

All About

# Japanese Computers

**The first unbiased objective report on Japanese Computers ever published in English.**

**9 full product reports on:**

- Ai Denshi Sokki ABC-20 Series
- Kanematsu Nixdorf Easy One
- Matsushita Series
- Oki Denki Kogyo IF800
- Panafacom C-15E
- Seiko 8300
- Sord M243 Series
- Toshiba BP-100
- Logic Systems International IBEX 7000

**Comparisons of over 200 minicomputers, small business computers and personal computers from such Japanese makers as:**

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- Casio
- Hitachi (Seisakusho)
- Matsushita Tshushin Kogyo
- Nippon Denki (NEC)
- Sharp
- Fujitsu
- Mitsubishi Denki
- Ricoh
- Teac
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- System Characteristics
- Options
- Hardware/Software
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In 1980, Datapro licensed Nikkei McGraw-Hill, a joint venture of McGraw-Hill and Nihon Keizai Shimbun, one of Japan's leading publishers, to translate and publish Datapro reports in Japan. The resulting four-volume service, **Nikkei Datapro Computer Files**, reports on both American and Japanese computer and word processing products and has gained immediate acceptance in Japan.

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**Nikkei Datapro Computer Files** is the first comprehensive report ever made of the Japanese computer industry. Published in Japanese by our Far East affiliate, this 3,400 page report has information on more than 3,000 Japanese computer products. In the coming months, **Nikkei Datapro Computer Files** will be excerpted and translated (in English) in a series of Datapro Feature Reports. *"All About Japanese Computers" is the first in the series.*

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# All About Japanese Computers

On August 12, 1981, IBM changed the rules of the game—and effectively changed the computer industry worldwide. As often happens when the world's largest computer company makes major policy changes, their significance was not immediately apparent because of the impact of IBM's primary announcement that day—the IBM Personal Computer.

But in announcing the personal computer, IBM put its stamp of approval on three off-Broadway concepts—an industry-standard operating system, independent software, and retail sales of computer systems. The Japanese must have celebrated all night.

Not only did IBM eliminate three of Japan's major problems in selling computer systems in the U.S. and Europe—software, marketing, and sales/support—the computer giant also established the de facto standards for small computers: 16-bit systems with a memory range of 16K to 256K bytes and priced from \$1,500 to about \$6,300.

Obviously, IBM did these things for its own marketing reasons, not for the Japanese, but a side effect many be to throw open the world's computer markets to the Japanese.

## QUALITY NOT ENOUGH

As they have in the stereo and automobile markets, the Japanese have become very successful in selling computer peripherals and for the same reason: quality products at a competitive price.

But in selling computer *systems*, quality and price alone have not been enough to overcome the reluctance of users to commit themselves to a foreign supplier. To date, the Japanese have had the most success selling IBM-compatible systems because such computers do not fence the users in. The users can easily drop the Japanese systems at any time without creating a software crisis for themselves.

Now, however, after more than 20 years of telling users that they should depend entirely on their computer vendor for hardware, software, and support, IBM has said it's all right to have a mixed-vendor system and to acquire it from a third party.

In other words, if IBM says it's all right to buy your system from Sears or Computerland, then it must be all right to buy other systems that way—including Japanese systems.

By following IBM's lead and selling their systems through dealers together with the CP/M operating system and independent software, the Japanese can now compete on quality and price, their two strongest advantages. The users' fear of becoming stuck with a system and no support is gone, because the users will be able to switch, if necessary, to any number of other systems and still run their applications software.

**This special feature reports presents the specifications of 47 minicomputers, 35 personal computers, and 124 small business computers that are sold primarily in Japan. Most are designed to be suitable for export. In addition, the report presents detailed reports on 9 personal computers, some of them similar to the new IBM Personal Computer. The information was abstracted from *Nikkei Datapro Computer Files*, published in Japan.**

## PRICING

IBM has also given the Japanese other information that they needed—the configurations and prices they must sell against.

Armed with this information, the Japanese can reconfigure their small systems to provide more features and still sell them for less than the IBM system.


The personal computers—intended for businessmen and not hobbyists—will arrive first. But as the idea of using standard software spreads to the small business computers, the Japanese may also find a ready market for them.

## INDUSTRY GIANTS

Unlike many of the computer companies in the U.S. and Europe, several of the Japanese vendors are giant corporations with vast resources—and the patience and funds to keep trying until they succeed.

Fujitsu, Japan's largest computer company, expects 1981 sales of \$2.2 billion. In addition to its part ownership of Amdahl Corporation in the U.S., Fujitsu has a joint venture with TRW in the U.S. and sells its IBM-compatible mainframes in Europe through Siemens. Fujitsu's main business is computers, and more than 10 percent of its sales dollars go into research and development.

TRW-Fujitsu Company (TFC), the U.S. joint venture, already is selling small business computers. Fujitsu provides the hardware, the V830 and V850 (called the TFC 8500 in the U.S.), and TRW provides software development, support, service, and nationwide sales. TFC announced its entry in the personal computer market—the Affinity 16—in June and also plans to announce medium-scale systems. The Affinity 16, with 128K bytes of memory and two mini-floppy disk drives, is expected to sell for \$6,000 to \$10,000, depending on options.

Hitachi, one of Japan's largest companies with 1980 sales of \$13.4 billion, is known for its consumer electronics 

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▷ equipment as well as its computers. Hitachi sells IBM-compatible mainframe computers in the U.S. and Europe through National Advanced Systems, Olivetti, and BASF. Hitachi sells all sizes of computers in Japan, but has not announced plans to export either small business computers or personal computers.

Nippon Electric Company (NEC), another major Japanese company, already has a U.S. subsidiary. Primarily in the U.S. peripherals market at the moment, NEC plans to sell both personal and small business computers in the U.S. Computers already announced in the U.S. include the PC-8001 personal computer and the Astra small business computer. Sales will be through distributors and retail outlets.

Mitsubishi, also a major Japanese company, already sells some small business computers in the U.S. and may expand this effort when the timing seems right.

Matsushita, one of the world's largest manufacturers of consumer electronics products, sells under the Panasonic, Quasar, and Technics labels in the U.S. Its JD 850 personal computer is a possible export.

Other Japanese vendors with an eye on the computer export market include Canon, Casio, Oki, Seiko, Sharp, Sony and Toshiba. Sord already exports to Europe.

### CHANGING MARKET

Office automation and personal computers represent an almost unlimited market. While mainframes will continue to be needed, the action is shifting to the idea that every office worker and executive needs a personal computer or a terminal on his or her desk.

Such a market is made to order for the Japanese because it requires what they do best: mass produce quality products at a competitive price.

And they have plenty of products waiting in the wings for export. As you look through the comparison charts and product reports in this feature report, you will see that the Japanese already have a wide variety of minicomputers, personal computers, and small business computers that can be exported any time the vendors see a market for them. In fact, some of them already are being exported, although without much success in most cases.

But now that the major obstacles to U.S. sales—software and support—have been removed by IBM's action, the situation may change rapidly.

### THE COMPARISON CHARTS

The comparison charts provide detailed information on 47 minicomputers, 35 personal computers, and 124 small business computers. There are also more detailed reports on 9 personal computers.

While most of the entries are self-explanatory, some unusual abbreviations have been used for space reasons, such as FDD for floppy disk drive. These abbreviations are explained in a footnote at the bottom of each page.

Pricing information poses two problems. First, the exchange rates are constantly changing, so we have not converted the prices from yen to dollars. Second, the prices listed are for sales in Japan and do not necessarily bear any close relationship to what the computers would sell for in the U.S. To get a rough approximation of what these prices would be in U.S. dollars, you can assume that 1 million yen are worth about \$4,000. For more exact conversions, you can divide the price in yen by the conversion rate listed daily or weekly in many business publications.

We think you will find the information in this report useful. Because the small Japanese computers have not been sold in large quantities outside of Japan, we tend to forget that they exist. But these products are very real, are being sold now, and, in most cases, are designed to be suitable for export. □



# Minicomputer Specifications

Outside of Japan, the Japanese don't talk very much about their minicomputers, so it may come as a surprise that several major Japanese companies manufacture 32-bit superminis. And these vendors include Hitachi, Mitsubishi, Nippon Electric (NEC), and Toshiba, all already heavily involved in exporting various products. But for the moment, these superminis appear to be of interest more as an indication of Japanese capabilities than as potential exports.

All of the 47 models described in this report are currently marketed in Japan and cover a broad performance range. These minicomputers serve three purposes: they provide home-grown computer power, defend the local market against imports, and give the manufacturers experience in designing and building minicomputers. Their export

**This report presents the salient characteristics, functions, and capacities of 47 currently marketed minicomputer models provided by 11 Japanese vendors. The information was abstracted from *Nikkei Datapro Computer Files*, a four-volume loose-leaf information service published in Japan.**

value may be as integral components of dedicated systems, such as communications and medical systems.

Japanese export interest, however, seems to have shifted away from minicomputers to personal computers and small business systems because these packaged systems make much more manageable exports.□

### Minicomputer Specifications

MANUFACTURER	Ai Denshi Sokki (Ai Electronic Measurement Instruments)	Ai Denshi Sokki (Ai Electronic Measurement Instruments)	Chuo Denshi (Central Electronics)	Hitachi	Hitachi
SYSTEM/SERIES	AICOM Series	AICOM Series	CEC 555 Series	HITAC 10 Series	HITAC 20
MODEL	Model C5	Model C6	Model A	10II/L	—
CENTRAL PROCESSING UNIT (CPU)					
Word Length (bits)	16	16	12	16	16
Fixed-decimal operand length (bits)	8, 16	8, 16, 32	36	—	—
Instruction length (bits)	16, 32, 48	16, 32, 48, 64	12	16	16, 32
Number of instructions	79	132	8	31	90 + 32
Number of Registers	16 general, 7 index	16 general, 7 index	1 accumulator, 1 index	2 accumulator	16 accumulator, 3 index, 15 base register
Add/subtract time, microseconds	2.1 (r-r), 2.6 (r-s)	1.5 (r-r), 4.5 (r-s)	1.30 (r-r), 2.72 (r-s)	1.47 MOS/1.76 CORE 6.76/7.35	0.72
Multiply/divide time, microseconds	12.3/14.4	7.0/10.0	22/22	—	6.48/10.32
Floating-point addition, microseconds	Opt. 27.0 (single)	12.0 (single), 13.2 double)	None	Opt. 6.8, 27.3	Opt. 8.16
Floating-point multiplication, microseconds	Opt. 73.0 (single)	52.8 (single), 126 double)	None	Opt. 26.8	Opt. 14.4
Decimal arithmetic operation, microseconds	None	None	None	None	None
CONTROL MEMORY					
Control method (control memory; type)	Wired logic	$\mu$ p (40bx3K:ROM)*1	$\mu$ p (27bx150: ROM)	$\mu$ p	$\mu$ p
Interrupt levels (internal & external)	4 + 7	4 + 7	1 + 2	1, opt. 4 (64KB)	6 + 4
Indirect Addressing	—	Map register	—	—	—
Cache memory (capacity; cycle time)	None	None	None	None	None
Timer	Optional	Standard	Optional	Standard	Standard
MAIN MEMORY					
Storage Type	MOS/Core	MOS	MOS	MOS/Core	Core
Cycle time, microseconds	0.5	0.6	0.68	0.4 MOS/0.65 CORE	0.65
Maximum capacity, bytes	64K	1M	8KW	64KB	128KB
Increment size, bytes	8K	16K/32K	8KW	16K, 32K	16KB
Error-checking/correcting method	Parity	Parity	Parity	Parity	Parity
Interleaving	None	None	None	—	—
INPUT/OUTPUT CHANNELS					
Low speed channel	100KB/s	200KB/s	50KW/s	—	308KB/s
High speed channel	2MB/s	2MB/s	500KW/s	1.7MB/s	2.4MB/s
PERIPHERAL EQUIPMENT					
Floppy disk (capacity x number of units)	250KB x 4	250KB x 4	150KW x 2 256KW x 1	242KB 524KB	242KB 196KB/392KB
Fixed disk (capacity)	—	—	—	—	—
Pack/cartridge disk (capacity)	4.9M/9.9MB x 4	4.9/9.9MB x 4	3.2MW x 4	4.9M/9.8MB	5MB/10MB x 4
Magnetic tape (transfer rates)	19.2KB/s, 40KB/s	19.2KB/s, 40KB/s	Yes	19.2KB/s, 40KB/s	20KB/s, 40KB/s
Input/output devices	TTY, CRT, LP, CR, PTR/P, PLOT	TTY, CRT, LP, CR, PTR, PTP, PLOT	LP, CR	TTY, SPR, LP, CR, PTR, PTP	TTY, CRT, LP, CR, PTR/P, PLOT PI/O
Special I/O devices	—	—	—	—	—
COMMUNICATION CONTROL					
Control method	—	—	Full-duplex/half- duplex	—	Full-duplex/half- duplex
Transmission method	—	—	Asynchronous	—	Asynchronous, synchronous
Communication speed, bits/second	—	—	9600	—	9600
SOFTWARE					
Operating systems (type)	DOS-5 (Batch)	DOS-6, RDOS-6, MTOS-6	MARK II (Disc base monitor)	PSIOD (Batch), PSIOE (Real time)	PS20 (Real time)
Programming languages	—	Assembler, FOR- TRAN, COBOL, BASIC	Assembler, FOR- TRAN, COBOL, RPG	Assembler, FOR- TRANS, BASIC	Assembler, FOR- TRAN
PRICING & AVAILABILITY					
Introduction date in Japan	July 1973	Spring 1977	Spring 1975	May 1978	April 1975
First shipment date in Japan	Spring 1974	September 1978	Spring 1975	August 1978	October 1975
Price for minimum configuration (CPU + memory)	—	—	—	Approx. 9,000,000 yen	—
Price for standard configuration	—	—	—	—	—
COMMENTS	—	*1User micropro- gram possible (40b x 1K; WCS)	All functions loaded in drawer base	—	—

ABBREVIATIONS: b (bit), B (byte), CP (card punch), CR (card reader), G (giga), GDP (graphics display), LP (line printer), M (mega), mr (map register), ns (nanoseconds), opt (optional), PLOT (plotter), PTR/P (paper tape reader/punch), r-r (register to register), r-s (register to storage), SP (serial printer), TTY (I/O typewriter),  $\mu$  (micro),  $\mu$ p (microprogrammed).

