 19LM	2,973	2,593	2,369	2,258	83,500	353
T3670-G1	FEP; 3670 II-G1, 64K bytes, 27LM	3,365	2,930	2,675	2,547	93,500	375
T3670-H1	RCP; 3670 II-H1, 64K bytes, 12LM	2,362	2,075	1,904	1,818	65,000	362
T3670-J1	RCP; 3670 II-J1, 64K bytes, 20LM	2,754	2,412	2,209	2,108	75,500	384
F3602-A1	Storage Expansion; 64K bytes	340	300	276	262	9,250	50
F1034-A1	IBM Channel Program Loader	57	50	46	44	1,265	10
F1027	Communications I/F Module	88	77	70	67	2,125	10
F2201-A1	Remote Initial Load—Basic	57	50	46	44	1,265	10
F2201-A2	Remote Initial Load—Second	30	26	24	23	665	5
T3018	IBM Channel I/F Adapter	300	255	237	225	7,420	25
T3025	IBM Channel I/F Adapter	170	150	138	131	3,945	25
T4008	Comten Console	166	145	133	126	3,500	20
F4002	System Select Switch	6	5	5	4	125	1
F4003	RS232C Interface	7	6	6	5	75	1
F1044	Peripheral Power Sequencer	62	54	50	47	1,800	8
F2205-B1	3670 Extended Distance I/F Adapter	5	4	4	3	100	1
T3671-A1	Module Controller; 6LM	420	365	350	330	10,500	40
T3671-A2	Module Controller; 6LM, 2 CPU	495	430	415	390	12,000	60
T3671-B1	Module Controller; 12LM	825	715	685	645	20,600	80
T3671-B2	Module Controller; 12LM, 2 CPU	975	850	815	770	23,600	120
T3671-C1	Module Controller; 18LM	1,275	1,070	1,025	965	30,700	120
T3671-C2	Module Controller; 18LM, 2 CPU	1,455	1,270	1,220	1,050	35,200	180
T3671-D1	Module Controller; 24LM	1,635	1,420	1,365	1,285	40,800	160
T3671-D2	Module Controller; 24LM, 2 CPU	1,930	1,685	1,620	1,530	46,800	240
3690 Systems							
T3690-A4	Free-standing; 3690-A4, 256K, 3LM	5,065	4,157	3,794	3,794	134,400	526
T3690-B4	RCP; 3690-B4, 256K, 3LM	4,536	3,723	3,398	3,398	120,400	471

*Includes Monthly Maintenance.

Comten 3650 II, 3670 II and 3690 Communications Processors

Configuration



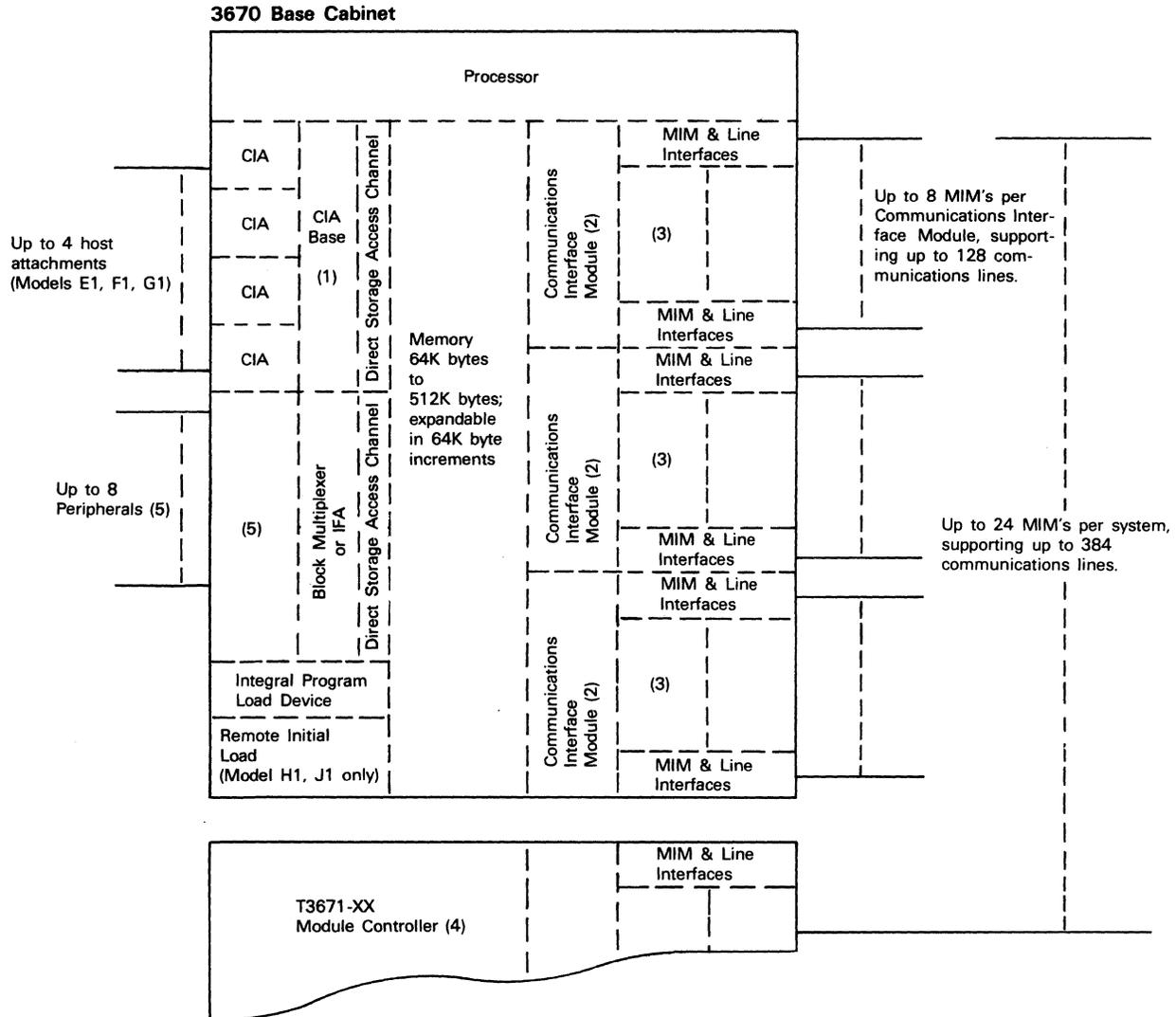
- (1) Basic 3650-C2 and D2 include one IBM Channel Interface Adapter T3019; optional for 3650-E2 and F2.
- (2) Direct Access Storage Channel available optionally for all models for peripheral attachment or for a second IBM Channel Interface Adapter.
- (3) Basic memory is 64K bytes, expandable to 512K bytes in 128K byte increments.
- (4) Up to eight Modem Interface Modules (MIM) plus associated Line Interfaces (see Table 2) per system, supporting up to 128 communications lines. Requirement for expansion housing for MIM's (Module Controller) is dependent on the MIM's selected and the space available in base cabinet; space available is expressed in Logic Modules. 3650-C2 and E2, have three Logic Modules available; 3650-D2 and F2 have 11 Logic Modules available. Three types of MIM's each utilize one Logic Module. A fourth MIM, the DLC-MIM, consumes one-half of two Logic Modules; two DLC-MIM's occupy two Logic modules. Basic 3650-E2 and F2 include one BSC-MIM and one CMS Trunkline Interface, accommodating 8 full-duplex lines at 1800 bps.
- (5) Module Controllers are available to accommodate either 6 Logic Modules or 11 Logic Modules. Each size has a version that permits dual access; i.e., two 3670's can have access to the controller.

		Monthly Charges*				Purchase Price	Monthly Maint.
		Monthly Lease	2-Year Lease	3-Year Lease	4-Year Lease		
3690 Systems (Continued)							
T3690-C4	FEP; 3690-C4, 256K, 3LM	4,597	3,773	3,444	3,444	122,000	478
T3690-D4	FEP; 3690-D4, 256K, CIA Base, 2LM	5,087	4,175	3,810	3,810	135,000	528
T3690-E4	FEP; 3690-E4, 256K, CIA Base, 7LM	6,070	4,975	4,537	4,537	162,200	594
F3607-A1	Storage Expansion, 256K bytes	1,028	900	821	788	27,500	150
T3018	IBM Channel I/F Adapter	300	260	237	225	7,420	25
T3019	IBM Channel I/F Adapter	300	260	237	225	7,420	25
T2023-A1	Communications Adapter	219	180	164	164	5,800	23
T2023-B1	Extended Distance Communication Adapter	294	241	220	220	7,800	30
T2023-C1	Extended Distance Communication Adapter, 2 CPU	414	340	310	310	11,000	43
T4008	Comten Console	166	145	133	126	3,500	20
F4003	RS232C Interface	7	6	6	5	75	1
F1044	Peripheral Power Sequencer	62	54	50	47	1,800	8

*Includes Monthly Maintenance.

Comten 3650 II, 3670 II and 3690 Communications Processors

Configuration



- (1) Base 3670-E1, F1, G1 includes Channel Interface Base and one T 3018 IBM Channel Interface Adapter; up to three additional adapters can be optionally attached. Base 3670-H1, J1 provides only for attachment of up to eight direct access peripheral controllers with the attachment of a Block Multiplexer, or up to four disk drives with the attachment of an Integrated File Adapter.
- (2) All base models include one Communications Interface Module. Two additional Communications Interface Modules can be optionally attached. Each Communications Interface Module supports up to eight Modem Interface Modules (MIM).
- (3) Up to eight Modem Interface Modules (MIM) plus associated Line Interfaces (see Table 2) per Communications Interface Module. Requirement for expansion housing for MIMs (Module Controller) is dependent on the MIM's selected and the space available in base cabinet; space available is expressed in Logic Modules. The 3670-E1 has 11 Logic Modules, Model F1 has 19, Model G1 has 27, Model H1 has 12, Model J1 has 20. Three types of MIMs each utilize one logic Module A fourth MIM, the DLC-MIM, consumes one-half of two Logic Modules. (Two DLC-MIMs occupy two Logic Modules.) The Basic 3670-H1, J1 includes one BSC-MIM and one CNS Trunkline Interface, accommodating 8 full-duplex lines at 1800 bps.
- (4) Module Controllers are available to accommodate either 6, 12, or 18 Logic Modules. Each size has a version that permits dual processor access; two 3670s can have access to the controller.
- (5) All models support optional attachment of a Block Multiplexer or an Integrated File Adapter. Up to eight peripheral controllers can be attached to the Block Multiplexer. Up to four disk drives can be attached to the IFA.

Monthly Charges*

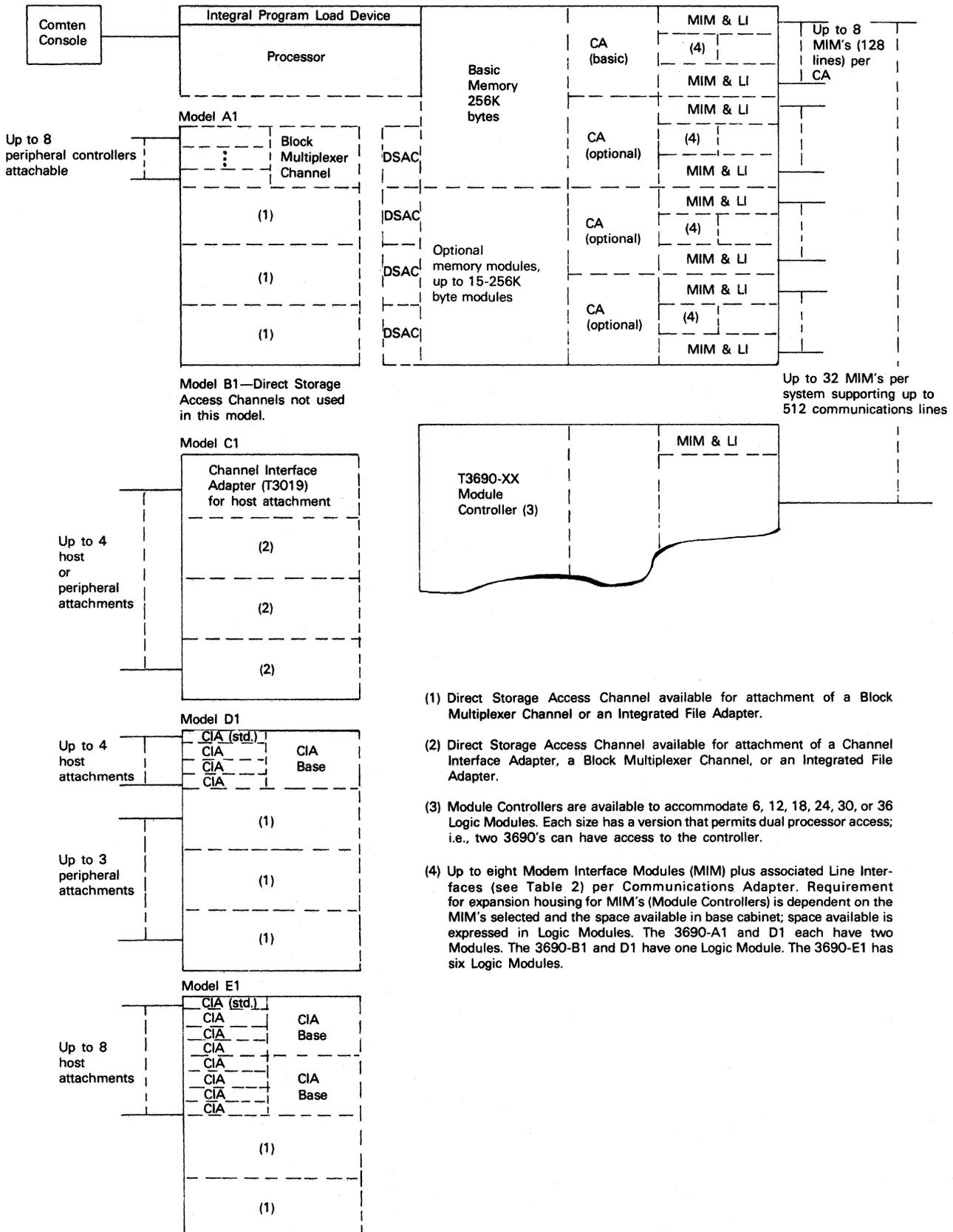
3690 Systems (Continued)		Monthly Lease	2-Year Lease	3-Year Lease	4-Year Lease	Purchase Price	Monthly Maint.
T3691-A1	Module Controller; 6LM	492	402	366	366	12,000	42
T3691-A2	Module Controller; 6LM, 2 CPU	580	479	436	436	13,800	63
T3691-A3	Module Controller; 6LM, adjacent cabinet	472	386	352	352	11,500	41

*Includes Monthly Maintenance.

Comten 3650 II, 3670 II and 3690 Communications Processors

Configuration

3690 Base Cabinet



- (1) Direct Storage Access Channel available for attachment of a Block Multiplexer Channel or an Integrated File Adapter.
- (2) Direct Storage Access Channel available for attachment of a Channel Interface Adapter, a Block Multiplexer Channel, or an Integrated File Adapter.
- (3) Module Controllers are available to accommodate 6, 12, 18, 24, 30, or 36 Logic Modules. Each size has a version that permits dual processor access; i.e., two 3690's can have access to the controller.
- (4) Up to eight Modem Interface Modules (MIM) plus associated Line Interfaces (see Table 2) per Communications Adapter. Requirement for expansion housing for MIM's (Module Controllers) is dependent on the MIM's selected and the space available in base cabinet; space available is expressed in Logic Modules. The 3690-A1 and D1 each have two Modules. The 3690-B1 and D1 have one Logic Module. The 3690-E1 has six Logic Modules.

