IBM 4331 Communications Adapter

MANAGEMENT SUMMARY

The IBM 4331 Communications Adapter is an optional hardware feature for the 4331 processor and serves as the principal communications control unit for the 4331. A significant feature of the 4331 Communications Adapter is that it permits the 4331 to function as a full SNA host *without* requiring a 370X front end. Previously, any IBM host with SNA/SDLC capabilities required either the 3704 or 3705 communications controller as a channel-attached front end. The communications adapter offers a much more cost effective alternative; the entire subsystem (excluding line bases and interfaces) costs about $10,000, or roughly 25 percent of what an entry-level 3705 would cost.

There are, of course, a number of limitations with the communications adapter which warrant careful consideration. For example, the 4331 host must absorb the entire workload of communications processing (message and terminal handling, code and protocol handling, etc.) that would otherwise be off-loaded into a front end. While this additional load will fluctuate significantly depending on the number, type and speed of the lines being handled, the net result of this increased processor utilization (cycles, buffer space, interrupts, etc.) will be a reduction of the resources available for other processing.

The total number of lines which may be handled by the adapter is limited to eight, although these may be a mixed combination of speeds, codes, protocols and transmission facilities. The communications adapter supports SDLC, BSC, and asynchronous (start/stop) protocols, but only two of these modes may be implemented on the 4331 system at the same time (with the adapter). If, for example, SDLC and BSC communications are being handled, asynchronous devices are excluded. Similarly, if BSC and asynchronous lines are implemented, SDLC communications is prohibited.

The communications adapter, in conjunction with the host's communications software (ACF/VTAME) works like a modified 3705 running in a Partitioned Emulation mode (PEP). That is, SDLC communications are handled by the ACF/VTAME like a 3705 in Network Control mode, while BSC and asynchronous traffic is handled by the adapter in a manner similar to a 2703 hard-wired transmission control unit. The communications adapter is a hard-wired unit, and is not user programmable. The network control functions found in the NCP software of the 3705 have been incorporated into the ACF/VTAME software.

The communications adapter will best serve the 4331 user who requires SDLC communications, but on a small scale. The adapter and the related host software is not designed for the user who anticipates expansion of his network beyond eight lines, or if more than two communications modes (SDLC, BSC) may be required. A user ➤

An optional feature of the IBM 4331 processor which supports SDLC, BSC or asynchronous communications without a 370X front-end communications controller.

The 4331 Communications Adapter supports the termination of up to eight communications lines, which may be a mixture of SDLC and BSC, or asynchronous in lieu of one of these synchronous modes. SDLC communications requires ACF/VTAME running under DOS/VSE in the 4331 host.

A fully-configured Communications Adapter with line bases and interfaces for eight synchronous, non-switched, voice-grade lines would add $536 per month to the rental cost of the 4331 system, including maintenance, or $16,837 to the purchase price. The additional monthly maintenance charge would be $50.

CHARACTERISTICS

VENDOR: International Business Machines Corporation, Data Processing Division, 1133 Westchester Avenue, White Plains, New York 10604. Telephone (914) 696-1900.

DATE OF ANNOUNCEMENT: January 1979.

DATE OF FIRST DELIVERY: Second quarter 1979.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: International Business Machines Corporation.

CONFIGURATION

The communications adapter is channel-attached to the byte multiplexer channel of the 4331. The channel is offered as an option, but is required for implementation of the communications adapter. The byte multiplexer channel (#5248) provides up to 31 subchannels on Model Group 1 systems and up to 36 subchannels on Model Group 2 systems. The communications adapter (#1601) and each line on the adapter require a dedicated subchannel. Therefore, to implement the adapter with eight lines would reduce the number of available subchannels from 31 to 22 (Model Group 1) or from 36 to 27 (Model Group 2).

Control storage is used in the 4331 to contain system microcode. For Model Group 1 systems, depending on the type of peripheral and communications devices configured with the system, the basic 64K bytes of control storage may need to be expanded. Control Storage Expansion (#1901) is used for this purpose, and enlarges the control storage capacity to 128K bytes. Model Group 2 systems contain 140K bytes of control storage (non-expandable) as a standard feature.

System microcode also resides in main processor storage, and again, the number and type of external devices will require ➤

IBM 4331 Communications Adapter

TABLE 1. COMMUNICATIONS ADAPTER LINE INTERFACES

Communications Feature	Timing*	Number per Communications Adapter	Number Lines Controlled	Maximum Line Speed (bps)	Feature Number	Line Base Required	Interface	Comments
External Modem; Switched or Non-Switched voice grade	Async/Sync	8	1	4800-Switched 9600-Non-switched 1200-Async	#3701	#4695 or #4696	RS-232-C/V24/ V28/X.21 bis	—
External Modem; Wideband Leased	Sync	1	1	56,000	#4720	#4695	V35	Excludes DDS
Digital Data Service (DDS)	Sync	8**	1	56,000	#5650	#4695	DDS	Excludes Wideband***
Local, Serial	Sync	8	1	9600	#4801	#4695	RS-232-C/V24/ V28	Limit 100 meters at 9600 bps
Integrated Modems— Nonswitched	Async/Sync	8	1	1200	#4781	#4696	IBM cable	May be 2- or 4-wire
Switched with Auto Answer	Async/Sync	8	1	1200	#4782	#4696	DAA type CBS	—
Nonswitched with Switched Backup, Manual Answer	Async/Sync	8	1	1200	#4787	#4696	DAA type CDT	—
Auto Answer	Async/Sync	8	1	1200	#4788	#4696	DAA type CBS	—
Autocall Unit Interface	—	2	1	—	#1020	Modem Dependent	RS-366/V.25	Requires #3701 Interface

*Where synchronous transmission is supported, BSC or SDLC may be implemented.
**May run at from 2400 bps to 56,000 bps; adapter throughput will limit number per system.
***If operating at 56,000 bps.

who contemplates eventual expansion beyond these limitations would be advised to consider acquiring a separate front end when the 4331 is installed.□

varying amounts of processor memory. The two current models of the 4331 Model Group 2, I1 and J1, contain 500K and 1MB bytes of processor storage, respectively. Processor storage for the four Model Group 2 models (J2, K2, KJ2, and L2) ranges from 1MB to 4MB.

For communications features, the system microcode storage requirements are detailed below. It should be noted that these are the requirements only for the communications features, and should be added to the storage required for all other attached devices in order to determine the total control and processor storage requirement for system microcode.