## Minicomputer Specifications

MANUFACTURER	Hitachi	Hitachi	Hokushin Denki	Hokushin Denki	Hokushin Denki
SYSTEM/SERIES	HITAC E-600	HITAC E-800	HOC 900	HOC 900	HOC 900
MODEL	Model 3/5	Model 5/7	LSI	15	34
CENTRAL PROCESSING UNIT (CPU)					
Word Length (bits)	16	32	16	16	16
Fixed-decimal operand length (bits)	—	16, 32, 64	16	16	16
Instruction length (bits)	—	16, 32, 48	16	16	16
Number of instructions	—	117 + 60	83 + 8	76	91 + 46
Number of Registers	—	16 general	8	8	8
Add/subtract time, microseconds	0.92*1, 1.33*2	0.4*1, 0.6*2	3.5	3.7	2.0
Multiply/divide time, microseconds	5.51/6.27*1, 5.92/6.7*2	5.1*1, 5.3*2	24~64/24~78	4.3/4.8	8.8/12.5
Floating-point addition, microseconds	Optional	Opt. 3.2*1, 12.0*2	61	None	7.5
Floating-point multiplication, microseconds	Optional	Opt. 4.2*1, 14.0*2	98	None	13.4
Decimal arithmetic operation, microseconds	None	Optional	—	—	—
CONTROL MEMORY					
Control method (control memory; type)	μP	μP	μP	μP	μP
Interrupt levels (internal & external)	4 + 1	3 + 6	1	4	4
Indirect Addressing	—	Paging (8MB)	—	—	—
Cache memory (capacity; cycle time)	None	16KB, 200ns	None	None	—
Timer	Standard	Standard	—	—	—
MAIN MEMORY					
Storage Type	MOS	MOS	Core	Core	Core
Cycle time, microseconds	0.25*1, 0.510*2	0.44	1.2	0.9	1.0
Maximum capacity, bytes	512KB*1, 256KB*2	2M	56K	56K	248K
Increment size, bytes	32KB*2, 64/128KB*1	256K	16K	8K	32K
Error-checking/correcting method	Parity	ECC	Parity	None	Parity
Interleaving	—	—	None	None	None
INPUT/OUTPUT CHANNELS					
Low speed channel	1.6MB/s*2	30KB/s, 600KB/s	1.6MB/s	2.2MB/s	2MB/s
High speed channel	2.4MB/s*1	4MB/s	—	—	—
PERIPHERAL EQUIPMENT					
Floppy disk (capacity x number of units)	242KB/984KB	243KB/985KB	128KB	128KB	128KB
Fixed disk (capacity)	4MB, 10MB, 40MB	9.4M/19.2M/38.3MB	—	—	—
Pack/cartridge disk (capacity)	—	71.5MB	2.4MB	2.4MB	2.4MB
Magnetic tape (transfer rates)	19.2KB/s, 40KB/s	20KB/s, 160KB/s	60KB/s	60KB/s	60KB/s
Input/output devices	TTY, CRT, SP, LP, CR, PTR, PTP	CRT, SP, LP, PTR, PTP, PLOT	TTY, CRT, CR, OMR, PTR	TTY, CRT, CR, OMR, PTR	TTY, CRT, CR, OMR, PTR
Special I/O devices	PI/O	PI/O	PI/O	PIO	PIO
COMMUNICATION CONTROL					
Control method	Half-duplex	Full-duplex/half-duplex	Full-duplex/half-duplex	Full-duplex/half-duplex	Full-duplex/half-duplex
Transmission method	Synchronous	Asynchronous, synchronous, HDLC	Asynchronous, synchronous	Asynchronous, synchronous	Asynchronous, synchronous
Communication speed, bits/second	9600	4800	9600	9600	9600
SOFTWARE					
Operating systems (type)	PS1 (Real time, dispersed)	DPOS (Real time, dispersed)	ORTOS 3C, ORTOS 3S	ORTOS 3C, ORTOS 3S	ORTOS 3F (Real time, Batch)
Programming languages	Assembler, FORTRAN, BASIC, Pascal	Assembler, FORTRAN, COBOL	Assembler	Assembler, FORTRAN, DACS 900 PL, MLSPL	Assembler, FORTRAN, DACS 900 PL, MLSPL
PRICING & AVAILABILITY					
Introduction date in Japan	September 1980	September 1980	January 1978	April 1973	July 1978
First shipment date in Japan	March 1981	September 1981	—	—	—
Price for minimum configuration (CPU + memory)	—	19,200,000 yen*1, 11,200,000 yen*2	—	—	—
Price for standard configuration	9,700,000 yen*1, 4,400,000 yen*2	—	—	—	—
COMMENTS	*1)Model 5, *2)Model 3	*1)Model 7, *2)Model 5	—	—	—

ABBREVIATIONS: b (bit), B (byte), CP (card punch), CR (card reader), G (giga), GDP (graphics display), LP (line printer), M (mega), mr (map register), ns (nanoseconds), opt (optional), PLOT (plotter), PTR/P (paper tape reader/punch), r-r (register to register), r-s (register to storage), SP (serial printer), TTY (I/O typewriter), μ (micro), μP (microprogrammed).

## Minicomputer Specifications

MANUFACTURER	Hokushin Denki	Hokushin Denki	Mitsubishi	Mitsubishi	Mitsubishi
SYSTEM/SERIES	HOC 900	HOC 900	MELCOM 70 Series	MELCOM 70 Series	MELCOM 70 Series
MODEL	35	45	Model 10	Model 20, 25	Model 30, 40
CENTRAL PROCESSING UNIT (CPU)					
Word Length (bits)	16	16	16	16	16
Fixed-decimal operand length (bits)	16	16	16, 32	16, 32	16, 32
Instruction length (bits)	16	16	16, 32, 48, 64	16, 32, 48, 64	16, 32, 48, 64
Number of instructions	85 + 6	—	80 + 36	70 + 27	147 + 71
Number of Registers	8	8 accumulator, 16 index	5	4	8 general, 3 index
Add/subtract time, microseconds	1.3	0.3	4.8	1.3 (r-r), 1.75 (r-s)	0.75 (r-r), 1.35 (r-s)
Multiply/divide time, microseconds	9.2/11.6	3.3/6.9	23.8/48.3	11.25/13.9	6.45/8.50
Floating-point addition, microseconds	25	Opt. 3.8 (single), 5.4 (double)	Opt. 26.1 (single), 42.4 (double)	Opt. 33.7 (single), 52.9 (double)	Opt. 2.3 (single), 3.3 (double)
Floating-point multiplication, microseconds	25	Opt. 5.8 (single), 11.2 (double)	Opt. 119 (single), 40.3 (double)	Opt. 74.9 (single), 240.0 (double)	Opt. 3.4 (single), 11.2 (double)
Decimal arithmetic operation, microseconds	—	None	Opt. 109	Opt. 140	Opt. 31 digits, 41.5
CONTROL MEMORY					
Control method (control memory; type)	μP	μP	μP	μP	μP*1 (ROM)
Interrupt levels (internal & external)	4	4	9 + 34	9 + 34	15 + 34
Indirect Addressing	—	—	—	—	Map register
Cache memory (capacity; cycle time)	None	None	None	None	None
Timer	—	—	Standard	Optional	Standard
MAIN MEMORY					
Storage Type	Core	Core	MOS	MOS	MOS
Cycle time, microseconds	0.99	0.85	0.6	0.5	0.55
Maximum capacity, bytes	248K	248K	128K	128K	256K*2, 512K*3
Increment size, bytes	32K	16K	32K	16K, 32K	32K, 64K, 128K
Error-checking/correcting method	Parity	Parity	Parity	Parity	Parity
Interleaving	None	—	None	None	None
INPUT/OUTPUT CHANNELS					
Low speed channel	—	—	20KB/s	20KB/s	20KB/s
High speed channel	2.2MB/s	3.8MB/s	2MB/s	25MB/s	2MB/s
PERIPHERAL EQUIPMENT					
Floppy disk (capacity x number of units)	128KB	256K/512KB	985KB	246KB	985KB x 4
Fixed disk (capacity)	—	—	60MB	41.4MB	60MB x 8
Pack/cartridge disk (capacity)	24MB	32-256M/5M/10MB	41.4MB/10MB	5MB	41.4MB/10MB x 8
Magnetic tape (transfer rates)	60KB/s	25-120KB/s	470K/72K/40KB/s	40K/20KB/s	470K/72K/40KB/s
Input/output devices	TTY, CRT, CR, OMR, PTR	TTY, CRT, SP, LP, CR, CP	TTY, CRT, SP, LP, CR, CP, PTR	TTY, CRT, SP, LP, CR, PTR, PTP	TTY, CRT, SP, LP, CR, CP, PTP
Special I/O devices	PIO	—	—	—	—
COMMUNICATION CONTROL					
Control method	Full-duplex/half-duplex	Full-duplex/half-duplex	Full-duplex/half-duplex	Full-duplex/half-duplex	Full-duplex/half-duplex
Transmission method	Asynchronous, synchronous	Asynchronous, synchronous	Asynchronous, HDLC, BSC	Asynchronous, HDLC, BSC	Asynchronous, HDLC, BSC
Communication speed, bits/second	9600	9600	48000	48000	48000
SOFTWARE					
Operating systems (type)	ORTOS 3F (Real time, Batch)	—	RTMS (Real time), BDOS (Batch)	RTMS, BDOS, RDOS, BOS	UOS (Real time, Batch, TSS)
Programming languages	Assembler, FOR-TRAN, DA CS 900 PL, MLSP	—	Assembler, FOR-TRAN, BASIC	Assembler, FOR-TRAN, BASIC, COBOL, BPL, MUMPS	Assembler, FOR-TRAN, BASIC, COBOL, Text editor, IDP 70, etc.
PRICING & AVAILABILITY					
Introduction date in Japan	December 1974	—	January 1979	April 1976	January 1979
First shipment date in Japan	—	—	April 1979	—	April 1979
Price for minimum configuration (CPU + memory)	—	—	—	—	—
Price for standard configuration	—	—	2,000,000~15,000,000 yen	3,000,000~50,000,000 yen	5,000,000*2 yen, 12,000,000*3~
COMMENTS	—	—	—	—	*1 User micro-program possible (1KW) *2 Model 30 *3 Model 40

ABBREVIATIONS: b (bit), B (byte), CP (card punch), CR (card reader), G (giga), GDP (graphics display), LP (line printer), M (mega), mr (map register), ns (nanoseconds), opt (optional), PLOT (plotter), PTR/P (paper tape reader/punch), r-r (register to register), r-s (register to storage), SP (serial printer), TTY (I/O typewriter), μ (micro), μP (microprogrammed).