Comten 3650 II, 3670 II and 3690
Communications Processors

		Monthly Charges*				Purchase Price	Monthly Maint.
		Monthly Lease	2-Year Lease	3-Year Lease	4-Year Lease		
3690 Systems (Continued)							
T3691-B1	Module Controller; 12LM	967	790	719	719	23,500	84
T3691-B2	Module Controller; 12LM, 2 CPU	1,144	940	859	859	27,100	126
T3691-B3	Module Controller; 12LM, adjacent cabinet	968	799	731	731	22,500	123
T3691-C1	Module Controller; 18LM	1,440	1,177	1,072	1,072	35,000	126
T3691-C2	Module Controller; 18LM, 2 CPU	1,706	1,403	1,282	1,282	40,400	190
T3691-C3	Module Controller; 18LM, adjacent cabinet	1,381	1,129	1,028	1,028	33,500	123
T3691-D1	Module Controller; 24LM	1,913	1,564	1,424	1,424	46,500	168
T3691-D2	Module Controller; 24LM, 2 CPU	2,269	1,866	1,705	1,705	53,700	253
T3691-E1	Module Controller; 30LM	2,389	1,953	1,779	1,779	58,000	211
T3691-E2	Module Controller; 30LM, 2 CPU	2,832	2,329	2,128	2,128	67,000	317
T3691-F1	Module Controller; 36LM	2,861	2,339	2,130	2,130	69,500	252
T3691-F2	Module Controller; 36LM, 2 CPU	3,394	2,791	2,550	2,550	80,300	380
36X0 Communication Control Equipment							
T2014-C1	Auto Call Adapter	135	110	100	95	3,100	12
T2014-D1	Auto Call Adapter	135	110	100	95	3,100	12
F2033-B1	Auto Call Interface	8	7	6	6	175	1
T2016-A2	16 Line A-MIM	125	108	98	93	3,600	10
F2027-OX	Multi-Baud Rate; 8 lines	13	11	10	10	295	2
F2068-O1	Telegraph I/F Base	6	5	5	4	125	1
F2074	2 Line Telegraph I/F	9	8	7	7	190	2
F2072-AX	2 Line EIA RS232C I/F	9	8	7	7	190	2
T2017-A1	BSC-MIM, 4 Line	154	134	122	116	4,250	16
F2003	BSC Autodial	48	41	37	35	1,425	2
F2040	BSC 2 Line Exp.	66	57	52	49	1,850	5
F2026-XX	Sync. Wideband I/F	29	25	23	22	725	2
F2029	Special Order Speed	17	15	14	13	475	1
T2018-A2	BSC-MIM; 16 lines	229	198	180	171	6,700	18
F2053-A1, C1	RS232C I/F; 2 lines	21	17	16	15	345	3
F2053-B1	RS232C I/F; 1 line	21	17	16	15	345	3
F2064-A1, B1	Wideband I/F; 1 line	30	25	23	22	630	4
F2092-A1	Wideband DDS I/F; 2 lines	44	36	33	31	1,010	5
F2092-B1	Wideband DDS I/F; 1 line	26	21	19	18	580	3
F2095	BSC EIA Sync. Clock; 2 lines	38	31	28	27	815	5
T2020-A2	DLC-MIM	292	239	218	208	8,000	29
T2020-B2	Extended Distance I/F DLC-MIM	348	285	260	248	9,500	35
T2020-C2	Extended Distance Dual I/F DLC-MIM	439	360	328	313	12,000	44
F2083	EIA/CCITT I/F; 2 lines	25	22	20	19	700	3
F2084	Wideband I/F; 1 line	32	28	26	25	825	5
F2085	Wideband DDS I/F; 1 line	31	27	25	24	800	5
F2088	Storage Expansion; 2K Instructions	52	45	41	39	1,500	4
F2097	Operand Storage Expansion	31	27	25	24	800	4
36X0 Peripheral Equipment							
T3023-A1	Block Multiplexer Channel	750	615	560	535	16,400	80
T3026-A1	Integrated File Adapter	638	523	478	458	14,000	68
T7214-B2	Disk Storage Control Unit	1,010	830	760	725	21,600	120
F7005-B2	Two Channel Switch	135	110	100	95	2,900	15
T6214-B2	Disk Storage Drive; 58M bytes	545	450	410	395	11,500	75
T6224-B2	Disk Storage Drive; 116M bytes	1,090	900	820	790	23,000	150
T7060-A1	Storage Control; up to four disk drives; for IAF attachment	731	601	547	521	16,690	75
T7065-A1	Storage Control; up to four disk drives; for block multiplexer attachment	1,466	1,206	1,098	1,050	33,490	154
F1044-A5	Peripheral Power Sequencer	59	51	47	44	1,800	5
F7009-A1	Two-Channel Switch	218	178	163	153	4,675	23
T6060-A1	Disk Storage Cabinet	141	116	107	101	3,500	15
T6062-A1	Fixed Media Disk; 24M bytes	397	327	297	287	9,070	42
T6063-A1	Fixed Media Disk; 80M bytes	897	737	672	642	20,500	92
T6067-A1	Removable Media Disk; 300M bytes	1,260	1,035	945	900	28,500	130

*Includes Monthly Maintenance.

**Comten 3650 II, 3670 II and 3690
Communications Processors**

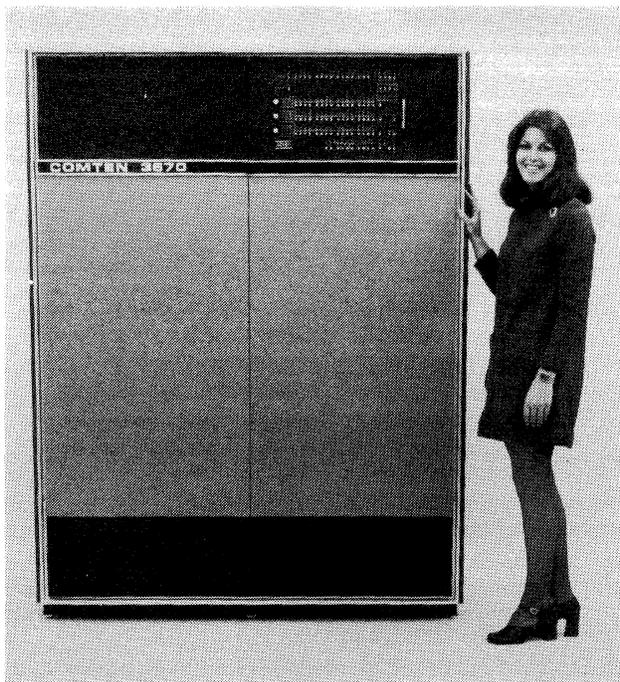
		Monthly Charges*				Purchase Price	Monthly Maint.
		Monthly Lease	2-Year Lease	3-Year Lease	4-Year Lease		
36X0 Peripheral Equipment (Continued)							
T7322-B2	Magnetic Tape Drive and Control; 75 ips	1,085	895	820	780	24,250	135
F7004-B2	Two-Channel Switch	112	91	83	79	2,500	8
F6322-B2	Magnetic Tape Drive; 75 ips	515	430	395	380	11,000	85
T7305-A2	Card Reader; 600 cpm	425	360	345	330	9,000	85
T7406-A2	Line Printer; 600 lpm	930	770	740	705	20,000	160
T7780-A1	HASP Workstation	1,355	1,130	1,085	1,035	29,000	245
T7781-A1	HASP Workstation, with Console	1,521	1,275	1,218	1,161	32,500	265

*Includes Monthly Maintenance.

SOFTWARE

SOFTWARE		Monthly License Fee
S-46F500000	Multi Leaving Workstation (MLW)	\$75
S-46010	DSS Release 1	30
S-56015	Network Manager Release 1	40
S-46012	Data Switch/MCP Release 1	50
S-46013	Auxiliary Storage	25
S-56010	CTAM Release 1	25
S-56013	3270 Emulation/TSE	25
S-56016	Message Level Host Interface/TSE	25
S-46F51	3270 MAF	74
S-46F52	Extended Start/Stop (SS1) Local	42

Comten 3650 II, 3670 II, and 3690 Communications Processors



MANAGEMENT SUMMARY

The Comten 3560 II, 3670 II, and 3690 can be viewed as a series of communications processor systems with the higher numbered systems offering greater memory capacity, communications line handling capacity, and direct host attachment capacity than lower numbered systems. Additionally, the Comten 3690 effectively operates three to six times faster than the Comten 3650 II and 3670 II.

Included in the equipment price is a full complement of software to operate the processor system as either a front-end processor, as a remote concentrator processor, or as a stand-alone communications processor. Both the equipment and the software closely parallel the operation of IBM's 370X communications processors. As a result, when using the Comten Emulation or the Comten CNS software packages in a Comten 36X0 that is attached to an IBM 360/370, no modification to the host software access method or application programs is required. When using Comten NCP, the host access method must be VTAM or TCAM, the same requirement imposed by IBM's NCP. Comten has enhanced its position as a supplier of competitive communications processors interfacing with IBM System 360/370 and the IBM plug-compatible systems, by the July announcement of Data Switching System (DSS). This new software module, in conjunction with existing software, conforms to the ground rules of IBM's SNA and affords the Comten processors the capability to operate as distributed system nodal processors. DSS will support SNA's protocol (SDLC) and the capabilities SNA described for IBM's 3705 II under the NCP/Advanced Communications Function.

A family of programmable processors and software to perform data communications handling functions in place of an IBM 3705.

Supports up to 512 communications lines and up to 8 direct attachments to IBM 360/370 and plug-compatible host computer systems; uses BSC, SDLC, and other protocols.

Software to emulate IBM 270X and 370X is provided in addition to a Network Control Program package. Data Switching System (DSS), software to be released in January 1978 supports SNA network ground rules.

A typical Comten 3650 with 32K bytes of memory that supports 16 asynchronous communications lines can be purchased for \$38,020 or leased on a 2-year basis for \$1,202 per month including maintenance.

A typical Comten 3690 with 256K bytes of memory and supporting 52 communications lines (16 asynchronous, 16 BSC at 9600 bps, 16 SDLC at 4800 bps, and 4 wideband at 56,000 bps) can be purchased for \$107,855 or leased on a 2-year basis for \$5,953 per month including maintenance.

CHARACTERISTICS

VENDOR: Comten, Inc., 1950 West County Road B-2, St. Paul, Minnesota 55113. Telephone (612) 633-8130.

DATE OF ANNOUNCEMENT: 3650 I — 3/75; 3650 II — 3/76; 3670 I — 1/72; 3670 II — 3/76; 3690 — 7/77.

DATE OF FIRST DELIVERY: 3650 I — 9/75; 3650 II — 6/76; 3670 I — 4/72; 3670 II — 6/76; 3690 — scheduled for first quarter of 1978.

NUMBER DELIVERED TO DATE: 3650 — over 200; 3670 — over 200.

SERVICED BY: Comten, Inc.

CONFIGURATION

The Comten 3670 II and the Comten 3650 II are based on the same hardwired processor with a memory cycle of 650 nanoseconds and a 16-bit word. The 3650 is a stripped-down version of the 3670 and supports a reduced number of direct host connections, communications lines, and memory capacity.

The Comten 3690 has a microprogrammed processor with architectural sophistication that enables the 3690 to operate from three to six times faster than the 3650/3670, despite the fact that all three processors have the same memory cycle time.

The most notable architectural changes that contribute to the speed enhancement of the 3690 are: the processor logic

Comten 3650 II, 3670 II, and 3690 Communications Processors

▷ The Comten 3650 II and 3670 II are enhanced versions of the original 3650 and 3670. The use of semiconductor memory and increased line capacity were among the enhancements included in the Version II models, first offered in February 1976.

Purchase prices for the Comten 3650/3670 listed in this report reflect a 20 to 30 percent decrease from the prices published in August 1976. Such reductions are in line with the round of price decreases the industry experienced in the spring of 1977. The reduction biases the purchase/lease decision towards purchasing compared to last year.

USER REACTION

In the May 1977 Communications Processor survey conducted by Datapro, 14 users of the Comten 3650 and 15 users of the Comten 3670 responded. Their ratings are summarized in the tables below. Two of the 3670 users had Amdahl host computer systems; all other users had IBM host computer systems. A "typical" 3650 system interfaced 43 communications lines with an average of two terminals per line. A "typical" 3670 system interfaced 115 communications lines with an average of 3 terminals per line.

Comten 3650	Excellent	Good	Fair	Poor	WA*
Overall satisfaction	9	4	1	0	3.6
Ease of installation	7	4	1	2	3.1
Throughput	9	5	0	0	3.6
Hardware reliability	11	2	1	0	3.7
Promptness of maintenance	7	6	1	0	3.4
Quality of maintenance	8	4	2	0	3.4
Software	7	6	1	0	3.4
Technical support	7	4	2	1	3.2

Comten 3670	Excellent	Good	Fair	Poor	WA*
Overall satisfaction	8	7	0	0	3.5
Ease of installation	5	10	0	0	3.3
Throughput	9	4	1	0	3.6
Hardware reliability	9	5	1	0	3.5
Promptness of maintenance	6	8	1	0	3.3
Quality of maintenance	6	8	1	0	3.3
Software	5	7	3	0	3.1
Technical support	4	5	4	1	2.9

*Weighted Average on a scale of 4.0 for Excellent.

Based on the ratings, Comten enjoys a satisfied user base. One user cited reliability experience as superior to the products of two other vendors. Documentation on interface software, however, was cited as poor by several users. Users in remote areas were the ones that rated technical support as poor or fair. □

▶ control is microprogrammed; data transfers to and from memory are via an odd/even dual access; the word size is 64 bits; and instruction execution includes look-ahead instruction execution.

All 36X0 models support direct attachment to the IBM System/360, 370; Control Data Omega systems, Amdahl systems, and Intel systems. Comten will also produce custom

interfaces for other host systems, as required. Table 2, The Comten 36X0 at a Glance, distinguishes the characteristics of each 36X0.

Software to operate the 36X0's as front-ends, remote concentrators, and as stand-alone communications processors is included with the equipment. The Emulation package permits the 36X0 to function as an IBM 370X or as an IBM 370X emulating an IBM 270X.

The Communications Networking System (CNS) package has all of the capabilities of the Emulation package plus the ability for multiple Comten processors within a network to communicate with each other.

The Network Control Program (NCP) relieves the host processor of the bulk of network control functions and is comparable to IBM's NCP. The host access method, when operating NCP in the Comten processor, must be IBM's TCAM or VTAM.

The Data Switching System (DSS), scheduled for early 1978 release, augments NCP and CNS to enable the Comten processor to efficiently operate as a distributed network nodal processor, conforming to the rules established by IBM's System Network Architecture (SNA).

Asynchronous lines up to 19.2K bps, and synchronous lines up to 56K bps are supported in either half- or full-duplex mode. Major protocols supported including Teletype, BSC, CNS trunkline (Comten's internal, BSC-like protocol), and SDLC.

Comten 3650 II

The 3650 II is offered in four basic models. Two of the models are intended for use as a front-end processor and two of the models are intended for use as a remote concentrator. All models include the base cabinet with the 650-nanosecond processor, 32K bytes of memory, the Integral Program Load Device and two Direct Storage Access channels. The two front-end processor models, the 3650-C2 and the 3650-D2, include one IBM Channel Interface Adapter, which provides a direct storage access connection with the host computer system. An optional second channel is available for attachment of either peripherals requiring a direct channel interface or a second IBM Channel Interface Adapter. The latter can be attached to the same host or to another host computer. The C2 and D2 models also include a Communications Interface Module that will permit the attachment of up to eight Modem Interface Modules (MIM) to the system. Each Modem Interface Module will support up to 16 communications lines.

