

# IBM 3704 Communications Controller



## MANAGEMENT SUMMARY

IBM's family of communications controllers, which includes Models 3704 and 3705, has undergone continual upgrading since the first 3705-I's were introduced in 1972. Model 3704, which was first available in 1973, is a scaled-down version of the 3705-I; although it supports the same software and communications disciplines as the 3705, it provides a smaller memory capacity and handles fewer communications lines. Subsequent to the releases of second generation 3705-II models in 1975 and 1978, demand for both the 3704 and 3705-I has declined to the point where IBM withdrew them from new production, the 3704 in August 1978 and the 3705-I in October 1979.

The 3704 can operate as a front-end or as a remote concentrator for IBM System/360 and 370 or 303X or 4300 Series Processor. When used with a System/360, ➤

A programmable processor used as a front-end processor or remote concentrator for IBM System/360 or /370 or 303X or 4300 Series Processor.

The 3704 is available with up to 64K bytes of memory and supports up to 32 communications lines. A smaller version of the IBM 3705, the 3704 is widely used as a replacement for the older IBM 270X controllers. A variety of line combinations can be accommodated including asynchronous or synchronous transmission, half- or full-duplex mode, and speeds from 45.5 to 50,000 bps.

Options offered include alternate connection to two computers, or two ports on the same computer, (manually selected); and remote program loading, diagnostics, and power-off control to a unit used as a remote concentrator.

A small system with 16K bytes of memory configured for 8 lines rents for approximately \$1,200 per month, including maintenance. A larger system with 64K bytes of memory configured for 32 lines rents for approximately \$1,900 per month, including maintenance.

## CHARACTERISTICS

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

**DATE OF ANNOUNCEMENT:** February 1973.

**DATE OF FIRST DELIVERY:** May 1973.

**NUMBER DELIVERED TO DATE:** Information not available.

**SERVICED BY:** International Business Machines Corporation.

## CONFIGURATION

A 3704 Communications Controller is composed of:

- The basic 3704 model (A1 through A4), which includes the central control unit, main memory (16K to 64K bytes in 16K-byte increments), and space for all interfaces between the central control unit and communications and between the control unit and the host computer.
- One Channel Adapter or Remote Program Loader.
- One Scanner.

*REFERENCE EDITION: This is a mature product line, and no significant further developments are anticipated. Because of its importance, coverage is being continued, but no future update is planned.*

## IBM 3704 Communications Controller

▷ the 3704 can operate in the 270X emulation mode only. When used with a System/370 or 303X or 4300 Series Processor, it can operate in emulation mode or under Network Control Program (NCP); an extension, Partitioned Emulation Program (PEP), allows the 3704 to operate under NCP and emulation concurrently.

Up to 32 half-duplex communications lines operating synchronously or asynchronously at up to 9600 bps can be physically attached to the 3704. Various devices including internal or external modems, local terminals, automatic calling units, and telegraph current loops can be accommodated. The line speeds accepted range from 45.5 to 50,000 bps. The maximum number of lines that can be interfaced concurrently depends upon the speed and mode of operation of the lines as well as the 3704 hardware/software configuration.

Selecting between the 3704 and 3705 is fairly easy. For applications that can be satisfied by either, the 3704 is more economical. For configurations just beyond the capability of one 3704, a single 3705 is less expensive than two 3704's. Also, if a great deal of pre-and/or post-processing is desired, the 64K-byte memory limitation of the 3704 may force a move to the 3705 even though the 3704 could handle the number of physical lines anticipated.

### USER REACTION

Datapro conducted a survey of users of data communications processors and controllers in March 1979. A total of 40 users responded with ratings and comments on a total of 44 IBM 3704 systems.

As with previous 3704 surveys conducted by Datapro, the majority of users (37) reported that they were operating in IBM 270X emulation mode. A total of 34 users reported that their computer systems were IBM 370's; the remaining responses indicated the use of System/360's (4 responses) or 3031's (2 responses). The average number of communications lines was 6.1 per controller. The average number of terminals serviced per line was 6.9 which included the totals for multipoint leased lines and multiple terminals sharing the same controller port on a dial-up basis.

The users' ratings were as follows:

	Excellent	Good	Fair	Poor	WA*
Overall satisfaction	21	18	1	0	3.5
Ease of installation	16	20	4	0	3.3
Throughput	18	19	2	0	3.4
Hardware reliability	29	10	1	0	3.7
Promptness of maintenance	17	21	2	1	3.4
Quality of maintenance	18	19	2	0	3.4
Software	8	22	7	3	2.9
Technical support	8	17	13	2	2.8

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

Users were also asked to make specific comments about any major difficulties they had experienced. The majority of users made no comment, implying that they are ▷

- ▶ ● One or two Line Interface Bases.
- Line Sets, which provide the interface for modems or directly with the communications lines.
- Business Machine Clocks, which provide timing when external modems or internal adapters do not.

Physically, the 3704 occupies only one cabinet in any configuration. Only one Channel Adapter for communications with a local System/360 or 370 byte multiplexer channel is available. A Two-Channel switch is an optional feature that permits the 3704 to be connected to two channels of the host computer or to two host computers. The channel is selected manually with a console switch; therefore, only one path is active at a time.

Two Communications Scanners are available: Type 2 is used when one or more communications lines are operated above 9600 bps; Type 1 is used for all other applications. The scanners provide the interface between the central control unit and the communications attachment features. Only one scanner can be implemented per 3704 and a Business Machine Clock is required to support the scanner.

A 3704 can support one or two Line Interface Bases (LIB's). There are a total of 8 LIB types available to accommodate various communications disciplines. Two LIB's can be mixed in any combination, with the following exceptions: Communications Scanner Type 2 is required to support an LIB Type A1 (the second LIB may be of any type) and a Communications Scanner Type 2 cannot support two Type 1 LIB's. All other combinations are possible. The LIB provides the interface between the Communications Scanner and the Line Sets. Each LIB in a 3704 can accommodate from one to eight Line Sets depending on type.

There are a total of 26 Line Set types available. The Line Sets interface the LIB to the outside world (e.g., external modem, local terminal, leased or switched private or carrier facility, telegraph loop, etc.). The configuration details on available Line Sets and LIB's are provided in the accompanying chart. Each Line Set can connect to one or two communications lines depending on type.

The configuration possibilities of various line speeds, disciplines, and feature options are too numerous to list. A few typical examples follow:

- Up to 32 9600 bps half-duplex lines; or
- Up to 16 9600 bps full-duplex lines; or
- 2 50,000 bps half-duplex lines, 4 9600 bps full-duplex lines, and 12 9600 half-duplex lines; or
- 2 50,000 bps half-duplex lines, 4 9600 bps half-duplex lines equipped with automatic calling feature, and 6 9600 bps full-duplex lines; or
- 8 74.2 bps half-duplex telegraph loops, 4 2400 bps half-duplex local terminals, 8 9600 bps half-duplex lines, and 1 2400 bps half-duplex line with integral automatic calling unit.

At least one Business Machine Clock is required per 3704 to support the Communications Scanner. When timing is not supplied by the internal or external modem, a clock is also required. Up to four Business Machine Clocks can be incorporated into a 3704. The following standard clock rates are available:

45.5 bps	150.0 bps
50.0 bps	300.0 bps
56.9 bps	600.0 bps

## IBM 3704 Communications Controller

### COMMUNICATIONS LINES HANDLED BY THE IBM 3704

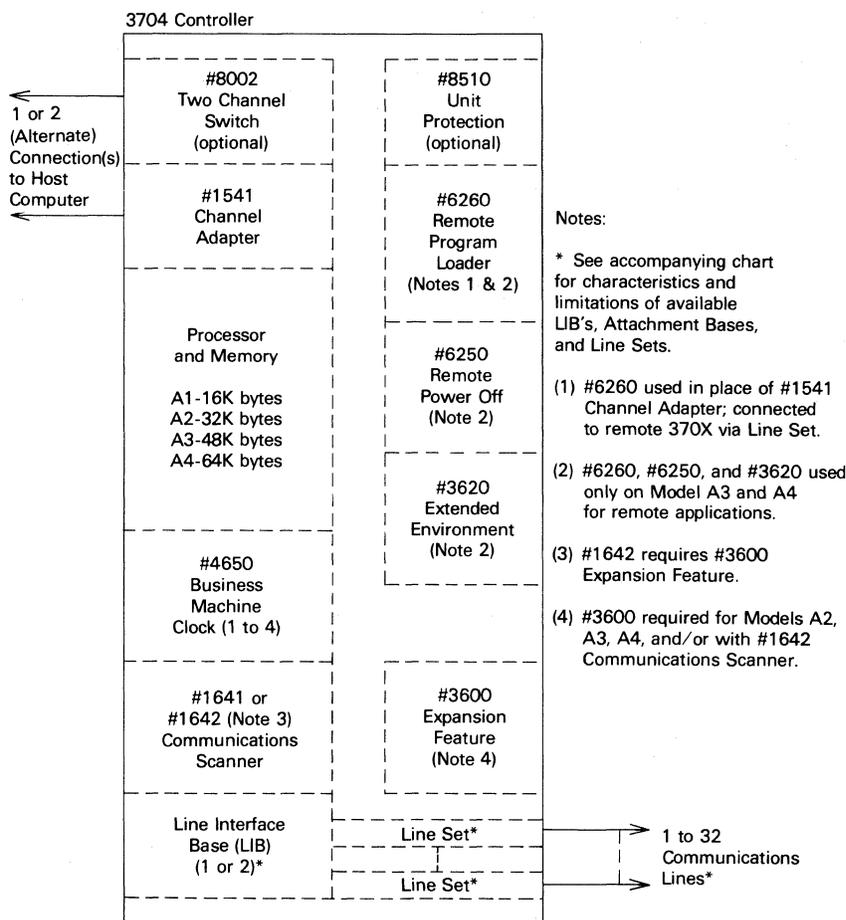
Type of Interface	Transmission Characteristics				LIB* Type	Attachment Base	Line Set	Max. Line Sets per LIB	Lines per Line Set	Comments
	Speed, bps	Timing	Mode	Facility						
External RS-232C modem	Up to 1200	Async.	Half-duplex	Leased or switched	Type 1	—	1A	8	2	Eight Line sets 1A, 1B, 1C, 1D, 1E, 1F, or 1H can be used in any combination per LIB Type 1.
	Up to 1200	Async.	Full-duplex	Leased	Type 1	—	1B	8	1	
	Up to 9600	Async./Sync.	Half-duplex	Leased or switched	Type 1	—	1D	8	2	
	Up to 9600	Sync.	Full-duplex	Leased	Type 1	—	1H	8	1	
External wideband modem	19.2K, 40.8K, or 50K	Sync.	Half-duplex	Leased or switched	Type A1	—	1G	2	1	Two Line Sets 1G or 1J (or one of each) plus four Line Sets 1A, 1B, 1C, 1D, 1E, 1F, or 1H can be used in any combination per LIB Type A1.
External MIL-188C modem	Up to 50K	Async./Sync.	Half-duplex	Leased	Type A1	—	1J	2	1	
Local attachment	Up to 1200	Async.	Half-duplex	IBM cables	Type 1	—	1C	8	2	Max. length 200 ft.
	Up to 2400	Sync.	Half-duplex	IBM cables	Type 1	—	1F	8	2	
Automatic dialing	—	—	—	Switched	Type 1	—	1E	8	2	For attachment to external dialing units; per RS-336.
Internal modems or adapters (no external modems required)	1200 or 2400	Sync.	Half-duplex	Leased	Type 1 or Type A1	#5101** (provides for two Line Sets 1L or LM or one of each).	1L	2	1	Point-to-point applications.
	1200 or 2400	Sync.	Half-duplex	Leased	Type 1 or Type A1	#5102** (provides for two IP Line sets).	1M	2	1	Multipoint applications. Automatic answer, requires CBS Coupler (or equivalent).
	1200 or 2400	Sync.	Half-duplex	Switched	Type 1 or Type A1	#3500** (Provides for two Line Sets 1X or 1Y or one of each).	1P	2	1	Point-to-point applications.
	1200 or 2400	Sync.	Full-duplex	Leased	Type 1 or Type A1	#3500** (Provides for two Line Sets 1X or 1Y or one of each).	1X	2	1	Multipoint applications.
	1200 or 2400	Sync.	Full-duplex	Leased	Type 1 or Type A1	—	1Y	2	1	Automatic answer and originate; no ACU required; requires CBS Coupler (or equivalent).
	1200 or 2400	Sync.	Half-duplex	Switched (Rotary dial)	Type 1 or Type A1	—	1Q**	1	1	Three Line Sets 3A and 3B in any combination per LIB.
	Up to 134.5	Async.	Half-duplex	2-wire, private; 4.75 wire-miles maximum	Type 3	—	3A	3	2	—
	Up to 134.5	Async.	Full-duplex	4-wire, private; 4.75 wire-miles maximum	Type 3	—	3B	3	2	—
	Up to 600	Async.	Half-duplex	2-wire, private; 8.25 wire-miles maximum	Type 4	—	4A	1	2	—
	Up to 600	Async.	Half-duplex	Leased (2-wire)	Type 4	—	4B	1	2	—
	Up to 600	Async.	Full-duplex	Leased (4-wire)	Type 4	—	4C	1	2	—
	600 or 1200	Async./Sync.	Half-duplex	Leased	Type 8	#5103 Modem Attachment Base-1200 bps (See comments)	8A	4	1	Two #5103 per LIB Type 8; each #5103 can accommodate two Line sets 8A, 8B, 8C and 8D in any combination.
	600 or 1200	Async./Sync.	Half-duplex	Switched	Type 8	See 8A comments.	8B	4	1	Automatic answer; requires CBS Coupler (or equivalent).
	300	Async.	Half-duplex	Leased	Type 8	See 8A comments.	8C	4	1	Bi-directional interrupt provided (2741 line control).
300	Async.	Half-duplex	Switched	Type 8	See 8A comments.	8D	4	1	Bi-directional interrupt (2741 line control); requires CBS Coupler (or equivalent).	
Up to 1200	Sync.	Half-duplex	Switched	Type 9	—	—	—	1	Handles one line; automatic answer and originate; no ACU required; requires CBS Coupler (or equivalent).	
Up to 1200	Sync.	Full-duplex	Leased	Type 10	—	10A	3	1	—	
Telegraph; 20, 40, or 62.5 ma. current loop	Up to 200	Async.	Half-duplex	Leased	Type 2	—	2A	4	2	Interfaces with ATT 83B, WU Plan 115, or equivalent.

\*The 3704 can accommodate two Line Interface Bases (LIB's). A Communications Scanner Type 1 is used for all LIB's except Type A1, which requires a Communications Scanner Type 2. In addition to the first LIB Type A1, the Communications Scanner Type 2 can accommodate one additional LIB of any type. Alternatively, the Scanner Type 2 can accommodate any two LIB's except two Type 1's. The Communications Scanner Type 1 can handle two LIB's of any type (except A) and in any combination.

\*\*#5101 Modem Attachment Base-2400 bps, #5102 Modem Attachment Base With Auto Answer-2400 bps, #3500 Duplex Data Attachment Base-2400 bps, and Line Set 1Q are mutually exclusive per LIB Type 1 or A1. One of the #5101, #5102, or #3500 (equipped with only one Line Set 1X or 1Y) feature can be substituted for one appearance of Line Set 1A, 1B, 1C, 1D, 1E, 1F, or 1H in LIB Type 1 or A1. One Line Set 1Q can be substituted for two appearances on Line Set 1A, 1B, 1C, 1D, 1E, 1F, or 1H in LIB Type 1 or A1. #5101 and #3500 cannot be used with the Remote Program Loader feature #6260.

## IBM 3704 Communications Controller

### Configuration



▷ generally satisfied with the performance of their 3704's. One user felt particularly pleased with the reliability of his unit, stating that "once installed, the 3704 has been running in the 270X emulation mode without hardware or software failure since March 1978".

Of those factors which *were* cited by these users as causes of major difficulties, the one that was most frequently mentioned was poor communications lines (13 responses). Trouble with the communications processor software (10 responses), host software (8 responses), and modems (8 responses) was also often mentioned. One user specifically commented on the lack of adequate software support for non-IBM (i.e. Teletype-compatible) terminals. Now that IBM has entered the ASCII terminal market with its Model 3101 Display Terminal, it is possible that their systems will become more supportive of this type of equipment. □

▶	74.2 bps	950.0 bps
	75.0 bps	1200.0 bps
	110.0 bps	2000.0 bps
	134.5 bps	2400.0 bps

**CONNECTION TO HOST COMPUTER:** Used as a local unit, the 3704 can be connected to a byte multiplexer channel of an IBM System/360 Model 30 (32K) or larger,

an IBM System/370 Model 115 through 195 or a 303X or 4300 Series Processor. Only one subchannel is used in the NCP mode; in the EP (270X emulation) mode, one subchannel is used for each line terminated.

As a remote concentrator, the 3704 communicates over a leased line with a local 3704 or 3705. Transmission can be full-duplex at up to 9600 bits per second, using Line Set 1H, or half-duplex at up to 50,000 bits per second, using Line Set 1G.