## Minicomputer Specifications

MANUFACTURER	Mitsubishi	Mitsubishi	Mitsubishi	Nippon Electric (NEC)	Nippon Electric (NEC)
SYSTEM/SERIES	MELCOM 70 Series	MELCOM 70 Series	MELCOM 70 Series	NEC MS Series	NEC MS Series
MODEL	Model 35	Model 60	Model 150	NEC MS 10	NEC MS 30
CENTRAL PROCESSING UNIT (CPU)					
Word Length (bits)	16	16	32	16	16
Fixed-decimal operand length (bits)	16, 32	16, 32	32	16, 32	16, 32
Instruction length (bits)	16, 32, 48, 64	16, 32, 48, 64	32	16, 32, 48, 64, 80, 96	16 ~ 144
Number of instructions	74 + 27	210	208	122 + 62	122 + 64
Number of Registers	4	8 general, 5 index, 8 base	16 general x 4, 8 base x 4	26	26
Add/subtract time, microseconds	1.10 (r-r), 1.60 (r-s)	0.3 (r-r)	1.3 (r-s)	*1	*1
Multiply/divide time, microseconds	8.60/11.75	2.0/5.5	2.5/7.3	*1	*1
Floating-point addition, microseconds	21.25 (single), 30.35 (double)	Opt. 1.5 (single), 1.7 (double)	Opt. 1.9 (single), 2.2 (double)	Opt. *1	Opt. *1
Floating-point multiplication, microseconds	43.65 (single), 142.45 (double)	Opt. 2.5 (single)	Opt. 2.2 (single), 3.3 (double)	Opt. *1	Opt. *1
Decimal arithmetic operation, microseconds	118	31 digits	31 digits	Opt. 31 digits	Opt. 31 digits
CONTROL MEMORY					
Control method (control memory; type)	$\mu$ P 9 + 34	$\mu$ P (RAM) 4 + 34	$\mu$ P (ROM) 48	$\mu$ P (ROM) 30 + 64	$\mu$ P*2 (ROM) 46 + 64
Interrupt levels (internal & external)	—	Map register, base register (16MB)	Map register, base register (16MB)	None	None
Indirect Addressing	—	Standard (8KB, 150 ns/4B)	None	None	None
Cache memory (capacity; cycle time)	None	Standard	Standard	Standard	Standard
Timer	Standard	Standard	Standard	Standard	Standard
MAIN MEMORY					
Storage Type	MOS	MOS	MOS	MOS	MOS
Cycle time, microseconds	0.5	0.3	0.28	0.7	0.7
Maximum capacity, bytes	256K	2M	2M	128K	512K
Increment size, bytes	16K, 32K	128K	0.5, 0.75, 1.0, 1.5, 2.0M	64K	64K, 256K
Error-checking/correcting method	Parity	ECC	ECC	FCC	ECC
Interleaving	None	2-way	1/2 way	None	None
INPUT/OUTPUT CHANNELS					
Low speed channel	20KB/s	20KB/s	—	—	—
High speed channel	2.5MB/s	1.5MB/s x 2	3MB/s	2MB/s	2MB/s
PERIPHERAL EQUIPMENT					
Floppy disk (capacity x number of units)	246KB	985KB x 4	985 x 4	1MB x 2	1MB x 2
Fixed disk (capacity)	41.4MB	60MB x 8	80MB x 8/cont. x 3	20M/40M/80MB x 4	20M/40M/80MB x 4
Pack/cartridge disk (capacity)	5MB	41MB/10MB x 8	80MB x 8/cont. x 3	12MB x 4, 58M/200MB	12MB x 4, 58M/200MB
Magnetic tape (transfer rates)	40K/20KB/s	470K/72K/40KB/s	470K/72K/40KB/s	120K/60KB/s	120K/60KB/s
Input/output devices	TTY, CRT, SP, LP, CR, PTR, PTP	TTY, CRT, SP, LP, CR, CP, PTR	TTY, CRT, SP, LP, CR, CP, PTR	TTY, CRT, SP, LP, CR, PTR, PTP	TTY, CRT, SP, LP, CR, PTR, PTP
Special I/O devices	—	—	CAMAC	PI/O	PI/O
COMMUNICATION CONTROL					
Control method	Full-duplex/half-duplex	Full-duplex/half-duplex	Full-duplex/half-duplex	Full-duplex/half-duplex	Full-duplex/half-duplex
Transmission method	Asynchronous, HDLC, BSC	Asynchronous, HDLC, BSC	Asynchronous, HDLC, BSC	Asynchronous, HDLC, BSC	Asynchronous, HDLC, BSC
Communication speed, bits/second	48000	48000	48000	4800	4800
SOFTWARE					
Operating systems (type)	RTMS, BDOS, RDOS, BOS	UOS (Real time, Batch, TSS)	VOS (TSS, Remote batch, Batch)	NCOS1 (Real-time, Batch, dispersed)	NCOS1 (Real time, Batch, Dispersed)
Programming languages	Assembler, FORTRAN, BASIC, COBOL, BPL	Assembler, FORTRAN, BASIC, COBOL, Text-editor	APL, IDP, INTERLISP, etc.	Assembler, FORTRAN, BASIC, COBOL	Assembler, FORTRAN, BASIC, COBOL
PRICING & AVAILABILITY					
Introduction date in Japan	April 1976	September 1978	March 1979	December 1978	February 1978
First shipment date in Japan	—	September 1979	July 1979	May 1979	May 1978
Price for minimum configuration (CPU + memory)	—	—	—	—	—
Price for standard configuration	8,000,000~ 80,000,000 yen	30,000,000~ 200,000,000 yen	40,000,000~ 300,000,000 yen	5,000,000 yen~	7,000,000 yen~
COMMENTS	—	—	—	*1Varies depending on conditions	*1Varies dep. on conditions *2User micro-program opt.

ABBREVIATIONS: b (bit), B (byte), CP (card punch), CR (card reader), G (giga), GDP (graphics display), LP (line printer), M (mega), mr (map register), ns (nanoseconds), opt (optional), PLOT (plotter), PTR/P (paper tape reader/punch), r-r (register to register), r-s (register to storage), SP (serial printer), TTY (I/O typewriter),  $\mu$  (micro),  $\mu$ P (microprogrammed).

### Minicomputer Specifications

MANUFACTURER	Nippon Electric (NEC)	Nippon Electric (NEC)	Nippon Electric (NEC)	Nippon Electric (NEC)	Nippon Musen
SYSTEM/SERIES	NEC MS Series	NEC MS Series	NEAC-M4 Series	NEAC Series 320	JAC 150
MODEL	NEC MS 50	NEC MS 70	M4/f	Model 70	Model 10
CENTRAL PROCESSING UNIT (CPU)					
Word Length (bits)	16	32	8	16	16
Fixed-decimal operand length (bits)	16, 32	32, 64	8	16	16, 32
Instruction length (bits)	16 ~ 144	16 ~ 144	8, 16, 24, 32	16	16, 32
Number of instructions	124 + 62	167 + 62	67	88 + 4	90 + 6
Number of Registers	26	33	16	12	16 general, 15 index
Add/subtract time, microseconds	*1	*1	1.6	1.7	1.0 (r-r), 3.0 (r-s)
Multiply/divide time, microseconds	*1	*1	4.8/8.0	4.1/7.6	Opt. 6.0/10.5
Floating-point addition, microseconds	Opt. *1	Opt. *1	None	Opt. 17 (single), 18 (double)	None
Floating-point multiplication, microseconds	Opt. *1	Opt. *1	None	Opt. 18 (single), 30 (double)	None
Decimal arithmetic operation, microseconds	Opt. 31 digits	Opt. 31 digits	None	None	None
CONTROL MEMORY					
Control method (control memory; type)	$\mu$ P *2 (ROM)	$\mu$ P (ROM)	Wired logic	Wired-logic	$\mu$ P
Interrupt levels (internal & external)	46 + 64	46 + 64	2 + 4	5 + 64	6 + 255
Indirect Addressing	None	None	None	None	None
Cache memory (capacity; cycle time)	Opt. (8KB, 200ns)	Standard (32KB, 165ns)	None	None	None
Timer	Standard	Standard	Opt.	Opt.	Opt.
MAIN MEMORY					
Storage Type	MOS	MOS	Core	Core	MOS/core
Cycle time, microseconds	0.465	0.435	0.8	0.85	1.0
Maximum capacity, bytes	2M	4M	64K	128K	64K
Increment size, bytes	128K, 256K	512K, 1M	16K	16K, 32K	32K
Error-checking/correcting method	ECC	ECC	Parity	Parity	Parity/ECC
Interleaving	Standard	Standard	None	None	None
INPUT/OUTPUT CHANNELS					
Low speed channel	—	600KB/s x 2	—	—	66KB/s
High speed channel	2MB/s	6MB/s	1.25MB/s	2.2MB/s	20MB/s
PERIPHERAL EQUIPMENT					
Floppy disk (capacity x number of units)	1MB x 2	1MB x 2	None	256KB	256K/1MB
Fixed disk (capacity)	20M/40M/80MB x4	20M/40M/80MB x4	64KB	262KB	2MB
Pack/cartridge disk (capacity)	12MB x 4, 58M/200MB	200MB x 4	2.8MB	6MB	200MB
Magnetic tape (transfer rates)	120K/60KB/s	470K/120K/60KB/s	19.2KB/s	32K/16KB/s	72K/60K/36KB/s
Input/output devices	TTY, CRT, SP, LP, CR, PTR, PTP	TTY, CRT, SP, LP, CR, PTR, PTP	TTY, LP, CR, PTR, PTP	TTY, CRT, SP, LP, CR, PLOT	TTY, CRT, SPR, LP, CR, PTR, CP
Special I/O devices	PI/O	PI/O	—	PI/O	PI/O
COMMUNICATION CONTROL					
Control method	Full-duplex/half-duplex	Full-duplex/half-duplex	Full-duplex/half-duplex	Full-duplex/half-duplex	Full-duplex/half-duplex
Transmission method	Asynchronous, HDLC, BSC	Asynchronous, HDLC, BSC	Asynchronous, synchronous	Asynchronous, HDLC, BSC	Asynchronous, HDLC
Communication speed, bits/second	4800	4800	2400	2400	9600
SOFTWARE					
Operating systems (type)	NCOS1 (Real time, Batch, Dispersed)	NCOS1 (Real time, Batch, Dispersed)	MESY (on-line) BOSY (Batch)	COM-32 (Real time, Batch)	ROS/16, BOS/16, BEX/16, RTM/16
Programming languages	Assembler, FORTRAN, BASIC, COBOL	Assembler, FORTRAN, BASIC, COBOL	Assembler, FORTRAN	Assembler, FORTRAN	JASP7, MACRO7, FORTRAN, BASIC
PRICING & AVAILABILITY					
Introduction date in Japan	February 1978	November 1980	November 1975	October 1974	October 1977
First shipment date in Japan	May 1978	July 1981	February 1976	April 1975	March 1978
Price for minimum configuration (CPU + memory)	—	—	—	—	4,700,000 yen (32KB)
Price for standard configuration	10,000,000 yen ~	25,000,000 yen ~	3,400,000 yen ~	3,900,000 yen ~	12,000,000 yen
COMMENTS	*1Varies dep. on conditions *2User micro-program opt.	*1Varies dep. on conditions	—	—	JAC 120 Corresponding preceding model JAC 120

ABBREVIATIONS: b (bit), B (byte), CP (card punch), CR (card reader), G (giga), GDP (graphics display), LP (line printer), M (mega), mr (map register), ns (nanoseconds), opt (optional), PLOT (plotter), PTR/P (paper tape reader/punch), r-r (register to register), r-s (register to storage), SP (serial printer), TTY (I/O typewriter),  $\mu$  (micro),  $\mu$ P (microprogrammed).

### Minicomputer Specifications

MANUFACTURER	Nippon Musen	Nippon Musen	Nippon Musen	OKI Electric Co.	OKI Electric Co.
SYSTEM/SERIES	JAC 150	JAC 150	JAC 150	OKITAC System 50	OKITAC System 50
MODEL	Model 20	Model 40	Model 80	10	20
CENTRAL PROCESSING UNIT (CPU)					
Word Length (bits)	16	32	32	16	16
Fixed-decimal operand length (bits)	16, 32	16, 32	16, 32	16, 32	16, 32
Instruction length (bits)	16, 32	8, 16, 32	8, 16, 32	16, 32, 48	16, 32, 48
Number of instructions	98 + 40	132 + 37	132 + 41	57 + 43	57 + 43
Number of Registers	16 general, 15 index	16 general x 2, 15 index x 2	16 general x 2, 15 index x 2	8 general	8 general
Add/subtract time, microseconds	0.75 (r-r), 2.0 (r-s)	1.0 (r-r), 3.2 (r-s)	0.4	1.6 (r-r), 3.52 (r-s)	1.02 (r-r), 2.04 (r-s)
Multiply/divide time, microseconds	Opt. 5.75/10.25	4.25/11.0	3.54/5.8	10.24/13.12	8.50/10.20
Floating-point addition, microseconds	Opt. 3.5	Opt. 3.75	Optional	Opt. 14.24 (single), 17.44 (double)	Opt. 18.36 (single), 41.14 (double)
Floating-point multiplication, microseconds	Opt. 10.25/10.75	Opt. 10.5/10.75	Optional	Opt. 38.72 (single), 41.73 (double)	Opt. 49.64 (single), 156.7 (double)
Decimal arithmetic operation, microseconds	—	None	None	Opt. 88.28	Optional
CONTROL MEMORY					
Control method (control memory; type)	μP	μP	μP*1	μP	μP
Interrupt levels (internal & external)	6 + 225	9 + 1020	9 + 1020	7	7
Indirect Addressing	Boundary switching (32KB)	Map register	Map register	Yes	None
Cache memory (capacity; cycle time)	None	None	Standard (64KB x 2100 ns)	None	None
Timer	Optional	Optional	Optional	Optional	Optional
MAIN MEMORY					
Storage Type	MOS/Core	MOS/Core	MOS/Core	MOS/Core	MOS/Core
Cycle time, microseconds	0.75	0.75	0.75	0.65	0.65
Maximum capacity, bytes	256K	1M	256K	128K	128K
Increment size, bytes	32K	32K	64K	32K, 64K	16K, 32K
Error-checking/correcting method	Parity/ECC	Parity/ECC	Parity/ECC	Parity	Parity
Interleaving	None	None	4-way	None	None
INPUT/OUTPUT CHANNELS					
Low speed channel	90.9KB/s	150KB/s	166KB/s	40KB/s	40KB/s
High speed channel	2.66MB/s	2.0MB/s	6.0MB/s	2MB/s	2MB/s
PERIPHERAL EQUIPMENT					
Floppy disk (capacity x number of units)	256K/1MB	315.4KB	315.4KB	1MB	1MB
Fixed disk (capacity)	2MB	2MB	2MB	2MB	2MB
Pack/cartridge disk (capacity)	200MB	200MB	200MB	10M/32M/64MB	10M/32M/64MB
Magnetic tape (transfer rates)	72K/60K/36KB/s	72K/160K/36KB/s	72K/60K/36KB/s	120K/60KB/s	120K/60KB/s
Input/output devices	TTY, CRT, SP, LP, CR, PTR, CP	TTY, CRT, SP, LP, CR, PTR, CP	TTY, CRT, SP, LP, CR, PTR, CP	TTY, CRT, LP, CR, CP, PTR, PTP	TTY, CRT, LP, CR, CP, PTR, PTP
Special I/O devices	PI/O	PI/O	PI/O	PI/O	PI/O
COMMUNICATION CONTROL					
Control method	Full-duplex/half-duplex	Full-duplex/half-duplex	Full-duplex/half-duplex	Full-duplex/half-duplex	Full-duplex/half-duplex
Transmission method	Asynchronous, HDLC	Asynchronous, HDLC	Asynchronous, HDLC	Asynchronous, HDLC	Asynchronous, HDLC
Communication speed, bits/second	9600	9600	9600	48000	48000
SOFTWARE					
Operating systems (type)	ROS/16, BOS/16, BEX/16, RTM/16	ROS/32	ROS/32	DOS, FOS, MOS	DOS, MOS, FOS
Programming languages	JASP7, MACRO7, FORTRAN, BASIC	JASP7, MACRO7, FORTRAN, BASIC, COBOL	JASP7, MACRO7, FORTRAN, BASIC, COBOL	FORTRAN, BASIC, COBOL, Assembler, BPL, MUMPS, SPL	FORTRAN, BASIC, COBOL, Assembler, MUMPS, SPL
PRICING & AVAILABILITY					
Introduction date in Japan	October 1977	October 1977	October 1977	July 1978	July 1975
First shipment date in Japan	October 1978	March 1978	April 1979	August 1978	March 1976
Price for minimum configuration (CPU + memory)	8,900,000 yen (64KB)	10,200,000 yen (64KB)	20,000,000 yen	1,000,000 yen	—
Price for standard configuration	16,000,000 yen	18,000,000 yen	30,000,000 yen	4,000,000 yen ~ 20,000,000 yen	10,000,000 yen ~ 40,000,000 yen
COMMENTS	—	—	*1 User micro-programming possible (WCS opt.)	—	—