	Control Storage Only (Bytes)	Processor Storage Only (Bytes)	Control or Processor Storage (Bytes)
Communications Adapter	8K	12K	9K
Asynchronous Communications	6K	—	—
BSC Communications	5K	—	—
SDLC Communications	12K	1K	—

These amounts reflect the memory requirements for control logic, and do not include storage space for buffering of messages. It should also be noted that no more than two of the above communications modes (asynchronous, BSC, SDLC) may be supported by the 4331 at the same time.

When more than three lines are attached to the communications adapter, an additional power feature is required. The Adapter Power Prerequisite (#1001) provides the additional power and control circuitry for the additional line features, up to a maximum of eight.

TRANSMISSION SPECIFICATIONS

In addition to the limitation on the number of lines and modes of communication, the adapter's aggregate data rate capacity may not exceed 64,000 bps. The maximum speed for each of the eight lines attachable to the communications adapter is 9600 bps, except that one of the lines may support high-speed synchronous transmission to 56,000 bps. The high-speed line requires an external modem, and may operate concurrently with the other voice-grade lines as long as the maximum throughput limitation of 64,000 bps is not exceeded.

Any or all of the eight lines may be configured without internal clocking (in cases where clocking is provided by external modems), or with internal clocking (for external modems or IBM integrated modem adapters). Alternately, any or all of the lines may be configured for local device attachment (serial synchronous communications) or for interface to Bell's Digital Data Service (DDS). For local device attachment, or interface to DDS, modems are not required.

Adapters for interface to DDS may support transmission at up to 56,000 bps, and if one DDS line is running at this speed, other DDS lines are not precluded as long as the total capacity for the adapter does not exceed 64,000 bps. If a DDS adapter is implemented at 56,000 bps, however, use of the high-speed modem adapter is prohibited. DDS communications will utilize either the BSC or SDLC line protocols.

IBM 4331 Communications Adapter

TABLE 2. COMMUNICATIONS ADAPTER SUPPORTED DEVICES

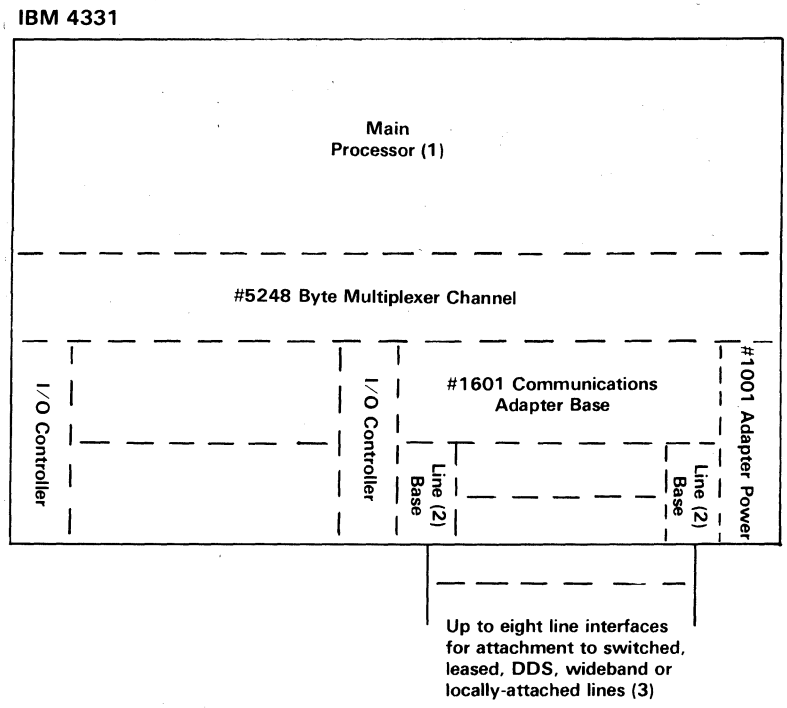
Terminal/Controller/System	Protocol/Timing	Maximum Line Speed (bps)	Emulation
2715-2	BSC	2400/4800	—
2740-1	Asynchronous	134.5	—
2740-2	Asynchronous	600	—
2741	Asynchronous	134.5	—
3271-1,2	BSC	9600	—
3271-11,12***	SDLC	9600	—
3274-1C, 21C, 31C, 51C	BSC	9600	—
	SDLC	56,000	—
3275-2	BSC	9600	—
3275-12***	SDLC	9600	—
3276-1-4	BSC	3600/7200	3271-1,2
	SDLC	9600	—
3276-11-14	SDLC	9600	3791
3601/3602	SDLC	9600	—
3614/3624	SDLC	2400/4800	—
3631/3632	BSC	9600	—
	SDLC	9600	3601/3602
3651-A50, B50, -25, -75	BSC	2400/4800	—
	SDLC	2400/4800	—
3651-A60, B60/3661	BSC	2400	—
	SDLC	2400	—
3684-1,2	BSC	2400/4800	—
	SDLC	2400/4800	—
3694	SDLC	9600	—
3704	BSC	9600	—
3705*	BSC	56,000	—
	SDLC	56,000	—
3741-2,4/3747	BSC	2400	—
3767-1-3	Asynchronous	1200	2740/2741
	SDLC	1200/2400	—
3771-1-3	SDLC	2400/4800	—
	BSC	2400/4800	2770/2772
3773-1-3, P1-P3	BSC	2400/4800	2770/2772
	SDLC	2400/4800	—
3774-1,2, P1,P2	SDLC	2400/4800	—
3774	BSC	2400/4800	2770/2772
3775	BSC	2400/4800	2770/2772
3775-1, P1	SDLC	2400/4800	—
3776-1,2	BSC	2400/4800	2770/3780
	SDLC	2400/4800	—
3776-3,4	SDLC	56,000	—
3777-1,2	BSC	56,000	2770/3780
3777-1,3	SDLC	56,000	—
3780	BSC	3600/7200	—
3791	SDLC	9600	—
5231-2	BSC	2400/4800	3741-2,4
5275	BSC	3600/7200	3275-1,2
5937	BSC	3600/7200	3271-1,2
System 360/370 (with 2701)	BSC	3600/7200	—
System/370-115, 125 (with ICA)	BSC	9600	—
System/370-135, 138 (with ICA)	BSC	3600/7200	—
5010	BSC	7200	Sys/3
5100	Asynchronous	300	2741
5110	Asynchronous	300	—
	BSC	3600/7200	2772
System/32	BSC	3600/7200	Sys/3
	SDLC	3600/7200	3770
System/34	BSC	56,000	Sys/3
	SDLC	56,000	3770 or 3791
System/3	BSC	9600	—
System/38	SDLC	9600	3770
8100 Info System	BSC	9600	3276
	SDLC	56,000	3791
Series/1	BSC	56,000	Sys/3
4331 (Other, remote)**	BSC	56,000	—
	SDLC	56,000	—

*Serves as primary station to 4331 if host running ACF/VTAM (Rel. 1 or 2).
**May serve as primary or secondary station if running ACF/VTAM (Rel. 1 or 2).
***Not supported by ACF/VTAME.