### TRANSMISSION SPECIFICATIONS

The accompanying chart summarizes the capabilities of the 3704 for accommodating various types of communications lines and techniques.

### SOFTWARE

The program stored in memory controls all functions of the 3704. Many functions such as control character recognition and error procedures are defined and controlled by software. In previous hard-wired controllers, such as the IBM 2701, 2702, and 2703, these functions were fixed once a particular set of adapters was selected. The 3704 is not totally independent, however. Functions are executed in response to commands issued by the host processor. Ultimately all control resides with the host processor, including program loading.

The software provided for the 3704 is the same as that provided for the 3705 (see Report C13-491-101). Operational ▶

## IBM 3704 Communications Controller

▶ differences exist primarily due to the smaller main memory of the 3704, which limits the number of lines that can be accommodated at any one time.

**REMOTE CONCENTRATION:** When the 3704 is configured as a remote concentrator, the Remote Program Loader feature replaces the Channel Adapter. This feature permits loading NCP/VS into the 3704 main memory over a communications line connecting the 3704 with a 3704 or 3705 at the host computer site. The line can be a full-duplex leased voice-band line operating synchronously at up to 9600 bps (Line Set 1H) or a half-duplex wide-band facility operating at up to 50,000 bps (Line Set 1G). All data transferred between the remote and local 370X pair is transmitted over this line. The Remote feature also permits running diagnostic aids at the remote site without involving the host computer.

The configuration of a remote concentrator arrangement follows the normal 3704 rules except that no Channel Adapter can be included. The maximum number of lines that can be connected to service terminals is, of course, reduced.

Several other features are available to supplement the remote operation of a 3704. Extended Environment allows operation at temperatures between 50 and 100 degrees F. Remote Power Off provides a capability for turning the power off in response to a command received over the communications line; power can be restored only from the unit's control panel. Unit Protection provides a physical locking capability for the 3704's control panel that prevents any switches except Power On and Power Off from being altered without a key; this feature can also be used with a locally connected 3704.

### PRICING

All 3704 components can be acquired by purchase or are available under the terms of IBM's Lease or Rental Agreement (LRA). LRA provides for month-to-month rentals or two-year leases. A lease can be extended indefinitely in

increments of one year, or, one time for less than one year. IBM's present pricing policy on the 3704 allows lease extensions at no increase in monthly charges (zero percent upper limit) for equipment in place. Penalty charges for early termination of a lease (including model downgrades and feature removals) are computed as the lower of either 5 months charges or 25 percent of the remaining value of the lease. The monthly charges for a lease are generally 15 percent less than monthly rental charges.

The 3704 is covered under Plan A of the Lease or Rental Agreement. Under rental Plan A, there is an overtime premium charge of 10 percent per hour over the 176 hours per month allowed; under the lease plan, there are no overtime charges. Purchase credits for basic payments made under LRA can be accrued up to a maximum of 60 percent of the total purchase price.

LRA includes prime-shift maintenance; a separate agreement can be arranged for maintenance on purchased units. The 3704 basic maintenance arrangement provides coverage for any consecutive nine-hour period between 7 AM and 6 PM, Monday through Friday (prime shift maintenance period). Extended period maintenance is available under the Category D schedule up to 24 hours a day, 7 days per week. The Monthly Maintenance Charge shown in the accompanying price list covers prime-shift maintenance for purchased equipment and serves as a basis for calculating extended charges for rented or leased equipment.

The premiums for extended maintenance are expressed in the following table as percentages of the basic maintenance charge shown in the price list.

Consecutive Hours	9*	12	16	20	24
Monday-Friday	10%	14%	18%	22%	26%
Saturday	4%	5%	7%	8%	9%
Sunday	5%	7%	9%	11%	12%

\*Outside prime shift.

3704 Communications Controller—  
Model A1 (16K bytes)  
Model A2 (32K bytes)  
Model A3 (48K bytes)  
Model A4 (64K bytes)

3600 Expansion Feature  
4650 Business Machine Clock  
8510 Unit Protection  
1541 Channel Adapter Type 1  
8002 Two-Channel Switch

#### Communications Scanners

1641 Type 1  
1642 Type 2

#### Communications Line Attachment Features

4701 Line Interface Base Type 1  
4711 Line Set Type 1A  
4712 Line Set Type 1B  
4713 Line Set Type 1C  
4714 Line Set Type 1D  
4715 Line Set Type 1E  
4716 Line Set Type 1F  
4718 Line Set Type 1H

	Monthly Charge* Rental	Lease	Purchase	Monthly Maint.
3704 Communications Controller—	\$ 797	\$679	\$22,100	\$149.00
Model A1 (16K bytes)	866	738	22,885	178.00
Model A2 (32K bytes)	935	797	23,670	208.00
Model A3 (48K bytes)	1,004	856	24,455	238.00
Model A4 (64K bytes)				
3600 Expansion Feature	12	10	408	0.50
4650 Business Machine Clock	12	10	408	1.00
8510 Unit Protection	35**	35**	35	NC
1541 Channel Adapter Type 1	159	135	3,515	23.00
8002 Two-Channel Switch	69	59	2,040	4.00
<b>Communications Scanners</b>				
1641 Type 1	27	23	816	1.50
1642 Type 2	143	122	3,180	5.50
<b>Communications Line Attachment Features</b>				
4701 Line Interface Base Type 1	27	23	636	1.50
4711 Line Set Type 1A	38	32	963	2.00
4712 Line Set Type 1B	38	32	1,235	2.00
4713 Line Set Type 1C	38	32	1,235	2.00
4714 Line Set Type 1D	115	98	2,555	8.50
4715 Line Set Type 1E	69	59	2,040	3.00
4716 Line Set Type 1F	115	98	3,275	8.50
4718 Line Set Type 1H	121	103	2,720	15.50

\*Includes monthly maintenance.

\*\*Single-Use Charge, one time.

NC No Charge.

## IBM 3704 Communications Controller

		Monthly Charge*		Purchase	Monthly Maint.
		Rental	Lease		
4771	Line Set Type 1Q	338	288	9,350	25.50
5101	Modem Attachment Base—2400 bps	121	103	3,485	3.50
4751	Line Set Type 1L	69	59	2,040	12.00
4752	Line Set Type 1M	63	54	1,830	11.00
5102	Modem Attachment Base—Auto-Answer, 2400 bps	143	122	4,080	3.50
4761	Line Set Type 1P	76	65	2,255	17.50
3500	Duplex Data Attachment Base—2400 bps	93	79	2,635	3.00
4754	Line Set Type 1X	115	98	3,275	16.50
4755	Line Set Type 1Y	106	90	3,060	14.00
4700	Line Interface Base Type A1 (can also use all Line Sets under LIB 1)	27	23	816	1.50
4717	Line Set Type 1G	93	79	2,635	9.50
4719	Line Set Type 1J	99	84	2,850	3.50
4702	Line Interface Base Type 2	27	23	816	1.00
4721	Line Set Type 2A	69	59	2,040	5.50
4703	Line Interface Base Type 3	86	73	2,465	3.50
4731	Line Set Type 3A	54	46	1,660	2.00
4732	Line Set Type 3B	54	46	1,660	2.00
4704	Line Interface Base Type 4	54	46	1,660	4.50
4741	Line Set Type 4A	99	84	2,850	5.00
4742	Line Set Type 4B	99	84	2,850	7.50
4743	Line Set Type 4C	99	84	2,850	7.50
4708	Line Interface Base Type 8	86	73	2,465	2.00
5103	Modem Attachment Base—1200 bps	54	46	1,660	2.00
4781	Line Set Type 8A	20	17	630	4.00
4782	Line Set Type 8B	27	23	840	6.00
4785	Line Set Type 8C	59	50	1,005	17.50
4786	Line Set Type 8D	66	56	1,120	18.50
4709	Line Interface Base Type 9	201	171	5,695	10.50
5000	Line Interface Base Type 10	54	46	1,660	3.50
4784	Line Set Type 10A	128	109	3,655	9.00

### Features for Remote Concentrator

3620	Extended Environment	25	21	816	NC
6250	Remote Power Off	12	10	408	0.50
6260	Remote Program Loader	217	185	6,120	38.50

\*Includes monthly maintenance.

\*\*Single-Use Charge, one time.

NC No Charge. ■

*Update*

## IBM 3704 Communications Controller

▶ differences exist primarily due to the smaller main memory of the 3704, which limits the number of lines that can be accommodated at any one time.