ABBREVIATIONS: b (bit), B (byte), CP (card punch), CR (card reader), G (giga), GDP (graphics display), LP (line printer), M (mega), mr (map register), ns (nanoseconds), opt (optional), PLOT (plotter), PTR/P (paper tape reader/punch), r-r (register to register), r-s (register to storage), SP (serial printer), TTY (I/O typewriter), μ (micro), μP (microprogrammed).

### Minicomputer Specifications

MANUFACTURER	OKI Electric Co.	OKI Electric Co.	OKI Electric Co.	Panafacom	Panafacom
SYSTEM/SERIES	OKITAC System 50	OKITAC System 50	OKITAC 4300 Series	PFU-1000 Series	PFU-1000 Series
MODEL	40	60	4300a	1100	1300
CENTRAL PROCESSING UNIT (CPU)					
Word Length (bits)	16	16	16	16	16
Fixed-decimal operand length (bits)	16, 32	16, 32	16	8, 16, 32	8, 16, 32
Instruction length (bits)	16, 32, 48	16, 32, 48	16	16, 32, 48	16, 32, 48
Number of instructions	66 + 34	82 + 37	44	90	90 + 14
Number of Registers	8 general	26	5	8 general	8 general
Add/subtract time, microseconds	1.02 (r-r), 0.4 (r-s)	0.25 (r-r), 0.75 (r-s)	1.48	2.8 (r-r), 4.4 (r-s)	0.8 (r-r), 1.8 (r-s)
Multiply/divide time, microseconds	8.5/10.20	5.5/6.0	10.7/17.3	48.0/57.6	4.9/10.0
Floating-point addition, microseconds	Opt. 3.4 (single), 4.08 (double)	1.75 (single), 1.75 (double)	None	None	Opt. 10.5 (single), 11.2 (double)
Floating-point multiplication, microseconds	Opt. 7.31 (single), 13.43 (double)	2.25 (double)	None	None	Opt. 16.4 (single), 22.2 (double)
Decimal arithmetic operation, microseconds	Optional	Optional	None	None	None
CONTROL MEMORY					
Control method (control memory; type)	$\mu$ P	$\mu$ P	Wire a logic	$\mu$ P	$\mu$ P
Interrupt levels (internal & external)	7	8	4	2 + 4	4 + 8
Indirect Addressing	Yes	Yes	None	None	None
Cache memory (capacity; cycle time)	None	Standard 4KB, 45ns	None	None	None
Timer	Standard	Standard	Optional	Standard	Standard
MAIN MEMORY					
Storage Type	MOS/Core	MOS	MOS/Core	MOS/Core	MOS/Core
Cycle time, microseconds	0.65	0.3	0.65	0.7/1.5	0.5/0.75
Maximum capacity, bytes	512K	2M	130K	64K	64K
Increment size, bytes	32K, 64K	128K, 256K	32K, 64K	None	None
Error-checking/correcting method	Parity	ECC	Parity	Parity	Parity
Interleaving	None	None	None	None	None
INPUT/OUTPUT CHANNELS					
Low speed channel	40KB/s	70KB/s	50KB/s	—	—
High speed channel	2MB/s	10MB/s	1MB/s	2MB/s	2MB/s
PERIPHERAL EQUIPMENT					
Floppy disk (capacity x number of units)	1MB 2MB	1MB 2MB	512KB 2MB	0.5MB x 16 10M/20M/40MB	0.5MB x 16 10M/20M/40MB
Fixed disk (capacity)					
Pack/cartridge disk (capacity)	10M/32M/64M/ 120MB	32M/64M/120M/ 240MB	5M/10MB	20M/40MB	20M/40MB
Magnetic tape (transfer rates)	120K/60KB/s	120K/60KB/s	24KB/s	43.2K/21.6KB/s	43.2K/21.6KB/s
Input/output devices	TTY, CRT, LP, CR, CP, PTR, PTP	TTY, CRT, LP, CR, CP, PTR, PTP	TTY, CRT, LP, CR, CP, PTR, PTP	TTY, CRT, SP, LP, CR, CP, PTR, PTP	TTY, CRT, SP, LP, CR, CP, PTR, PTP
Special I/O devices	PI/O	PI/O	PI/O	PI/O	PI/O
COMMUNICATION CONTROL					
Control method	Full-duplex/half-duplex	Full-duplex/half-duplex	Full-duplex/half-duplex	Full-duplex/half-duplex	Full-duplex/half-duplex
Transmission method	Asynchronous, HDLC	Asynchronous, HDLC	Asynchronous, HDLC	Asynchronous, HDLC	Asynchronous, HDLC
Communication speed, bits/second	48000	48000	9600	9600	9600
SOFTWARE					
Operating systems (type)	DOS, MOS, FOS	DOS, Real time, Batch	DOS, MOS, SDOS	OS/UDS, OS/UFS, Batch, Real-time	OS/UDS, OS/UFS, Batch, Real time
Programming languages	FORTRAN, BASIC, Assembler, COBOL, BPL, MUMPS, SPL	FORTRAN, COBOL, BASIC, Assembler, BPL, MUMPS, SPL	FORTRAN, Assembler, RPA, CAI	FORTRAN, COBOL, MACRO-PF	FORTRAN, COBOL, MACRO-PF
PRICING & AVAILABILITY					
Introduction date in Japan	July 1975	July 1978	April 1980	July 1978	July 1978
First shipment date in Japan	March 1976	April 1979	July 1980	March 1979	January 1979
Price for minimum configuration (CPU + memory)	—	—	—	—	—
Price for standard configuration	12,000,000 yen ~ 70,000,000 yen	25,000,000 yen ~ 200,000,000 yen	2,000,000 yen ~ 15,000,000 yen	6,000,000 yen	16,000,000 yen
COMMENTS	—	—	—	—	—

ABBREVIATIONS: b (bit), B (byte), CP (card punch), CR (card reader), G (giga), GDP (graphics display), LP (line printer), M (mega), mr (map register), ns (nanoseconds), opt (optional), PLOT (plotter), PTR/P (paper tape reader/punch), r-r (register to register), r-s (register to storage), SP (serial printer), TTY (I/O typewriter),  $\mu$  (micro),  $\mu$ P (microprogrammed).



## Minicomputer Specifications

MANUFACTURER	Panafacom	Panafacom	Tokyo Shibaura Electric (Toshiba)	Tokyo Shibaura Electric (Toshiba)	Tokyo Shibaura Electric (Toshiba)
SYSTEM/SERIES	PFU-1000 Series	PFU-1000 Series	TOSBAC Series 7	TOSBAC Series 7	TOSBAC Series 7
MODEL	1400	1500	10	40	60
CENTRAL PROCESSING UNIT (CPU)					
Word Length (bits)	16	16	16	16	32
Fixed-decimal operand length (bits)	8, 16, 32	8, 16, 32	16	16, 32	16, 32
Instruction length (bits)	16, 32, 48	16, 32, 48	16, 32	16, 32, 64	16, 32, 64
Number of instructions	164 + 31	172 + 31	141 + 4	133 + 28	186
Number of Registers	8 general	8 general	16 general, 1.5 index	16 general, 1.5 index	16 general, 7 index
Add/subtract time, microseconds	0.8 (r-r), 2.1 (r-s)	0.45 (r-r), 1.6 (r-s)	2.2	0.36	0.3
Multiply/divide time, microseconds	7.6/10.5	4.0/5.2	12.0/24.0	4.32/7.2	4.44/5.28
Floating-point addition, microseconds	Opt. 9.9 (single), 11.5 (double)	Opt. 2.2 (single), 3.8 (double)	38.3	Opt. 4.68 (hardware)	0.6
Floating-point multiplication, microseconds	Opt. 12.2 (single), 19.8 (double)	Opt. 2.5 (single), 5.3 (double)	13.1	Opt. 9.36 (hardware)	3.84
Decimal arithmetic operation, microseconds	Optional	Optional	None	Optional	None
CONTROL MEMORY					
Control method (control memory; type)	$\mu$ p*1	$\mu$ p*1	$\mu$ p	$\mu$ p	$\mu$ p
Interrupt levels (internal & external)	4 + 8	4 + 8	1 + 1	6 + 1	10 + 6
Indirect Addressing	Map register	Map register	Map register	Map register	None (16MB)
Cache memory (capacity; cycle time)	None	None	None	None	None
Timer	Standard	Standard	Standard	Standard	Standard
MAIN MEMORY					
Storage Type	MOS	MOS/Core	MOS	MOS	MOS
Cycle time, microseconds	0.45	0.2/0.375	1.0	0.36 (0.45)*1	0.6
Maximum capacity, bytes	512K	2M	128K	512K	512K
Increment size, bytes	128K	64K	64K	64K	256K
Error-checking/correcting method	ECC	Parity/ECC	Parity	Parity/ECC	ECC
Interleaving	None	None	None	None	None
INPUT/OUTPUT CHANNELS					
Low speed channel	—	—	38KB/s	70KB/s	80KB/s
High speed channel	2MB/s	2MB/s, 7MB/s	2.5MB/s	4.8MB/s	4MB/s
PERIPHERAL EQUIPMENT					
Floppy disk (capacity x number of units)	0.5MB x 16	0.5MB x 16	256K/1MB	256K/1MB	256KB
Fixed disk (capacity)	10M/20M/40MB	10MB/20M/40MB	9.9M/29.7MB	9.9M/29.7MB	9.9MB
Pack/cartridge disk (capacity)	20M/40MB	20M/40MB	2.4M/9.6MB	2.4M/9.6M/153MB	9.6MB
Magnetic tape (transfer rates)	43.2K/21.6KB/s	43.2K/21.6KB/s	38K/20KB/s	38K/20KB/s	None
Input/output devices	TTY, CRT, SP, LP, CR, CP, PTR, PTP	TTY, CRT, SP, LP, CR, CP, PTR, PTP	TTY, CRT, LP, CR, PTR, PTP	TTY, CRT, LP, CR, PTR, PTP	TTY, CRT, LP, CR, PTR, PTP
Special I/O devices	PI/O	PI/O	PI/O	PI/O	PI/O
COMMUNICATION CONTROL					
Control method	Full-duplex/half-duplex	Full-duplex/half-duplex	Full-duplex/half-duplex	Full-duplex/half-duplex	Full-duplex/half-duplex
Transmission method	Asynchronous, HDLC	Asynchronous, HDLC	Asynchronous, HDLC	Asynchronous, HDLC	Asynchronous, HDLC
Communication speed, bits/second	48000	48000	9600	9600	9600
SOFTWARE					
Operating systems (type)	OS/UAS, OS/UAS II	OS/UAS, OS/UAS II	POPS-I/II, DOS-1, MYLOS-II	POPS-I/II, DOS-1, TMCS-II	TREX (Real time)
Programming languages	FORTRAN, COBOL, MACRO-PF, BASIC, MUMPS	FORTRAN, COBOL, MACRO-PF, BASIC, MUMPS	FORTRAN, COBOL, PL-7/40, Assembler	TPL, FORTRAN, PL-7/40, COBOL, Assembler	TPL, FORTRAN, PL-7/70 GMP
PRICING & AVAILABILITY					
Introduction date in Japan	July 1980	July 1978	September 1978	September 1978	November 1980
First shipment date in Japan	December 1980	January 1979	April 1979	April 1979	November 1980
Price for minimum configuration (CPU + memory)	—	—	—	—	—
Price for standard configuration	15,000,000 yen	45,000,000 yen	10,000,000 yen	20,000,000 yen	18,000,000 yen
COMMENTS	*1User micro-program possible (opt.)	*1User micro-program possible (opt.) expanding	—	*1Case of CMOS	—

ABBREVIATIONS: b (bit), B (byte), CP (card punch), CR (card reader), G (giga), GDP (graphics display), LP (line printer), M (mega), mr (map register), ns (nanoseconds), opt (optional), PLOT (plotter), PTR/P (paper tape reader/punch), r-r (register to register), r-s (register to storage), SP (serial printer), TTY (I/O typewriter),  $\mu$  (micro),  $\mu$ p (microprogrammed).