When the interface is implemented for local attachment of terminal devices, transmission is synchronous (again, using either BSC or SDLC), but line speed and distance are limited and are inversely proportional. For example, data rates of 1200 bps will support terminal devices attached by local cable to 800 meters, whereas speeds of 9600 bps can be used over local cable to a distance of not more than 100 meters.

For modem attachment to the public switched network, IBM provides cables for attachment of its integrated modems to

IBM 4331 Communications Adapter



(1) Depending on model, main processor supports 500K to 4MB of main processor storage, and 64K to 140K of control storage.
(2) Either #4695 when clocking is provided by modem, or #4696 with non-clocked modems.
(3) See Table 1 for available line interfaces; Table 2 provides communications specifications for remote IBM systems, devices and terminals.

the Data Access Arrangement (DAA), which is the point of entry into the switched network. With IBM's 1200 bps switched modem, connection is made to a DAA type CBS, or FCC-registered equivalent. For its 1200 bps leased line modem with switched backup (and manual answer), connection is made to DAA type CDT, or equivalent. The leased line modem with switched backup (and auto answer) also connects via a type CBS DAA.

Each line feature connected to the communications adapter requires one line attachment base. Two types of line attachment bases are offered. The Line Attachment Base for clocked modems (#4695) is used for all line features which obtain clocking from an external modem or other source, The Line Attachment Base for nonclocked modems (#4696) is used for modems which do not provide clocking. The nonclocked line base is wired at installation time for a specific data rate: 75, 134.5, 300, 600 or 1200 bps for asynchronous transmission, and 600 or 1200 bps for synchronous (BSC or SDLC) transmission.

LINE INTERFACES

The following line interfaces can be configured with the IBM 4331 communications adapter. In addition to the descriptions given below, Table 1 offers a thumbnail comparison of these interfaces.

The high-speed modem adapter (#4720) provides for the attachment of an external modem with clocking for high-speed data transmission rates. The interface is V35 or X.21 bis, and support is provided for a single, synchronous, leased line operating at 19.2K, 20.4K, 40.8K, 48K or 56K bps. Only one of these adapters can be implemented per communications adapter, even though two could be operated at for example, 20.4K bps and still not exceed the 64,000 bps maximum capacity. The high-speed adapter supports either BSC or SDLC protocols, and uses a #4695 line base for clocked modems.

The local attachment interface (#4801) provides for connection of a single, serial, synchronous communications cable. The interface uses an RS-232-C/V24 interface, which is also required by the attached terminal. Clocking is provided by the interface for both the communications adapter and the terminal, and is fixed at installation time at either 1200, 2400, 4800 or 9600 bps. The distance permitted for the cable is a function of the speed, and ranges from 100 meters at 9600 bps, to 800 meters at 1200 bps. The interface requires a #4695 line base for clocked modems.

The Digital Data Service adapter (#5650) provides for connection to the DDS network, and supports synchronous communications without modems at up to 56K bps. The same adapter supports operation at speeds of 2400, 4800 and 9600 bps, also using DDS. Up to seven additional DDS adapters can be configured with a communications adapter, as long as the 64,000 bps capacity is not exceeded. Also, any other adapters may be mixed with DDS, except that a DDS line operating at 56K bps precludes a high-speed modem adapter. The DDS adapter supports either BSC or SDLC protocols and requires a #4695 line base for clocked modems.

IBM also markets a series of four integrated modem adapters for use with the communications adapter, and all operate at a maximum of 1200 bps. Three of the adapters are designed for leased (or nonswitched) lines: the #4781; the #4787, which includes switched line backup with manual answer; and the #4788, which includes switched line backup with automatic answering. The fourth, #4782, supports switched lines with automatic answering only. All support either asynchronous, BSC or SDLC communications, and each requires a #4696 line base for nonclocked modems.

The 4331 communications adapter will also support up to two autocall unit interfaces (#1020). The autocall adapters use an RS-366/V25 interface and would, of course, only be used in conjunction with switched lines. The #1020 autocall interface requires one of the general-purpose EIA/CCITT adapters (#3701).

IBM 4331 Communications Adapter

The general purpose EIA/CCITT interface (#3701) supports a single, external modem, which may be any modem complying with RS-232-C, V24, or X.21 bis specifications. It may be configured for either a switched or nonswitched line. Either a #4695 or #4696 line base will be required, depending on whether the modem supplies clocking or not. When used for a nonswitched line with switched line backup, maximum line speed is 9600 bps on the nonswitched line, and 4800 bps on the switched. With the #4695 line base, synchronous (BSC or SDLC) transmission is supported. With the #4696 line base, transmission may be either asynchronous or synchronous.

SOFTWARE

The IBM 4331 can operate in one of two modes: ECPS/VSE mode, which utilizes the DOS/VSE operating system; or 370 mode, which essentially emulates IBM System/370 operation and uses certain releases of specified operating systems (DOS/VSE with VSE/AF Release 1 and 2, VM/370 Release 6, OS/VS1 Release 7, DOS Release 26, and DOS/VS Release 34).

Only the DOS/VSE operating system supports the 4331 communications adapter with SDLC communications. The 4331 host may alternately be running DOS/VSE as a guest under VM/370 (Release 6), which will also support SDLC communications with the adapter. On systems where DOS/VSE is not present, the communications adapter may be implemented, but operation will be in IBM 2703 emulation, and only BSC or asynchronous devices may be supported.

Also required is the ACF/VTAME telecommunications access method.

Because there is no 370X controller required with the communications adapter, many of the functions performed by the front-end software (NCP) have been incorporated into ACF/VTAME. These functions include call establishment, buffering, code and protocol conversions, SNA terminal handling, and so on.

ACF/VTAME is predefined with communications parameters (i.e. protocols) as part of the 4331 system generation. Domains are defined by inputting a parameter deck for each major node and path table. After initialization, the network operator may dynamically activate or deactivate any node or specific program, terminal or cluster. Additionally, ACF/VTAME permits the operator to effect impressive status displays for modems, lines, programs, buffer pools, etc., as well as utilize an inherent trace facility.

