

# Magnuson M80 Series

## MANAGEMENT SUMMARY

The Magnuson M80 Series of plug-compatible mainframes (PCMs) consists of six models that offer improved performance, lower cost, greater flexibility, and more reliability than their IBM competition, the 4300 Series. Magnuson's latest system, the M80/30, reflects the company's commitment to address the entire 4300 product line, not just the high or low end. Datapro's 1981 User Ratings of Computer Systems clearly indicates what DP users think of Magnuson computers: this year Magnuson was rated first in overall satisfaction by mainframe users.

Six years ago, when Amdahl Corporation paved the way for the PCM industry with its 470 Series, the idea of using a non-IBM computer to execute IBM-type applications and run IBM operating systems was a scary proposition. The idea persisted, the products proved themselves, and today several firms are competing aggressively in the PCM arena. With over 300 systems installed, a profitable financial picture, and a definite push toward more microcode-based system enhancements, Magnuson has tenaciously staked out its position in the marketplace.

Magnuson's philosophy is to manufacture mid-range computer systems that 1) have improved price/performance over comparable IBM systems, 2) use readily-available LSI components with innovative systems architectures, 3) provide greater flexibility and expandability through modular design, 4) have better reliability and maintainability than the competition, and 5) offer total compatibility with IBM through extensive use of microcode. It appears this philosophy has been well-founded, as Magnuson enjoys its reputation as one of the leaders in the PCM industry.

Magnuson's M80 Series placed first in overall user satisfaction among mainframe computer users in Datapro's 1981 User Ratings of Computer Systems. The six models in the M80 family are plug-compatible with comparable IBM 4300 Series processors, and are all field-upgradeable.

**MODELS:** M80/30, M80/31, M80/32, M80/42, M80/43, M80/44.

**CONFIGURATION:** The M80 systems have from 0.5 to 16 megabytes of main memory, expandable in either 0.5- or 1-megabyte increments (depending on model), and from 2 to 16 I/O channels.

**COMPETITION:** IBM 4331-1, 4331-2, 4341-1, and 4341-2; Cambex 1600 Series; Control Data Omega/480 Series; IPL 4400 Series; Nanodata QMX 6300 Series; and NAS AS/3000 and AS/5000 Series.

**PRICE:** Base purchase prices range from \$86,050 (M80/30) to \$297,000 (M80/44).

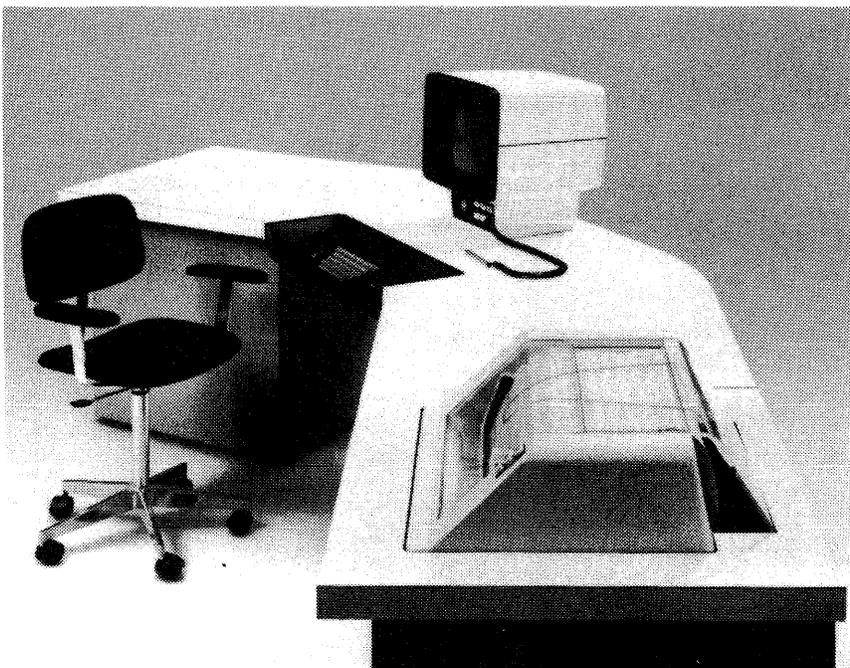
## CHARACTERISTICS

**MANUFACTURER:** Magnuson Computer Systems, 2902 Orchard Park Way, San Jose, CA 95134. Telephone (408) 946-8100.

**CURRENT MODELS:** M80/30, M80/31, M80/32, M80/42, M80/43, and M80/44.

**PRIOR MODELS:** M80/3 and M80/4.

**NUMBER INSTALLED TO DATE:** Over 300 worldwide.



All six of the current Magnuson processors are housed in this compact cabinet, which contains the CPU, console display and keyboard, up to 4 megabytes of memory, and up to 8 I/O channels. Larger configurations require an add-on Expansion Module that adds 26 inches to the overall cabinet width.