The base cabinet of the 3650-C2 has space and electrical interfaces to accommodate three Logic Modules. (A Logic Module is a deck of up to 70 circuit boards occupying about 23 x 6 x 9 inches of space within the cabinet). Three of the four types of attachable MIM's require the space of one Logic Module. Three of these MIM's, in any combination, can be installed on the 3650-C2 models with each MIM supporting up to 16 lines. A fourth type of MIM, the DLC-MIM, occupies one-half of two adjacent Logic Modules. The basic 3650-C2 therefore can accommodate only two of the DLC-MIM's. Physical considerations prevent the third Logic Module from being used when two DLC-MIM's are attached. An alternate configuration permits one DLC-MIM and one of the other three types of MIM's to be attached. Expansion cabinets (Module Controllers) must be employed to add more MIM's to reach the system maximum of eight MIM's. The Module Controllers are available in two models. One model supplies space to accommodate six Logic Modules; the other model supplies space to accommodate 12 Logic Modules. Two additional models, a 6 LM and a 12 LM size, provide for two 3650's to have access to the same Module Controller. One use for the dual access Module Controller is for fall-back. When the primary 3650

Comten 3650 II, 3670 II, and 3690 Communications Processors

TABLE 1. THE COMTEN 36X0 AT A GLANCE

	Comten 3650 II	Comten 3670 II	Comten 3690
Processor—			
Main memory cycle time, nanoseconds	650	650	650*
Main memory word size, bits	16	16	64
Basic main memory capacity, bytes	32K	64K	256K
Maximum main memory capacity, bytes	256K	512K	1024K
Logic Control	Hardwired	Hardwired	Microprogrammed
Network—			
Maximum number of communications lines physically attachable	128	384	512
Maximum number of direct host attachments	2	4	8
Host systems supported			
	IBM 360/370, CDC Omega, Amdahl, ITEL, Custom	IBM 360/370, CDC Omega, Amdahl, ITEL, Custom	IBM 360/370, CDC Omega, Amdahl, ITEL, Custom

*Despite identical memory cycle timing, the look-ahead instruction execution, dual storage access, and a 64-bit word results in the 3690 operating 3 to 6 times faster than the other two models.

► front-end is not operative, the secondary 3650 can assume the prime function in handling the lines. The basic 3650-D2 includes capacity for housing 11 Logic Modules. When more Logic Modules are required, Module Controllers are employed.

The basic 3650-E2 and the 3650-F2 remote concentrators do not include a Channel Interface Adapter; however, up to two adapters can be optionally attached to each system. Included in the basic 3650-E2 and the 3650-F2 are a BSC-MIM and a Line Interface that will support eight full-duplex communications lines. The two features are used to support Comten's CNS trunkline protocol and can transmit data at speeds up to 56K bps.

Comten 3670 II

The Comten 3670 is offered in five basic models. Two models, the Comten 3670-H1 and J1, are intended as remote concentrator processors. The remaining three, the Comten 3670-E1, F1, and G1, are intended for use as front-end processors. All models include the base cabinet with the 650-nanosecond processor, 64K bytes of memory, an Integral Program Load Device, two Direct Storage Access Channels, and one Communications Interface Module (CIM). The CIM can accommodate up to eight Modem Interface Modules (MIM). Each MIM can support Line Interfaces for up to 16 communications lines.

The three front-end basic systems (E1, F1, G1) include one IBM Channel Interface Adapter. Up to three additional adapters, along with up to eight direct access peripheral controllers, can be optionally attached. A Block Multiplexer feature is required to attach the peripheral controllers. The Block Multiplexer attaches to the Direct Storage Access Channel. Alternatively, an Integrated File Adapter (IFA) can be attached to the Direct Storage Access Channel, to support up to four disk drives. Two additional Communications Interface Modules can be optionally added to the basic CIM for all models, permitting attachment of a total of 24 MIM's or up to 384 communications lines.

The three front-end base models, the 3670-E1, F1, and G1, have 11, 19, and 27 Logic Modules, respectively. A Logic Module is the space available to mount one rack of PC boards. When more MIM's are required than can be contained in the base configuration, expansion cabinets (Module Controllers) are necessary. Module Controllers are available in 4 models containing 6, 12, 18, and 24 Logic Modules. Each controller comes in a single processor version and a dual processor version. The dual processor version

permits two 3670's to be attached to the controller. The net effect is that two front-end processors can have access to the communications lines that are attached to the controller.

The two remote concentrator systems (H1, J1) include one BSC-MIM with one trunk line interface that accommodates up to 8 full-duplex lines at speeds up to 56K bps. One additional Communications Interface Module can be optionally added, permitting a total of 24 MIM's or up to 384 communications lines. Two Direct Storage Access Channels are available on the remote system for attachment of up to 16 direct access peripheral controllers when a Block Multiplexer is attached to each Direct Storage Access Channel. The basic 3670-H1 has 12 Logic Modules. When adding more MIM's than can be contained in the base configuration, the Module Controllers, as described above, are used.

Comten 3690

The Comten 3690 is offered in five basic models. All models include the 520-nanosecond, microprogrammed processor with dual-odd/even storage access, an Integral Program Load Device, 256K bytes of 650-nanosecond memory, and one Communications Adapter (CA). The CA accommodates up to 8 Modem Interface Modules and associated Line Interfaces to support up to 128 communications lines. Up to three additional CA's can be optionally attached permitting physically attaching up to 512 communications lines per 3690 system. Since the basic models include space for one, two, or six Logic Modules, Module Controller expansion cabinets are provided to accommodate the attachment of MIM's and Line Interfaces. The Module Controllers are available to handle Logic Module requirements of 6, 12, 18, 24, 30 or 36 Logic Modules. Each of the controller sizes has a version that permits dual 3690's to access the controller and the lines attached to that controller.

The basic 256K bytes of memory can be expanded to 1024K bytes by the attachment of up to six Memory Modules; each module contains 128K bytes of memory.

The five 3690 basic models differ in the number of Direct Storage Access Channels (DSAC) provided and the device that can be attached to the DSAC's.

The 3690-A1 is intended to operate as a stand-alone data switching system configured to support a variety of peripheral attachments. Therefore, the 3690-A1 provides four DSAC's with one of the DSAC's having a Block Multiplexer Channel attached. The Block Multiplexer has the capacity to accommodate up to eight peripheral controllers. The remaining three DSAC's can optionally receive Block Multi-►

Comten 3650 II, 3670 II, and 3690
Communications Processors

TABLE 2. COMMUNICATIONS LINE INTERFACES & MODEM INTERFACE MODULES

Line Interface		Timing	Half- or Full-Duplex	Speed, bps	Line Interface Feature	Lines per Interface	No. of Interfaces per MIM	MIM Feature
EIA RS 232C	Bell 113B, 103A, 202	Async.	Half	Up to 1800	F2072-A1	2	8	T2016-A2**
	Unwired, for special applications	Async.	Half	Up to 1800	F2072-A2	2	8	T2016-A2**
	BSC	Sync.	Half	Up to 20K	F2053-A1	2	8	T2018-A2
	CNS trunkline	Sync.	Full	Up to 20K	F2053-B1	1	8	T2018-A2
	IBM 2848/2260, 2845/2265	Async.	Half	Up to 20K	F2053-C1	2	8	T2018-A2
SDLC		Sync.	Both	Up to 20K	F2083	2	8	T2020-A2
Current loop, 20 ma or 60 ma		Async.	Half	Up to 75	F2074*	2	8	T2016-A2**
Wideband	Bell 300 Series	Sync.	Half	Up to 50K	F2064-A1	1	4	T2018-A2
	CNS trunkline	Sync.	Full	Up to 50K	F2064-B1	1	4	T2018-A2
DDS	BSC	Sync.	Half	Up to 56K	F2092-A1	2	2	T2018-A2
	CNS trunkline	Sync.	Full	Up to 56K	F2092-B1	1	2	T2018-A2
	Bell System Data Service Unit	Sync.	Both	Up to 56K	F2085	1	2	T2020-A2
Wideband	BSC	Sync.	Both	Up to 230K	F2026-A1	2	2	T2017-A1 ***
	BSC	Sync.	Both	Up to 230K	F2026-B1	2	2	T2017-A1 ***
	BSC	Sync.	Both	Up to 230K	F2026-C1	2	2	T2017-A1 ***
	Bell 300 Series	Sync.	Both	Up to 50K	F2084	1	2	T2020-A2
Auto call Adapter	#T2014-XX 1	—	—	—	F2033-XX	1	16	T2016-A2
	#T2014-XX	—	—	—	F2033-XX	1	16	T2018-A2

*Requires Telegraph Interface Base Feature #F2068.

**F2028 or F2077-XX required for each T2016. F2028 (no charge) allows only single speed. F2027-XX permits program selection of a different speed for each line.

***Requires F2040 when more than one F2026 is attached.

► **Multiplexer Channels or Integrated File Adapters (for multiple disk attachment).** This model includes space for two Logic Modules in the base cabinet.

The 3690-B1 is intended to function as a remote communications processor and does not include any Direct Storage Access Channels. This model includes space for two Logic Modules in the base cabinet.

The 3690-C1, D1, and E1 are intended to function as front-end processors. All three models include four Direct Storage Access Channels. The 3690-C1 also includes one Channel Interface Adapter for direct attachment to the host. The three remaining DSAC's can be used to attach up to three additional Channel Interface Adapters, up to three Block Multiplexer Channels, up to three Integrated File Adapters, or any combination of the three feature attachments.

The 3690-D1 has a Channel Interface Adapter Base attachment to one of the DSAC's. This CIA Base can support attachment of up to four Channel Interface Adapters, still leaving three DSAC's available. The three DSAC's are restricted to attachment of Block Multiplexers or Integrated File Adapters. The basic 3690-D1 also includes one IBM Channel Interface Adapter.

The 3690-E1 includes two CIA Bases, each able to accommodate up to four host attachments or a system total of eight. One of the CIA Bases includes an IBM Channel Interface Adapter as part of the basic configuration. The two remaining DSAC's can be used for Block Multiplexer or Integrated File Adapter attachment.

CONNECTION TO HOST COMPUTER

The 3650 supports up to two direct host connections; the 3670, up to four; and the 3690, up to eight. The Channel Interface Adapter controls byte transfers between the Comten processors and the multiplexer channel on an IBM host computer. Subchannel addresses from 1 to 256 are supported. When the Comten processor is emulating an IBM 270X, an Emulator Identifier feature is required along with the Channel Interface Adapter.

TRANSMISSION SPECIFICATIONS

Asynchronous lines up to 19.2K bps, and synchronous lines up to 56K bps are supported. EIA RS 232C, current loop, wideband, and DDS interfaces are supported in either full- or half-duplex mode. Notable among the protocols supported are binary synchronous communication (BSC), SDLC, and CNS trunkline. The latter is a BSC-like protocol used internally on Comten networks.

Each type of line interface requires specific Modem Interface Module and Line Interface features. These features are attached to the system Communications Interface Module. Table 2, Communications Line Interfaces and Modem Interface Modules, lists the features required to support the various types of communications lines. Throughput limitations are noted by the number of lines each MIM will support for a given type of interface, despite the physical capability of attaching 16 lines per MIM.

SOFTWARE

Currently, three major software packages are available, at no additional charge, for operating Comten 36X0 systems. They are Comten Emulation, Communications Networking System (CNS), and Network Control Program (NCP).

Emulation

Comten Emulation permits the 36X0 to operate as an IBM 3704/3705 controller, including the capability to emulate an IBM 270X. In addition to permitting one Comten 36X0 to replace multiple 270X/370X devices attached to one host, the 36X0 can be connected to multiple hosts. Emulation also supports terminals that are not compatible with the 270X and 370X.

Emulation consists of a module for each terminal-type requiring support and a string of special purpose programs such as TILS, ABRD, MAF, and DIAL. TILS, Terminal-Initiated Line Switching, assigns the appropriate host sub-

Comten 3650 II, 3670 II, and 3690 Communications Processors

channel address that is associated with a particular application. The assignment is based upon the terminal operator's description of the linkage required. TILS includes a feature that will automatically reroute transactions to a backup host when the primary host is unavailable. ABRD, Automatic Baud Rate Detection, enables multiple start/stop terminals with different speeds and data-link control procedures to share the same line to a Comten front-end processor. ABRD is used in conjunction with TILS. When a terminal operator initiates a linkage under TILS, it is ABRD that determines the terminal's speed and data-link control. SILS, Site-Initiated Line Switching, under the control of the front-end processor's operator, performs the TILS function for dedicated lines. MAF, Multiple Access Facility, relieves the host of the polling function for IBM 3270 systems and permits the terminals to select applications in any host computer attached to the Comten front-end processor. DIAL, Automatic Dialing, handles up to 16 phone lines for host-originated calls.

Emulation also provides utility programs for monitoring and maintenance, on-line terminal testing, console I/O, and on-line system generation.

Communications Network System (CNS)

When there is a need for two or more Comten processors to communicate with each other, within a network, the Emulation software package is replaced with the Communications Networking System (CNS). While performing all of the functions of Emulation, CNS also enables a Comten processor functioning as a remote concentrator to transmit to and receive from a Comten processor functioning as a front-end processor. Terminals using start/stop or BSC protocols are supported by the remote concentrator through the CNS interface modules ASWX and BSWX. While these modules perform the data-link function, the Transparent Concentrator (TCON) module performs the function of multiplexing/demultiplexing of the data from each terminal. The module that handles the network's internal protocol (CNS Trunk Handler) is the TCTH module. This internal protocol is transparent to the terminals and the host processors. CNS emulator modules, comparable to the Emulation modules above, are resident in the front-end processor for each terminal-type sending and receiving data. An optional module, STAR, performs trunk monitoring and reporting. Information on trunk utilization, current circuit status, and error statistics are provided by STAR, along with automatic notification of circuit failures. Other CNS features support alternate routing, node reconfiguration, satellite links, remote auto-dial, and multiple-circuit trunks.

Network Control Program (NCP)

Both the CNS and the Emulation packages require a separate subchannel address for each terminal communicating with the host. Controlling multiple accesses consumes significant host processor time. NCP provides for all data between the host and the front-end processor to be multiplexed over a single subchannel, significantly reducing the host control function. Comten NCP is compatible with IBM NCP in performing the line handling and communications control functions. While the access method in the host is transparent to Emulation and CNS, NCP requires that the host access method be either IBM TCAM or VTAM. Comten NCP provides concurrent support for multiple IBM host processors.

When the Comten NCP system is used to emulate in a mode comparable to IBM's NCP Partitioned Emulation Processing (PEP) mode, Comten NCP is operated concurrently with Emulation and CNS. This capability is generally needed to ease application program conversion from the 270X multi-access mode to NCP single-access mode.

System Generation

Parameter setting for tailoring either Emulation, CNS, or NCP for a given system is done in CODEL, a Comten

source language. System generation is performed on the host computer and is loaded into the front-end processor.

Data Switching System (DSS)

The Comten processor can be operated as a nodal processor on a distributed network by the use of the Data Switching System. Operated under the control of the Communications Operating System (COS), DSS operates coresident with NCP and CNS. DSS adds to the capabilities of NCP file-level host interface, basic message handling and queuing, message switching, network security, and network control functions. In effect, DSS can independently drive a communications network.

DSS is composed of four modules: the Communications Access Method (CAM), the Data Switch Message Control Program (DS/MCP), the Network Manager, and the File Access Method (FAM).

The Communications Access Method controls the access to all lines assigned to CAM, whether to a terminal, to another node processor, or to a host processor. Four sub-modules of CAM provide a standard interface with the remainder of the CAM module and each of the four separate protocols. The sub-modules are called Transmission Subsystem Elements (TSE). The Basic Mode SNA TSE provides the interface between CAM and data received (from terminals) by the processor via NCP. The Communications Networking System TSE provides the interface between CAM and data received (from terminals and other Comten processors) by the processor via CNS. The 3270 Emulation TSE provides the interface between CAM and up to four IBM 360/370 hosts. The hosts, operating BTAM or TCAM applications programs, view the interface between CAM and IBM 360/370 systems executing "read/write" queries to DDS through the host's Basic Sequential Access Method (BSAM).

The Data Switch/Message Control Program performs the message handling function for data it receives from CAM. Messages are analyzed, edited, routed, queued, and logged. Error recovery is controlled by this DSS module.