The operator functions for ACF/VTAME are accomplished with an appropriate version of the Network Communications Control Facility (NCCF). There is also available a Teleprocessing On-line Test Executive Program (TOLTEP) which runs under ACF/VTAME and handles the selection, loading and execution of on-line test programs.

ACF/VTAME with its communications adapter is capable of establishing cross-domain SDLC sessions and, as previously stated, the functions performed by NCP with regards to session establishment are all incorporated into ACF/VTAME. When a terminal in its domain is accessing a resource of another domain, ACF/VTAME remains involved during the entire conduct of the session, whereas with a 370X front end, the host access method disengages itself after initial session establishment.

PRICING

The IBM 4331 is offered on a purchase, lease, or rental basis, as are its components including the communications adapter, its line bases, interfaces, etc. The standard IBM lease or rental contract includes equipment maintenance and entitles the customer to unlimited usage of the machine.

IBM 4331 users receive DOS/VSE at no additional cost, but all other related software, including ACF/VTAME, is priced separately.

		Monthly Charge*			
		Rental	Lease	Purchase	Monthly Maint.
#1001	Adapter Power Prerequisite	$ 83	$ 71	$2,520	$ 9
#1901	Control Storage Expansion; 64K bytes; for Model Group 1 only	177	151	5,355	47.50
#5248	Byte Multiplexer Channel	122	104	3,695	2.50
#1601	Communications Adapter Base	107	91	3,230	2.50
#1020	Autocall Unit Interface	14	12	462	3
#3701	General-Purpose EIA/CCITT Interface	14	12	462	3
#4695	Line Attachment Base; for clocked modems	14	12	462	1.50
#4696	Line Attachment Base; for nonclocked modems	16	14	546	1.50
#4720	High-Speed Modem Adapter	39	33	1,385	3
#4781	1200 bps Integrated Modem; non-switched	21	18	701	4.50
#4782	1200 bps Integrated Modem; switched w/ auto answer	29	25	903	4.50
#4787	1200 bps Integrated Modem; non-switched w/switched backup and manual answer	31	26	955	4.50
#4788	1200 bps Integrated Modem; non-switched w/switched backup and auto answer	34	29	1,065	5
#4801	Local Attachment Interface	34	29	1,155	4
#5650	DDS Adapter	28	24	882	3.50

SOFTWARE PRICES

		Basic Monthly License	DSLO Monthly License	Monthly Licensed Program Support	Monthly Additional Licensed Program Support
—	DOS/VSE	N/C	N/C	N/C	N/C
5746-RC7	ACF/VTAME	114	86	61	37

*Includes monthly maintenance charge.■

IBM 4331 Communications Adapter

SOFTWARE

The IBM 4331 can operate in one of two modes; ECPS/VSE mode, which utilizes the DOS/VSE operating system, or in 370 mode, which essentially emulates IBM System/370 operation and uses one of the operating systems such as OS/VS1 or DOS/VS. The communications adapter may be implemented on a 4331 operating in 370 mode, but operation will be in IBM 270X emulation, and only BSC or asynchronous devices may be supported.

Only the DOS/VSE operating system supports the 4331 communications adapter with SDLC communications. The 4331 host may alternately be running DOS/VSE as a guest under VM/370 (Release 6), which will also support SDLC communications with the adapter.

Also required is the ACF/VTAME telecommunications access method.

Because there is no 370X controller required with the communications adapter, many of the functions performed by the front-end software (NCP) have been incorporated into ACF/VTAME. These functions include call establishment, buffering, code and protocol conversions, SNA terminal handling, and so on.

ACF/AVTAME is predefined with communications parameters (i.e. protocols) as part of the 4331 system generation. Domains are defined by inputting a parameter deck for each major node and path table. After initialization, the network operator may dynamically activate or deactivate any node or specific program, terminal or clsuter. Additionally, ACF/VTAME permits the operator to effect impressive status displays for modems, lines, programs, buffer pools, etc., as well as utilize an inherent trace facility.

The operator functions for ACF/VTAME are accomplished with an appropriate version of the Network Communications Control Facility (NCCF). There is also available a Teleprocessing On-line Test Executive Program (TOLTEP) which runs under ACF/VTAME and handles the selection, loading and execution of on-line test programs.

ACF/VTAME with its communications adapter is capable of establishing cross-domain SDLC sessions and, as previously stated, the functions performed by NCP with regards to session establishment are all incorporated into ACF/VTAME. When a terminal in its domain is accessing a resource of another domain, ACF/VTAME remains involved during the entire conduct of the session, whereas with a 370X front end, the host access method disengages itself after initial session establishment.

PRICING

The IBM 4331 is offered on a purchase, lease or rental basis, as are its components including the communications adapter, its line bases, interfaces, etc. The standard IBM lease or rental contract includes equipment maintenance and entitles the customer to unlimited usage of the machine.

IBM 4331 users receive DOS/VSE at no additional cost, but all other related software, including ACF/VTAME, is priced separately. Effective January 1, 1980, IBM will begin charging two different rates for software maintenance, a basic charge for Service Center support, and an additional charge for extended maintenance support.

EQUIPMENT PRICES

		Monthly Charge*			
		Rental	Lease	Purchase	Monthly Maint.
#1001	Adapter Power Prerequisite	$ 78	66	$2,520	$ 7
#1901	Control Storage Expansion; 64K bytes	167	142	5,355	36
#5248	Byte Multiplexer Channel	115	98	3,695	1.50
#1601	Communications Adapter Base	100	85	3,230	1.50
#1020	Autocall Unit Interface	13	11	462	2
#3701	General-Purpose EIA/CCITT Interface	13	11	462	2
#4695	Line Attachment Base; for clocked modems	13	11	462	0.50
#4696	Line Attachment Base; for nonclocked modems	15	13	546	0.50
#4720	High-Speed Modem Adapter	36	31	1,385	2
#4781	1200 bps Integrated Modem; non-switched	20	17	701	3.50
#4782	1200 bps Integrated Modem; switched w/ auto answer	27	23	903	3.50
#4787	1200 bps Integrated Modem; non-switched w/switched backup and manual answer	28	24	955	3.50
#4788	1200 bps Integrated Modem; non-switched w/switched backup and auto answer	32	27	1,065	4
#4801	Local Attachment Interface	32	27	1,155	3
#5650	DDS Adapter	26	22	882	2.50

SOFTWARE PRICES

		Monthly Licensed Program Support Charge	Extended Support Monthly Charge
—	DOS/VSE	N/C	N/C
5746-RC7	ACF/VTAME	61	37

*Includes monthly maintenance charge.■

IBM 4331 Communications Adapter

MANAGEMENT SUMMARY

With the introduction of the 4300 Series of low-end mainframes in January 1979, IBM displayed several deviations from its traditional marketing strategy. A new, unbundled operating system was announced, and many of the hardware components previously included as part of the basic system were now being offered as modular options.