**REMOTE CONCENTRATION:** When the 3704 is configured as a remote concentrator, the Remote Program Loader feature replaces the Channel Adapter. This feature permits loading NCP/VS into the 3704 main memory over a communications line connecting the 3704 with a 3704 or 3705 at the host computer site. The line can be a full-duplex leased voice-band line operating synchronously at up to 9600 bps (Line Set 1H) or a half-duplex wide-band facility operating at up to 50,000 bps (Line Set 1G). All data transferred between the remote and local 370X pair is transmitted over this line. The Remote feature also permits running diagnostic aids at the remote site without involving the host computer.

The configuration of a remote concentrator arrangement follows the normal 3704 rules except that no Channel Adapter can be included. The maximum number of lines that can be connected to service terminals is, of course, reduced.

Several other features are available to supplement the remote operation of a 3704. Extended Environment allows operation at temperatures between 50 and 100 degrees F. Remote Power Off provides a capability for turning the power off in response to a command received over the communications line; power can be restored only from the unit's control panel. Unit Protection provides a physical locking capability for the 3704's control panel that prevents any switches except Power On and Power Off from being altered without a key; this feature can also be used with a locally connected 3704.

### PRICING

All 3704 components can be acquired by purchase or are available under the terms of IBM's Lease or Rental Agreement (LRA). LRA provides for month-to-month rentals or two-year leases. A lease can be extended indefinitely in

increments of one year, or, one time for less than one year. IBM's present pricing policy on the 3704 allows lease extensions at no increase in monthly charges (zero percent upper limit) for equipment in place. Penalty charges for early termination of a lease (including model downgrades and feature removals) are computed as the lower of either 5 months charges or 25 percent of the remaining value of the lease. The monthly charges for a lease are generally 15 percent less than monthly rental charges.

The 3704 is covered under Plan A of the Lease or Rental Agreement. Under rental Plan A, there is an overtime premium charge of 10 percent per hour over the 176 hours per month allowed; under the lease plan, there are no overtime charges. Purchase credits for basic payments made under LRA can be accrued up to a maximum of 60 percent of the total purchase price.

LRA includes prime-shift maintenance; a separate agreement can be arranged for maintenance on purchased units. The 3704 basic maintenance arrangement provides coverage for any consecutive nine-hour period between 7 AM and 6 PM, Monday through Friday (prime shift maintenance period). Extended period maintenance is available under the Category D schedule up to 24 hours a day, 7 days per week. The Monthly Maintenance Charge shown in the accompanying price list covers prime-shift maintenance for purchased equipment and serves as a basis for calculating extended charges for rented or leased equipment.

The premiums for extended maintenance are expressed in the following table as percentages of the basic maintenance charge shown in the price list.

Consecutive Hours	9*	12	16	20	24
Monday-Friday	10%	14%	18%	22%	26%
Saturday	4%	5%	7%	8%	9%
Sunday	5%	7%	9%	11%	12%

\*Outside prime shift.

	Monthly Charge* Rental	Lease	Purchase	Monthly Maint.
3704 Communications Controller—				
Model A1 (16K bytes)	\$836	\$712	\$22,100	\$149.00
Model A2 (32K bytes)	907	773	22,885	178.00
Model A3 (48K bytes)	978	834	23,670	208.00
Model A4 (64K bytes)	1,049	895	24,455	238.00
3600 Expansion Feature	12	10	408	0.50
4650 Business Machine Clock	12	10	408	1.00
8510 Unit Protection	35**	35** *	35	NC
1541 Channel Adapter Type 1	166	141	3,515	23.00
8002 Two-Channel Switch	72	61	2,040	4.00

### Communications Scanners

1641 Type 1	28	24	816	1.50
1642 Type 2	150	128	3,180	5.50

### Communications Line Attachment Features

4701 Line Interface Base Type 1	28	24	636	1.50
4711 Line Set Type 1A	39	33	963	2.00
4712 Line Set Type 1B	39	33	1,235	2.00
4713 Line Set Type 1C	39	33	1,235	2.00
4714 Line Set Type 1D	120	102	2,555	8.50
4715 Line Set Type 1E	72	61	2,040	3.00
4716 Line Set Type 1F	120	102	3,275	8.50
4718 Line Set Type 1H	127	108	2,720	15.50

\*Includes monthly maintenance.  
\*\*Single-Use Charge, one time.  
NC No Charge.

## IBM 3704 Communications Controller

		Monthly Charge*		Purchase	Monthly Maint.
		Rental	Lease		
4771	Line Set Type 1Q	354	301	9,350	25.50
5101	Modem Attachment Base—2400 bps	127	108	3,485	3.50
4751	Line Set Type 1L	72	61	2,040	12.00
4752	Line Set Type 1M	66	56	1,830	11.00
5102	Modem Attachment Base—Auto-Answer, 2400 bps	150	128	4,080	3.50
4761	Line Set Type 1P	79	67	2,255	17.50
3500	Duplex Data Attachment Base—2400 bps	96	82	2,635	3.00
4754	Line Set Type 1X	120	102	3,275	16.50
4755	Line Set Type 1Y	110	94	3,060	14.00
4700	Line Interface Base Type A1 (can also use all Line Sets under LIB 1)	28	24	816	1.50
4717	Line Set Type 1G	96	82	2,635	9.50
4719	Line Set Type 1J	103	88	2,850	3.50
4702	Line Interface Base Type 2	28	24	816	1.00
4721	Line Set Type 2A	72	61	2,040	5.50
4703	Line Interface Base Type 3	89	76	2,465	3.50
4731	Line Set Type 3A	56	48	1,660	2.00
4732	Line Set Type 3B	56	48	1,660	2.00
4704	Line Interface Base Type 4	56	48	1,660	4.50
4741	Line Set Type 4A	103	88	2,850	5.00
4742	Line Set Type 4B	103	88	2,850	7.50
4743	Line Set Type 4C	103	88	2,850	7.50
4708	Line Interface Base Type 8	89	76	2,465	2.00
5103	Modem Attachment Base—1200 bps	56	48	1,660	2.00
4781	Line Set Type 8A	20	17	630	4.00
4782	Line Set Type 8B	28	24	840	6.00
4785	Line Set Type 8C	61	52	1,005	17.50
4786	Line Set Type 8D	68	58	1,120	18.50
4709	Line Interface Base Type 9	210	179	5,695	10.50
5000	Line Interface Base Type 10	56	48	1,660	3.50
4784	Line Set Type 10A	134	114	3,655	9.00
<b>Features for Remote Concentrator</b>					
3620	Extended Environment	25	21	816	NC
6250	Remote Power Off	12	10	408	0.50
6260	Remote Program Loader	227	193	6,120	38.50

\*Includes monthly maintenance.  
 \*\*Single-Use Charge, one time.  
 NC No Charge. ■

IBM 3704 Communications Controller *Update*

PRICING

All 3704 components can be acquired by purchase or are available under the terms of IBM's Lease or Rental Agreement (LRA). LRA provides for month-to-month rentals or two-year leases. A lease can be extended indefinitely in increments of one year, or, one time for less than one year. IBM's present pricing policy on the 3704 allows lease extensions at no increase in monthly charges (zero percent upper limit) for equipment in place. Penalty charges for early termination of a lease (including model downgrades and feature removals) are computed as the lower of either 5 months charges or 25 percent of the remaining value of the lease. The monthly charges for a lease are generally 15 percent less than monthly rental charges.

The 3704 is covered under Plan A of the Lease or Rental Agreement. Under rental Plan A, there is an overtime premium charge of 10 percent per hour over the 176 hours per month allowed; under the lease plan, there are no overtime charges. Purchase credits for basic payments made under LRA can be accrued up to a maximum of 60 percent of the total purchase price.

LRA includes prime-shift maintenance; a separate agreement can be arranged for maintenance on purchased units. The 3704 basic maintenance arrangement provides coverage for any consecutive nine-hour period between 7 AM and 6 PM, Monday through Friday (prime shift maintenance period). Extended period maintenance is available under the Category D schedule up to 24 hours a day, 7 days per week. The Monthly Maintenance Charge shown in the accompanying price list covers prime-shift maintenance for purchased equipment and serves as a basis for calculating extended charges for rented or leased equipment.

The premiums for extended maintenance are expressed in the following table as percentages of the basic maintenance charge shown in the price list.

Consecutive Hours	9*	12	16	20	24
Monday-Friday	10%	14%	18%	22%	26%
Saturday	4%	5%	7%	8%	9%
Sunday	5%	7%	9%	11%	12%

\*Outside prime shift.