The Network Manager portion of DSS is responsible for network configuration, startup, shutdown, session establishment, and other related functions.

The File Access Method module of DSS provides the access interface between locally attached disk drives, card readers, and printers and the Data Switch/Message Control Program.

Application programs in the Comten processor have interfaces with the File Access Method, the Data Switch/Message Control Program, and the Network Manager through a module of the operating system (COS) called Application Program Support.

Release 1 of DSS is scheduled for delivery in January 1978. The following elements will not be included until Release 2: user file access, disk queues, multiple priority for queues, File-Level host access, detailed statistics file, extended support for any start/stop and bisynchronous devices of NCP, warm start recovery. Release 2 is scheduled for August 1978.

Peripherals

Flexible disk storage arrangements are provided including removable pack and fixed head units, as well as the capability to support IBM 3330-style drives from IBM and some independents.

The 7214 Controller attaches to one position on the Block Multiplexer channel and supports up to nine double-density 2314-style drives; if the full complement of nine drives is

Comten 3650 II, 3670 II, and 3690 Communications Processors

installed, one is a spare. Two drive models are available; the 6214 single spindle and the 6224 dual spindle. Any combination of models is supported that does not exceed nine spindles. Each spindle accepts a 2316 disk pack organized in two sets of 200 interleaved cylinders; each spindle is two logical units. The capacity supported by each spindle is 58.352 megabytes. Average head positioning time is 35 milliseconds. Rotational delay averages 12.5 milliseconds. The transfer rate is 312K bytes per second.

Fixed disk drives and 3330-11-style removable pack drives can be attached to the Block Multiplexer or Integrated File Adapter. Either arrangement requires the T7005-A1 Formatter. Attachment to the Multiplexer channel also requires the T7215-A1 Storage Control Unit (available mid-1978). The Disk Formatter accommodates up to four drives in any combination of 24-megabyte (T6124-A1) or 48-megabyte (T6148-A1) fixed disk drives and 150-megabyte (T6215-A1) or 300-megabyte (T6230-A1) removable pack drives that accept IBM 3336-11 style disk packs. The fixed disk drives also include 97K bytes of storage under fixed heads (no head positioning delay). The data transfer rate for all models is 1,209K bytes per second. The rotational

delay for all models is 8.4 milliseconds. The average head positioning time for the fixed disk models is 40 milliseconds; for the removable pack drives, it is 30 milliseconds.

The Block Multiplexer Channel is certified for use with IBM 3830-2/3330-11/3333-11 200-megabyte Controller/Drive subsystems. The Control Data 38302/33332/33301/33302 100- and 200-megabyte Controller/Drive subsystems are also certified. Products from other plug compatible vendors are certifiable on an individual basis.

A 75-ips magnetic tape drive, a 600-cpm card reader, and a 600-lpm line printer are offered, along with a HASP Workstation. The latter is available with or without a console.

PRICING

The Comten processors are available for purchase or on a 30-day, 2-year, 3-year, or 4-year lease. All system software is included in the price of the equipment, except for DDS which will be offered for a monthly license fee. A separate monthly maintenance contract is available.

Monthly Charges

		<u>Monthly Lease</u>	<u>2-Year Lease</u>	<u>3-Year Lease</u>	<u>4-Year Lease</u>	<u>Purchase Price</u>	<u>Monthly Maint.</u>
3650 II Systems							
T3650-C2	FEP; 3650II-C2, 32K bytes, 3LM	1,172	1,030	947	905	\$32,900	\$195
T3650-D2	FEP; 3650II-D2, 32K bytes, 11LM	1,560	1,365	1,250	1,193	43,400	215
T3650-E2	RCP; 3650II-E2, 32K bytes, 3LM	1,250	1,105	1,018	974	34,400	230
T3650-F2	RCP; 3650II-E2, 32K bytes, 11LM	1,640	1,440	1,321	1,262	44,900	250
F3601-A1	Storage Module; 32K bytes	170	150	138	131	4,625	25
F3602-A1	Storage Expansion; 64K bytes	340	300	276	262	9,250	50
F1034-A1	IBM Channel Program Loader	57	50	46	44	1,265	10
F2200	Remote Initial Load	30	26	24	23	665	5
T3019	IBM Channel IF Adapter	285	245	222	210	7,420	10
T4008	Comten Console	166	145	133	126	3,500	20
F4002	System Select Switch	6	5	5	4	125	1
F4003	RS232C Interface	7	6	6	5	75	1
F1044	Peripheral Power Sequencer	59	51	47	44	1,800	5
F2205-A1	3650 Extended Distance I/F Adapter	5	4	4	3	100	1
T3651-A1	Module Controller; 6LM	420	365	350	330	10,500	40
T3651-A2	Module Controller; 6LM, 2 CPU	495	430	415	390	12,000	60
T3651-B1	Module Controller; 12LM	825	715	685	645	20,600	80
T3651-B2	Module Controller; 12LM, 2 CPU	975	850	815	770	23,600	120
3670 II Systems							
T3670-E1	FEP; 3670 II-E1, 64K bytes, 11LM	2,551	2,226	2,034	1,937	73,500	301
T3670-F1	FEP; 3670 II-F1, 64K bytes, 19LM	2,941	2,561	2,337	2,226	83,500	321
T3670-G1	FEP; 3670 II-G1, 64K bytes, 27LM	3,331	2,896	2,641	2,513	93,500	341
T3670-H1	RCP; 3670 II-H1, 64K bytes, 12LM	2,329	2,042	1,871	1,785	65,000	329
T3670-J1	RCP; 3670 II-J1, 64K bytes, 20LM	2,719	2,377	2,174	2,073	75,500	349
F3601-A1	Storage Module; 32K bytes	170	150	138	131	4,625	25
F3602-A1	Storage Expansion; 64K bytes	340	300	276	262	9,250	50

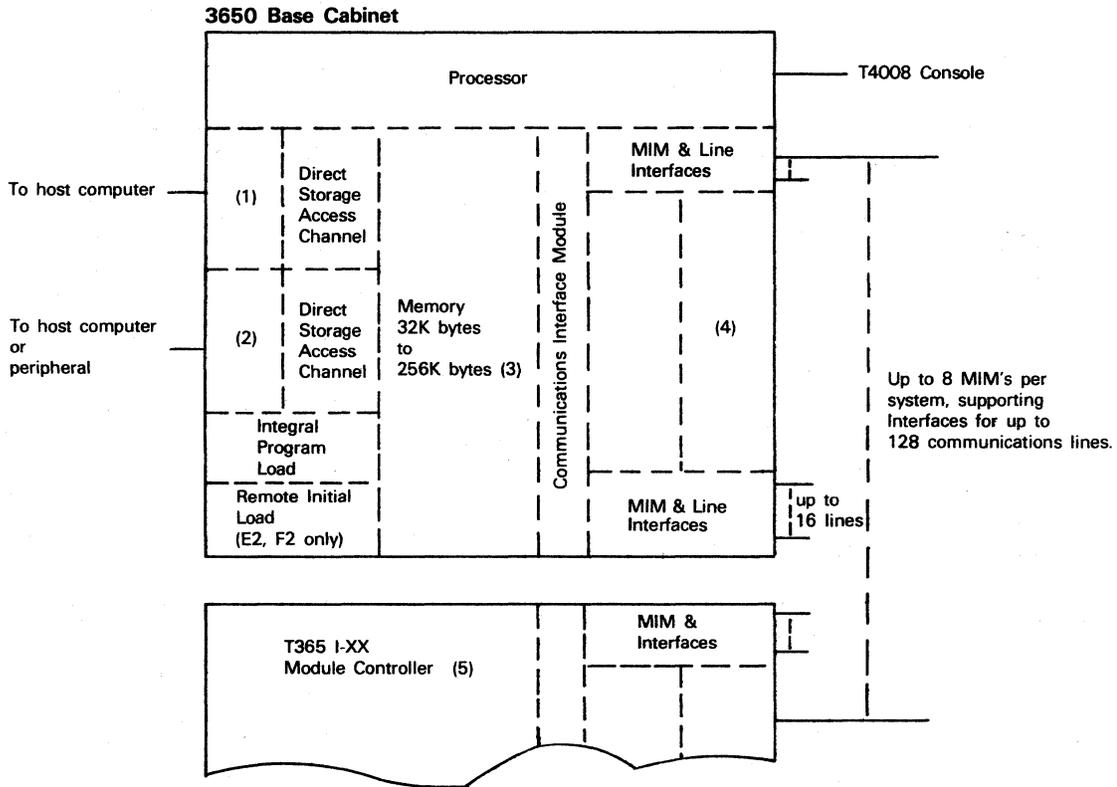
Comten 3650 II, 3670 II, and 3690
Communications Processors

Monthly Charges*

		Monthly Lease	2-Year Lease	3-Year Lease	4-Year Lease	Purchase Price	Monthly Maint.
3670 II Systems (continued)							
F1034-A1	IBM Channel Program Loader	57	50	46	44	1,265	10
F1027	Communications I/F Module	88	77	70	67	2,125	10
F2201-A1	Remote Initial Load — Basic	56	49	45	43	1,265	9
F2201-A2	Remote Initial Load — Second	30	26	24	23	665	5
T3018	IBM Channel I/F Adapter	285	245	222	210	7,420	10
T3025	IBM Channel I/F Adapter	155	135	123	116	3,945	10
T4008	Comten Console	166	145	133	126	3,500	20
F4002	System Select Switch	6	5	5	4	125	1
F4003	RS232C Interface	7	6	6	5	75	1
F1044	Peripheral Power Sequencer	59	51	47	44	1,800	5
F2205-B1	3670 Extended Distance I/F Adapter	5	4	4	3	100	1
T3671-A1	Module Controller; 6LM	420	365	350	330	10,500	40
T3671-A2	Module Controller; 6LM, 2 CPU	495	430	415	390	12,000	60
T3671-B1	Module Controller; 12LM	825	715	685	645	20,600	80
T3671-B2	Module Controller; 12LM, 2 CPU	975	850	815	770	23,600	120
T3671-C1	Module Controller; 18LM	1,275	1,070	1,025	965	30,700	120
T3671-C2	Module Controller; 18LM, 2 CPU	1,455	1,270	1,220	1,050	35,200	180
T3671-D1	Module Controller; 24LM	1,635	1,420	1,365	1,285	40,800	160
T3671-D2	Module Controller; 24LM, 2 CPU	1,930	1,685	1,620	1,530	46,800	240
3690 Systems							
T3690-A1	Free-standing; 3690-A1, 256K, 2LM	4,687	3,847	3,512	3,342	103,350	487
T3690-B1	RCP; 3690-B1, 256K, 2LM	4,201	3,446	3,146	2,991	92,900	436
T3690-C1	FEP; 3690-C1, 256K, 2LM	4,257	3,492	3,187	3,032	93,200	442
T3690-D1	FEP; 256K, 3690-D1, CIA Base, 1LM	4,709	3,864	3,529	3,354	103,800	489
T3690-E1	FEP; 3690-E1, 256K, 2-CIA Bases, 6LM	5,620	4,605	4,200	3,990	124,650	550
F3604-A1	Storage Expansion, 128K bytes	655	575	527	499	18,500	75
F1048-A1	Auto Power Restart	37	30	27	26	750	4
F2207-A1	Remote Initial Load, Basic	62	51	47	45	1,275	9
F2207-A2	Remote Initial Load, Second	30	26	24	23	665	5
T3018	IBM Channel I/F Adapter	285	245	222	210	7,420	10
T3019	IBM Channel I/F Adapter	285	245	222	210	7,420	10
T2023-A1	Communications Adapter	206	166	151	146	4,470	21
T2023-B1	Extended Distance Communi- cation Adapter	273	223	203	193	6,000	28
T2023-C1	Extended Distance Communi- cation Adapter, 2 CPU	385	315	285	275	8,450	40
T4008	Comten Console	166	145	133	126	3,500	20
F4003	RS232C Interface	7	6	6	5	75	1
F1044	Peripheral Power Sequencer	59	51	47	44	1,800	5
F2205-C1	3690 Extended Distance I/F Adapter	5	4	4	3	100	1
T3691-A1	Module Controller; 6 LM	470	385	350	335	10,650	40
T3691-A2	Module Controller; 6 LM, 2 CPU	555	455	415	395	12,150	60
T3691-A3	Module Controller; 6 LM, adjacent cabinet	460	375	345	325	10,500	40
T3691-B1	Module Controller; 12 LM	925	755	685	655	20,800	80
T3691-B2	Module Controller; 12 LM, 2 CPU	1,090	895	815	780	23,800	120
T3691-B3	Module Controller; 12 LM, adjacent cabinet	905	740	675	645	20,500	80
T3691-C1	Module Controller; 18 LM	1,370	1,120	1,020	970	30,950	120
T3691-C2	Module Controller; 18 LM, 2 CPU	1,620	1,330	1,215	1,160	35,450	180
T3691-C3	Module Controller; 18 LM, adjacent cabinet	1,345	1,100	1,005	955	30,500	120
T3691-D1	Module Controller; 24 LM	1,825	1,490	1,355	1,290	41,100	160
T3691-D2	Module Controller; 24 LM, 2 CPU	2,155	1,770	1,615	1,540	47,100	240

Comten 3650 II, 3670 II, and 3690 Communications Processors

Configuration



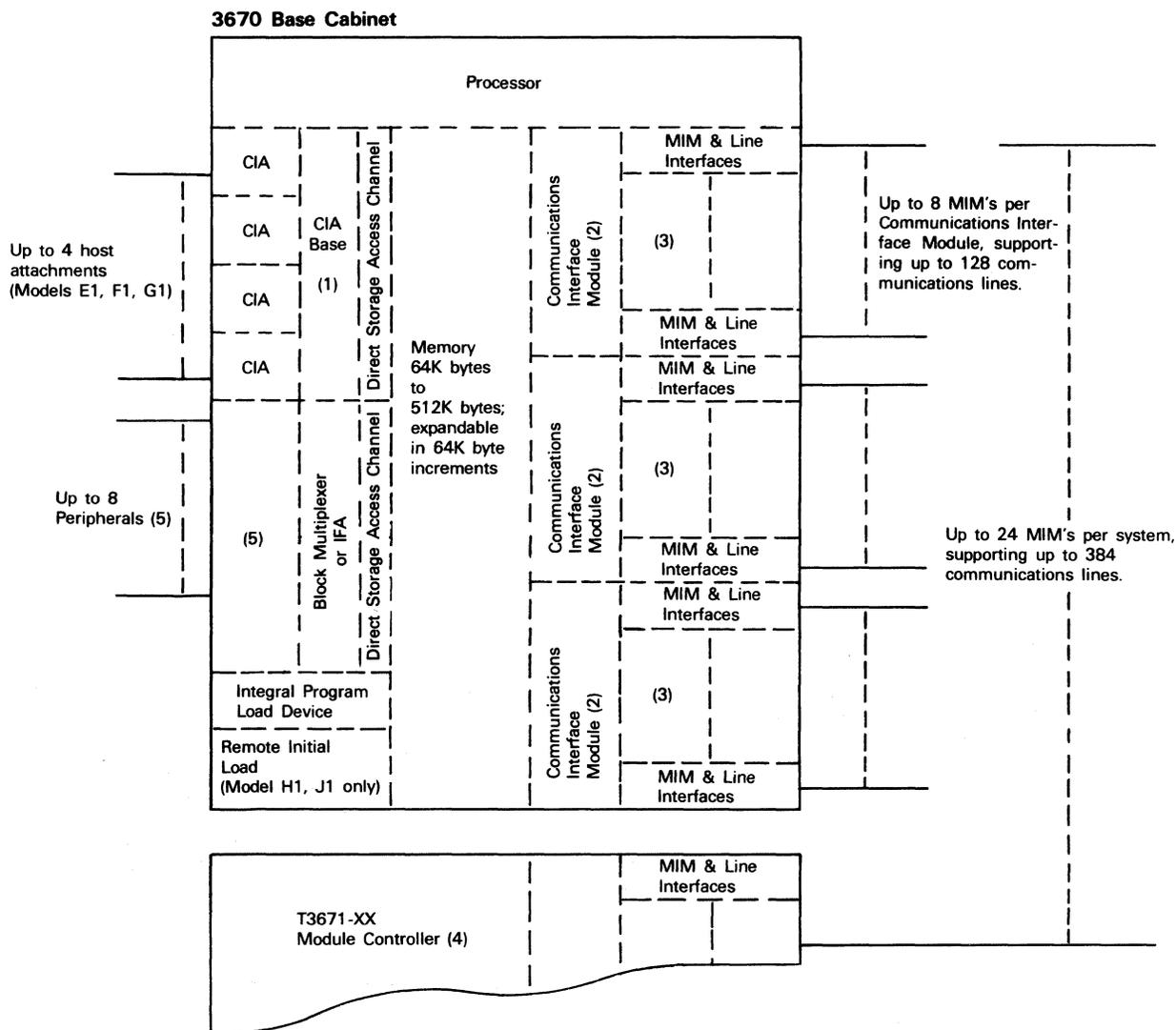
- (1) Basic 3650-C2 and D2 include one IBM Channel Interface Adapter T3019; optional for 3650-E2 and F2.
- (2) Direct Access Storage Channel available optionally for all models for peripheral attachment or for a second IBM Channel Interface Adapter.
- (3) Basic memory is 32K bytes, expandable to 256K bytes in 64K byte increments.
- (4) Up to eight Modem Interface Modules (MIM) plus associated Line Interfaces (see Table 2) per system, supporting up to 128 communications lines. Requirement for expansion housing for MIM's (Module Controller) is dependent on the MIM's selected and the space available in base cabinet; space available is expressed in Logic Modules. 3650-C2 and E2, have three Logic Modules available; 3650-D2 and F2 have 11 Logic Modules available. Three types of MIM's each utilize one Logic Module. A fourth MIM, the DLC-MIM, consumes one-half of two Logic Modules; two DLC-MIM's occupy two Logic modules. Basic 3650-E2 and F2 include one BSC-MIM and one CMS Trunkline Interface, accommodating 8 full-duplex lines at 1800 bps.
- (5) Module Controllers are available to accommodate either 6 Logic Modules or 11 Logic Modules. Each size has a version that permits dual access; i.e., two 3670's can have access to the controller.