Several of IBM's current mainframe operating systems are scheduled to be adapted for the 4300 in addition to the new DOS/VSE. A significant new feature of DOS/VSE and its related telecommunications access method, ACF/VTAME (E for entry), is support of a communications adaspter which permits the 4331 to function as a full SNA host *without* requiring a 370X front end. Previously, any IBM host with SNA/SDLC capabilities required either the 3704 or 3705 communications controller as a channel-attached front end. The communications adapter offers a much more cost effective alternative; the entire subsystem costs about $10,000, or roughly 20 percent of what a mid-range 3705 would cost.

There are, of course, a number of limitations with the communications adapter which warrant careful consideration. For example, the 4331 host must absorb the entire workload of communications processing (message and terminal handling, code and protocol handling, etc.) that would otherwise be off-loaded into a front end. While this additional load will fluctuate significantly depending on the number, type and speed of the lines being handled, the net result of this increased processor utilization (cycles, buffer space, interrupts, etc.) will be a reduction of the resources available for other processing.

The total number of lines which may be handled by the adapter is limited to eight, although these may be a mixed combination of speeds, codes, protocols and transmission facilities. The communications adapter supports SDLC, BSC, and asynchronous (start/stop) protocols, but only two of these modes may be implemented on the 4331 system at the same time (with the adapter). If, for example, SDLC and BSC communications are being handled, asynchronous devices are excluded. Similarly, if BSC and asynchronous lines are implemented, SDLC communications is prohibited.

The communications adapter, in conjunction with the host's communications software (ACF/VTAME) works like a modified 3705 running in a Partitioned Emulation mode (PEP). That is, SDLC communications are handled by the ACF/VTAME like a 3705 in Network Control mode, while BSC and asynchronous traffic is handled by the adapter in a manner similar to a 270X hard-wired transmission control unit. The communications adapter is a hard-wired unit, and is not user programmable. The network control functions found in the NCP software of the 3705 have been incorporated into the ACF/VTAME software.

An optional feature of the IBM 4331 processor which supports SDLC, BSC or asynchronous communications without a 370X front-end communications controller.

The 4331 Communications Adapter supports the termination of up to eight communications lines, which may be a mixture of SDLC and BSC, or asynchronous in lieu of one of these synchronous modes. SDLC communications requires ACF/VTAME running under DOS/VSE in the 4331 host.

A fully-configured Communications Adapter with line bases and interfaces for eight synchronous, non-switched, voice-grade lines would add $420 per month to the rental cost of the 4331 system, including maintenance, or $15,080 to the purchase price. The additional monthly maintenance charge would be $41.

CHARACTERISTICS

VENDOR: International Business Machines Corporation, Data Processing Division, 1133 Westchester Avenue, White Plains, New York 10604. Telephone (914) 696-1900.

DATE OF ANNOUNCEMENT: January 1979.

DATE OF FIRST DELIVERY: Second quarter 1979.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: International Business Machines Corporation.

CONFIGURATION

The communications adapter is channel-attached to the byte multiplexer channel of the 4331. The channel is offered as an option, but is required for implementation of the communications adapter. The byte multiplexer channel (#5248) provides up to 31 subchannels, and the communications adapter (#1601) and each line on the adapter require a dedicated subchannel. Therefore, to implement the adapter with eight lines would reduce the number of available subchannels from 31 to 22.

Control storage is used in the 4331 to contain system microcode, but depending on the type of peripheral and communications devices configured with the system, the basic 64K bytes of control storage may need to be expanded. Control Storage Expansion (#1901) is used for this purpose, and enlarges the control storage capacity to 128K bytes.

System microcode also resides in main processor storage, and again, the number and type of external devices will require varying amounts of processor memory. The two current models of the 4331, I1 and J1, contain 500K and 1,000K bytes of processor storage, respectively.

For communications features, the system microcode storage requirements are detailed below. It should be noted that these

IBM 4331 Communications Adapter

TABLE 1. COMMUNICATIONS ADAPTER LINE INTERFACES

Communications Feature	Timing*	Number per Communications Adapter	Number Lines Controlled	Maximum Line Speed (bps)	Feature Number	Line Base Required	Interface	Comments
External Modem; Swtiched or Non-Switched voice grade	Sync	8	1	4800-Switched 9600-Non-switched	#3701	#4695	RS232C/V24	—
	Async	8	1	1200-Async	#3701	#4695	RS232C/V24	—
External Modem; Wideband Leased	Sync	1	1	56,000	#4720	#4695	V35	Excludes DDS
Digital Data Service (DDS)	Sync	8**	1	56,000	#5650	#4695	DDS	Excludes Wideband***
Local, Serial	Sync	8	1	9600	#4801	#4695	RS232C/V24	Limit 100 meters at 9600 bps
Integrated Modems; Nonswitched	Async/Sync	8	1	1200	#4781	#4696	IBM cable	May be 2- or 4-wire
Switched with Auto Answer	Async/Sync	8	1	1200	#4782	#4696	DAA type CBS	—
Nonswitched with Switched Backup, Manual Answer	Async/Sync	8	1	1200	#4787	#4696	Cable and DAA type CDT	—
Auto Answer	Async/Sync	8	1	1200	#4788	#4696	Cable and DAA type CBS	—
Autocall Unit Interface	—	2	1	—	#1020	Modem Dependent	RS366/V25	Requires #3701 Interface

*Where synchronous transmission is supported, BSC or SDLC may be implemented.
**May run at from 2400 bps to 56,000 bps; adapter throughput will limit number per system.
***If operating at 56,000 bps.

The communications adapter will best serve the 4331 user who requires SDLC communications, but on a small scale. The adapter and the related host software is not designed for the user who anticipates expansion of his network beyond eight lines, or if more than two communications modes (SDLC, BSC) may be required. A user who contemplates eventual expansion beyond these limitations would be advised to consider acquiring a separate front end when the 4331 is installed.

IBM has only recently begun delivery of the 4300 Series, and it is still too early to include meaningful user reaction in this report. It will be interesting to see what percentage of 4331 customers select this option over a tradition 370X front end.□

are the requirements only for the communications features, and should be added to the storage required for all other attached devices in order to determine the total control and processor storage requirement for system microcode.