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### CHARACTERISTICS OF THE M80 SERIES PROCESSORS

	M80/30	M80/31	M80/32
<b>SYSTEM CHARACTERISTICS</b>			
Relative performance level	0.66	1.00	1.25
Data announced	8/81	6/80	3/79
Date of first delivery	4th qtr. 1981	7/80	2nd qtr. 1980
Virtual storage capability	Std.	Std.	Std.
Multiprocessor configurations	No	No	No
Principal operating systems	OS/VS1, SVS, MVS, DOS/VS, DOS/VSE, VM/370	OS/VS1, SVS, MVS, DOS/VS, DOS/VSE, VM/370	OS/VS1, SVS, MVS, DOS/VS, DOS/VSE, VM/370
Upgradable to	M80/31, M80/32, M80/42, M80/43, M80/44	M80/32, M80/42, M80/43, M80/44	M80/42, M80/43, M80/44
<b>MAIN STORAGE</b>			
Type	NMOS (64K-bit)	NMOS (64K-bit)	NMOS (64K-bit)
Cycle time, nanoseconds	600	600	600
Bytes fetched per cycle	8	8	8
Minimum capacity, bytes	524,288	1,048,576	1,048,576
Maximum capacity, bytes	8,388,608	8,388,608	8,388,608
Increment size, bytes	524,288	1,048,576	1,048,576
Interleaving	No	No	No
Error checking and correction	Std.	Std.	Std.
<b>PROCESSOR</b>			
Processor cycle time, nanoseconds	100	100	100
Control storage:			
Capacity, bytes	65,536*	65,536*	65,536*
Cycle time, nanoseconds	100	100	100
Buffer (cache) storage:			
Capacity, bytes	NA	NA	16,384 (opt.)
Cycle time, nanoseconds	NA	NA	50
<b>I/O CHANNELS</b>			
Number of channels:			
Standard	2	3	3
Maximum	6	6	6
Subchannels per channel (max.)	128	128	128
Control units per channel (max.)	8	8	8
Maximum channel data rates:			
Burst mode, bytes/second	2,500,000	2,500,000	3,000,000
Byte mode, bytes/second	100,000	100,000	100,000
Maximum aggregate data rate, bytes/second	13,300,000	13,300,000	13,300,000

\*Control storage is expandable to a maximum of 256K bytes in all models.

#### ➤ PROCESSORS AND MAIN MEMORY

The six current M80 systems can serve as effective alternatives to any of the mid-range IBM computers, from the 370/138 and 4331 through the 370/158 and 4341-2. All six of the Magnuson systems use the same basic central processor, which has a machine cycle time of 100 nanoseconds in the M80/30, /31 and /32, 50 nanoseconds in the M80/42, /43, and /44, and a main memory cycle time of 600 nanoseconds.

The M80/30, M80/31, and M80/32 are the company's "entry-level" systems. Magnuson's newest model, the M80/30, costs about the same as the IBM 4331 Model Group 1 and has about 50 percent more performance than it. Both the M80/31 and M80/32 offer increased processor performance over IBM's 4331 Model Group 2. The M80/31, at \$135,000, costs about 10 percent less than the 4331-2, yet offers almost 20 percent more power. The M80/32, at \$170,000, costs about 13 percent more and has 50 percent more power than the 4331-2. Both systems have

#### ➤ DATA FORMATS

All data formats, instruction formats, and other architectural features completely follow the IBM System/370 functional architecture.

**BASIC UNIT:** 8-bit byte. Each byte can represent 1 alphanumeric character, 2 BCD digits, or 8 binary bits. Two consecutive bytes form a "halfword" of 16 bit, while 4 consecutive bytes form a 32-bit "word".

**FIXED-POINT OPERANDS:** Can range from 1 to 16 bytes (1 to 31 digits plus sign) in decimal mode; 1 halfword (16 bits) or 1 word (32 bits) in binary mode.

**FLOATING-POINT OPERANDS:** 1 word, consisting of 24-bit fraction and 7-bit hexadecimal exponent, in "short" format; 2 words, consisting of 56-bit fraction and 7-bit hexadecimal exponent, in "long" format; or 4 words in "extended precision" format.