	Monthly Rental	Charge* Lease	Purchase	Monthly Maint.
3704 Communications Controller—				
Model A1 (16K bytes)	\$746	\$635	\$22,100	\$149.00
Model A2 (32K bytes)	812	691	23,275	178.00
Model A3 (48K bytes)	878	747	24,450	208.00
Model A4 (64K bytes)	944	803	25,625	238.00
3600 Expansion Feature	12	10	408	0.50
4650 Business Machine Clock	12	10	408	1.00
8510 Unit Protection	35**	35**	35	NC
1541 Channel Adapter Type 1	149	127	3,515	23.00
8002 Two-Channel Switch	66	56	2,040	4.00

Communications Scanners

1641 Type 1	26	22	816	1.50
1642 Type 2	135	115	3,180	5.50

Communications Line Attachment Features

4701 Line Interface Base Type 1	26	22	636	1.50
4711 Line Set Type 1A	36	31	963	2.00
4712 Line Set Type 1B	36	31	1,235	2.00
4713 Line Set Type 1C	36	31	1,235	2.00
4714 Line Set Type 1D	108	92	2,555	8.50
4715 Line Set Type 1E	66	56	2,040	3.00
4716 Line Set Type 1F	108	92	3,275	8.50
4718 Line Set Type 1H	114	97	2,720	15.50
4771 Line Set Type 1Q	317	270	9,350	25.50
5101 Modem Attachment Base—2400 bps	114	97	3,485	3.50
4751 Line Set Type 1L	66	56	2,040	12.00
4752 Line Set Type 1M	60	51	1,830	11.00
5102 Modem Attachment Base—Auto-Answer, 2400 bps	135	115	4,080	3.50
4761 Line Set Type 1P	72	61	2,255	17.50
3500 Duplex Data Attachment Base—2400 bps	87	74	2,635	3.00
4754 Line Set Type 1X	108	92	3,275	16.50
4755 Line Set Type 1Y	100	85	3,060	14.00
4700 Line Interface Base Type A1 (can also use all Line Sets under LIB 1)	26	22	816	1.50
4717 Line Set Type 1G	87	74	2,635	9.50
4719 Line Set Type 1J	93	79	2,850	3.50
4702 Line Interface Base Type 2	26	22	816	1.00
4721 Line Set Type 2A	66	56	2,040	5.50
4703 Line Interface Base Type 3	81	69	2,465	3.50
4731 Line Set Type 3A	51	43	1,660	2.00
4732 Line Set Type 3B	51	43	1,660	2.00
4704 Line Interface Base Type 4	51	43	1,660	4.50
4741 Line Set Type 4A	93	79	2,850	5.00
4742 Line Set Type 4B	93	79	2,850	7.50
4743 Line Set Type 4C	93	79	2,850	7.50

\*Includes monthly maintenance.

\*\*Single-Use Charge, one time.

NC No Charge.

## IBM 3704 Communications Controller

		<u>Monthly Rental</u>	<u>Charge* Lease</u>	<u>Purchase</u>	<u>Monthly Maint.</u>
4708	Line Interface Base Type 8	81	69	2,465	2.00
5103	Modem Attachment Base—1200 bps	51	43	1,660	2.00
4781	Line Set Type 8A	19	16	630	4.00
4782	Line Set Type 8B	26	22	840	6.00
4785	Line Set Type 8C	56	48	1,005	17.50
4786	Line Set Type 8D	62	53	1,120	18.50
4709	Line Interface Base Type 9	188	160	5,695	10.50
5000	Line Interface Base Type 10	51	43	1,660	3.50
4784	Line Set Type 10A	120	102	3,655	9.00
<b>Features for Remote Concentrator</b>					
3620	Extended Environment	25	21	816	NC
6250	Remote Power Off	12	10	408	0.50
6260	Remote Program Loader	203	173	6,120	38.50

\*Includes monthly maintenance.  
 \*\*Single-Use Charge, one time.  
 NC No Charge. ■

## IBM 3704 Communications Controller

► The minimum 3704 model that can include the remote concentrator feature of NCP/VS is the A3 (48K bytes).

### PRICING

The 3704 can be acquired by purchase, short-term rental, or under IBM's Extended Term Lease Plan. Maintenance charges are included in the figures for both the short-term rental and Extended Term Plan; a separate arrangement is available for purchased units.

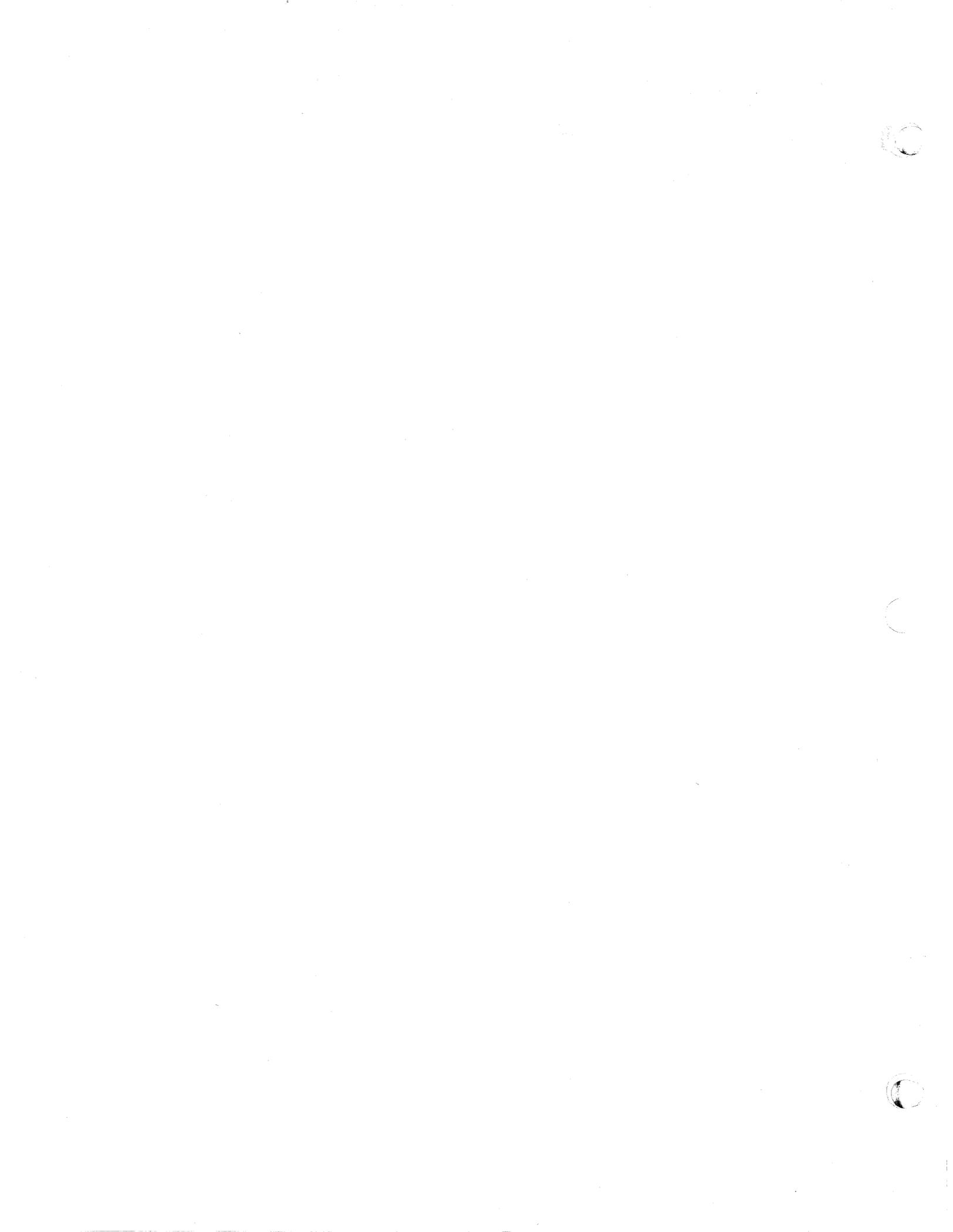
Under the short-term plan, overtime usage is charged at 10 percent of the regular hourly rates. Under the Extended Term Plan, there are no overtime charges. The initial lease period for the Extended Term Plan is 24 months and is extendable indefinitely in increments of one year or one time for less than a year. However, charges for early termination of the Extended Term Plan range from two to five times the monthly rental, depending on how long the lease has been in effect; equipment can be upgraded without incurring termination charges.