## Minicomputer Specifications

MANUFACTURER	Tokyo Shibaura Electric (Toshiba)	Tokyo Shibaura Electric (Toshiba)	Tokyo Shibaura Electric (Toshiba)	Tokyo Shibaura Electric (Toshiba)	Yokokawa Electric Co.
SYSTEM/SERIES	TOSBAC Series 7	TOSBAC 40 Series	TOSBAC 40 Series	TOSBAC 40 Series	YODIC
MODEL	70	40D	40L	40C	100
CENTRAL PROCESSING UNIT (CPU)					
Word Length (bits)	32	16	16	16	16
Fixed-decimal operand length (bits)	16, 32	16, 32	16	16	16
Instruction length (bits)	16, 32, 64	16, 32	16, 32	16, 32	16, 32
Number of instructions	186	130 + 28	126 + 15	113 + 7	37 + 12
Number of Registers	16 general, *17 base	24	24	24	4 accumulator, 3 index
Add/subtract time, microseconds	0.36 (r-r)	0.8	2.1	1.0	2.64
Multiply/divide time, microseconds	4.68/5.76	5.9/7.5	11.5/23.0	6.8/13.3	10.32/10.8
Floating-point addition, microseconds	0.72 (hardware)	6.2	37.8	18.8	Optional
Floating-point multiplication, microseconds	3.96 (hardware)	17.0	13.3	32.8	Optional
Decimal arithmetic operation, microseconds	None	None	None	None	None
CONTROL MEMORY					
Control method (control memory; type)	$\mu$ P	$\mu$ P	$\mu$ P	$\mu$ P	$\mu$ P
Interrupt levels (internal & external)	10 + 6	6 + 255	6 + 255	6 + 255	1 + 3
Indirect Addressing	None (16MB)	Map register	Map register	Map register	—
Cache memory (capacity; cycle time)	Standard (4KB, 120ns)	None	None	None	None
Timer	Standard	Optional	Optional	Optional	Standard
MAIN MEMORY					
Storage Type	MOS	MOS/Core	MOS/Core	Core	Core
Cycle time, microseconds	0.24	0.7	0.98	0.8	1.2
Maximum capacity, bytes	2M	256K	256K	64K	64K
Increment size, bytes	128K, 256K	16K	16K, 32K	8K, 16K	32K
Error-checking/correcting method	ECC	Parity	Parity	Parity	Parity
Interleaving	2 way	None	None	None	—
INPUT/OUTPUT CHANNELS					
Low speed channel	100KB/s	70KB/s	38KB/s	65KB/s	200KB/s
High speed channel	8MB/s	2.8MB/s	2.5MB/s	2.5MB/s	—
PERIPHERAL EQUIPMENT					
Floppy disk (capacity x number of units)	256K/1MB	None	256KB	None	None
Fixed disk (capacity)	9.9M/29.7MB	None	None	None	None
Pack/cartridge disk (capacity)	9.6M/153MB	2.4M/9.6MB	2.4M/9.6M/155MB	2.4M/9.6MB	None
Magnetic tape (transfer rates)	38K/20KB/s	38K/20KB/s	None	38K/20KB/s	None
Input/output devices	TTY, CRT, LP, CR, PTR, PTP	TTY, CRT, SP, LP, PTR, PTP	TTY, CRT, SP, CR, PTR, PTP	TTY, CRT, SP, LP, CR, PTR, PTP	PTR, PTP, CR, CP, TTY, LP, CRT
Special I/O devices	PI/O	PI/O	PI/O	PI/O	PI/O
COMMUNICATION CONTROL					
Control method	Full-duplex/half-duplex	Full-duplex/half-duplex	Full-duplex/half-duplex	Full-duplex/half-duplex	Full-duplex/half-duplex
Transmission method	Asynchronous, HDLC	Asynchronous, HDLC	Asynchronous, HDLC	Asynchronous, HDLC	Asynchronous, synchronous
Communication speed, bits/second	9600	9600	9600	9600	4800
SOFTWARE					
Operating systems (type)	TREX (Real time)	DOS-II, POPS-I/II, TMCS-II	DOS-1, POPS-C, MYCOS-II	DOS-1, POPS-C	YOS-M
Programming languages	TPL, FORTRAN, PL-7/70 GMP	Assembler, FORTRAN, BASIC, COBOL, TPL, PL-7/40	Assembler, FORTRAN, COBOL, PL-7/40	Assembler, FORTRAN, COBOL, PL-7/40	Assembler, FORTRAN
PRICING & AVAILABILITY					
Introduction date in Japan	January 1978	April 1975	October 1975	April 1973	November 1971
First shipment date in Japan	December 1978	—	July 1976	—	—
Price for minimum configuration (CPU + memory)	—	—	—	—	—
Price for standard configuration	30,000,000 yen	10,000,000 yen	5,000,000 yen	—	—
COMMENTS	*17 can be used as index	—	—	—	—

ABBREVIATIONS: b (bit), B (byte), CP (card punch), CR (card reader), G (giga), GDP (graphics display), LP (line printer), M (mega), mr (map register), ns (nanoseconds), opt (optional), PLOT (plotter), PTR/P (paper tape reader/punch), r-r (register to register), r-s (register to storage), SP (serial printer), TTY (I/O typewriter),  $\mu$  (micro),  $\mu$ P (microprogrammed).

### Minicomputer Specifications

MANUFACTURER	Yokokawa Electric Co.	Yokokawa Electric Co.			
SYSTEM/SERIES	YODIC	YODIC			
MODEL	600	1000			
CENTRAL PROCESSING UNIT (CPU)					
Word Length (bits)	16	16			
Fixed-decimal operand length (bits)	16	16			
Instruction length (bits)	—	16, 32			
Number of instructions	36	37 + 12			
Number of Registers	36	4 accumulator, 3 index			
Add/subtract time, microseconds	1.92	1.4			
Multiply/divide time, microseconds	9.6	5.0/5.4			
Floating-point addition, microseconds	None	Optional			
Floating-point multiplication, microseconds	None	Optional			
Decimal arithmetic operation, microseconds	None	Optional			
CONTROL MEMORY					
Control method (control memory; type)	$\mu P$	$\mu P$			
Interrupt levels (internal & external)	1 + 3	1 + 3			
Indirect Addressing	—	—			
Cache memory (capacity; cycle time)	None	None			
Timer	Standard	Standard			
MAIN MEMORY					
Storage Type	—	Core			
Cycle time, microseconds	0.96	0.7			
Maximum capacity, bytes	64K	512K			
Increment size, bytes	32K	32K			
Error-checking/correcting method	Parity	Parity			
Interleaving	—	—			
INPUT/OUTPUT CHANNELS					
Low speed channel	—	400KB/s			
High speed channel	1MB/s	1.3MB/s			
PERIPHERAL EQUIPMENT					
Floppy disk (capacity x number of units)	None	308KB			
Fixed disk (capacity)	None	1MB x 2			
Pack/cartridge disk (capacity)	None	2.4MB x 2			
Magnetic tape (transfer rates)	None	60KB/s			
Input/output devices	PTR, TTY	TTY, PTR, PTP, CR, SP, LP, CRT			
Special I/O devices	PI/O	PI/O			
COMMUNICATION CONTROL					
Control method	Half-duplex	—			
Transmission method	—	Asynchronous, synchronous			
Communication speed, bits/second	1200	4800			
SOFTWARE					
Operating systems (type)	YOS	YOS-LD, YOS-L			
Programming languages	Assembler	Assembler, FORTRAN			
PRICING & AVAILABILITY					
Introduction date in Japan	December 1970	September 1976			
First shipment date in Japan	—	—			
Price for minimum configuration (CPU + memory)	—	—			
Price for standard configuration	—	—			
COMMENTS	—	—			

ABBREVIATIONS: b (bit), B (byte), CP (card punch), CR (card reader), G (giga), GDP (graphics display), LP (line printer), M (mega), mr (map register), ns (nanoseconds), opt (optional), PLOT (plotter), PTR/P (paper tape reader/punch), r-r (register to register), r-s (register to storage), SP (serial printer), TTY (teletypewriter),  $\mu$  (micro),  $\mu p$  (microprogrammed).



# Personal Computer Specifications

Personal computers represent an ideal market for the Japanese. All kinds of de facto hardware and software standards are developing, standards that will make small computers as compatible as stereo components. And we all know who makes most of the stereo components.

Acknowledged standards already include the CP/M operating system, the BASIC and Pascal programming languages, 300 baud communications, and a variety of applications software packages.

Freed from worrying about software and support, the Japanese can stamp out personal computers like cookies, and with the coincident economies of large-scale production.

Although the 35 personal computers in this report were all announced before the recent announcements by IBM and Hewlett-Packard, you will see that the Japanese were prepared for almost any contingency. Note the wide variety of languages and peripherals they were prepared to deliver, if needed. Note the number of systems offering Digital Research's CP/M, Microsoft's BASIC, and UCSD Pascal.

**This report presents the salient characteristics, functions, and capacities of 35 Japanese personal computers from 20 vendors. The information was abstracted from *Nikkei Datapro Computer Files*, a four-volume loose-leaf service published in Japan.**

A multi-billion-dollar consumer and business market is at stake. Just as the Japanese crank out videocassette recorders for both the home and business markets, they will flood these markets with personal computers.

So far, the Japanese have only put their toe in the export market for personal computers because they were waiting for the market to take shape. Now it has. The recent support given CP/M by IBM, Xerox, and Hewlett-Packard has set the stage.

It seems a safe bet that the next generation of Japanese personal computers will be 16-bit systems with more standard features at a lower price than anyone else offers.□

### Personal Computer Specifications

MANUFACTURER	Adachi Electric	Ai Denshi Sokki (Ai Electronic Measurement Instruments)	Ai Denshi Sokki (Ai Electronic Measurement Instruments)	Ando Electric	Canon
SYSTEM	DDC7705A	ABC-20	ABC-20	AMICS80	BX-10
MODEL	—	21, 22, 24, 25	26	—	—
HARDWARE PACKAGING	Desk top	Desk top	Desk top	Desk top	Desk top
PROCESSOR					
Model, word length	16-bit	Z80A, 8-bit	Z80A, 8-bit	—	—
Memory type, cycle time (nanoseconds)	—	MOS	MOS	—	—
Memory capacity (bytes), error checking	8K-30K	64K	1M	64K	Max. 15K
ROM capacity (bytes)	32K	4K	4K	—	—
Expansion ROM (bytes)	—	—	—	—	—
MASS STORAGE					
Standard devices	Mini-floppy (80KB)	Mini-floppy (161KB) x 2	Floppy (2.3MB) x 2	Mini-floppy (544KB) x 2	Audio cassette
Optional devices	Cassette	Hard disk, magnetic tape	Two floppies (2.3MB) Winchester- type disk	Cassette, floppy disk	Mini-floppy (65.5KB), (512KB)
KEYBOARD/DISPLAY					
Screen size, colors	Plasma display	9 in., monochrome	2 in., green	9 in.	Digitron display
Characters/line & number of lines	32 x 1	80 x 24-32	80 x 20	40 x 16	24 x 1
Character sets	—	English, Kana	English, Kana	English, Kana, symbols	English, Kana
Graphic points	None	Character units	Character units	—	None
Keyboard style, numeric keypad, function keys	ASCII, yes	JIS, yes	ASCII, yes	JIS, yes	JIS, yes
Calculator keys, Control key	Yes	Yes	Yes	Yes	Yes
STANDARD PRINTER					
Type, characters/line	Dot matrix, 80	Dot matrix, 132	Dot matrix, 132	—	Thermal, 48
Speed (characters/second)	1 line/1.4 sec. (including return)	180	180	—	—
Character sets	—	160 characters	160 characters	—	English
OTHER PERIPHERALS	Display, printer, plotter, AD con- verter	Coupler, modem, X-Y plotter, color CRT, card reader, paper tape	Light pen, X-Y plot., misc. printers, mag. card reader	Printer, card reader, X-Y plotter	Printer, X-Y plot., CRT display, punched tape
COMMUNICATIONS					
Mode, code	—	Half/full duplex	Half/full duplex	RS-232-C	—
Protocols	—	ASYN, BSYN, others	ASYN, BSYN, others	4 ports	—
Maximum number of lines, speed (bits/second)	—	1, 110-9600	2, 110-9600	—	—
OTHER INTERFACES	IEC-1B, modem	IEEE 488, parallel 8- bit x 2, RS-232-C x 2	IEEE 488, RS-232-C x 2, para. 8-bit x 2	GP-1B	Serial, BCD input unit
SOFTWARE					
Programming languages	Expanded BASIC	FORTRAN, BASIC, Assembler	FORTRAN, BASIC	Expanded BASIC	BASIC
Other software	—	COBOL, CPM, Pascal	Under DOSKET's language processor	—	—
Computation range, accuracy	Base 10, 12 digits	10E ± 16, 13	10E ± 16, 13	10E ± 38, 11	10E ± 99, 13
Utilities	—	Eng. Word Processor comms. control pro- gram	Debugger, linker, editor file comb.	—	—
APPLICATIONS	Measurement	Business, data communications	Business	Scientific computa- tions, automatic measurement, bus. admin., science	Business, measure- ment, scientific calculations
AVAILABILITY & PRICING					
Date introduced in Japan	May 1978	May 1979	April 1979	—	—
First shipment in Japan	—	August 1979	September 1980	—	—
Price of minimum configuration (yen)	—	1.5 to 1.6 million	2.1 million	—	360,000
Price of standard configuration (yen)	—	1.5 to 1.6 million	2.1 million	—	360,000
COMMENTS		● Model 20 1.5 million yen Model 21 1.55 million yen Model 24 & 25 1.6 million yen	● Minimum con- figuration is unit with 2, 8 in. FDD (2.3MB), 12 in. CRT		