**INSTRUCTIONS:** 2, 4, or 6 bytes in length, specifying 0, 1, or 2 memory addresses, respectively.

**INTERNAL CODE:** EBCDIC (Extended Binary-Coded Decimal Interchange Code).

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## CHARACTERISTICS OF THE M80 SERIES PROCESSORS

	M80/42	M80/43	M80/44
<b>SYSTEM CHARACTERISTICS</b>			
Relative performance level	1.80	2.10	2.70
Date announced	3/79	3/79	11/80
Date of first delivery	2nd qtr. 1980	2nd qtr. 1980	3rd qtr. 1981
Virtual storage capability	Std.	Std.	Std.
Multiprocessor configurations	No	No	No
Principal operating systems	OS/VS1, SVS, MVS, DOS/VS, DOS/VSE, VM/370	OS/VS1, SVS, MVS, DOS/VS, DOS/VSE, VM/370	OS/VS1, SVS, MVS, DOS/VS, DOS/VSE, VM/370
Upgradable to	M80/43, M80/44	M80/44	—
<b>MAIN STORAGE</b>			
Type	NMOS (64K-bit)	NMOS (64K-bit)	NMOS (64K-bit)
Cycle time, nanoseconds	600	600	600
Bytes fetched per cycle	8	8	8
Minimum capacity, bytes	2,097,152	2,097,152	2,097,152
Maximum capacity, bytes	16,777,216	16,777,216	16,777,216
Increment size, bytes	1,048,576	1,048,576	1,048,576
Interleaving	No	No	No
Error checking and correction	Std.	Std.	Std.
<b>PROCESSOR</b>			
Processor cycle time, nanoseconds	50	50	50
Control storage:			
Capacity, bytes	65,536*	65,536*	65,536*
Cycle time, nanoseconds	100	100	100
Buffer (cache) storage:			
Capacity, bytes	16,384 (std.)	16,384 (std.)	16,384 (std.)
Cycle time, nanoseconds	50	50	50
<b>I/O CHANNELS</b>			
Number of channels:			
Standard	3	6	6
Maximum	16	16	16
Subchannels per channel (max.)	128	128	128
Control units per channel (max.)	8	8	8
Maximum channel data rates:			
Burst mode, bytes/second	3,000,000	3,000,000	3,000,000
Byte mode, bytes/second	100,000	100,000	100,000
Maximum aggregate data rate, bytes/second	13,300,000	13,300,000	13,300,000

\*Control storage is expandable to a maximum of 256K bytes in all models.

▷ one megabyte of main memory as standard, which can be expanded to eight megabytes in one-megabyte increments. The new M80/30 has 512K bytes of memory as standard, which can be expanded to eight megabytes in 512K- or one-megabyte increments. Three high-speed I/O channels are standard on both the M80/31 and M80/32, expandable to six, which can be configured as either byte or block multiplexer channels. The M80/30 has two channels as standard, and can be expanded to six channels. A 16K-byte buffer is an option on all three models. The processor cycle time is 100 nanoseconds and the memory cycle time is 600 nanoseconds in all three models. The M80/30 is field upgradeable to the M80/31, which is field upgradeable to the M80/32. The M80/32 can in turn be upgraded to any of the larger models.

Magnuson's three higher-performance models are the M80/42, M80/43, and the top-end M80/44, which competes head-on with IBM's 4341 Model Group 2. The M80/42 and /43 bracket IBM's 4341 Model Group 1 in price but both have greater performance than the 4341-I. ▷

▶ **MAIN STORAGE**

**STORAGE TYPE:** MOS RAM (i.e., metal oxide semiconductor random-access memory), using 16K- or 64K-bit chips.

**CAPACITY:** Model M80/30—512K to 8192K bytes in 512K- or 1024K-byte increments; Models M80/31 and /32—1,024K to 8192K bytes in 1024K-byte increments; Models M80/42, /43, and /44—2,048K to 16,384K bytes in 1,024-byte increments.

**CYCLE TIME:** 600 nanoseconds in all models. Main storage fetch width is 8 bytes (64 bits).

**CHECKING:** Error checking and correction (ECC), a standard feature, detects and corrects all single-bit main storage errors and detects (but cannot correct) all double-bit and most multiple-bit errors. Parity checking verifies data transfers that do not involve main storage.

**STORAGE PROTECTION:** The Store and Fetch Protection features, which guard against inadvertent overwriting and/or unauthorized reading of data in specified 2048-byte blocks of storage, are standard in all models. ▶

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➤ Both the M80/42 and /43 have two megabytes of memory, which is expandable up to 16 megabytes in one-megabyte increments. Three channels are standard, and up to 16 can be provided. Both systems have 16K bytes of buffer storage as standard. The M80/42 costs \$210,000, or about 18 percent less than the IBM 4341-1, and has about 10 percent more processing power. The M80/43, at \$270,000, costs about 5 percent more than the 4341-1, and has about 30 percent more power. Both are fully field-upgradeable.

Magnuson's most powerful system, was the M80/44, was announced in November, 1980. It is rated equal in performance to IBM's 4341-2, yet at \$297,000 costs about 23 percent less. The M80/44 has from two to 16 megabytes of main memory, compared with two to eight megabytes in the 4341-2. The number of I/O channels ranges from six to 16 in the M80/44, compared to only six in the 4341-2. The M80/44 also features a 16K-byte buffer storage unit.