	Monthly Rental*			Monthly Maint.
	Short Term	Extended Term	Purchase	
<b>3704 Communications Controller—</b>				
Model A1 (16K bytes)	\$ 711	\$605	\$22,100	\$135.00
Model A2 (32K bytes)	793	675	23,850	162.00
Model A3 (48K bytes)	875	745	25,600	189.00
Model A4 (64K bytes)	958	815	27,350	216.00
<b>3600 Expansion Feature</b>				
8510 Unit Protection	12	10	408	0.50
	35*	35*	35	N/C
<b>1541 Channel Adapter Type 1</b>				
8002 Two-Channel Switch	142	121	4,505	21.00
	63	54	2,040	3.50
<b>Communications Scanners—</b>				
1641 Type 1	25	21	816	1.50
1642 Type 2	129	110	4,080	5.00
<b>Communications Line Attachment Features—</b>				
<b>4701 Line Interface Base Type 1:</b>				
4711 Line Set Type 1A	25	21	816	1.50
4712 Line Set Type 1B	36	31	1,235	2.00
4713 Line Set Type 1C	36	31	1,235	2.00
4714 Line Set Type 1D	36	31	1,235	2.00
4715 Line Set Type 1E	103	88	3,275	7.50
4716 Line Set Type 1F	63	54	2,040	2.50
4717 Line Set Type 1G	103	88	3,275	7.50
4718 Line Set Type 1H	109	93	3,485	14.00
4771 Line Set Type 1Q	303	258	9,350	23.00
<b>5101 Modem Attachment Base—2400 bps</b>				
4751 Line Set Type 1L	63	54	2,040	11.00
4752 Line Set Type 1M	58	49	1,830	10.00
<b>5102 Modem Attachment Base—Auto-Answer</b>				
4761 Line Set Type 1P	69	59	2,255	16.00
<b>3500 Duplex Data Attachment Base</b>				
4754 Line Set Type 1X	83	71	2,635	2.50
4755 Line Set Type 1Y	103	88	3,275	15.00
	96	82	3,060	12.50
<b>4700 Line Interface Base Type A1</b>				
(can also be used with all line Sets under LIB 1):				
4717 Line Set Type 1G	25	21	816	1.50
4719 Line Set Type 1J	83	71	2,635	8.50
4702 Line Interface Base Type 2:	89	76	2,850	3.00
4721 Line Set Type 2A	25	21	816	1.00
4703 Line Interface Base Type 3:	63	54	2,040	5.00
4731 Line Set Type 3A	78	66	2,465	3.00
4732 Line Set Type 3B	49	42	1,660	2.00
4704 Line Interface Base Type 4:	49	42	1,660	4.00
4741 Line Set Type 4A	89	76	2,850	4.50
4742 Line Set Type 4B	89	76	2,850	7.00
4743 Line Set Type 4C	89	76	2,850	7.00
4708 Line Interface Base Type 8:	78	66	2,465	2.00
5103 Modem Attachment Base—1200 bps	49	42	1,660	2.00
4781 Line Set Type 8A	19	16	630	3.50
4782 Line Set Type 8B	25	21	840	5.50
4785 Line Set Type 8C	54	46	1,005	16.00
4786 Line Set Type 8D	60	51	1,120	17.00
4709 Line Interface Base Type 9	180	153	5,695	9.50
5000 Line Interface Base Type 10	49	42	1,660	3.00
4784 Line Set Type 10A	115	98	3,655	8.00
4650 Business Machines Clock	12	10	408	1.00
<b>Features for Remote Concentrator—</b>				
3620 Extended Environment	25	21	816	N/C
6250 Remote Power Off	12	10	408	.50
6260 Remote Program Loader	194	165	6,120	35.00

\* Includes monthly maintenance.

\*\*Single-Use Charge, one time

NC—No Charge. ■



# IBM 3704 Communications Controller



## MANAGEMENT SUMMARY

The 3704 Communications Controller appears to be more than ready for the kind of boost recently given its big brother, the 3705 (C17-491-101), with the announcement of Version II in November 1975. But no such announcement has been forthcoming for the 3704 to date, and its hard-wired predecessor, the 2701 controller is still available. Future enhancement of the 3704 will likely involve withdrawal of the 2701 and the addition of "Version II" type features.

The 3704 was announced in February 1973, and first delivery was in May 1973. Since that time, it has undergone several price changes, but no product changes. In the present price/performance spectrum, the 3704 is less expensive and more flexible than the 2701. On the other hand, two 3704's are required for equivalence with one 3705, and the pair would be more expensive and less flexible than the single 3705.

Essentially a reduced version of the 3705 with the same software support and communications line and discipline possibilities, the 3704 can handle up to 32 lines operating at up to 7200 bits per second. (Additionally, a 9600 bps line rate is available from IBM on a RFQ basis.) A limited capability (one or two lines) is provided for accommodating high-speed lines at up to 50,000 bits per second. With the appropriate software control program, the 3704 can emulate a hard-wired 270X controller, perform front-end processing for an IBM System/370 computer system, or act as a remote concentrator for multiple low-speed communications lines.

The decision between the 3704 and 3705 is easy to make. For configurations that can be satisfied by either the 3704 or 3705, the 3704 is more economical. For configurations just beyond the capability of one 3704, a single 3705 is more economical than two 3704's. One more point is worth noting: if a great deal of pre- and/or post-processing

A programmable front-end processor for IBM System/360 or 370 available with up to 64K bytes of memory supporting a maximum of 32 communications lines.

The system is offered as a small version of the IBM 3705 or as a replacement for the older IBM 2701.

Options include remote or local operation, alternate connection to two computers, and a variety of line combinations. Transmission can be asynchronous or synchronous, half- or full-duplex at 600 to 50,000 bps.

The short term monthly rental for a Model A1 (16 bytes) with eight line capability is approximately \$1,200 per month, including maintenance.

A Model A3 (48K bytes) with 32 line capability rents for approximately \$2,300 per month, including maintenance.

## CHARACTERISTICS

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

**DATE OF ANNOUNCEMENT:** February 1973.

**DATE OF FIRST DELIVERY:** May 1973.

**NUMBER DELIVERED TO DATE:** Information not available.

**SERVICED BY:** International Business Machines Corporation.

## CONFIGURATION

A 3704 Communications Controller is composed of:

- The basic 3704 model (A1 through A4), which includes the central control unit, main memory, and space for all interfaces between the central control unit and communications and between the control unit and the host computer.
- One Channel Adapter or Remote Program Loader.
- One Scanner.
- One or two Line Interface Bases.
- Line Sets, which provide the interface for modems or directly with the communications lines.

## IBM 3704 Communications Controller

of data in the communications processor is desired beyond simple 270X emulation, the 64K-byte limitation on the 3704 may force a move to the 3705 even though the 3704 could be physically configured to accommodate the number of lines anticipated.

### USER REACTION

Datapro conducted a survey of users of data communications processors and controllers in December 1975. A total of 63 users responded with ratings and comments on the 3704 representing a total of 71 systems installed.

All but three of the 63 users reported using their units to emulate IBM 270X hard-wired controllers. (The other three employed the 3704 in remote concentration.) Only 54 respondents (representing 65 units) identified the computers with which their controllers were used. Of the 65 units, 59 were used with System/370 computers (26 on Model 145, 19 on Model 158, and 14 on various other models), and only 6 were used with System/360's. The average number of terminals serviced per line was 4.1, including both multi-drop leased lines and multiple terminals sharing the same switched telephone network port. The average number of lines per controller was 5.5.

The users' ratings were as follows:

	Excellent	Good	Fair	Poor	WA*
Overall satisfaction	27	30	5	0	3.4
Ease of installation	30	21	11	1	3.3
Throughput	17	42	2	0	3.2
Hardware reliability	36	25	1	1	3.5
Promptness of maintenance	28	31	4	0	3.4
Quality of maintenance	31	25	6	1	3.4
Software	14	28	14	6	2.8
Technical support	19	22	18	4	2.9

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

The pattern of these results is very similar to that for the 3705 (Report 70D-491-31), as well as to the previous year's survey results for the 3704.

Users were also asked to make specific comments about the advantages or disadvantages they considered significant. The majority of favorable comments cited the reliability, reconfiguration flexibility, and cost-effectiveness of the 3704 when compared to the multiple 2701's it replaced. Seven users commented that IBM's technical support was good, although three others expressed dissatisfaction with the training they received. Documentation and diagnostics received equal numbers of good and bad comments (three each).

The most numerous (18) and negative comments were that the software was poor in the area of emulation, leaving too much load on the host CPU. Users complained that throughput suffered and diagnostics did not help to uncover hardware failures. The lack of NCP was only mentioned once; but six users took time to express concern about a poor maintenance system, which takes

A Two-Channel Switch feature permits the 3704 to be connected to two channels of the same processor or to two different System/360 or System/370 processors. Only one path can be active at a time; selection of the active path is made through a switch on the console.

Physically, the 3704 occupies only one cabinet in any configuration. It can be configured to serve as a front-end processor connected directly to a System/360 or System/370 input/output channel or as a remote concentrator communicating over a leased line with another 3704/3705 that is connected directly to the host processor.