Monthly Charges*

		Monthly Lease	2-Year Lease	3-Year Lease	4-Year Lease	Purchase Price	Monthly Maint.
3690 Systems (continued)							
T3691-E1	Module Controller; 30 LM	2,270	1,855	1,690	1,610	51,250	200
T3691-E2	Module Controller; 30 LM, 2 CPU	2,680	2,205	2,015	1,920	58,750	300
T3691-F1	Module Controller; 36 LM	2,720	2,225	2,025	1,930	61,400	240
T3691-F2	Module Controller; 36 LM, 2 CPU	3,215	2,645	2,415	2,305	70,400	360
36X0 Communication Control Equipment							
T2014-A1	Auto Call Adapter	114	99	90	86	2,800	10
T2014-B1	Auto Call Adapter	114	99	90	86	2,800	10
F2033-A1	Auto Call Interface	7	6	6	5	160	1
T2014-C1	Auto Call Adapter	121	105	96	91	3,000	10
T2014-D1	Auto Call Adapter	121	105	96	91	3,000	10
F2033-B1	Auto Call Interface	8	7	6	6	175	1

Comten 3650 II, 3670 II, and 3690 Communications Processors

Configuration



- (1) Base 3670-E1, F1, G1 includes Channel Interface Base and one T 3018 IBM Channel Interface Adapter; up to three additional adapters can be optionally attached. Base 3670-H1, J1 provides only for attachment of up to eight direct access peripheral controllers with the attachment of a Block Multiplexer, or up to four disk drives with the attachment of an Integrated File Adapter.
- (2) All base models include one Communications Interface Module. Two additional Communications Interface Modules can be optionally attached. Each Communications Interface Module supports up to eight Modem Interface Modules (MIM).
- (3) Up to eight Modem Interface Modules (MIM) plus associated Line Interfaces (see Table 2) per Communications Interface Module. Requirement for expansion housing for MIMs (Module Controller) is dependent on the MIM's selected and the space available in base cabinet; space available is expressed in Logic Modules. The 3670-E1 has 11 Logic Modules, Model F1 has 19, Model G1 has 27, Model H1 has 12, Model J1 has 20. Three types of MIMs each utilize one logic Module A fourth MIM, the DLC-MIM, consumes one-half of two Logic Modules. (Two DLC-MIMs occupy two Logic Modules.) The Basic 3670-H1, J1 includes one BSC-MIM and one CNS Trunkline Interface, accommodating 8 full-duplex lines at 1800 bps.
- (4) Module Controllers are available to accommodate either 6, 12, or 18 Logic Modules. Each size has a version that permits dual processor access; two 3670s can have access to the controller.
- (5) All models support optional attachment of a Block Multiplexer or an Integrated File Adapter. Up to eight peripheral controllers can be attached to the Block Multiplexer. Up to four disk drives can be attached to the IFA.

Monthly Charges*

Monthly Lease	2-Year Lease	3-Year Lease	4-Year Lease	Purchase Price	Monthly Maint.
---------------	--------------	--------------	--------------	----------------	----------------

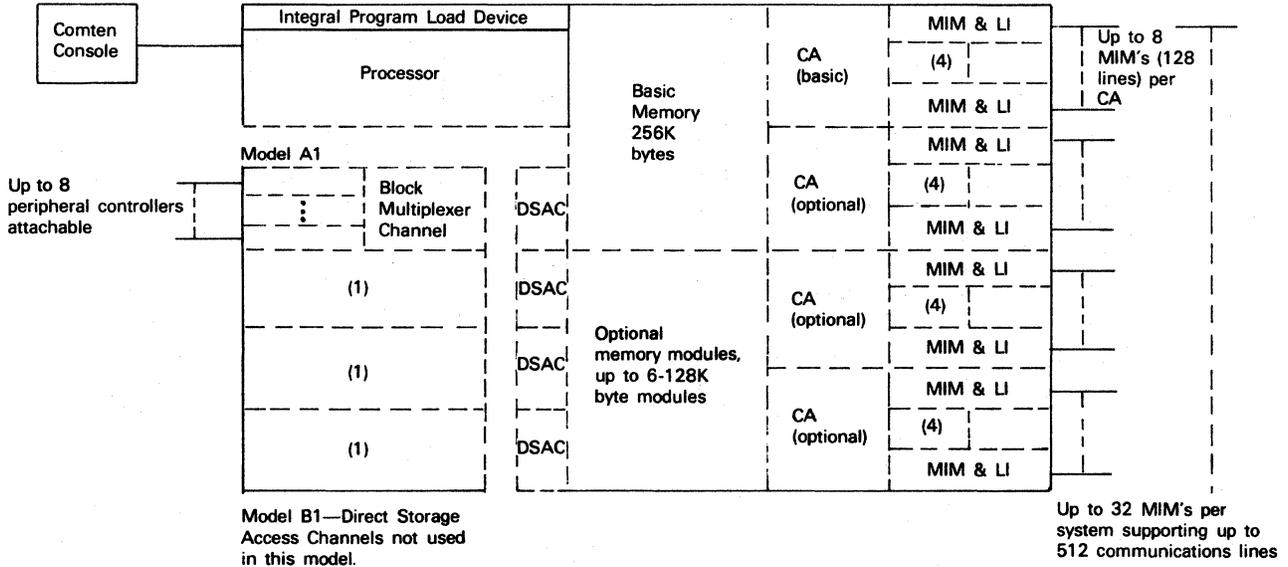
36X0 Communication Control Equipment (continued)

T2016-A2	16 Line A-MIM	125	108	98	93	3,600	10
F2027-OX	Multi-Baud Rate; 8 lines	13	11	10	10	295	2
F2068-O1	Telegraph I/F Base	6	5	5	4	125	1
F2074	2 Line Telegraph 1/F	9	8	7	7	190	2
F2072-AX	2 Line EIA RS232C I/F	9	8	7	7	190	2

Comten 3650 II, 3670 II, and 3690 Communications Processors

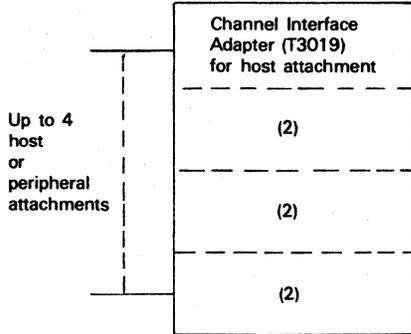
Configuration

3690 Base Cabinet

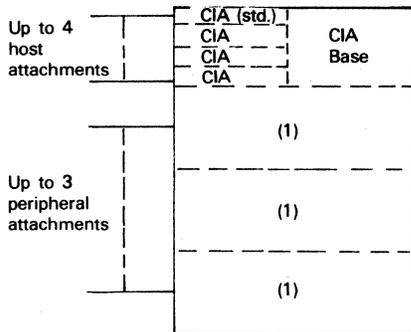


Model B1—Direct Storage Access Channels not used in this model.

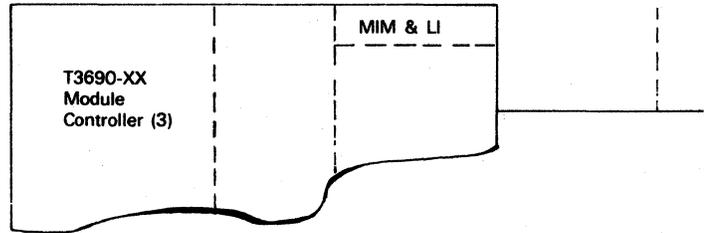
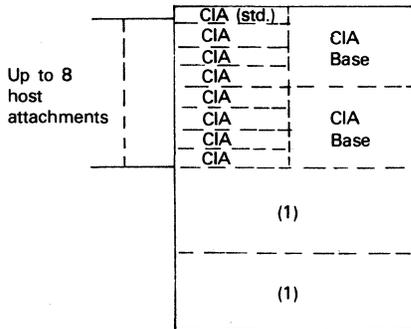
Model C1



Model D1



Model E1



- (1) Direct Storage Access Channel available for attachment of a Block Multiplexer Channel or an Integrated File Adapter.
- (2) Direct Storage Access Channel available for attachment of a Channel Interface Adapter, a Block Multiplexer Channel, or an Integrated File Adapter.
- (3) Module Controllers are available to accommodate 6, 12, 18, 24, 30, or 36 Logic Modules. Each size has a version that permits dual processor access; i.e., two 3690's can have access to the controller.
- (4) Up to eight Modem Interface Modules (MIM) plus associated Line Interfaces (see Table 2) per Communications Adapter. Requirement for expansion housing for MIM's (Module Controllers) is dependent on the MIM's selected and the space available in base cabinet; space available is expressed in Logic Modules. The 3690-A1 and D1 each have two Modules. The 3690-B1 and D1 have one Logic Module. The 3690-E1 has six Logic Modules.

Comten 3650 II, 3670 II, and 3690
Communications Processors

		Monthly Charges*					
		Monthly Lease	2-Year Lease	3-Year Lease	4-Year Lease	Purchase Price	Monthly Maint.
36X0 Communication Control Equipment (continued)							
T2017-A1	BSC-MIM, 4 Line	154	134	122	116	4,250	16
F2003	BSC Autodial	48	41	37	35	1,425	2
F2040	BSC 2 Line Exp.	66	57	52	49	1,850	5
F2026-XX	Sync. Wideband I/F	29	25	23	22	725	2
F2029	Special Order Speed	17	15	14	13	475	1
T2018-A2	BSC-MIM; 16 lines	197	171	156	148	6,500	16
F2053-A1, C1	RS232C I/F; 2 lines	18	16	15	14	320	3
F2053-B1	RS232C I/F; 1 line	18	16	15	14	320	3
F2064-A1, B1	Wideband I/F; 1 line	27	24	23	21	600	4
F2092-A1	Wideband DDS I/F; 2 lines	40	35	32	31	975	5
F2092-B1	Wideband DDS I/F; 1 line	23	20	18	17	550	3
F2095	BSC EIA Sync. Clock; 2 lines	34	30	28	26	785	5
T2020-A2	DLC-MIM	237	207	189	180	8,000	27
T2020-B2	Extended Distance I/F	284	247	226	215	9,500	32
T2020-C2	DLC-MIM Extended Distance Dual I/F	356	310	283	270	12,000	40
F2083	EIA/CCITT I/F; 2 lines	25	22	20	19	700	3
F2084	Wideband I/F; 1 line	32	28	26	25	825	5
F2085	Wideband DDS I/F; 1 line	31	27	25	24	800	5
F2088	Storage Expansion; 2K Instructions	52	45	41	39	1,500	4
F2097	Operand Storage Expansion	31	27	25	24	800	4
36X0 Peripheral Equipment							
T3023-A1	Block Multiplexer Channel	750	615	560	535	16,400	80
T3026-A1	Integrated File Adapter	638	523	478	458	14,000	68
T7214-B2	Disk Storage Control Unit	1,010	830	760	725	21,600	120
F7005-B2	Two Channel Switch	135	110	100	95	2,900	15
T6214-B2	Disk Storage Drive; 58M bytes	545	450	410	395	11,500	75
T6224-B2	Disk Storage Drive; 116M bytes	1,090	900	820	790	23,000	150
T7215-A1	Storage Control Unit	678	558	508	488	15,400	73
F7009	Two Channel Switch	218	178	163	153	4,675	23
T7005-A1	Disk Formatter	590	485	440	420	13,190	60
T6124-A1	Fixed Media Disk; 24M bytes	397	327	297	287	9,070	42
T6148-A1	Fixed Media Disk; 42M bytes	630	515	470	450	14,075	65
T6215-A1	Removable Media Disk; 15M bytes	897	737	672	642	20,500	92
T6230-A1	Removable Media Disk; 300M bytes	1,260	1,035	945	900	28,500	130
T7322-B2	Magnetic Tape Drive and Con- trol; 75 ips	1,085	895	820	780	24,250	135
F7004-B2	Two Channel Switch	112	91	83	79	2,500	8
T6322-B2	Magnetic Tape Drive; 75 ips	515	430	395	380	11,000	85
T7305-A2	Card Reader; 600 cpm	425	360	345	330	9,000	85
T7406-A2	Line Printer; 600 lpm	930	770	740	705	20,000	160
T7780-A1	HASP Workstation	1,355	1,130	1,085	1,035	29,000	245
T7781-A1	HASP Workstation, with Console	1,521	1,275	1,218	1,161	32,500	265
T8009	Disk Storage Cabinet	141	116	107	101	3,500	15
F8017	DC Power Feature	57	47	43	41	1,400	6

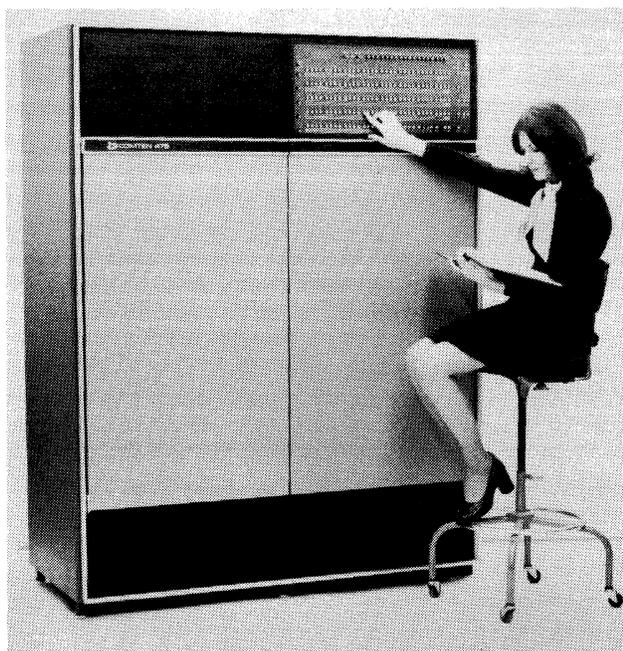
*Includes Monthly Maintenance.