### Personal Computer Specifications

MANUFACTURER	Casio Keisanki (Casio Computers)	Chuo Denshi (Central Electronics)	Chuo Denshi (Central Electronics)	Chuo Denshi (Central Electronics)	Hitachi
SYSTEM	V-900	CEC	CEC	CEC	BASIC MASTER LEVEL 3
MODEL	—	500	800	8000	—
HARDWARE PACKAGING	Desk top	Desk top	Cabinet	Cabinet	Desk top
PROCESSOR					
Model, word length	9900A, 16-bit	Z80A, 8-bit	Z80, 8-bit	Z8001, 16-bit	6809, 8-bit
Memory type, cycle time (nanoseconds)	MOS	MOS, 500	MOS, 500	—	MOS
Memory capacity (bytes), error checking	32K	40K	256K	8M	60K
ROM capacity (bytes)	32K	24K	4K	—	24K
Expansion ROM (bytes)	8K	—	—	—	8K
MASS STORAGE					
Standard devices	Cassette, (256KB on 1 side)	Floppy (1MB) x 2	Floppy (1MB) x 2	Floppy (1MB) x 2	None
Optional devices	Floppy x 4	Winchester-type disc, magnetic tape	Winchester-type disc, magnetic tape	Winchester-type disc, MT, floppy disc	Audio cassette, mini-floppy
KEYBOARD/DISPLAY					
Screen size, colors	9 in., green	12 in., green	12 in., green	12 inch, green	14 in., color
Characters/line & number of lines	80 x 24	80 x 24	80 x 20	80 x 20	80 x 25
Character sets	English, Kana	—	ANK, graphics	English, Kana	English, Kana, graphics
Graphic points	Character units	Character units	None	None	640 x 200
Keyboard style, numeric keypad, function keys	JIS/ASCII, yes	JIS, none	JIS, yes	JIS, yes	JIS, yes
Calculator keys, Control key	Yes	None	Yes	—	Yes
STANDARD PRINTER					
Type, characters/line	Thermal, 80	Dot matrix, 136	Dot matrix, 136	Dot matrix	Dot matrix, 80
Speed (characters/second)	60	120	120	120	80
Character sets	English, Kana	English, Kana	—	English, Kana	English, Kana
OTHER PERIPHERALS					
	Dot printer, X-Y plotter line printer	Color CRT, X-Y plotter line printer, modem	Color CRT, X-Y plotter line printer, modem	Line printer, color CRT, graphics printer	Light pen, 12 in. CRT
COMMUNICATIONS					
Mode, code	Asynch/synch, 110-9600	—	Polling half-duplex	—	Full/half duplex switchover
Protocols	—	—	Asynch., synch.	—	—
Maximum number of lines, speed (bits/second)	—	—	1, 9600	1200-2400	5, 4800
OTHER INTERFACES	None	RS-232-C, Centronics x 2	IEEE 488, RS-232-C, Centronics	IEEE 488, RS-232-C	Interface card
SOFTWARE					
Programming languages	BASIC	FORTRAN, BASIC, Pascal	FORTRAN, BASIC, COBOL	Pascal, BASIC, FORTRAN	—
Other software	None	CP/M, UCSD Pascal	Pascal, Assembler, PL/Z, CP/M	—	—
Computation range, accuracy	10E ± 99	—	—	—	16 digits
Utilities	None	—	—	—	—
APPLICATIONS	Science & tech. computation, statistics, gen. business	—	Measurement, controller for control systems, real-time	Measurement, control	Hobby, business, education
AVAILABILITY & PRICING					
Date introduced in Japan	October 1978	—	—	—	May 1980
First shipment in Japan	January 1979	—	—	—	November 1980
Price of minimum configuration (yen)	1.35 million	—	—	—	347,800
Price of standard configuration (yen)	2.45 million	1.5 million	—	—	466,000
COMMENTS	● Standard system price: basic unit plus thermal printer and two floppy disks	—	● By connecting channel control & common memory package, multiprocessor configuration is possible	● Standard unit configuration is two floppies (2MB), 12 in. CRT ● Other connectable I/O devices include: graphic display, X-Y plotter	● Minimum configuration has 32K, ROM (24K), monochrome display ● Standard system configuration has 32K, ROM (24K) with color display

Personal Computer Specifications

MANUFACTURER	Kanto Denshi Kiki Hambai (Kanto Electronic Equipment)	Logic Systems International	Logic Systems International	Logic Systems International	Logic Systems International
SYSTEM	LIS-II, III	IBEX 2000 series	IBEX 7000 series	IBEX 7000 Series	IBEX 7000 Series
MODEL	—	Model 2200	Model 7100	Model 7200	Model 7500
HARDWARE PACKAGING	Modular	—	Desk top	Desk top	—
PROCESSOR					
Model, word length	Z-80, 8-bit	Z80, 8-bit	Z80, 8-bit	Z80, 8-bit	Z80A, 8-bit
Memory type, cycle time (nanoseconds)	MOS 16K	MOS 16K	MOS 16K	MOS 16K	MOS 16K
Memory capacity (bytes), error checking	64K	32K-64K	64K, parity	64K, parity	96K-54K
ROM capacity (bytes)	3K	—	—	—	—
Expansion ROM (bytes)	32K EPROM	—	—	—	—
MASS STORAGE					
Standard devices	Floppy disc (256KB) x 2	—	—	—	—
Optional devices	Two floppy discs	—	Floppy x 2	Floppy x 2, 8-inch fixed disc	Dual floppies x 2, 8- inch fixed disc x 3
KEYBOARD/DISPLAY					
Screen size, colors	None	9 in., green	12 inch, green	12 inch, green	12 inch, green
Characters/line & number of lines	None	40 or 80 x 24	40 or 80 x 24, 120 x 14	40 or 80 by 24, 120 x 16	84 x 24
Character sets	None	English, Kana graphics	English, Kana, graphics	English, Kana, graphics	English, Kana, graphics
Graphic points	None	—	—	—	—
Keyboard style, numeric keypad, function keys	None	Typewriter, yes, yes	Typewriter, yes, yes	Typewriter, yes, yes	Typewriter, yes, yes
Calculator keys, Control key	None	—	—	—	—
STANDARD PRINTER					
Type, characters/line	None	9 x 7 matrix, 136	9 x 7 matrix, 136	9 x 7 matrix, 136	9 x 7 matrix, 136
Speed (characters/second)	None	125	125	125	125
Character sets	None	English, Kana	English, Kana	English, Kana	English, Kana
OTHER PERIPHERALS	Typewriter, plotter, paper tape reader/ punch	Modem, various printers	Modem, various printers	Modem, various printers	Modem, various printers
COMMUNICATIONS					
Mode, code	Full duplex	Full/half duplex	Half/full duplex	Half/full duplex	Half/full duplex
Protocols	Asynch., synch.	Asynchronous	Asynch/synch	Synch/asynch	—
Maximum number of lines, speed (bits/second)	2, max. 19,200	1, max. 9600	1, max. 9600	1, max. 9600	1, max. 9600
OTHER INTERFACES	—	—	—	—	—
SOFTWARE					
Programming languages	FORTRAN, COBOL, Pascal	Assembler, FOR- TRAN, COBOL,	Assembler, BASIC, FORTRAN, COBOL	Assembler, BASIC, FORTRAN, COBOL	Assembler, BASIC, FORTRAN, COBOL
Other software	CP/M, BASIC	—	—	—	—
Computation range, accuracy	—	Editor, debugger, CP/M utilities	Editor, debugger, CP/M utilities	Editor, debugger, CP/M utilities	—
Utilities	—	—	—	—	—
APPLICATIONS	General business, scientific, education, measurement, control	Stock management, general finance, sales mgt., English composition	Stock mgt., general finance, sales mgt.	Stock mgt., general finance, sales mgt.	Stock mgt., general finance, sales mgt.
AVAILABILITY & PRICING					
Date introduced in Japan	—	October 1980	October 1979	October 1979	October 1980
First shipment in Japan	—	November 1980	October 1979	October 1979	December 1980
Price of minimum configuration (yen)	1.2 million	450,000	650,000	850,000	850,000
Price of standard configuration (yen)	1.2 million	597,000	797,000	11.29 million	11.29 million
COMMENTS	<ul style="list-style-type: none"> <li>● CRT, printer are user selected (RS-232-C)</li> <li>● Minimum configuration is LDS-II with 2 floppies</li> <li>● LDS-III (500KB x 2)</li> <li>● LDS-III (500KB x 2) is 1.4 million yen</li> </ul>		<ul style="list-style-type: none"> <li>● Two-sided double-density mini-FDDs (2) and an 8-inch fixed disc (10M) are connectable</li> </ul>	<ul style="list-style-type: none"> <li>● Two double-sided double-density mini-FDDs and an 8-inch fixed DD (10M) are connectable</li> </ul>	<ul style="list-style-type: none"> <li>● Two double-sided double-density mini-FDDs and an 8-inch fixed DD (10M) are connectable</li> </ul>