The four models of the 3704 provide a main memory capacity of 16K, 32K, 48K, or 64K bytes.

The selection of the Type 1 or Type 2 Scanner is primarily a configuration decision. Type 2 is used only with Line Interface Base A1; Type 1 is used with all other LIB's. The Type 1 requires the program to perform character assembly, while the Type 2 includes additional hardware to perform character assembly prior to transferring data to the controller.

Other configuration details are completely stated in the accompanying table. In general, maximum configuration possibilities can be summed up as follows:

- Up to 32 half-duplex asynchronous or synchronous lines operating at up to 7200 bits per second; or
- Up to 16 full-duplex synchronous or asynchronous lines operating at up to 7200 bits per second; or
- Up to 2 half-duplex synchronous lines operating at up to 50,000 bits per second plus up to 8 half-duplex or 4 full-duplex asynchronous or synchronous lines operating at up to 7200 bits per second.

Use of Line Sets including internal modems may reduce these maximums.

**CONNECTION TO HOST COMPUTER:** Used as a local unit, the 3704 can be connected to a byte multiplexer channel of an IBM System/360 Model 30 (32K) or larger, or an IBM System/370 Model 115 through 195. Only one subchannel is used in the NCP mode; in the EP (270X emulation) mode, one subchannel is used for each line terminated.

As a remote concentrator, the 3704 communicates over a leased line with a local 3704 or 3705. Transmission can be full-duplex at up to 7200 bits per second, using Line Set 1H, or half-duplex at up to 50,000 bits per second, using Line Set 1G.

### TRANSMISSION SPECIFICATIONS

The accompanying table summarizes the capabilities of the 3704 for accommodating various types of communications lines and techniques.

### SOFTWARE

The program stored in memory controls all functions of the 3704. Many functions such as control character recognition and error procedures are defined and controlled by software. In previous, hard-wired controllers, such as the IBM 2701, 2702, and 2703, these functions were fixed once a particular set of adapters was selected. The 3704 is not totally independent, however. Functions are executed in response to commands issued by the host processor. Indeed, all control ultimately resides with the host processor, including program loading.

### IBM 3704 Communications Controller

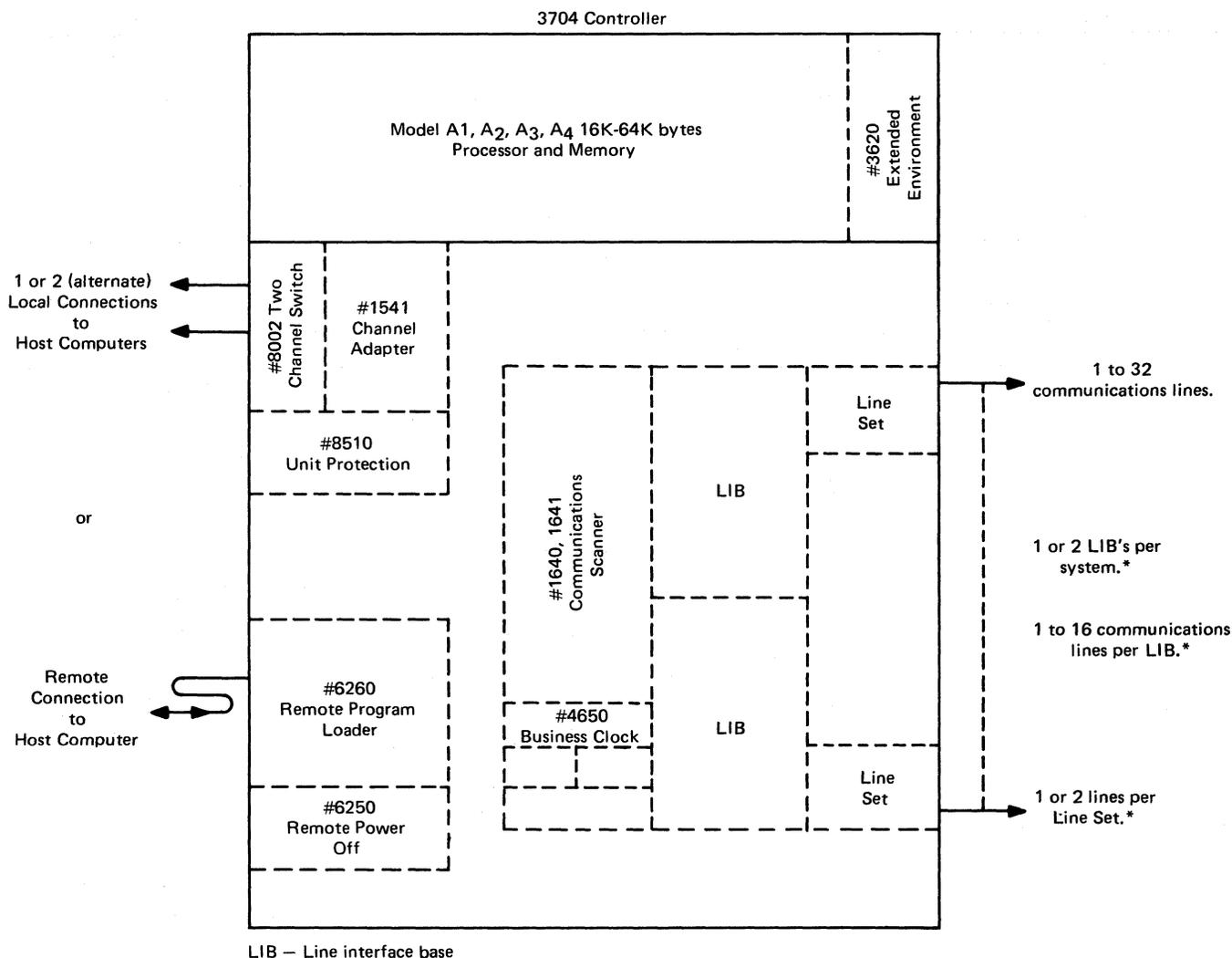
#### COMMUNICATIONS LINES HANDLED BY THE IBM 3704

Type of Interface	LIB	Line Sets per LIB	Line Set	Lines per Line Set	Speed, bps	Transmission			Comments
						Timing	Mode	Line	
External RS-232C modem	Type 1	8	1A	2	Up to 1200	Asynchronous	Half-duplex	Leased or switched	
	Type A1	4	1A						
	Type 1	8	1B	1	Up to 1200	Asynchronous	Full-duplex	Leased	
	Type A1	4	1B						
	Type 1	8	1D	2	Up to 7200	Asynch./synch.	Half-duplex	Leased or switched	
	Type A1	4	1D						
	Type 1	8	1H	1	Up to 7200	Asynch./synch.	Full-duplex	Leased	
External wide-band modem	Type A1	2	1G	1	19.2, 40.8, or 50K	Synchronous	Half-duplex	Leased or switched	The two 1G and/or 1J Line Sets are in addition to the four 1A, 1B, 1C, 1D, 1E, 1F, and/or 1H Line Sets on LIB A1.
External Mil 188C modem	Type A1	2	1J	1	Up to 50K	Asynch./synch.	Half-duplex	Leased	
Local attachment	Type 1	8	1C	2	Up to 1200	Asynchronous	Half-duplex	—	Maximum cable length is 200 ft.
	Type A1	4	1C						
	Type 1	8	1F	2	Up to 2400	Synchronous	Half-duplex	—	
	Type A1	4	1F						
Automatic dialing; RS-366	Type 1	8	1E	2	—	—	—	Switched	For attachment of external dialing units.
	Type A1	4	1E						
Telegraph; 20, 40, or 62.5 ma current loop	Type 2	4	2A	2	Up to 75	Asynchronous	Half-duplex	Leased	For attachment to AT&T 83B2/83B3, Western Union Plan 115A, or IBM terminals with Telegraph feature.
Internal modems or adapters (require no external modems)	Type 1	2*	1L	1	2400 or 1200	Synchronous	Half-duplex	Leased	1L includes point-to-point modems; 1M, multipoint modems. These Line Sets require Modem Attachment Base—2400 bps, which replaces 1 Line Set appearance on LIB and serves 2 1L and/or 1M Line Sets. Equivalent to Line Sets 5A and 5B on 3705.
	or	2*	1M	1	2400 or 1200	Synchronous	Half-duplex	Leased	
	Type A1								
	Type 1	2*	1P	1	2400 or 1200	Synchronous	Half-duplex	Switched	
	or								
	Type A1								
	Type 1	1*	1Q	1	2400 or 1200	Synchronous	Half-duplex	Switched	
	or								
	Type A1								
	Type 1	2*	1X	1	2400 or 1200	Synchronous	Full-duplex	Leased	
	or	2*	1Y	1	2400 or 1200	Synchronous	Full-duplex	Leased	
	Type A1								
	Type 3	3	3A	2	134.5	Asynchronous	Half-duplex	2-wire private	
3		3B	2	134.5	Asynchronous	Full-duplex	4-wire private		
Type 4	1	4A	2	Up to 600	Asynchronous	Half-duplex	2-wire private	IBM Limited Distance Type 2 Line Adapters; 8.25 wire miles maximum.	
	1	4B	2	Up to 600	Asynchronous	Half-duplex	Leased		
	1	4C	2	Up to 600	Asynchronous	Full-duplex	Leased		
Type 8	4	8A	1	1200 or 600	Synchronous	Half-duplex	Leased	IBM Leased Line, Line Adapters, 2-wire.	
	4	8B	1	1200 or 600	Synchronous	Half-duplex	Switched		
	4	8C	1	300	Asynchronous	Half-duplex	Leased		
	4	8D	1	300	Asynchronous	Half-duplex	Switched		
Type 9	1	—	1	Up to 1200	Asynch./Synch.	Half-duplex	Switched	8B and D modems include auto-answer, 8C and D modems provide a bidirectional interrupt signal for IBM 3767's operating as 2741's. One Modem Attachment Base—1200 bps is required for each pair of Line Sets. 8C and D are equivalent to 3705 12A and B Line Sets. Auto-dial and auto-answer modems.	
Type 10	3	10A	1	Up to 1200	Synchronous	Full-duplex	Leased		