Additional memory for all Magnuson systems is priced at \$15,700 per megabyte—the same price as IBM's 4300 Series. A 512K-byte increment, available only on the new M80/30, costs \$7,850. Additional I/O channels are priced at \$5,600 each for all systems.

A noteworthy feature of the M80 Series is the fact that any model can readily be upgraded to any higher model within the series. Field upgrades can be accomplished by simply replacing circuit boards rather than entire processors. The cost of an upgrade is equal to the difference in purchase price between the two models.

The M80 channels can support up to 8 control units per channel. Each control unit can in turn support up to 16 devices. The high-speed block multiplexer channels can accommodate data transfer rates up to 2.5 megabytes per second in all models. Data streaming can be supported on two channels per system. Channels configured as byte multiplexers have data rates up to 100K bytes per second in all models. The maximum aggregate data rate for all systems is 13.3 megabytes per second. Up to three channel-to-channel adapters can be packaged in a single frame, when loosely-coupled multiprocessor configurations are desired. Channel command retry, channel indirect addressing, and channel one-level addressing are all standard system features.

### TECHNOLOGY

The M80 Series hardware is based on a highly modular design concept, called "Strategic Architecture," that yields considerably more expandability and flexibility than the competitive systems from IBM and most other manufacturers. Magnuson claims that its Strategic Architecture removes most of the traditional constraints on system expansion, performance range, and software compatibility, in addition to reducing system costs, facilitating upgrades, improving reliability, and making the system easier to use and maintain.

Magnuson's equipment is modular in structure as well as in function. This means that the various processor ➤

### ➤ CENTRAL PROCESSORS

The Magnuson M80 processors are designed to provide total compatibility with IBM System/360 and System/370 processors except in the cases of: 1) programs that use model-dependent data; 2) programs that use the ASCII bit (PSW bit 12); 3) programs that require features or devices which are not on the M80; and 4) programs that depend upon retention of valid data after a power-down/power-up sequence. Software written for System/360 or System/370 computers should also be checked for: 1) programs that depend on inherent S/360 or S/370 timing; 2) programs that require S/360 or S/370 model-independent features; and 3) programs that access main storage locations 128-511 (decimal) after a diagnostic logout.

**CONTROL STORAGE:** All M80 Series processor operations are controlled by microprograms that reside in high-speed control storage. The standard control storage capacity is 64K bytes in all current models, and is sufficient to hold the microcode required for the System/370 Universal Instruction Set and all of the standard software assist features. Control storage can be expanded as required to a maximum of 256K bytes in all models.

The microprograms are loaded into control storage by means of a diskette unit called the Console File. Redundant diskette drives are provided for increased system availability. Magnuson supplies read-only diskettes containing the microcode required for a specific M80 configuration, as well as other diskettes containing system diagnostics.

**REGISTERS:** Each of the M80 Series processors has sixteen 32-bit general-purpose registers, which can be used for indexing, base addressing, and as accumulators, plus four 64-bit floating-point registers.

**INSTRUCTION REPERTOIRE:** The System/370 Universal Instruction Set is standard in all M80 Series processors.

**INSTRUCTION TIMES:** Magnuson Systems rates its processors in terms of "relative performance" figures. Using Magnuson's ratings, with the M80/32 as a basis, here's how the Magnuson processors and comparable IBM 4300 Series models measure up:

Manufacturer	Model	Relative
Magnuson	M80/44	2.15
IBM	4341-2	2.15
Magnuson	M80/43	1.65
Magnuson	M80/42	1.40
IBM	4341-1	1.27
Magnuson	M80/32	1.00
Magnuson	M80/31	0.80
IBM	4331-2	0.67
Magnuson	M80/30	0.53
IBM	4331-1	0.36

**OPERATIONAL MODES:** The Extended Control (EC) and Extended Control Program Support (ECPS) features are standard on the M80 Series processors. As a result, all six models can operate in any of the following modes: Basic Control (for System/360 programs), Extended Control (for programs that require dynamic address translation), ECPS:VSI (which uses microcoding to improve system performance under the VSI operating system), ECPS:VM/370 (which provides improved system performance under VM/370), and ECPS:VSE mode, which uses microcoding to reduce overhead and improve system throughput under DOS/VSE.

**PROCESSOR FEATURES:** The following features are standard on all of the M80 processors: Advanced Control Program Support, Audible Alarm, Byte-Oriented Operand, ➤

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▷ subsystems are interconnected by means of a central bus rather than the usual maze of cabling. In this respect, the Magnuson design represents an extension of the bus-structured architecture of many contemporary mini-computers and microcomputers. The entire system consists of a relatively small number of printed-circuit boards, and the same family of boards is used in all the current M80 Series models.