Personal Computer Specifications

MANUFACTURER	Matsushita Tsushin Kogyo (Matsushita Communications Industries)	Matsushita Tsushin Kogyo (Matsushita Communications Industries)	Nippon Electric (NEC)	Oki Denki Kogyo (Oki Electric Industries)	Oki Denki Kogyo (Oki Electric Industries)
SYSTEM	My Brain	My Brain	PC8000	IF800	IF800
MODEL	700	800	PC8001	20	10
HARDWARE PACKAGING	Desk top	Desk top	Desk top	Desk top	Desk top
PROCESSOR					
Model, word length	8085A, 8-bit	8085A, 8-bit	Z80A, 8-bit	Z80A, 8-bit	Z80A, 8-bit
Memory type, cycle time (nanoseconds)	—	—	MOS	MOS, 1 microsec.	MOS, 1 microsec.
Memory capacity (bytes), error checking	64K	64K	Max. 32K	64K	64K
ROM capacity (bytes)	2K	2K	24K	2K	2K
Expansion ROM (bytes)	—	—	8K	—	40K
MASS STORAGE					
Standard devices	Mini-floppy x 2	Floppy x 2 (500KB)	None	Mini-floppy x 2 (560KB)	Audio cassette
Optional devices	None	None	Mini-floppy (143KB), audio cassette	Cassette, audio cassette, floppy	Mini-floppy, cassette, floppy
KEYBOARD/DISPLAY					
Screen size, colors	12 inch, green	12 in., green	12 in., color or green	12 in., green or color	12 in., green or color
Characters/line & number of lines	80 x 24	60 x 24	80 x 25	80 x 25	80 x 25
Character sets	English, Kana	English, Kana	English, Kana, graphics	English, Kana	English, Kana
Graphic points	None	None	160 x 1000	640 x 200	600 x 200
Keyboard style, numeric keypad, function keys	JIS, yes	JIS, yes	JIS, yes	JIS, yes	JIS, yes
Calculator keys, Control key	Yes	Yes	Yes	Yes	Yes
STANDARD PRINTER					
Type, characters/line	Dot matrix, 136	Dot matrix, 136	Dot matrix, 80	Dot matrix	Dot matrix
Speed (characters/second)	100	100	125	80	80
Character sets	JIS	JIS	English, Kana	English, graphics, Kana	English, graphics, Kana
OTHER PERIPHERALS	Serial printers, acoustical coupler	Serial printers, acoustic coupler	Home TV adapter, thermal printer, light pen	Parallel printer, AD/DA converter, home TV	Parallel printer, AD/DA converter, home TV
COMMUNICATIONS					
Mode, code	Half/full duplex	Full/half duplex	—	Half duplex	Half duplex
Protocols	Asynch./synch.	Asynch, synch.	—	—	—
Maximum number of lines, speed (bits/second)	3, max. 9600	3, max. 9600	1, max. 4800	4, max. 9600	4, max. 9600
OTHER INTERFACES	RS-232-C (3 ports)	RS-232-C (3 ports)	RS-232-C, IEEE 488	IEEE 488, RS-232-C	IEEE 488, RS-232-C
SOFTWARE					
Programming languages	BASIC	BASIC	BASIC	BASIC	BASIC
Other software	CP/M	CP/M	—	CP/M	CP/M
Computation range, accuracy	10E ± 38, 16	10E ± 38, 16	10E ± 38, 16	10E ± 38, 16	10E ± 38, 16
Utilities	Print, copy, load, format	Print, copy, load, format	—	Debugger, linker, simple data base	Debugger
APPLICATIONS	Business	Business	Hobby, scientific computations, measurement	Business, scientific computations, measurement	Scientific calculations, measurement, home use
AVAILABILITY & PRICING					
Date introduced in Japan	September 1978	June 1979	April 1979	May 1980	May 1980
First shipment in Japan	September 1978	June 1979	Fall 1979	October 1980	January 1981
Price of minimum configuration (yen)	1.73 million	2.23 million	168,000	1.28 million	370,000
Price of standard configuration (yen)	1.73 million	2.23 million	278,860 w. color CRT	1.28 million	370,000
COMMENTS	<ul style="list-style-type: none"> <li>● Minimum system configuration: 64K, two mini-FDD (143.3KB), 12 in. CRT</li> <li>● Model 740 has 64K, two mini-FDD (560KB), 12 in. CRT for 2.1 million yen, shipped April 1980</li> </ul>	<ul style="list-style-type: none"> <li>● Minimum system configuration: 64K, 8 in. FDD (two) (500KB), 12 inch CRT</li> <li>● Model 840 is the 65K unit, two 8 in. FDD (2MB), with a 12 inch CRT is 2.48 million yen (shipment is January 1980)</li> </ul>	<ul style="list-style-type: none"> <li>● Possible to increase RAM with expansion units</li> </ul>	<ul style="list-style-type: none"> <li>● Other standard I/O: light pen, RS-232-C, speaker, calendar, clock</li> <li>● Basic functions: music, graphics, terminal functions, matrix letters, etc.</li> <li>● Standard system configuration is printer, mini-FDD (560KB), green CRT</li> </ul>	<ul style="list-style-type: none"> <li>● Other standard I/O: light pen, RS-232-C, speaker, calendar, clock</li> <li>● Standard configuration includes unit and printer</li> </ul>

### Personal Computer Specifications

MANUFACTURER	Panafacom	Panafacom	Sharp	Sharp	Sord Computer Systems
SYSTEM	PANAFACOM	PANAFACOM C15E	MZ-80	MZ-80	M243
MODEL	C-180	Model 1, Model 2	MZ-80KZ	MZ-80C	Mark IV, V, VI
HARDWARE PACKAGING	Desk top	Desk top	Desk top	Desk top	Desk top
PROCESSOR Model, word length Memory type, cycle time (nanoseconds) Memory capacity (bytes), error checking ROM capacity (bytes) Expansion ROM (bytes)	MN1610A, 16-bit MOS 124K 4K —	IM16 10A, 16-bit MOS, 500 96/124K, parity 4K —	Z80, 8-bit MOS Max. 48K 4K —	Z80, 8-bit MOS 48K 4K —	Z80A, 8-bit MOS 64K 192K, ECC 2K —
MASS STORAGE Standard devices Optional devices	Mini-floppy (320KB) x 2 Mini-floppy x 2, (1.2MB)	Cassette tape Digital cassette (256KB)	Audio cassette Mini-floppy (180KB)	Audio cassette Mini-floppy (140KB)	MK IV-mini-floppy; MK V 5 in. floppy; MK VI-fixed disc Cartridge
KEYBOARD/DISPLAY Screen size, colors Characters/line & number of lines Character sets Graphic points Keyboard style, numeric keypad, function keys Calculator keys, Control key	12 inch, green 80 x 24 English, Kana, Kanji Character units JIS, yes Yes	— 64 x 16 English, Kana, graphics Character units JIS 69 key, yes Yes	10 in., black & white 40 x 25 40 x 25 Special, none None	10 in., green 40 x 25 English, Kana, graphics 40 x 25 ASCII, none None	Monochrome or color 80 x 24 English, Kana, Kanji 640 x 400 JIS, yes Yes
STANDARD PRINTER Type, characters/line Speed (characters/second) Character sets	Dot matrix, 80 125 English, Kana	Thermal, 12 2 lines/second English, Kana	Dot matrix, 80 — English, Kana, graphics	Dot matrix, 80 — English, Kana, graphics	Dot matrix 150 English, Kana
OTHER PERIPHERALS	Business Kanji	Serial printer (80 & 60 cps)	Color display, electrical discharge printer	Color display, disc interface unit	Paper tape, plotter, card reader, coupler, modem
COMMUNICATIONS Mode, code Protocols Maximum number of lines, speed (bits/second)	Half duplex — 2, 4800	Half/full duplex Asynch./synch. 2, max. 9600	None — —	None — —	Full/half duplex Synchronous 1, max. 4800
OTHER INTERFACES	DIO 4 ports, GPIB 1 port	IEEE 488, RS-232-C, digital input adaptor	Interface card	Interface card	S100 bus, (3 ports), RS-232-C (4 ports)
SOFTWARE Programming languages Other software Computation range, accuracy Utilities	BASIC (inter- mediate) Double precision BASIC, Bus. BASIC 15 digits File conversion, TSS terminal conversion	BASIC — 15 digits Editor, diag. prog., system copy prog.	BASIC Disk BASIC, Assembler —	BASIC Disk BASIC, Assembler —	BASIC, COBOL, FORTRAN Pascal, PIPS, MDOS — —
APPLICATIONS	TSS terminal, scientific measure- ments, business	Scientific & tech. computation, statis- tics, data analysis math modeling	Hobby, measure- ment	Hobby, measure- ment, business	Word processing, inquiry processing, data entry
AVAILABILITY & PRICING Date introduced in Japan First shipment in Japan Price of minimum configuration (yen) Price of standard configuration (yen)	October 1980 January 1981 1.65 million 1.9 million	December 1979 December 1979 1.2-1.4 million 2.22 million	1980 1980 198,000 693,800	1979 1979 2.68 million (48) 763,800	September 1980 February 1981 1.45 million (MK IV) 1.73 million (MK V)
COMMENTS	<ul style="list-style-type: none"> <li>● Printer expansion print capability</li> <li>● Kanji only on display</li> <li>● Standard system adds a printer to the minimum configuration of CPU, CRT, and floppy disc</li> </ul>	<ul style="list-style-type: none"> <li>● Model 1 has main memory capacity of 96K, while Model 2 has 124K. There are two input slots, and by interface it can be structured as a measurement or control system</li> <li>● The standard system configuration is the minimum system + cassette + serial printer</li> </ul>	<ul style="list-style-type: none"> <li>● Standard system is 32K + 2 mini-floppies + printer</li> </ul>	<ul style="list-style-type: none"> <li>Standard system is 48K, 2 mini-floppies, printer</li> </ul>	<ul style="list-style-type: none"> <li>● Can be expanded in 64K units up to 1M because memory management functions were strengthened</li> <li>● Mark IV file is 720KB, Mark V file 1MB, Mark VI file 20MB</li> <li>● Mark VI is 2.56 million yen</li> </ul>

## Personal Computer Specifications

MANUFACTURER	Sord Computer Systems	Sord Computer Systems	Sord Computer Systems	TEAC	Toa Microcomputer
SYSTEM	M243	M200	SDC-8M	PS-80	VOICE
MODEL	Mark Kanji System	Mark III, IV, V	—	PS-80	1000
HARDWARE PACKAGING	Desk top	Desk top	Desk top	Desk top	Desk top
PROCESSOR Model, word length Memory type, cycle time (nanoseconds) Memory capacity (bytes), error checking ROM capacity (bytes) Expansion ROM (bytes)	Z80A, 8-bit MOS 64K 192K, ECC option 2K —	Z80A, 8-bit MOS, 800 64K 2K 8K	Z80A, 8-bit MOS 16K 16K to 64K 1K —	Z80, 8-bit MOS Max. 48K 12K —	8085, 8-bit MOS, 450 32K 4K —
MASS STORAGE Standard devices Optional devices	Mini-floppy (720KB)  (1MB), 8 in. Winchester disc (9.3MB)	MK III—mini-floppy; MK IV & V—floppy 3, 5-in. mini-FDD, 3 hard disc, 13MB MT cart. 8" FDD	Up to 4 mini- floppy discs —	None  Cassette, mini- floppy	1 cassette MT (250KB) 1 cassette MT (250KB), floppy (1 or 2MB)
KEYBOARD/DISPLAY Screen size, colors Characters/line & number of lines Character sets Graphic points Keyboard style, numeric keypad, function keys Calculator keys, Control key	Monochrome 1920/800 (Eng./ Kanji) English, Kana, Kanji 640 x 600 JIS, (yes)  Yes	12 in., green or color 80 x 24  English, Kana  526 x 526 JIS, yes  Yes	12 inch 80 x 24  —  None ASCII  Yes	12 inch, green 64 x 16  English  128 x 48 ASCII, yes  Arithmetic keys	12 inch, green 80 x 24  JIS  None JIS, yes  None
STANDARD PRINTER Type, characters/line Speed (characters/second) Character sets	Dot matrix 50 (Kanji)  English, Kana, Kanji	Dot matrix, 132 120  English, Kana, graphics	None —  —	Dot matrix, 80 80  English, graphics	Dot matrix, 20 40  JIS
OTHER PERIPHERALS	Plotter, punched tape, card reader, modem	Graphics printer, modem, card reader	Printer, paper tape reader/punch	AD/DA converter	None
COMMUNICATIONS Mode, code Protocols Maximum number of lines, speed (bits/second)	Full/half duplex  — —	Full/half duplex  Synchronous 1, max. 4800	—  Asynch./BSC Max. 9600	—  — —	Half/full duplex  Asynch./synch 1, max. 9600
OTHER INTERFACES	S100 bus (3 ports), RS-232-C (4 ports)	S100 bus, 3 slots; RS-232-C, 2 slots	S-100 bus	GB-1B, RS-232-C	RS-232-C (1 port), Centronics (1 port)
SOFTWARE Programming languages Other software Computation range, accuracy Utilities	BASIC, COBOL, FORTRAN Pascal, PIPS, Kanji BASIC Kanji data entry, Kanji editor  —	Basic (intermediate, compiler) DOS, FORTRAN, COBOL —  PIPS, info mgt.	Assembler, COBOL, FORT., BASIC, Pascal, Algol, Macro Assembler 14 digits  English, Japanese WP; file manager	BASIC  Assembler  —  —	BASIC, Assembler  —  10E ± 37, 16  None
APPLICATIONS	Billing, communi- cations, Kanji terminal, word processing	Business, measure- ment control fields	Intelligent terminal, local data base, measurement, per- sonal computer	Business, research	Business
AVAILABILITY & PRICING Date introduced in Japan First shipment in Japan Price of minimum configuration (yen) Price of standard configuration (yen)	— — — —	September 1979 November 1979 830,000 1.15 million	— — — —	1980 1980 498,000 593,000	May 1980 September 1980 3.5 million 3.5 million
COMMENTS	<ul style="list-style-type: none"> <li>● Kanji is JIS level 1, and up to 100 characters of foreign language may be used</li> <li>● Standard system configuration is the Mark IV with Kanji printer</li> </ul>	<ul style="list-style-type: none"> <li>● M223 types connect with S100 bus</li> <li>● M203 MK II: 830,000 yen</li> <li>● M203 MK IV: 1.15 million yen</li> <li>● M223 MK III: 1.08 million yen</li> <li>● M223 MK VI: 2.33 million yen</li> </ul>		<ul style="list-style-type: none"> <li>● Minimum configuration is display + 1 MT; standard system is display + 2 MT</li> </ul>	<ul style="list-style-type: none"> <li>● Minimum system configuration is 32K, CRT, 1 cassette MT (250KB), and printer, all housed in the same unit</li> <li>● BASIC for voice input</li> </ul>