Comten 3650 II, 3670 II, and 3690
Communications Processors

SOFTWARE

SOFTWARE		Monthly License Fee
S-46F500000	Multi Leaving Workstation (MLW)	\$ 75
S-46010	DSS Release 1	30
S-46010	DSS Release 2	50
S-46011	Network Manager Release 1	40
S-46011	Network Manager Release 2	125
S-46012	Data Switch/MCP Release 1	50
S-46012	Data Switch/MCP Release 2	125
S-46013	Auxiliary Storage	25
S-56010	CAM Release 1	25
S-56010	CAM Release 2	50
S-56011	SNA/TSE	25
S-56012	CNS/TSE	25
S-56013	3270 Emulation/TSE	25
S-56014	FILE LEVEL/TSE	25
S-56020	FAM Release 2	30■

Comten 476 Communications Processor



MANAGEMENT SUMMARY

The Comten 476 Communications Processor is the predecessor of the Comten 3650/3670/3690 family of communications processors and the successor to the Comten 45 and 65, which were themselves replacements for the Comten 40 and 60.

Until the mid-1977 introduction of the Comten 3690 with DSS software and a full line of 36X0 peripherals, the Comten 476 represented Comten's only offering of a free-standing data communications processor. The Comten 476 is upward compatible with the faster Comten 3690 system.

While still actively marketed and suitable for certain requirements, the Comten 476 increasingly becomes less attractive on a price/performance basis compared to the Comten 36X0 processors. This is especially true when purchase, rather than leasing, of the system is contemplated. The 476 did not share the recent price reductions that engulfed the computer industry. By contrast, the 36X0 processor purchase prices were reduced a handsome 20 to 30 per cent.

The 476, like the 3650 and the 3670, is a hardwired processor. The 3690 is microprogrammable and incorporates significant architectural enhancements over previous models. Another 476 predecessor is the Comten 20 which was introduced in 1971 as a customized processor produced for Computer Sciences Corporation's Infonet. The customized processor is a 750-nanosecond, hardwired, 16-bit processor accommodating up to 128 communications lines. □

A message-switching communications processor or a front-end processor for IBM 360/370 computer systems.

Up to 240 communications lines are supported along with up to 2 direct host attachments.

A Comten 476-A1 with 96K bytes of memory and supporting 16 asynchronous communications lines can be purchased for \$110,360 or leased on a 3-year basis for \$3,914 per month including maintenance of \$596 per month.

Comten 476 is an upward compatible predecessor of the Comten 36X0 family of communications processors (Report C13-242-101).

CHARACTERISTICS

VENDOR: Comten, Inc., 1950 West County Road B-2, St. Paul, Minnesota 55113. Telephone (612) 633-8130.

DATE OF ANNOUNCEMENT: 1969.

DATE OF FIRST DELIVERY: 1969.

NUMBER DELIVERED TO DATE: Over 60.

SERVICED BY: Comten, Inc.

CONFIGURATION

The Comten Base Processing System consists of a central processing unit, 32K bytes of 750-nanosecond, 32-bit word core storage, integral load device with programmable read-only storage, and real-time clock.

The base system has four channels for attaching any combination of four Computer Interface Adapters, Peripheral Interface Adapters or directly attached peripheral subsystems. Up to 112 communication channels can be attached to the base system via seven Modem Interface Modules (MIM's). The seven MIM's attach to the base system Communication Interface Module (CIM). A second CIM can be added for attaching 128 more communication lines via eight MIM's. Three model upgrades are available, each adding an expansion cabinet and eight additional logic module spaces to a maximum of 4 cabinets and twenty-eight logic modules. Memory is expandable from a basic 32K bytes to 512K bytes in 32K byte increments.

The Comten 476 is available in four models that differ only in the number of Logic Modules they contain. A Logic Module is equivalent to the space and electrical connections required to mount one rack of PC boards. Mounting requirements of attachments are expressed in Logic Modules.

The Comten 476-A1 contains space for 4 Logic Modules; the A2 model, for 12 Logic Modules; the A3 model, for 20 Logic Modules; and the A4 model, for 28 Logic Modules. ▶

Comten 476 Communications Processor

COMMUNICATIONS LINES HANDLED

MIM	Interface	Interface/MIM*	Lines/Interface	Speed, bps	Transmission	
					Timing	Mode
T2016-A1 16 line Async.	F2072-RS232	8	2	Up to 1800	Asynch.	Half-duplex
	F2074-Telegraph	8	2	Up to 75	Asynch.	Half-duplex
T2017-A1 4 line BSC	F2006 - RS232	2	2	Up to 20K	Synch.	Half-duplex
	F2026-Wideband	2	2	Up to 230.4K	Synch.	Half-duplex
T2018-A1 16 line BSC	F2053-A1-RS232	8	2	Up to 20K	Synch.	Half-duplex
	F2053-B1-RS232	8	1	Up to 20K	Synch.	Full-duplex
	F2064-A1-Wideband	4	1	Up to 50K	Synch.	Half-duplex
	F2064-B1-Wideband	4	1	Up to 50K	Synch.	Full-duplex
	F2092-A1-DDS	2	2	Up to 56K	Synch.	Half-duplex
	F2092-B1-DDS	2	1	Up to 56K	Synch.	Full-duplex
	F2095-BSC	8	2	1200	Synch.	Half-duplex
T2014 Auto Call Adapter	F2033	16	1	-	-	-

*The maximum number of MIM's per CIM is eight.

► CONNECTION TO HOST COMPUTER

Up to two direct storage access attachments to IBM 360/370 computer systems are supported by the Comten 476. The direct access channels are also used to attach peripherals. Comten will customize adapters for other host systems.

TRANSMISSION SPECIFICATIONS

The accompanying table, Communications Lines Handled, summarizes the capabilities of the system for accommodating various types of communications lines.

SOFTWARE

All Comten system are supplied with full software support including operating systems, assembler, a telecommunication access package, a network control package, and a series of utility programs for monitoring and control.

The Comten operating system is built around an executive supervisor program which controls all computer and I/O tasks. Supervisor functions include concurrent, multi-sequential task scheduling by priority, program execution on a variable time basis via a real time clock, peripheral allocation and I/O control communication, I/O initiation and coordination, interrupt tabling, and console control.

The assembler for the Comten system is very similar to the IBM 360/370 assembler. Comten uses the Communication

Definition Language (CODEL) which is translated into machine language by the assembler processor.

The Comten Telecommunication Access Method (CTAM) provides the communication control functions and interfaces to the different types of lines and terminal devices. CTAM consists of two packages: the Network Control Package (NCP) for the Comten processor and the Compute Interface Package (CIP) for the IBM 360/370. NCP provides stand alone message switching and, when used in conjunction with CIP, provides front-end capabilities.

The Network Control Package (NCP), the 476 resident portion of CTAM, controls the communication lines and terminal devices, validates message header information, performs line error processing and queues messages. The Computer Interface Package (CIP), the host computer resident portion of CTAM, controls the channel and replaces the IBM access method (TCAM, BTAM, etc.).

The utility packages offered by Comten include a complement of monitoring functions. Subchannel, communications line, and trunk subline utilization information is provided. Input controls to effect changes in these functions are also offered.

PRICING

The Comten 476 is available for purchase or lease on either a 5-year or a 3-year basis. Software is included in the price of the equipment. A monthly maintenance contract is available.

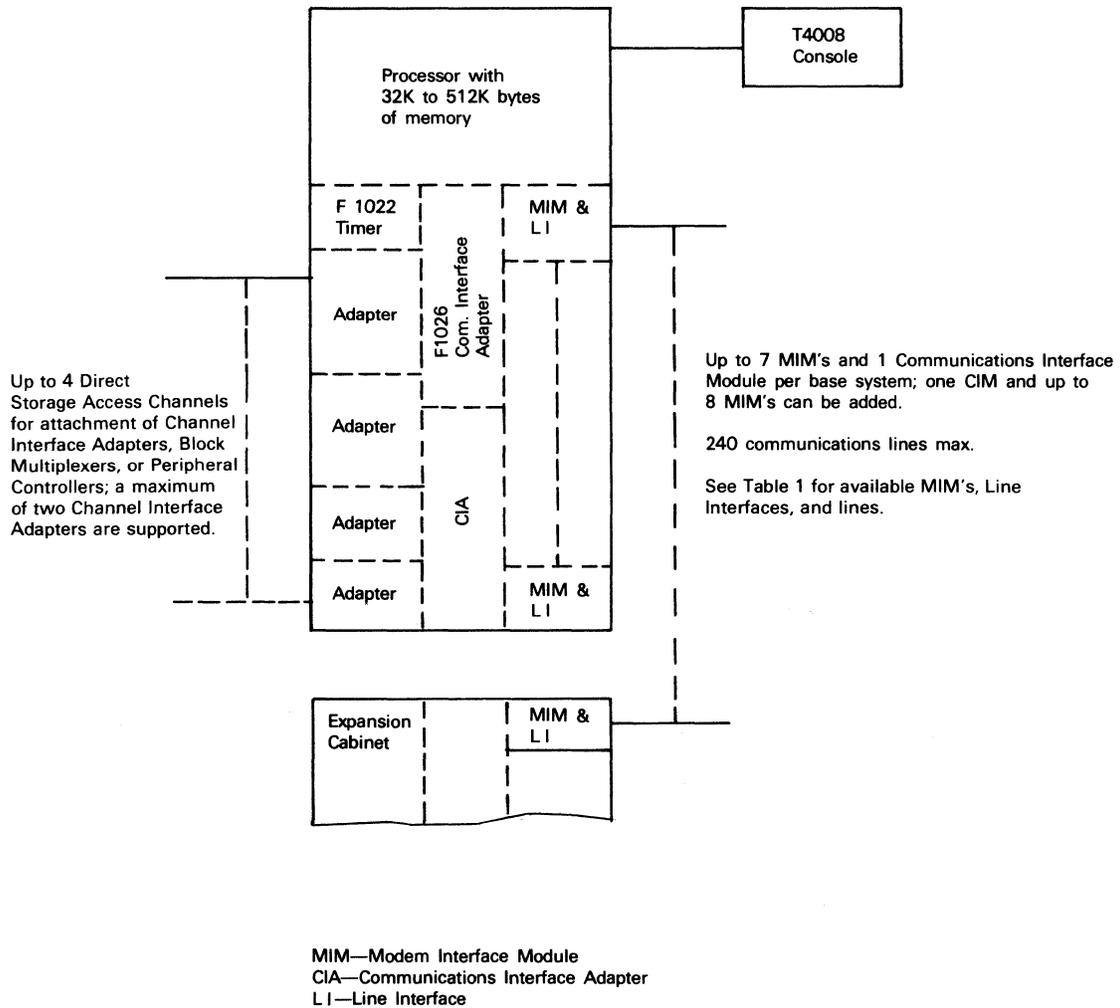
		Monthly Rental*			
		3-Year Lease	5-Year Lease	Purchase	Monthly Maint.
T1476-A1	476 System, 4LM**	\$2,580	\$1,926	\$ 76,000	\$450
T1476-A2	476 System, 12LM**	2,950	2,196	86,000	480
T1476-A3	476 System, 20LM**	3,320	2,466	96,000	510
T1476-A4	476 System, 28LM**	3,690	2,736	106,000	540
F1476	Storage Module, 32K bytes	410	300	10,700	50
F1022	Watchdog Timer	32	22	800	2
F1026	Comm. Interface Module	180	130	5,000	10

*Includes monthly maintenance.

**LM-Logic Module. Components that consume Logic Modules include T2014, T2016, T2017, T2018, T3004, and T3023.

Comten 476 Communications Processor

Configuration



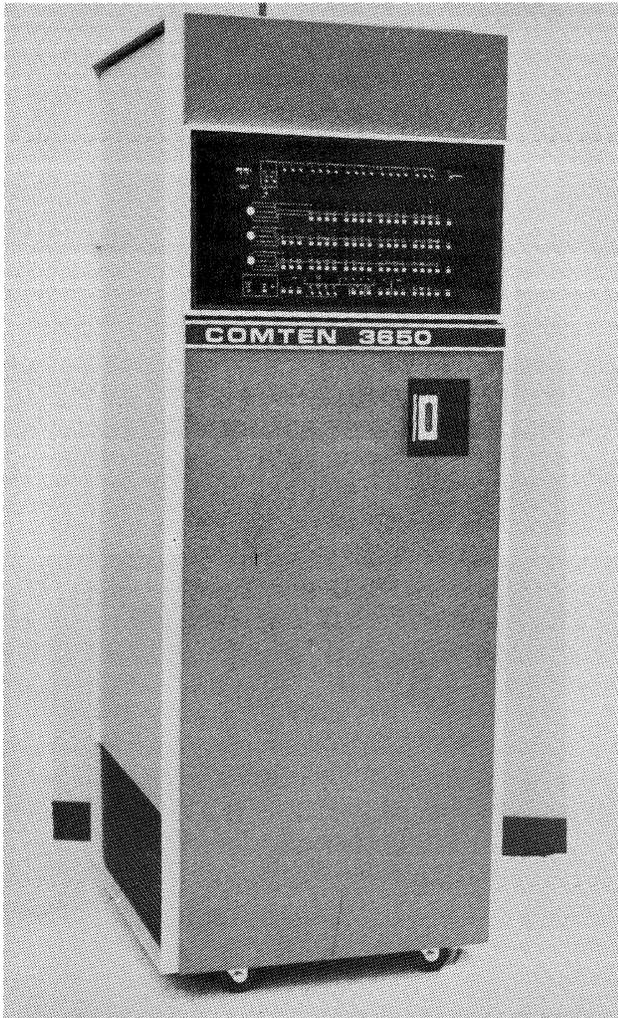
Comten 476 Communications Processor

		Monthly Rental*			
		3-Year Lease	5-Year Lease	Purchase	Monthly Maint.
T3004	IBM Channel Interface Adapter	313	223	9,000	13
T4002	System Activity Monitor	268	198	7,000	28
T4008	Console	140	130	3,500	20
F4002	System Select Switch	4	3	125	1
F4003	RS232C Interface	4	3	75	1
Peripheral Systems					
T3023C	Block Multiplexer Channel	780	550	19,000	30
T3023D	Block Multiplexer Channel Expansion	670	470	16,400	20
F1044	Peripheral Power Sequencer	77	55	1,800	5
T7214	Disk Storage Control Unit	1,160	915	34,000	120
F7005	Two Channel Switch	175	125	4,600	15
T6214	Disk Storage Drive	680	495	18,000	75
T6224	Disk Storage Drive, 2 spindle	1,360	990	36,000	150
T7908-A1	Disk Storage Controller	480	360	12,000	80
T7908-A2	Disk Storage Controller, Expansion	405	300	10,500	55
F7901	Dual Interface	58	43	1,650	3
F3900	I/O Extension	93	68	2,500	8
T6918	Disk Storage Drive, 128 Track	705	520	18,000	100
T6928	Disk Storage Drive, 256 Track	1,050	765	28,000	110
T6948	Disk Storage Drive, 512 Track	1,530	1,100	42,000	120
T7322	Magnetic Tape Unit & Control	975	625	24,200	135
F7004	Two Channel Switch	93	68	2,500	8
T6322	Magnetic Tape Drive, 75 ips	425	325	9,200	85
T7305	Card Reader, 600 cpm	385	293	8,900	85
T7405A1	Printer; 300 lpm, 64 char.	655	480	13,000	130
T7405B1	Printer; 240 lpm, 96 char.	725	435	14,500	145
T7406A1	Printer; 600 lpm, 64 char.	800	590	16,000	160
T7406B1	Printer; 436 lpm, 96 char.	875	650	17,500	175
Communications Control Equipment					
T2014	Auto Call Adapter (Asynch., Synch.)	135	100	3,700	10
F2033	Auto Call Interface	11	6	225	1
T2016	16 Line A-MIM	245	175	7,000	10
F2027	Multiple Baud Rate	17	12	460	2
F2068	Telegraph Interface Base	11	6	150	1
F2074	2 Line Telegraph Interface	12	8	250	2
F2072	2 Line EIA RS232 Interface	12	8	250	2
T2017	BSC MIM, 4 Line	226	161	6,200	16
F2003	BSC Autodial	57	47	1,600	2
F2040	BSC 2 Line Expansion	95	65	2,600	5
F2026	Wideband Interface; EBCDIC or ASCII	33	23	900	3
F2029	Special Order Speed	21	16	600	1
T2018	16 Line BSC MIM	276	196	8,000	16
F2053	RS232C Interface; 1 or 2 lines BSC, Data Dup., clocked for IBM 2260	19	15	500	3
F2064	Wideband Interface; 1 line, BSC, CNS	24	19	600	4
F2092-A1	Wideband DDS Interface; 2 lines, BSC	45	33	1,200	5
F2092-B1	Wideband DDS Interface; 1 line, CNS	26	19	680	3
F2095	BSC EIA Synch. Clock	39	28	1,000	5

*Includes monthly maintenance.