The use of readily available "off-the-shelf" components is a key element in Magnuson's strategy. In the current M80 Series equipment, the company is using standard TTL and ECL logic circuits and NMOS RAM memory, made up of 16K or 64K chips depending on overall memory size. Magnuson emphasizes, however, that when higher-performance technologies become economical, they can readily be utilized by substituting card modules built with the new devices for the current cards.

A significant advantage of Magnuson's structural modularity is the fact that future advances in both hardware and software technology can readily be incorporated. For example, the Magnuson hardware is capable of addressing up to four billion bytes of main memory. Thus, as IBM removes the memory size limitation currently imposed by its system software, Magnuson users will be able to maintain IBM compatibility. The architecture also allows software functions to be incorporated into microcoded "firmware" for increased performance. Up to 256K bytes of control storage is available to hold microcoded system control and software assist functions, and only 32K bytes of this space is needed for the entire System/370 instruction set and Virtual Machine Assist features.

## SOFTWARE AND SUPPORT

All of the current Magnuson computers can utilize any of the following IBM operating systems: DOS/VS, DOS/VSE, OS/VS1, OS/VS2 (SVS or MVS), MVS/SE and MVS/SP (all releases), or VM/370. Virtual Machine Assist and Extended Control Program Support (ECPS) for DOS/VSE, OS/VS1, and VM/370 are standard features in all models.

Microcode-based system enhancements are also available from Magnuson. Direct Control permits direct connection of the IBM 1419 Magnetic Character Reader to an M80. MVS Extended Facilities supports all releases of MVS/SE and MVS/SP when running in an M80. IDMS Microcode Assist, the result of a joint effort with Cullinane Database Systems, Inc. is said to improve system performance when using the IDMS data base management system by about 10 percent.

In planning its strategy for winning a significant share of the PCM market, Magnuson has not overlooked the importance of customer support. The company has established its own support organization, with service offices currently located in 21 cities nationwide. ▷

▶ Channel Command Retry, Channel Indirect Addressing, Clock Comparator and CPU Timer, Console File, Control Registers, Doubleword Buffer, Dynamic Address Translation, Extended Control, Extended Control Program Support, Extended-Precision Floating Point, Interval Timer, Machine Check Handling, Program Event Recording, Storage Protection (Store and Fetch), System/370 Universal Instruction Set, Time of Day Clock, Virtual Machine Assist, ECPS/VSE Mode, Channel One-Level Addressing, CPU One-Level Addressing, and Move Inverse Instruction.

Optional features available for any of the M80 Series processors include: Channel-to-Channel Adapter, Direct Control, Integrated Console Printer, Light Pen, Remote Console, and additional main storage increments, control storage increments, and I/O channels. The M80/32 processor can optionally be equipped with the buffer (cache) storage that is standard on the M80/42, /43, and /44. Buffer storage is not available in the M80/30 and /31.

CONSOLE: The M80 system console is supplied with all of the central processor models. It consists of a control panel, keyboard, CRT display with optional light pen, the Console File (a pair of diskette drives used to load the M80 microcode and system diagnostics into control storage), and an optional console printer. The system console can operate in either of two modes, as selected during the initial microprogram load (IMPL) procedure.

- Display mode, in which the CRT and keyboard appear to the operating system as an IBM 3277 Model 2 Display Station with keyboard. This mode requires the Device-Independent Display Operator Console Support (DIDDOCS) software or its equivalent. If the optional console printer is included, it requires the Multiple Console Support (MCS) software or its equivalent and must be addressed separately as an IBM 3213 Console Printer.
- Printer-keyboard mode, in which the CRT, keyboard, and optional console printer appear to the operating system as an IBM 3215 Console Printer-Keyboard. This mode is supported by DOS, DOS/VS, OS, OS/VS, and VM/370.

The system console also contains a microprocessor for diagnostic functions and a remote data link facility that provides on-line communications with a remote console, such as the one at Magnuson's Technical Support Center at its Santa Clara headquarters. The data link enables personnel at the Support Center to operate the user's system remotely in order to diagnose problems.

PHYSICAL SPECIFICATIONS: The M80 processor is housed in a desk-high cabinet that can contain up to 4 million bytes of memory and 8 I/O channels. The add-on Expansion Module increases these capacities to 16 million bytes and 16 channels. The M80 models are also available in space-saving configurations that can occupy up to half the floor space of a comparable IBM 4300 system. Listed below are the dimensions and power requirements of the basic M80 processor (all models), the M80/E (basic processor with Expansion Module), and the optional console printer.