	Control Storage Only (Bytes)	Processor Storage Only (Bytes)	Control & Processor Storage (Bytes)
Communications Adapter	8K	12K	9K
Asynchronous Communications	6K	—	—
BSC Communications	5K	—	—
SDLC Communications	12K	1K	—

These amounts reflect the memory requirements for control logic, and do not include storage space for buffering of messages. It should also be noted that no more than two of the above communications modes (asynchronous, BSC, SDLC) may be supported by the 4331 at the same time.

When more than three lines are attached to the communications adapter, an additional power feature is required. The Adapter Power Prerequisite (#1001) provides the additional power and control circuitry for the additional line features, up to a maximum of eight.

TRANSMISSION SPECIFICATIONS

In addition to the limitation on the number of lines and modes of communication, the adapter's aggregate data rate capacity may not exceed 64,000 bps. The maximum speed for each of the eight lines attachable to the communications adapter is 9600 bps, except that one of the lines may support high-speed synchronous transmission to 56,000 bps. The high-speed line requires an external modem, and may operate concurrently with the other voice-grade lines as long as the maximum throughput limitation of 64,000 bps is not exceeded.

Any or all of the eight lines may be configured without internal clocking (in cases where clocking is provided by external modems), or with internal clocking (for external modems or IBM integrated modem adapters). Alternately, any or all of the lines may be configured for local device attachment (serial synchronous communications) or for interface to Bell's Digital Data Service (DDS). For local device attachment, or interface to DDS, modems are not required.

Adapters for interface to DDS may support transmission at up to 56,000 bps, and if one DDS line is running at this speed, other DDS lines are not precluded as long as the total capacity

IBM 4331 Communications Adapter

TABLE 2. COMMUNICATIONS ADAPTER SUPPORTED DEVICES

Terminal/Controller/System	Protocol/Timing	Maximum Line Speed (bps)	Emulation
2740-1	Asynchronous	134.5	—
2740-2	Asynchronous	600	—
2741	Asynchronous	134.5	—
3271-1,2	BSC	3600/7200	—
3274-1C	BSC	3600/7200	—
	SDLC	9600	—
3275-2	BSC	3600/7200	—
3276-1-4	BSC	3600/7200	3271-1,2
3276-11-14	SDLC	9600	3791
3601/3602	SDLC	9600	—
3614/3624	SDLC	2400/4800	—
3631/3632	BSC	9600	—
	SDLC	9600	3601/3602
3651-A50, B50	BSC	2400/4800	—
	SDLC	2400/4800	—
3651-A60, B60/3661	BSC	2400	—
	SDLC	2400	—
3704	BSC	9600	—
3705*	BSC	56,000	—
	SDLC	56,000	—
3735	BSC	2400/4800	—
3741-2,4/3747	BSC	2400	—
3767-1-3	Asynchronous	1200	2740/2741
	SDLC	1200/2400	—
3771-1-3	SDLC	2400/4800	—
	BSC	2400/4800	2770
3774-1,2, P1,P2	SDLC	2400/4800	—
3774	BSC	2400/4800	—
3775	BSC	2400/4800	2770
3775-1, P1	SDLC	2400/4800	—
3776-1,2	BSC	2400/4800	2770/3780
	SDLC	2400/4800	—
3776-3,4	SDLC	9600	—
3777-1,2	BSC	9600	2770/3780
3777-1,2,3	SDLC	9600	—
3780	BSC	3600/7200	—
3791	SDLC	9600	—
5231-2	BSC	2400/4800	3741-2,4
5100	Asynchronous	300	2741
5110	Asynchronous	300	—
System 360/370 (with 2701)	BSC	3600/7200	—
System/370-115, 125 (with ICA)	BSC	9600	—
System/370-135, 138 (with ICA)	BSC	3600/7200	—
5010	BSC	7200	Syst/3
System/32	BSC	9600	Syst/3
	SDLC	3600/7200	3770
System/34	BSC	9600	Syst/3
	SDLC	9600	3770
System/3	BSC	9600	—
System/38	SDLC	56,000	3770
8100 Info System	BSC	9600	3276
	SDLC	56,000	3791
Series/1	BSC	9600	—
4331 (Other, remote)**	BSC	56,000	—
	SDLC	56,000	—

*Serves as primary station to 4331 if host running ACF/VTAM (Rel. 1 or 2).
**May serve as primary or secondary station if running ACF/VTAM (Rel. 1 or 2).

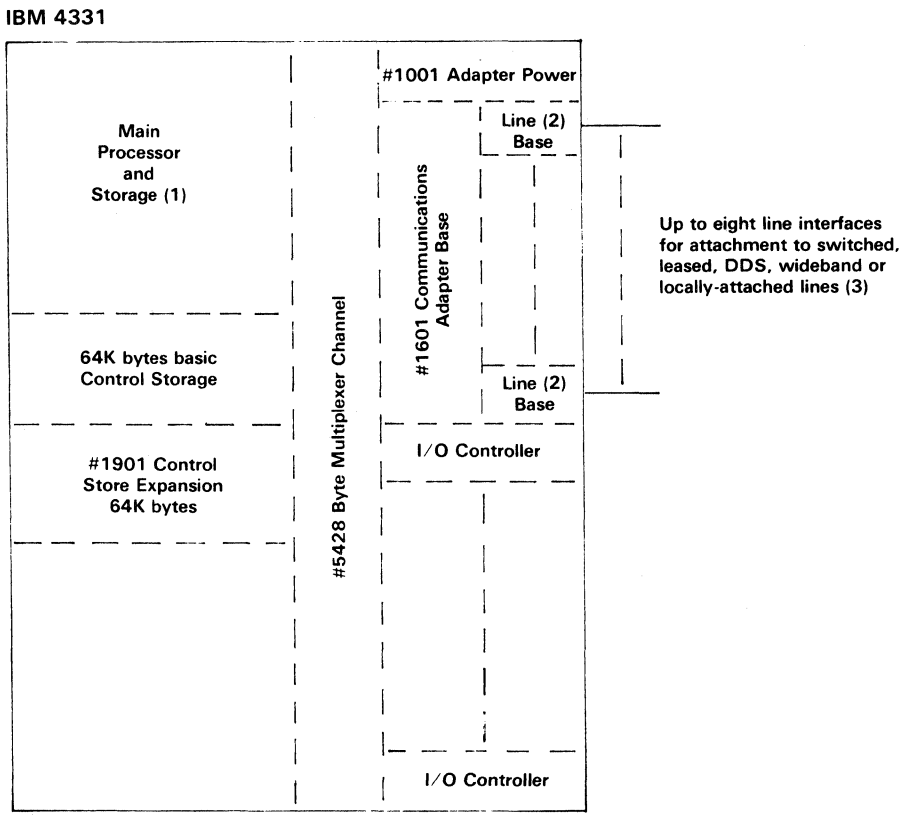
for the adapter does not exceed 64,000 bps. If a DDS adapter is implemented at 56,000 bps, however, use of the high-speed modem adapter is prohibited. DDS communications will utilize either the BSC or SDLC line protocols.