**LM-Logic Module. Components that consume Logic Modules include T2014, T2016, T2017, T2018, T3004, and T3023. ■

Comten 476, 3650, and 3670 Processors



MANAGEMENT SUMMARY

Comten, Inc. is among the largest of the independents in the data communications field and offers a variety of programmable communications processors designed for message switching and front-end processing.

Comten introduced its first processors, the Model 45 and 65, in 1969 followed in 1971 by the Model 20. The Model 45 and 65 were designed primarily for front-end processing and message switching applications while the Model 20 was designed for remote concentration. In September 1975, the company announced its Model 476, which effectively replaced Models 20, 45, and 65. Since the introduction of the 476, the latter models have been dropped from the product line.

In order to successfully compete with the IBM 270X and 370X product lines Comten introduced two processors that provide emulation of the IBM products, as well as providing custom applications in front-end, message switching, and other communications processing. The first of these products, the Model 3670, was introduced by

A family of programmable processors for front-end, message-switching, and communication control applications, including IBM 270X and 370X emulation.

Memory sizes range from 32K to 512K bytes and support from 128 to 384 communications lines.

Options include up to 4 channel input and an extensive variety of line set combinations with line transmission rates from 75 bps to 230K bps as well as asynchronous and synchronous transmission in both half- and full-duplex modes.

A Model 476 in a basic configuration with 32K memory that supports 64 communication lines rents for approximately \$4,600 on the three-year lease plan, including maintenance.

The monthly rental for a Model 3670 with 256K of memory that supports 128 communication lines is approximately \$7,430, including maintenance.

CHARACTERISTICS

VENDOR: Comten, Inc., 1950 West Country Road B-2, St. Paul, Minnesota 55113. Telephone (612) 633-8130.

DATE OF ANNOUNCEMENT: See System Characteristics table.

DATE OF FIRST DELIVERY: See System Characteristics table.

NUMBER DELIVERED TO DATE: See System Characteristics table.

SERVICED BY: Comten, Inc.

MODELS

Comten 476: Available in four models which differ primarily in the number of logic modules they contain. Configuration possibilities for the number and type of communication lines that can be connected are the same for all models.

Comten 3650 I, II: Available in eight models, of which, four are front-end processors, and four are remote communications processors. Within these categories the four models differ primarily in the number of logic modules they contain.

Comten 3670 I, II: Available in three front end processor models, which differ primarily in the number of logic modules they contain. Configuration possibilities for the number and type of communications lines that can be connected are the same for all models.

Comten 476, 3650, and 3670 Processors

Comten System Characteristics

	476	3650 I/II	3670 I/II
Supported Applications—			
IBM 270X	No	Yes	Yes
IBM 370X NCP	No	Yes	No
IBM 370X w/o NCP	No	Yes	Yes
Front end processing	Yes	Yes	Yes
Message Switching	Yes	Yes	Yes
Remote concentration	No	Yes	Yes
Communication Lines—			
Max. number supported (half-duplex)	256	128	384
Line discipline	Asynch., Synch; SDLC	Asynch., Synch; SDLC	Asynch., Synch; SDLC
Processor			
Cycle time (nanoseconds)	0.75	0.65	0.65
Memory capacity (bytes)	32K to 512K	32K to 512K	64K to 512K
Software			
Oper. system	Yes	Yes	Yes
Message control	Yes	Yes	Yes
Assembly	Yes	Yes	Yes
Cross assembly	Yes—IBM 360/370	Yes—IBM/360/370, Comten 476	Yes—IBM/360/370, Comten 476
Terminal Supported	IBM, TTY, other	IBM, TTY, other	IBM, TTY, other
Date of Announcement	6/75	3650-I-3/75 3650-II-3/76	3670-I-6/72 3670-II-3/76
Date of First Delivery	9/75	3650-I-9/75 3650-II-6/76	3670-I-9/72 3670-II-6/76
Number Installed to Date	Over 60	Over 70	Over 170

➤ Comten in 1972. In March 1975, a smaller version of the 3670, the Model 3650, was introduced.

Following IBM's lead, Comten introduced enhanced versions of the 3650 and 3670 in February 1976. Appropriately named the Model 3650-II and 3670-II (the older models became 3650-I and 3670-I), the systems offered enhancements over their predecessors, such as semiconductor storage and increased line capacity.

The accompanying chart of system characteristics highlights features of each of the Comten systems and allows comparison between models.

Compared to the IBM 3705, the Comten 3650 and 3670 offer a number of distinct advantages. The most significant is lower cost. Rental prices for the IBM 3705 range from \$1,250 to \$16,000 per month, while the equivalent Comten systems range from \$1,000 to \$8,000 per month, representing a considerable cost savings. In addition to this cost savings, other advantages of the Comten system are faster memory cycle time (650 nanoseconds compared to 1000 nanoseconds for the IBM 3705), greater maximum line capacity (384 versus 356 for the IBM 370X), and greater memory capacity (512K bytes versus 256K for the IBM 3705). Types of communication lines handled by the Comten systems are comparable to IBM and are shown in Table I and II.

USER REACTION

In Datapro's November 1975 survey of communications processor users, a total of nine responses were received ➤

► CONFIGURATION

Comten 476: The Comten Base Processing System consists of a central processing unit, 32K bytes of 750 nanosecond core storage, integral load device with programmable read-only storage, and a real-time clock.

The base system has four channels for attaching any combination of four Computer Interface Adapters, Peripheral Interface Adapters or directly attached peripheral subsystems. Up to 112 communication channels can be attached to the base system via seven Modem Interface Modules (MIM's). The seven MIM's attach to the base system Communication Interface Module (CIM). A second CIM can be added for attaching 128 more communication lines via eight MIM's. Three model upgrades are available, each adding an expansion cabinet and eight additional logic module spaces to a maximum of 4 cabinets and twenty-eight logic modules. Memory is expandable from a basic 32K bytes to 512K bytes in 32K byte increments.

Comten 3650 I/II: Configured as a front-end processor, it consists of a central processing unit in a basic system cabinet, 32K bytes of 650 nanosecond storage, Integral Program Load Device, Communication Interface Module with eight MIM attachment interfaces, and an IBM Channel Interface Adapter. When configured as a remote communications processor, the IBM channel Interface Adapter is replaced with the BSC-MIM with Data Duplex EIA Interface, and a Remote Initial Load capability.

Either configuration has an additional channel for attaching devices which require direct access to storage. Up to 128 communications lines may be directly attached via up to 8 MIM's. ➤

Comten 476, 3650, and 3670 Processors

Table I – COMMUNICATIONS LINES HANDLED BY THE COMTEN 476

MIM	Interface	Interface/MIM*	Lines/Interface	Speed, bps	Transmission	
					Timing	Mode
T2016-A1 16 line Async.	F2072-RS232	8	2	Up to 1800	Asynch.	Half-duplex
	F2074-Telegraph	8	2	Up to 75	Asynch.	Half-duplex
T2017-A1 4 line BSC	F2006-A1-RS232	2	2	Up to 20K	Synch.	Half-duplex
	F2006-B1-RS232	2	2	Up to 20K	Synch.	Full-duplex
	F2026-Wideband	2	2	Up to 230.4K	Synch.	Half-duplex
T2018-A1 16 line BSC	F2053-A1-RS232	8	2	Up to 20K	Synch.	Half-duplex
	F2053-B1-RS232	8	1	Up to 20K	Synch.	Full-duplex
	F2064-A1-Wideband	4	1	Up to 50K	Synch.	Half-duplex
	F2064-B1-Wideband	4	1	Up to 50K	Synch.	Full-duplex
	F2092-A1-Dataphone	2	2	Up to 56K	Synch.	Half-duplex
	F2092-B1-Dataphone	2	1	Up to 56K	Synch.	Full-duplex
	F2095-A1-Sync. Clock	8	2	Up to 1200	Synch.	Half-duplex
	F2095-B1-Sync. Clock	8	2	Up to 1200	Synch.	Full-duplex
T2014 Auto Call Adapter	F2072-A1	16	1	—	Asynch.	Half-duplex
	F2072-B1	16	1	—	Synch.	Half-duplex

*The maximum number of MIM's per system is eight.

▷ from users of Comten systems. These responses included seven Model 3670's, one Model 476, and one Model 45, representing a total of 19 installed systems. The user ratings are presented in the following table.

	Excellent	Good	Fair	Poor	WA*
Overall satisfaction	6	3	0	0	3.7
Ease of installation	3	3	2	0	3.1
Throughput	4	3	2	0	3.2
Hardware reliability	6	3	0	0	3.7
Promptness of maintenance	5	4	0	0	3.6
Quality of maintenance	5	4	0	0	3.6
Software	3	5	1	0	3.2
Technical support	5	2	1	1	3.2

*Weighted Average on a scale of 4.0 for Excellent.

All respondents were using their Comten units with IBM host computers. The host systems ranged from one System 360/30 to four System 370/168 computers. Applications varied, but were predominately IBM 270X and 370X emulation. Other applications included communications control, front-end processing, data concentration, and message switching.

As reflected by the ratings, users were generally quite satisfied with their Comten units. The most often cited advantage was cost savings relative to the IBM 3705. A number of users also cited favorable flexibility, reliability, and increased throughput of the Comten units. Other advantages listed included the capability for interfacing with 4 CPU's, greater line capacity, expansion and growth potential, and faster processing speeds than IBM systems.

On the negative side, criticisms were few, but did include individual comments from users such as a poorly written assembly package and a physically large unit. Two users reported faulty power supplies, but both indicated these problems had been solved by Comten. □

▶ Memory is expandable from a basic 32K bytes to 512K bytes in 4K byte or 32K byte increments.

Model upgrades are dependent on configuration and number of logic modules. In the FEP configuration, the base cabinet contains space for four logic modules with an expansion cabinet housing an additional seven logic module spaces. In the RCP configuration, the base cabinet contains space for four logic modules expandable to 12 logic modules with an additional cabinet. Space requirements are dependent upon type of MIM's used.

Comten 3670 I/II: In a basic front-end configuration it consists of a Central Processing Unit, 64K bytes of 650 nanosecond storage, Integral Program Load Device, Communications Interface Module with eight MIM attachment interfaces, and an IBM channel Interface Adapter.

The base system has a capability for adding three additional IBM Channel Interface Adapters and two additional Communication Interface Modules. It has one additional direct storage access channel for use by some future device. Up to 384 communication lines may be directly attached via 24 MIM's.

Memory is expandable from a basic 64K bytes to 512K bytes in 4K byte or 12K byte increments.

Model upgrades are dependent upon number of logic module spaces required. The base unit is contained in two cabinets housing space for 11 logic modules. Each expansion cabinet adds space for eight additional logic modules. Space requirements are dependent upon number of CIM's used and type of MIM's.

For additional configuration detail on the 476, 3650 or 3670, please see the accompanying configuration charts.

TRANSMISSION SPECIFICATIONS

The accompanying Tables I and II summarize the capabilities of the Comten 476, 3650, and 3670 for accommodating various types of communications lines and techniques.

Comten 476, 3650, and 3670 Processors

Table II – COMMUNICATIONS LINES HANDLED BY THE COMTEN 3650/3670

MIM	Interface	Interface/MIM*	Lines/Interface	Speed, bps	Transmission	
					Timing	Mode
T2016-A1 16 line Asynch.	F2072-RS232	8	2	Up to 1800	Asynch.	Half-duplex
	F2074-Telegraph	8	2	Up to 75	Asynch.	Half-duplex
T2017-A1 4 line BSC	F2006-A1-RS232	2	2	Up to 20K	Synch.	Half-duplex
	F2006-B1-RS232	2	2	Up to 20K	Synch.	Full-duplex
	F2026-RS232	2	2	Up to 20K	Synch.	Half-duplex
T2018-A2 16 line BSC	F2053-A1-Wideband	8	2	Up to 20K	Synch.	Half-duplex
	F2053-B1-Wideband	8	1	Up to 20K	Synch.	Full-duplex
	F2064-A1 Wideband	4	1	Up to 50K	Synch.	Half-duplex
	F2064-B1 Wideband	4	1	Up to 50K	Synch.	Full-duplex
	F2092-A1 Dataphone	2	2	Up to 56K	Synch.	Half-duplex
	F2092-B1 Dataphone	2	1	Up to 56K	Synch.	Full-duplex
	F2095-A1-Synch. Clock	8	2	Up to 1200	Synch.	Half-duplex
	F2095-B1-Synch. Clock	8	2	Up to 1200	Synch.	Full-duplex
T2014-A1 Auto Call Adapter	F2033	16	1	—	—	—
T202-A2 Data Link Control	F2083-A1-RS232	8	2	Up to 20K	Synch.	Half-duplex
	F2083-B1-RS232	8	2	Up to 20K	Synch.	Full-duplex
	F2084-A1 Wideband	2	1	Up to 50K	Synch.	Half-duplex
	F2084-B1-Wideband	2	1	Up to 50K	Synch.	Full-duplex
	F2085-A1-Dataphone	2	1	Up to 56K	Synch.	Half-duplex
	F2085-B1-Dataphone	2	1	Up to 56K	Synch.	Full-duplex

*Maximum number of MIM's per system are dependent on Model and size of module used; the range is from a maximum of 12 for the 3650 to 27 for the 3750.

► SOFTWARE

All Comten system are supplied with full software support including operating systems, assembler, a telecommunications access package, a network control package, emulation of the IBM 270X and 370X, and a series of utility programs for monitoring and control.

The Comten operating system is built around an executive supervisor program which controls all computer and I/O tasks. Supervisor functions include concurrent, multi-sequential task scheduling by priority, program execution on a variable time basis via a real time clock, peripheral allocation and I/O control communication, I/O initiation and coordination, interrupt tabling, and console control.

The assembler for the Comten system is very similar to the IBM 360/370 assembler. Comten uses the Communication Definition Language (CODEL) which is translated into machine language by the assembler processor.

The Comten Telecommunication Access Method (CTAM) provides the communication control functions and interfaces to the different types of lines and terminal devices. CTAM consists of two packages: the Network Control Package (NCP) for the Comten processor and the Compute Interface Package (CIP) for the IBM 360/370. NCP provides stand alone message switching and, when used in conjunction with CIP, provides front-end capabilities.

The Network Control Package (NCP), the resident portion of CTAM, controls the communication lines and terminal devices, validates message header information, line error processing and queuing messages. It also provides a compatible interface to IBM TCAM and VTAM (3650 and 3670 only). The emulation can also be used with the Partitioned Emulation Processing (PEP) software system.