	M80	M80/E	Console Printer
<b>Dimensions:</b>			
Width, in (cm)	112 (285)	138 (351)	30 (76)
Depth, in (cm)	45 (114)	60 (152)	30 (76)
Height, in (cm)	30 (76)	30 (76)	30 (76)
Weight, lb (kg)	820 (372)	1196 (542)	245 (111)
<b>Power requirements:</b>			
Voltage	180-256	180-256	110±10%
Phases	3 (4-wire)	3 (4-wire)	1 (3-wire)
Frequency, Hz	50-60	50-60	50-60
Fan air flow, cfm	1284	2344	110
Heat output, BTU/hr	10,000	15,000	513

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➤ Magnuson supports its products by means of an innovative unbundled support program that provides local and remote maintenance for both hardware and system software. Local support for both hardware and software is provided by a Systems Support Representative (SSR). The local SSR is backed up by an on-line communications link between the customer's computer and a Technical Support Center at Magnuson's headquarters. This allows headquarters technical specialists to operate the computer and aid the on-site SSR in diagnosing and solving problems. Magnuson says that the remote maintenance facility, together with the reliability and easy maintainability of its equipment, make it practical for a single local representative to provide both hardware and software maintenance.

### USER REACTION

Magnuson was rated first in overall user satisfaction among mainframes in Datapro's 1981 User Ratings of Computer Systems. Quite an achievement for a relatively new company competing against the likes of Amdahl, IBM, and National Advanced Systems. Datapro received 18 user responses representing a total of 24 installed systems. The models were distributed as follows: M80/3-one, M80/4-eleven, M80/31-four, M80/32-six, M80/42-one, M80/43-one. Nine users purchased their systems, eight leased them from Magnuson, and one user employed a third-party leasing firm.

The most frequent users of the M80 were service bureaus, with four responses. Manufacturing and banking/finance were second with three each. Education and retail/wholesale were next with two each. With one response were government, media, and transportation. One user didn't specify business type.

The M80 most frequently replaced an IBM System/370, particularly Models 135, 145, 148, and 155. Other systems replaced were IBM System/360 Models 30, 40, 50, and 65. One lone user went from a National CSS timesharing service to an M80.

Financial and payroll/personnel headed the list of frequently used applications, followed by order processing/inventory control, and a fairly even distribution of banking, engineering, manufacturing, mathematics, purchasing, and sales distribution.

The M80 systems were configured with from one to eight megabytes of main memory, with only one user reporting over eight megabytes in use. The majority of users had over 1,200 megabytes of direct access storage, and the rest typically had from 600 to 1,200 megabytes. All systems were located in their firm's central processing site. Just about all Magnuson users had workstation/terminals installed at the central site, and about half had terminals installed in remote locations.

Magnuson users ran their applications most frequently under DOS/VS, followed by OS/VS1 and DOS/VSE. Five of these users were running in a VM/370 ➤

➤ Environmental requirements for all the above units are as follows: operating temperature range—60 to 90 degrees F. (15 to 32 degrees C.); relative humidity range—20 to 80 percent; maximum wet bulb temperature—78 degrees F. (25.5 degrees C.).

### INPUT/OUTPUT CONTROL

I/O CHANNELS: The M80 Series processors include from 2 to 6 standard channels and can have a maximum of either 6 or 16 channels, as detailed below:

<u>Model</u>	<u>Standard Channels</u>	<u>Optional Channels</u>	<u>Total Channels</u>
M80/30	2	4	6
M80/31	3	3	6
M80/32	3	3	6
M80/42	3	13	16
M80/43	6	10	16
M80/44	6	10	16

The channels can be configured as either block multiplexer or byte multiplexer channels, and the user can select any desired combination of the two types. Up to 8 control units can be connected to each channel. Moreover, each control unit can address up to 16 I/O devices. A unique (i.e., unshared) unit control word (UCW) is assigned to each attached I/O device and holds a dynamic record of the status of the I/O operation on the corresponding subchannel.

Channels configured as byte multiplexer channels can operate in either burst mode or byte mode, while channels configured as block multiplexer channels transfer data in burst mode only. Burst mode accommodates high-speed data transfers, whereas byte mode allows the byte multiplexer channel's single data path to be time-sliced in order to service multiple low-speed I/O devices operating simultaneously.

I/O DATA RATES: The maximum block multiplexer channel data rate is 3.0 million bytes per second for all models except the M80/30 and M80/31, which is 2.5 million bytes per second. The maximum data rate for byte multiplexer channels is 100,000 bytes per second for all models. The maximum aggregate data rate (for all channels operating simultaneously) is 13.3 million bytes per second for all models. IBM's Data Streaming feature can be supported on up to two channels.

SIMULTANEOUS OPERATIONS: Concurrently with computing, an M80 Series processor can control a maximum of one high-speed I/O data transfer operation on each block multiplexer channel and one low-speed I/O data transfer operation on each subchannel of each byte multiplexer channel, subject to the maximum channel and aggregate data rates specified above. Alternatively, a byte multiplexer channel can operate in burst mode and handle a single high-speed I/O operation instead of multiple low-speed operations.