When the interface is implemented for local attachment of terminal devices, transmission is synchronous (again, using either BSC or SDLC), but line speed and distance are limited and are inversely proportional. For example, data rates of 1200 bps will support terminal devices attached by local cable to 800 meters, whereas speeds of 9600 bps can be used over local cable to a distance of not more than 100 meters.

For modem attachment to the public switched network, IBM provides cables for attachment of its integrated modems to the Data Access Arrangement (DAA), which is the point of entry into the switched network. With IBM's 1200 bps switched modem, connection is made to a DAA type CBS, or FCC-registered equivalent. For its 1200 bps leased line modem with switched backup (and manual answer), connection is made to DAA type CDT, or equivalent. The leased line modem with switched backup (and auto answer) also connects via a type CBS DAA.

All line features connected to the communications adapter require one of two line attachment bases. The Line Attachment Base for clocked modems (#4695) is used for all line features which obtain clocking from an external modem or other source, The Line Attachment Base for nonclocked modems (#4696) is used for modems which do not provide clocking. The nonclocked line base is wired at installation time for a specific data rate: 75, 134.5, 300, 600 or 1200 bps for asynchronous transmission, and 600 or 1200 bps for synchronous (BSC or SDLC) transmission.

IBM 4331 Communications Adapter



(1) Includes 500K bytes main processor storage; Model J1 has 1,000K bytes.
(2) Either #4695 when clocking is provided by modem, or #4696 with non-clocked modems.
(3) See Table 1 for available line interfaces; Table 2 provides communications specifications for remote IBM systems, devices and terminals.

LINE INTERFACES

The following line interfaces can be configured with the IBM 4331 communications adapter. In addition to the descriptions given below, Table 1 offers a thumbnail comparison of these interfaces.

The high-speed modem adapter (#4720) provides for the attachment of an external modem with clocking for high-speed data transmission rates. The interface is V35, and support is provided for a single, synchronous, leased line operating at 20.4K, 40.8K, 48K or 56K bps. Only one of these adapters can be implemented per communications adapter, even though two could be operated at for example, 20.4K bps and still not exceed the 64,000 bps maximum capacity. The high-speed adapter supports either BSC or SDLC protocols, and uses a #4695 line base for clocked modems.

The local attachment interface (#4801) provides for connection of a single, serial, synchronous communications cable. The interface uses an RS-232C/V24 interface, which is also required by the attached terminal. Clocking is provided by the interface for both the communications adapter and the terminal, and is fixed at installation time at either 1200, 2400, 4800 or 9600 bps. The distance permitted for the cable is a function of the speed, and ranges from 100 meters at 9600 bps, to 800 meters at 1200 bps. The interface requires a #4695 line base for clocked modems.

The Digital Data Service adapter (#5650) provides for connection to the DDS network, and supports synchronous communications without modems at up to 56K bps. The same adapter supports operation at speeds of 2400, 4800 and 9600 bps, also using DDS. Up to seven additional DDS adapters can be configured with a communications adapter, as long as the 64,000 bps capacity is not exceeded. Also, any other adapters may be mixed with DDS, except that a DDS line operating at 56K bps precludes a high-speed modem adapter. The DDS adapter supports either BSC or SDLC protocols and requires a #4695 line base for clocked modems.

IBM also markets a series of four integrated modem adapters for use with the communications adapter, and all operate at a maximum of 1200 bps. Three of the adapters are designed for leased (or nonswitched) lines: the #4781, the #4787, which includes switched line backup with manual answer, and the #4788, which includes switched line backup with automatic answering. The fourth, #4782, supports switched lines with automatic answering only. All support either asynchronous, BSC or SDLC communications, and each requires a #4696 line base for nonclocked modems.

The 4331 communications adapter will also support up to two autocall unit interfaces (#1020). The autocall adapters use an RS-366/V25 interface and would, of course, only be used in conjunction with switched lines. The #1020 autocall interface requires one of the general-purpose EIA/CCITT adapters (#3701).

The general purpose EIA/CCITT interface (#3701) supports a single, external modem, and may be any modem complying with RS-232C or V24 specifications. It may be configured for either a switched or nonswitched line. Either a #4695 or #4696 line base will be required, depending on whether the modem supplies clocking or not. When used for a non-switched line with switched line backup, maximum line speed is 9600 bps on the nonswitched line, and 4800 bps on the switched. With the #4695 line base, synchronous (BSC or SDLC) transmission is supported. With the #4696 line base, transmission may be either asynchronous or synchronous.

IBM 4331 Communications Adapter

SOFTWARE

Only the DOS/VSE operating system supports the 4331 communications adapter with SDLC communications. The 4331 host may alternately be running DOS/VSE as a guest under VM/370 (Release 6), which will also support SDLC communications with the adapter.

The IBM 4331 can operate in one of two modes; ECPS/VSE mode, which utilizes the DOS/VSE operating system, or in 370 mode, which essentially emulates IBM System/370 operation and uses one of the operating systems such as OS/VS1 or DOS/VS. The communications adapter may be implemented on a 4331 operating in 370 mode, but operation will be in IBM 270X emulation, and only BSC or asynchronous devices may be supported.

To utilize the communications adapter for SDLC requires that the 4331 be operating in its native, ECPS/VSE mode with DOS/VSE. Also required will be the ACF/VTAME telecommunications access method.

Because there is no 370X controller required with the communications adapter, many of the functions performed by the front-end software (NCP) have been incorporated into ACF/VTAME. These functions include call establishment, buffering, code and protocol conversions, SNA terminal handling, and so on.

ACF/AVTAME is predefined with communications parameters (i.e. protocols) as part of the 4331 system generation. Domains are defined by inputting a parameter deck for each major node and path table. After initialization, the network operator may dynamically activate or deactivate any node or specific program, terminal or clsuter. Additionally, ACF/VTAME permits the operator to effect impressive status displays for modems, lines, programs, buffer pools, etc., as well as utilize an inherent trace facility.

The operator functions for ACF/VTAME are accomplished with an appropriate version of the Network Communications Control Facility (NCCF). There is also available a Teleprocessing On-line Test Executive Program (TOLTEP) which runs under ACF/VTAME and handles the selection, loading and execution of on-line test programs.