\*These are also the maximums for the 3704 system; only one LIB Type 1 can be equipped with these Line Sets. Line Sets 1L/1M, 1P, 1Q, and 1X/1Y are mutually exclusive. Line Sets 1L/1M and 1X/1Y are mutually exclusive with the Remote Program Loader feature. A 3704 system can include one or two Type 1, 2, 3, 4, 8, 9, or 10 LIB's in any combination. If a Type A1 LIB is installed, no other LIB can be installed.

## IBM 3704 Communications Controller

### IBM 3704 CONFIGURATION



LIB - Line interface base

\*See accompanying chart for characteristics of available LIB's and Line Sets.

▷ the entire 3704 off-line for frequent EC's and upgrades, and about the drawn-out initialization and loading process due to overall complexities.

Certain areas which were highly satisfactory to several users were equally unsatisfactory to others. We believe this is indicative of the diverse reasons for the installation of data communications processors in general and the IBM 3704 in particular. □

▶ The software provided for the 3704 is the same as provided for the 3705 (see Report C17-491-101). Operational differences will exist primarily because of the smaller main memory of the 3704, which will limit the number of lines that can be accommodated at any one time.

**REMOTE CONCENTRATION:** When the 3704 is configured as a remote concentrator, the Remote Program Loader feature replaces the Channel Adapter. This feature permits loading NCP/V5 into the 3704 main memory over the communications line connecting the 3704 with a 3704 or 3705 at the host computer site. The line can be a

full-duplex leased voice-band line operating synchronously at up to 7200 bps (Line Set 1H) or a half-duplex wide-band facility operating at up to 50,000 bps (Line Set 1G). All data transferred between the remote and local 370X pair is transmitted over this line. The Remote feature also permits running the diagnostic aids at the remote site without involving the host computer.

Configuration of a remote concentrator arrangement follows the normal 3704 rules as long as the above requirements are satisfied. The maximum number of lines that can be connected to service terminals is, of course, reduced.

Several other features are available to supplement remote location of a 3704. Extended Environment allows operation of the 3704 at temperatures between 50 and 100 degrees F. Remote Power Off includes a capability for turning the power off in response to a command received over the communications line; power can be restored only from the unit's control panel. Unit Protection provides a physical locking capability for the 3704's control panel that prevents any switches except Power On and Power Off from being altered without a key; this feature can also be used with a locally connected 3704. ▶

## IBM 3704 Communications Controller

▶ The minimum 3704 model that can include the remote concentrator feature of NCP/VS is the A3 (48K bytes).

### PRICING

The 3704 can be acquired by purchase, short-term rental, or under IBM's Extended Term Lease Plan. Maintenance charges are included in the figures for both the short-term rental and Extended Term Plan; a separate arrangement is available for purchased units.

Under the short-term plan, overtime usage is charged at 10 percent of the regular hourly rates. Under the Extended Term Plan, there are no overtime charges. The initial lease period for the Extended Term Plan is 24 months and is extendable indefinitely in increments of one year or one time for less than a year. However, charges for early termination of the Extended Term Plan range from two to five times the monthly rental, depending on how long the lease has been in effect; equipment can be upgraded without incurring termination charges.

	Monthly Rental*			Monthly Maint.
	Short Term	Extended Term	Purchase	
<b>3704 Communications Controller—</b>				
Model A1 (16K bytes)	\$ 711	\$605	\$22,100	\$135.00
Model A2 (32K bytes)	841	716	24,860	162.00
Model A3 (48K bytes)	971	826	27,620	189.00
Model A4 (64K bytes)	1,100	936	30,380	216.00
<b>3600 Expansion Feature</b>	12	10	408	0.50
<b>8510 Unit Protection</b>	35*	35*	35	N/C
<b>1541 Channel Adapter Type 1</b>	142	121	4,505	21.00
<b>8002 Two-Channel Switch</b>	63	54	2,040	3.50
<b>Communications Scanners—</b>				
1641 Type 1	25	21	816	1.50
1642 Type 2	129	110	4,080	5.00
<b>Communications Line Attachment Features—</b>				
<b>4701 Line Interface Base Type 1:</b>				
4711 Line Set Type 1A	25	21	816	1.50
4712 Line Set Type 1B	36	31	1,235	2.00
4713 Line Set Type 1C	36	31	1,235	2.00
4714 Line Set Type 1D	36	31	1,235	2.00
4715 Line Set Type 1E	103	88	3,275	7.50
4716 Line Set Type 1F	63	54	2,040	2.50
4717 Line Set Type 1H	103	88	3,275	7.50
4718 Line Set Type 1I	109	93	3,485	14.00
4719 Line Set Type 1J	303	258	9,350	23.00
<b>5101 Modem Attachment Base—2400 bps</b>				
4751 Line Set Type 1L	63	54	2,040	11.00
4752 Line Set Type 1M	58	49	1,830	10.00
<b>5102 Modem Attachment Base—Auto-Answer</b>				
4761 Line Set Type 1P	69	59	2,255	16.00
<b>3500 Duplex Data Attachment Base</b>				
4754 Line Set Type 1X	83	71	2,635	2.50
4755 Line Set Type 1Y	103	88	3,275	15.00
4756 Line Set Type 1Z	96	82	3,060	12.50
<b>4700 Line Interface Base Type A1</b>	25	21	816	1.50
(can also be used with all line Sets under LIB 1):				
4717 Line Set Type 1G	83	71	2,635	8.50
4719 Line Set Type 1J	89	76	2,850	3.00
<b>4702 Line Interface Base Type 2:</b>				
4721 Line Set Type 2A	25	21	816	1.00
4722 Line Set Type 2B	63	54	2,040	5.00
<b>4703 Line Interface Base Type 3:</b>				
4731 Line Set Type 3A	78	66	2,465	3.00
4732 Line Set Type 3B	49	42	1,660	2.00
4733 Line Set Type 3C	49	42	1,660	2.00
<b>4704 Line Interface Base Type 4:</b>				
4741 Line Set Type 4A	49	42	1,660	4.00
4742 Line Set Type 4B	89	76	2,850	4.50
4743 Line Set Type 4C	89	76	2,850	7.00
4744 Line Set Type 4D	89	76	2,850	7.00
<b>4708 Line Interface Base Type 8:</b>				
4781 Line Set Type 8A	78	66	2,465	2.00
4782 Line Set Type 8B	49	42	1,660	2.00
4783 Line Set Type 8C	19	16	630	3.50
4784 Line Set Type 8D	25	21	840	5.50
4785 Line Set Type 8E	54	46	1,005	16.00
4786 Line Set Type 8F	60	51	1,120	17.00
<b>4709 Line Interface Base Type 9</b>	180	153	5,695	9.50
<b>5000 Line Interface Base Type 10</b>				
4784 Line Set Type 10A	49	42	1,660	3.00
4785 Line Set Type 10B	115	98	3,655	8.00
<b>4650 Business Machines Clock</b>	12	10	408	1.00
<b>Features for Remote Concentrator—</b>				
3620 Extended Environment	25	21	816	N/C
6250 Remote Power Off	12	10	408	.50
6260 Remote Program Loader	194	165	6,120	35.00

\* Includes monthly maintenance.

\*\*Single-Use Charge, one time

NC—No Charge. ■