### CONFIGURATION RULES

Magnuson M80 systems can be configured in essentially the same manner as IBM System/370 computer systems, except that no integrated peripheral controllers are available for the Magnuson computers. Channel-to-channel adapters are available as an option. Up to 8 control units and 128 I/O devices can be connected to each M80 I/O channel, and any channel can be configured to operate as either a block multiplexer or byte multiplexer channel.

### PERIPHERAL EQUIPMENT

The Magnuson M80 systems can utilize all IBM System/370 and 4300 Series input/output and mass storage subsystems, ➤

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environment. Two users were running DOS/MVT from Software Pursuits, and one was using EDOS/VS, from Nixdorf Computer Software Company. COBOL was the most popular programming language, with 11 users, followed by Assembler (4), PL/1 (2), and FORTRAN (1). Seven reported using a data base management system, and thirteen were using a communications monitor. Two Magnuson users were performing word processing in their systems.

With few exceptions, Magnuson users were very pleased with their systems, and had no plans to replace them in 1981. Activities planned for 1981 included adding more proprietary software, more data communications, and expanding hardware facilities. Only a few users were planning increased distributed processing and word processing activities for 1981. Of the 18 respondents, 16 felt their systems performed as expected, and two were undecided. Seventeen said they would recommend their systems to other users, while the remaining user was undecided. The following chart presents Magnuson user ratings for 1981.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	13	5	0	0	3.72
Reliability of Mainframe	16	2	0	0	3.89
Reliability of Peripherals	3	13	0	0	3.19
Responsiveness of maintenance service	8	9	0	0	3.47
Effectiveness of maintenance service	7	9	1	0	3.35
Technical support:					
Trouble-shooting	6	9	1	0	3.31
Education	5	6	6	0	2.94
Documentation	4	10	2	1	3.00
Operating system	3	10	0	0	3.23
Compilers and assemblers	1	11	0	0	3.08
Applications programs	0	7	1	0	2.88
Ease of programming	3	9	0	0	3.25
Ease of conversion	11	5	1	0	3.59
Overall satisfaction	11	7	0	0	3.61

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

Datapro telephoned several Magnuson users for their comments, which were consistent in their praise for the M80. Our first call was a midwestern manufacturing firm's DP center, that uses its M80/32 for on-line transactions with its banking subsidiary as well as its manufacturing operations. The company's previous computer, an IBM 360/50, had insufficient power to handle on-line activities, and they selected the M80 over an IBM 4341-1 because of the M80's lower price and upgradeability. The conversion was very easy, the M80 has had virtually no problems, and the DP manager rated Magnuson's support a "10." He praised the M80's ability to test itself because of its separate diagnostic processor. His future plans include expanded banking activities which he was confident the M80 could handle easily.

Our next call was to a media organization in the northeast that previously used the timesharing services of National CSS before doing its work in-house. Both a Hewlett-Packard HP-3000 and IBM 4341-1 were considered before going to a Magnuson M80/4. To date uptime has been "excellent," and the DP manager gave Magnuson high

except those that require integrated controllers or adapters, as well as the plug-compatible counterparts of these IBM subsystems offered by other vendors. Detailed coverage of many of these peripherals can be found in Volume 2 of DATAPRO 70.

## SOFTWARE

All of the current M80 Series computer systems fully support the following IBM operating systems: DOS/VS, DOS/VSE, OS/VS1, OS/VS2 (SVS and MVS), and VM/370. Detailed descriptions of these operating systems can be found in Reports 70C-491-06 (IBM 303X Series) and 70C-491-08 (IBM 4300 Series). Extended Control Program Support (ECPS) for VS1, DOS/VSE, and VM/370 is standard in all models.

Magnuson users purchase their system software from IBM and then obtain software support from Magnuson as part of the company's unbundled hardware and software maintenance program. Magnuson also provides several microcode-based products that offer improved system performance. The current products available are listed below.

**DIRECT CONTROL:** A hardware/firmware product that permits connection of IBM 1419 Magnetic Character Readers on-line to an M80 system. When the 1419 is switched to on-line mode, it interrupts any other jobs in progress and operates at the highest priority level allowed by the operating system. The feature includes a circuit board, microcode, and a cable for connecting the 1419.

**MVS Extended Facilities:** A microcode assist product designed to support IBM's MVS/System Extension releases 1 and 2, and MVS/System Program releases 1, 2, and 3. The product is claimed to increase system performance as much as 17 percent.

**IDMS Microcode Assist:** In a joint effort with Cullinane Database Systems, Magnuson developed a microcode enhancement for M80 systems using Cullinane's IDMS data base management system. IDMS:MA adds several ECPS-type instructions to the System/370 instruction set which replace frequently used routines in IDMS. Performance increases of 10 to 15 percent have been projected by Magnuson when running IDMS and using the IDMS:MA feature.