The Comten Network System (CNS) provides the system software and procedures to connect Comten processors to front-end processors, processors to remote concentrators, and remote concentrators to remote concentrators in both emulation and NCP modes.

The utility packages offered by Comten include a complement of monitoring functions. Subchannel, communications line, and trunk subline utilization information is provided. Input controls to effect changes in these functions are also offered.

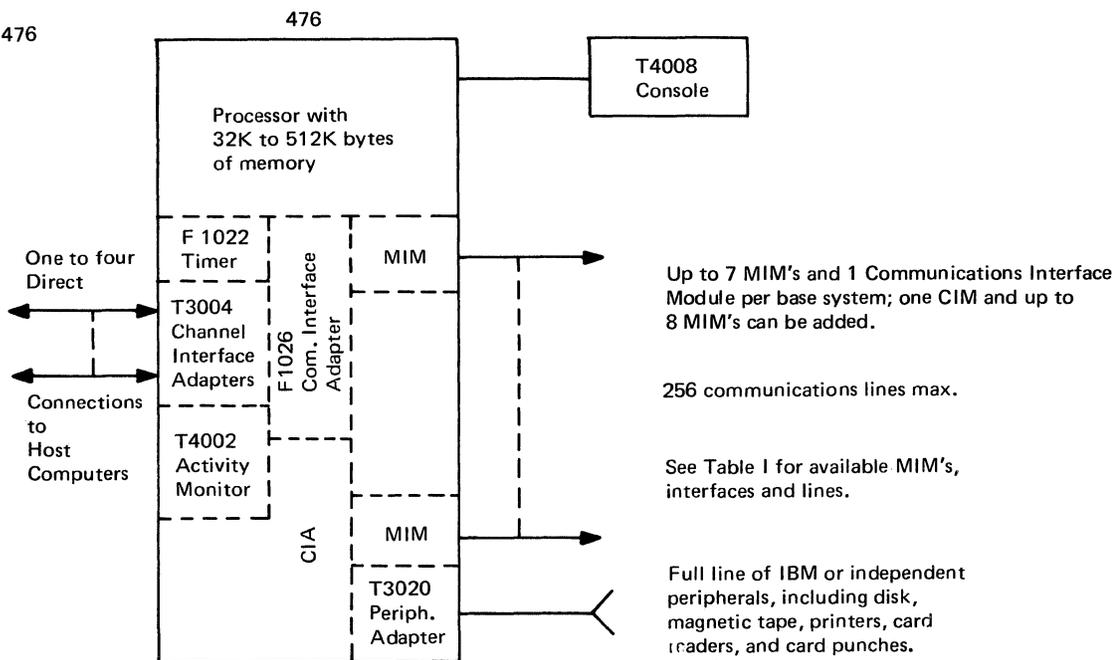
PRICING

The Comten processors are available for purchase or on lease. In the case of the 476 and related features, lease terms are 3 and 5 years. For the 3650 and 3670, the length of lease is monthly and 2 years. In the following list, lease prices are given and combined where appropriate. These leases include monthly maintenance. A separate maintenance contract is available for purchased units.

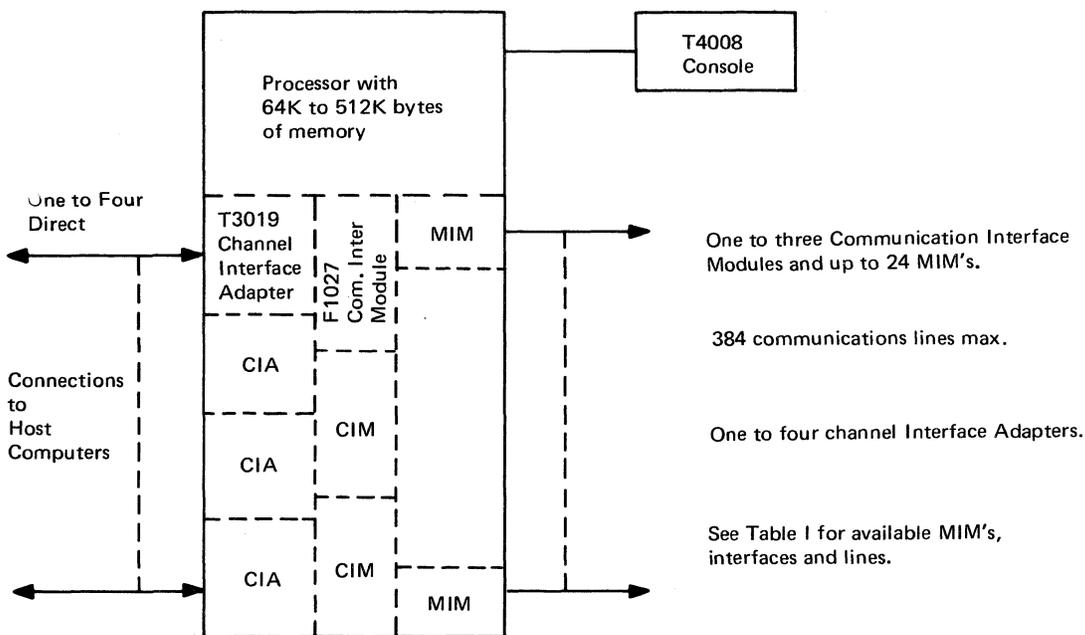
Comten 476, 3650, and 3670 Processors

Configuration

Model 476

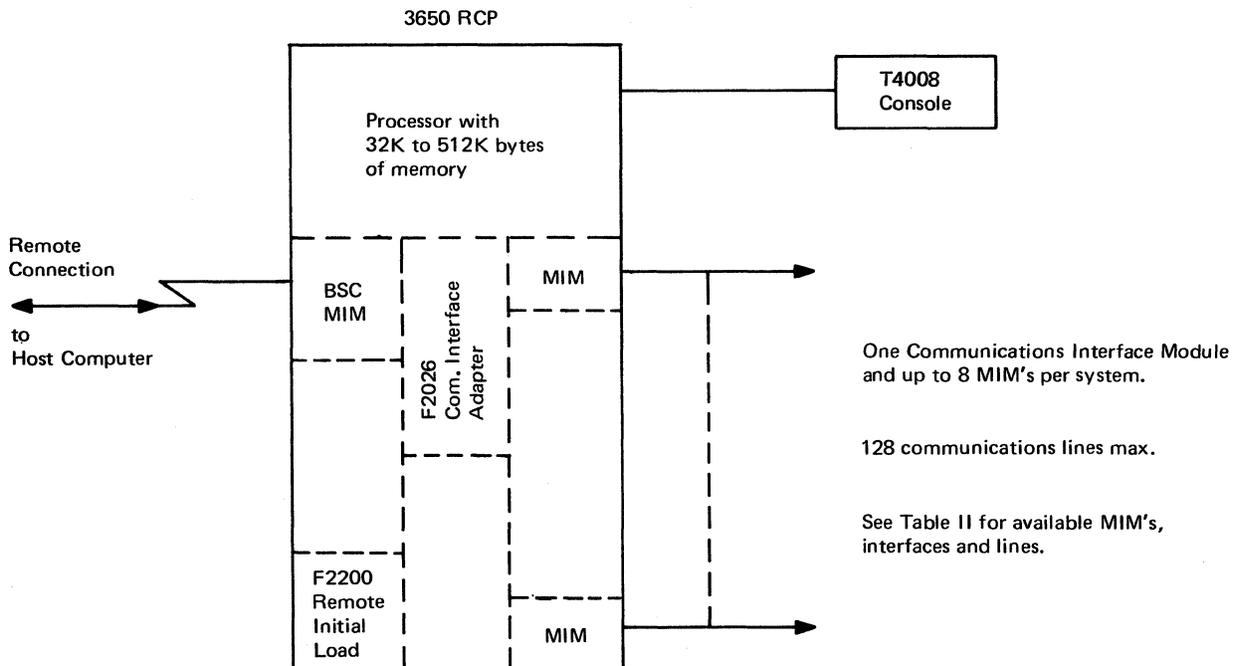
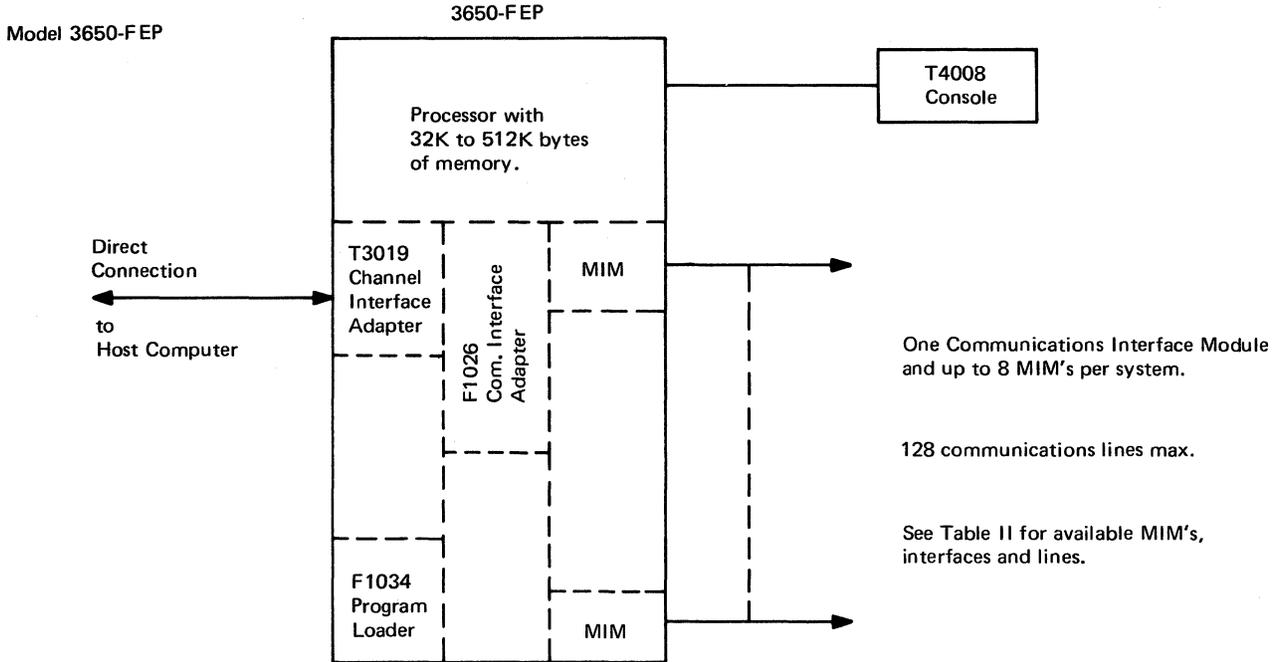


3670



Comten 476, 3650, and 3670 Processors

Configuration



Comten 476, 3650, and 3670 Processors

	Monthly Rental*				Purchase	Monthly Maint.
	5-Year Lease	3-Year Lease	2-Year Lease	Monthly Rental		
476 System						
T1476-A1 476 System, 4LM	\$1,476	\$2,130	—	—	\$ 76,000	\$450
T1476-A2 476 System, 12LM	1,716	2,470	—	—	86,000	480
T1476-A3 476 System, 20LM	1,956	2,810	—	—	96,000	510
T1476-A4 476 System, 28LM	2,196	3,150	—	—	106,000	540
F1476 Storage Module, 32K bytes	250	360	—	—	10,700	50
F1022 Watchdog Timer	20	30	—	—	800	2
F1026 Comm. Interface Module	120	170	—	—	5,000	10
T3004 IBM Channel Interface Adapter	210	300	—	—	9,000	10
T4002 System Activity Monitor	170	240	—	—	7,000	25
T4008 Console	110	120	—	—	3,500	20
F4002 System Select Switch	2	3	—	—	125	1
F4003 RS232C Interface	2	3	—	—	75	1
T3020 IBM Peripheral Interface Adapter	270	390	—	—	11,700	38
3650/3670 System						
T3650-C1 3650-II, CCM FEP 32K-128K bytes, 4LM	—	—	825	965	43,000	195
T3650-C2 3650-II, CCM, FEP 32K-256K bytes, 4LM	—	—	835	977	43,500	195
T3650-D1 3650-II, CCM FEP 32K-128K bytes, 12LM	—	—	1,140	1,335	54,000	215
T3650-D2 3650-II, CCM FEP 32K-256K bytes, 11CM	—	—	1,150	1,345	54,500	215
T3650-E1 3650-II, CCM RCP 32K-128K bytes, 4LM	—	—	865	1,010	45,000	230
T3650-E2 3650-II, CCM RCP 32K-256K bytes, 3LM	—	—	875	1,020	45,500	230
T3650-F1 3650-II, CCM RCP 32K-128K bytes, 12LM	—	—	1,180	1,380	56,000	250
T3650-F2 3650-II, CCM RCP 32K-256K bytes, 11LM	—	—	1,190	1,390	56,500	250
T3670-E1 3670-II, CCM FEP 64K-512K bytes, 11LM	—	—	1,925	2,250	102,000	301
T3670-F1 3670-II, CCM FEP 64K-512K bytes, 19LM	—	—	2,240	2,620	113,000	321
T3670-G1 3670-II, CCM FEP 64K-512K bytes, 27LM	—	—	2,555	2,990	124,000	341
F3601 Storage module, 32K bytes	—	—	125	145	5,600	25
F1034 IBM Channel Program Loader	—	—	40	47	1,400	10
F2200 Remote Initial Load (3650)	—	—	21	25	1,000	5
F1027 Comm. I/F Module (3670)	—	—	67	78	3,500	10
T3019 IBM Channel Interface Adapter	—	—	235	275	8,300	10
T4008 Console	—	—	125	146	3,500	20
F4002 System Select Switch	—	—	4	5	125	1
F4003 RS232C Interface	—	—	5	6	75	1
476/3650/3670 Control Equipment**						
T2014 Auto Call Adapter (Asynch., Synch.)	90	125	89	104	3,700	10
F2033 Auto Call Interface	5	10	5	6	225	1
T2016 16 Line A-MIM	165	235	98	115	7,000	10
F2027 Multiple Baud Rate	10	15	9	11	460	2
F2068 Telegraph Interface Base	5	10	4	5	150	1
F2074 2 Line Telegraph Interface	6	10	6	7	250	2
F2072 2 Line EIA RS232 Interface	6	10	6	7	250	2
T2017 BSC MIM, 4 Line	145	210	118	138	6,200	16
F2003 BSC Autodial	45	55	39	46	1,600	2
F2040 BSC 2 Line Expansion	60	90	52	61	2,600	5
F2026 Wideband Interface (EBCDIC, ASCII)	20	30	23	27	900	3
F2029 Special Order Speed	15	20	14	16	600	1
T2018 16 Line BSC MIM	180	260	155	181	8,000	16
F2053 RS232C Interface (1 or 2 lines BSC, Data Dup., Clocked S/S for IBM 2260)	12	16	13	15	500	3
F2064 Wideband Interface (1 line, BSC, CNS)	15	20	20	23	600	4
F2092-A1 Wideband DDS Interface (2 lines, BSC)	28	40	30	35	1,200	5
F2092-B1 Wideband DDS Interface (1 line, CNS)	16	23	17	20	680	3
F2095 BSC EIA Synch. Clock	23	34	25	29	1,000	5
T2020 DLC MIM (3670 only)	—	—	180	210	9,100	20
F2083 RS232 EIA I/F	—	—	19	22	700	2
F2084 Wideband Interface	—	—	42	49	1,470	8
F2087 I/F to second CIM	—	—	27	32	960	3
F2088 Storage Expansion, 4KB	—	—	41	48	1,880	4

* Includes monthly maintenance.

**These units are available for the 476 under a three-year or five-year lease; for the 3650/3670 under a monthly or two-year lease.

LM—Logic Module. 476 LM components include T2014, T2016, T2017, T2018, T3004, and T3020; 3650/3670 LM components include T2014, T2016, T2017, T2018, T2020, T3018 and T3019. ■