ACF/VTAME with its communications adapter is capable of establishing cross-domain SDLC sessions and, as previously stated, the functions performed by NCP with regards to session establishment are all incorporated into ACF/VTAME. When a terminal in its domain is accessing a resource of another domain, ACF/VTAME remains involved during the entire conduct of the session, whereas with a 370X front end, the host access method disengages itself after initial session establishment.

PRICING

The IBM 4331 is offered on a purchase, lease or rental basis, as are its components including the communications adapter, its line bases, interfaces, etc. The standard IBM lease or rental contract includes equipment maintenance and entitles the customer to unlimited usage of the machine.

IBM 4331 users receive DOS/VSE at no additional cost, but all other related software, including ACF/VTAME, is priced separately. Effective January 1, 1980, IBM will begin charging two different rates for software maintenance, a basic charge for Service Center support, and an additional charge for extended maintenance support.

EQUIPMENT PRICES

		Purchase Price	Monthly Maintenance	Monthly* Rental	Monthly Lease* (Two-year)
#1001	Adapter Power Prerequisite	$2,400	$ 7	$ 71	$ 60
#1901	Control Storage Expansion; 64K bytes	5,100	34	150	128
#5248	Byte Multiplexer Channel	3,520	2	103	88
#1601	Communications Adapter Base	3,080	2	90	77
#1020	Autocall Unit Interface	440	2	13	11
#3701	General-Purpose EIA/CCITT Interface	440	2	13	11
#4695	Line Attachment Base; for clocked modems	440	1	13	11
#4696	Line Attachment Base; for nonclocked modems	520	1	15	13
#4720	High-Speed Modem Adapter	1,320	2	35	30
#4781	1200 bps Integrated Modem; non-switched	668	4	25	21
#4782	1200 bps Integrated Modem; switched w/ auto answer	860	4	25	21
#4787	1200 bps Integrated Modem; non-switched w/switched backup and manual answer	910	4	26	22
#4788	1200 bps Integrated Modem; non-switched w/switched backup and auto answer	1,015	4	29	25
#4801	Local Attachment Interface	1,100	3	29	25
#5650	DDS Adapter	840	3	24	20

SOFTWARE PRICES**

		Monthly Licensed Program Support Charge	Extended Support Monthly Charge
	DOS/VSE	N/C	N/C
5746-RC7	ACF/VTAME	$56	$34

*Includes monthly maintenance charge.
**Effective 1/1/80.■

IBM 4331 Communications Adapter

SOFTWARE

The IBM 4331 can operate in one of two modes; ECPS/VSE mode, which utilizes the DOS/VSE operating system, or in 370 mode, which essentially emulates IBM System/370 operation and uses one of the operating systems such as OS/VS1 or DOS/VS. The communications adapter may be implemented on a 4331 operating in 370 mode, but operation will be in IBM 270X emulation, and only BSC or asynchronous devices may be supported.

Only the DOS/VSE operating system supports the 4331 communications adapter with SDLC communications. The 4331 host may alternately be running DOS/VSE as a guest under VM/370 (Release 6), which will also support SDLC communications with the adapter.

Also required is the ACF/VTAME telecommunications access method.

Because there is no 370X controller required with the communications adapter, many of the functions performed by the front-end software (NCP) have been incorporated into ACF/VTAME. These functions include call establishment, buffering, code and protocol conversions, SNA terminal handling, and so on.

ACF/AVTAME is predefined with communications parameters (i.e. protocols) as part of the 4331 system generation. Domains are defined by inputting a parameter deck for each major node and path table. After initialization, the network operator may dynamically activate or deactivate any node or specific program, terminal or clsuter. Additionally, ACF/VTAME permits the operator to effect impressive status displays for modems, lines, programs, buffer pools, etc., as well as utilize an inherent trace facility.

The operator functions for ACF/VTAME are accomplished with an appropriate version of the Network Communications Control Facility (NCCF). There is also available a Teleprocessing On-line Test Executive Program (TOLTEP) which runs under ACF/VTAME and handles the selection, loading and execution of on-line test programs.

ACF/VTAME with its communications adapter is capable of establishing cross-domain SDLC sessions and, as previously stated, the functions performed by NCP with regards to session establishment are all incorporated into ACF/VTAME. When a terminal in its domain is accessing a resource of another domain, ACF/VTAME remains involved during the entire conduct of the session, whereas with a 370X front end, the host access method disengages itself after initial session establishment.

PRICING

The IBM 4331 is offered on a purchase, lease or rental basis, as are its components including the communications adapter, its line bases, interfaces, etc. The standard IBM lease or rental contract includes equipment maintenance and entitles the customer to unlimited usage of the machine.

IBM 4331 users receive DOS/VSE at no additional cost, but all other related software, including ACF/VTAME, is priced separately. Effective January 1, 1980, IBM will begin charging two different rates for software maintenance, a basic charge for Service Center support, and an additional charge for extended maintenance support.

EQUIPMENT PRICES

		Purchase Price	Monthly Maintenance	Monthly* Rental	Monthly Lease* (Two-year)
#1001	Adapter Power Prerequisite	$2,520	$ 7	$ 75	$ 64
#1901	Control Storage Expansion; 64K bytes	5,355	36	160	136
#5248	Byte Multiplexer Channel	3,695	1.50	110	94
#1601	Communications Adapter Base	3,230	1.50	96	82
#1020	Autocall Unit Interface	462	2	13	11
#3701	General-Purpose EIA/CCITT Interface	462	2	13	11
#4695	Line Attachment Base; for clocked modems	462	0.50	13	11
#4696	Line Attachment Base; for nonclocked modems	546	0.50	15	13
#4720	High-Speed Modem Adapter	1,385	2	36	31
#4781	1200 bps Integrated Modem; non-switched	701	3.50	20	17
#4782	1200 bps Integrated Modem; switched w/ auto answer	903	3.50	26	22
#4787	1200 bps Integrated Modem; non-switched w/switched backup and manual answer	955	3.50	27	23
#4788	1200 bps Integrated Modem; non-switched w/switched backup and auto answer	1,065	4	31	26
#4801	Local Attachment Interface	1,155	3	31	26
#5650	DDS Adapter	882	2.50	25	21

SOFTWARE PRICES

		Monthly Licensed Program Support Charge	Extended Support Monthly Charge
—	DOS/VSE	N/C	N/C
5746-RC7	ACF/VTAME	61	37

*Includes monthly maintenance charge.■