## PRICING

The Magnuson M80 Series systems are offered for out-right purchase or under an unusually flexible direct leasing program.

Five basic types of leases are available:

- **Operating leases**—12- to 24-month leases with purchase option accruals of up to 50 percent of the monthly payments and optional investment tax credits.
- **Finance leases (commercial)**—48- to 72-month leases with options to either terminate or purchase at the end of the initial term.
- **Finance leases (government)**—48- to 84-month leases with full payout and equipment ownership together with fiscal funding protection.
- **Tax-oriented leases**—60- to 84-month leases under which the lessor retains tax benefits and equipment ownership, resulting in a low effective interest rate for the lessee.

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marks for service. One key point was that he always gets the same technicians, if and when a repair is needed. Although he commented that Magnuson's documentation was somewhat limited, he felt the system's ease of operation more than offset that problem. They are planning to upgrade their system to an M80/43 in the fall, and add another channel and disk controller.

Our final interview was with a southeastern bank whose original pair of 370/135s was replaced by two M80/3s. Subsequently they upgraded to two M80/4s, and then to the present M80/32s. All the conversions were "100% smooth," according to the firm's DP director. A multi-vendor advocate, the DP director told Datapro he saved about \$50,000 by going with Magnuson, and has experienced "99.9%" uptime ever since. Interestingly, since becoming a multi-vendor shop (with over a dozen firms on the playing field), his staff morale has improved and turnover has declined. He is very proud of his Magnuson systems, and told Datapro that whenever he's needed service, Magnuson has "come through like champs." Both M80/32s are targeted for upgrading to M80/42s next year. □

Two-year lease prices are provided at the end of this report. For additional pricing options, contact Magnuson.

The cost of an upgrade from one M80 Series model to another is equal to the difference in purchase price between the two models.

Magnuson's customer support organization has service offices currently located in 21 cities nationwide. Under the company's unbundled hardware/software maintenance program, support for both the hardware and system control programs (SCPs) is provided by a local Systems Support Representative (SSR). Backup support for the SSR is provided by the M80 Remote Support Facility, which establishes an on-line link between the user's computer and Magnuson's Technical Support Center in Santa Clara. The Remote Support Facility provides access to technical specialists who can assist the local SSR in diagnosing and correcting both hardware and SCP problems.

The minimum monthly maintenance charges, as shown in the following price list, include support for both the hardware and system control programs for one shift per day, five days per week. Full maintenance coverage for 24 hours per day, seven days per week is available.

### EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Monthly* Rental Charge	2-year* Lease
<b>PROCESSORS AND MAIN MEMORY</b>					
M80/30	Processing Unit with 512K bytes of storage, 2 configurable channels, system console with audible alarm, and remote data link	\$86,050	\$303	\$3,753	\$3,218
	4500 512K-byte memory module	7,850	12	238	202
	4600 1,024K-byte memory module	15,700	23	475	404
M80/31	Processing Unit with 1,024K bytes of storage, 3 configurable channels, system console with audible alarm, and remote data link	135,000	303	5,599	4,795
	4600 1,024K-byte memory module	15,700	23	475	404
M80/32	Processing Unit with 1,024K bytes of storage, 3 configurable channels, system console with audible alarm, and remote data link	170,000	303	6,936	5,931
	4600 1,024K-byte memory module	15,700	23	475	404
M80/42	Processing Unit with 2,048K bytes of storage, 3 configurable channels, system console with audible alarm, and remote data link	210,000	450	8,134	6,956
	4700 1,024K-byte memory module	15,700	23	475	404
M80/43	Processing Unit with 2,048K bytes of storage, 3 configurable channels, system console with audible alarm, and remote data link	270,000	450	10,004	8,568
	4700 1,024K-byte memory module	15,700	23	475	404
M80/44	Processing Unit with 2,048K bytes of storage, 6 configurable channels, system console with audible alarm, and remote data link	297,000	465	11,400	9,765
	4700 1,024K-byte memory module	15,700	23	475	404
*Includes maintenance.					
<b>SYSTEM OPTIONS</b>					
3600	Additional channel for M80/30, /31, and /32	5,600	5	192	164
3700	Additional channel for M80/43, /43, and /44	5,600	5	192	164
3750	Channel-to-channel Adapter				
	1st line	12,500	19	—	—
	2nd and 3rd line, each	10,000	15	—	—
7820	Remote console	7,500	4	—	—
7840	Console Printer	9,000	35	—	—
8500	Expansion Module	43,380	130	—	—
8550	Direct Control	5,640	4	—	—
8560	Light Pen	430	1	—	—
<b>SOFTWARE</b>					
	MVS Extended Facilities	8,000	—	—	—
	IDMS Microcode Assist (IDMS.MA)	5,000	—	—	—