### Personal Computer Specifications

MANUFACTURER	Toa Microcomputer	Tokyo Denki (Tokyo Electric)	Tokyo Sanyo Denki (Sanyo)	Tokyo Sanyo Denki (Sanyo)	Tokyo Shibaura Denki (Toshiba)
SYSTEM	VOICE	My Tech T-555	BMC-2000/3000	PHC-1000	BP-100
MODEL	3000	—	—	1000, 1830N	BP-100
HARDWARE PACKAGING	Desk top	Desk top	Desk top	Desk top	Desk top
PROCESSOR					
Model, word length	Two 8085, 8-bit	—	TMS9900, 16-bit	8085A, 8-bit	TMS 9085
Memory type, cycle time (nanoseconds)	MOS, 250	—	MOS	MOS	MOS
Memory capacity (bytes), error checking	64K	—	64K	32K	48K
ROM capacity (bytes)	4K	—	4K	4K	8K
Expansion ROM (bytes)	—	—	8K	—	—
MASS STORAGE					
Standard devices	Floppy (1 or 2MB) x 2	Mini-floppy x 2	2000D: mini-FDD (300KB) x 2 3000D: FDD (1MB) x 2 3000S: FDD (521KB) x 2	Digital cassette (256KB/one side) None	Mini-floppy (280KB) x 2
Optional devices	—	—	—	—	—
KEYBOARD/DISPLAY					
Screen size, colors	12 inch, green	12 inch, green	12 inch, green	12 inch, green	9 inch, green
Characters/line & number of lines	80 x 24	80 x 25	80 x 24	80 x 24	40 x 13
Character sets	English, Kana	English, Kanji	English, Kana	English, graphics	English, Kana
Graphic points	None	Character units	Character units	Character units	None
Keyboard style, numeric keypad, function keys	JIS (yes)	Keymat (yes)	ASCII (yes)	JIS (yes)	Touch-in-Book
Calculator keys, Control key	Yes	Yes	Yes	Yes	None
STANDARD PRINTER					
Type, characters/line	None	Dot matrix	Dot matrix, 80	Dot matrix, 20	Dot matrix, 80
Speed (characters/second)	None	130	80	90 lines/minute	125
Character sets	None	—	English, Kana, symbols	English, Kana	English, Kana
OTHER PERIPHERALS	None	Data collector	Punched tape reader, punch	None	—
COMMUNICATIONS					
Mode, code	Half/full duplex	—	Half/full duplex	None	—
Protocols	Asynch/synch	—	Asynch/synch*	—	—
Maximum number of lines, speed (bits/second)	1, 9600	—	2, 300-19,200	—	—
OTHER INTERFACES	RS-232-C (2 ports), Centronics (1 port)	Assembler	RS-232-C, 8-bit parallel	RS-232-C (1 port)	—
SOFTWARE					
Programming languages	BASIC, Assembler, COBOL	—	BASIC	BASIC	BASIC
Other software	CP/M, FDOS	—	TSDOS, CP/M	—	—
Computation range, accuracy	10E ± 60, 10	—	10E ± 63	11 digits	14 digits
Utilities	Sort, merge	—	—	Editor	Sort, disk initializa- tion, copy, file
APPLICATIONS	Business	Business	Financial, salary, customer and sales records	General business, education, hobby/ home use	Business, payroll, stock, sales, administration
AVAILABILITY & PRICING					
Date introduced in Japan	February 1981	August 1980	October 1980	October 1979	1980
First shipment in Japan	May 1981	August 1980	December 1981	October 1979	October 1980
Price of minimum configuration (yen)	4.5 million	2.2 million	1.08 million	698,000	1.31 million yens
Price of standard configuration (yen)	4.5 million	2.66 million	1.38 million	1.12 million	1.47 million yens
COMMENTS	<ul style="list-style-type: none"> <li>● Standard system configuration is unit (64KB), CRT, KB, 2 8-in. FDD (1 or 2 MB)</li> <li>● BASIC for voice input</li> </ul>	<ul style="list-style-type: none"> <li>● Simple Kanji display is possible</li> <li>● Keymat input mode</li> <li>● Standard system price includes 15-inch printer</li> <li>● IBM compatible interface</li> </ul>	<ul style="list-style-type: none"> <li>● Keyboard separate from unit</li> <li>● 2000D: 1.08 mil. yen</li> <li>● 3000S: 1.38 mil. yen</li> <li>● 3000D: 1.68 mil. yen</li> <li>* 2 Asynchronous. When synchronous: 1200-9600 bps</li> </ul>	<ul style="list-style-type: none"> <li>● Model 1830N includes a printer (PHC-800) and cassette MT</li> <li>● Minimum configuration cost model 1000, standard configuration cost is model 1830N</li> </ul>	<ul style="list-style-type: none"> <li>● Typewriter type keyboard is planned</li> </ul>

# Ai Electronics ABC-20 Series

## MANAGEMENT SUMMARY

Ai Denshi Sokki (Ai Electronic Measuring Instruments) was founded in April 1962 and began manufacturing and marketing electronic circuits, etc. Later, when applications for microcomputers increased with the increasing demand for industrial measurement and control applications, Ai Denshi Sokki advanced into the field of microcomputers. The AIDACS-3000 FDPS (Floppy Disk Programming System) announced in January 1976 used a U.S.-made microprocessor, the Zilog Z-80, in the microcomputer-sized floppy disk system. This was developed primarily as a tool for developing programs for the Z-80 and the U.S.-made Intel 8080 and 8085 microprocessors. The FDPS is equipped with an operating system called DOSKET, and a JIS 7000-level FORTRAN compiler can be used.

In April 1974, the ABC-20 aimed at the small scale business applications in a desk top personal computer. At present, including the ABC-20, there are the ABC-21, 24, 25, and 26 for a total of five configurations. Each model has interchangeability, so that it is easy to upgrade within the ABC Series.

The ABC Series is classified according to the size of the CRT display and the capacity of the floppy disk. The ABC-20 and 21 use a 9-inch display, while the ABC-24, 25, 26 use a 12-inch display. The ABC-20 contains two 5.25-inch (about 13.3cm) mini-floppy disk drives with normal density capacity on both sides of 161K bytes. In the ABC-21 and 24, there are two double-density two-sided 320K-byte mini-floppy disks. The ABC-25 has that same double density, but it has two mini-floppy disk drives with 366K-byte capacity. The ABC-26 is equipped with two 8-inch (about 20.3 cm) standard double-density floppy disks with capacities of 1.15M bytes.

All of the ABC series have CRT display, ASCII keyboard configuration, two mini or standard floppy disk drives, ▶



The ABC-24 includes a 12-inch display with two integral 320K-byte double-density floppy disk drives. The ASCII keyboard includes programmable function keys and a 10-key numeric keypad.

In Ai Denshi Sokki's ABC Series, two floppy disk drives and the keyboard/display are housed within one unit to comprise a desk-top personal computer for business applications. Models are divided according to the capacity of the floppy disks and by display screen size. There are 5 models from the lowest priced ABC-20 on through the 21, 24, 25, and 26. The DOSKET-20 operating system allows the use of BASIC, FORTRAN, COBOL, etc. A printer, externally connected, is optional. Prices in the ABC Series begin at 1.5 million yen.

## CHARACTERISTICS

**MODELS:** ABC-20, 21, 24, 25, 26.

**MANUFACTURE & SALES:** Ai Denshi Sokki, Shitamurushi 2-28-16, Ota-ku, Tokyo 146, Japan. Tel. (03) 756-4111.

**INTRODUCTION:** April 1979 (ABC-20), April 1980 (ABC-21, 24, 25, 26).

**SHIPMENT:** August 1979 (ABC-20), June 1980 (ABC-21, 24), August 1980 (ABC-25, 26).

**NUMBER OF UNITS IN OPERATION:** For the whole ABC series, 120 in Japan, 230 in foreign countries (as of June 1980).

## DATA MODE AND COMMANDS

**BASIC UNITS:** 8 bits (1 byte).

**FIXED DECIMAL OPERAND:** Units accuracy 16 bits. Exponential accuracy 32 bits.

**FLOATING DECIMAL OPERAND:** Units accuracy 32 bits (mantissa = sign + 24 bits, exp. = sign + 6 bits). Units accuracy 64 bits (mantissa = sign + 47 bits, exp. = sign + 15 bits).

**COMMANDS:** 158 types of commands using the U.S.-made Zilog Z80A microprocessor.

**CODES:** ASCII (a model has also been prepared so that JIS C-6220 code can be used). It is possible to process EBCDIC code within applicable business programs.

## MAIN MEMORY

**TYPE:** n channel dynamic MOS RAM (16 bits/chip).

**CYCLE TIME:** 375 nanoseconds.

**MEMORY CAPACITY:** 64KB, expandable to 1MB with options.

**ERROR CHECKING:** None.

**MEMORY PROTECTION CAPABILITY:** None. ▶

## Ai Electronics ABC-20 Series

▷ and are equipped with connections for an externally connected printer. Within the desk top unit, there are the power supply, CPU (Z-80A), main memory (64K to 1M bytes), the keyboard/display, and the floppy disk drives. It is equipped with DOSKET-20, a floppy disk-based operating system, JIS 7000-level FORTRAN, BASIC-2, COBOL, PL/3 (similar to PL/M), and Macro Assembler can be used. It is also possible to use the CP/M operating system developed in the U.S. by the Digital Research Company. UCSD (University of California, San Diego) Pascal can also be used.

DOSKET-20 starts the bootstrap loader housed in ROM, and the main control program on the floppy disk called DSMAIN is read into the main memory RAM; after which, the system can be used. DSMAIN normally remains in main memory. The job control program, called JOBCON, can be implemented to allot a specific input/output unit for the system unit, or to process call commands from various language compilers or interpreters. JOBCON commands also call the file/text editor, debugging monitor, and linkage loader so they can be used.

It is possible to use BASIC, COBOL, etc. according to the specific needs of the user's business. Using the 65K to 1M-byte RAM, applications such as stock control, accounting, word processing, and data filing are possible. Also, there are 16 function keys on the keyboard for user programming, in addition to a 10-key numeric keypad.

The lowest cost unit in the ABC Series is the ABC-20 at 1.5 million yen. The CSLP-I option for connecting a printer is 300,000 yen. □

### ▶ CENTRAL PROCESSING UNIT

The processor uses a 4MHz clock and is a Z80A micro-processor. It uses a single 5V power source and a single-phase 5V clock. For computation, a U.S.-made Advanced Micro Device AMD9511A (2MHz clock standard, 4MHz optional) is used. The 9511A has a 16-byte stack. Computation processing uses the data on the stack. Computation results, too, are left on the stack. The 9511A handles 16-bit/32-bit 4-function arithmetic computations, 32-bit floating decimal computations, a variety of function computations, and stack operation.

**CONTROL MEMORY:** The initial loader is housed within ROM. When the system is started, the normal module called is DSMAIN, which is loaded into RAM.

**TYPES OF REGISTERS:** There are 17 internal registers: 9 types of 8-bit registers, 3 types of 16-bit registers, and 4 types of 16-bit register pairs.

**INTERRUPTS:** The Z80A has 3 interrupt modes. Interrupt control is accomplished by the (U.S.) Intel 8259A chip. Interrupt factors are timers (two kinds), SIO (2 kinds), floppy disk PIO (2 kinds), GP-IB, CRT, APU, and monitor switch flag, and there is provision for expansion through one external input. The interrupt uses a vector system using the CALL command.

**ADDRESSING:** Various modes including immediate, expanded immediate, index, register, page zero modification, implied, relative, indirect register, expansion, and bit.

**TYPES OF COMMANDS:** 8-bit load, 16-bit load, exchange, memory block move, memory block search, 8-bit compute/logic compute, 16-bit compute, universal accumulator/flag operation, and CPU control commands.

**COMMAND IMPLEMENTATION TIME:** Minimum of one microsecond.

**CLOCK:** 4MHz.

### INPUT/OUTPUT CONTROL

Between the floppy disk and RAM, the GP-IB interface and RAM, and between the CRT controller and RAM are data converters, the Intel 8257-5 (in ABC-20) or the 9517-4 x 2 (in the ABC-21 to 26). These accomplish direct memory access.

Standard equipment for input/output includes two serial I/O ports, two parallel I/O ports (8-bit), and GP-IB. Options include a printer/light pen adapter, a photoelectric paper tape reader adapter, and an automatic call device connection adapter (for a modem). Also, an internal bus expansion option interface can be connected for an expansion unit (EXU).

### MASS STORAGE

Two floppy disk drives are standard and are integrated within the unit. It is possible to add two more drives externally. Capacity differs by model. In the ABC-20, two-sided standard-density mini-floppy disks are used and each has a 161KB capacity. In the ABC-21 and 24, there are two-sided double-density 320KB floppy disk drives, and in the ABC-25 there are two-sided double-density 366KB mini-floppy disk drives. The ABC-26 has two-sided double-density 1.16MB standard floppy disks. Data transfer speed is 124K bits/second in the ABC-20, 250K bits/second in the ABC 21-25, and 400K bits/second in the ABC-26. Connectable options include Winchester-type disk units, cartridge disk units, magnetic tape units, and cartridge-type magnetic tape units.

### INPUT/OUTPUT UNITS

The display on the ABC-20 is a 9-inch screen with 80-character by 32-line format. On the others, there is a 12-inch screen with 80-character by 24-line format. The keyboard has a total of 101 keys, including 16 function keys and 10 numeric keys.

An option allows external connection of printer where paper width, print method, and graphic capabilities can be chosen.

### COMMUNICATIONS CONTROL

It is possible to connect an RS-232-C or a CCITT V.24 interface. The communications mode is either half- or full-duplex. Both asynchronous and synchronous transmission modes are possible.

### SOFTWARE

The operating system is called DOSKET-20 and supports Macro Assembler, JIS 7000-level FORTRAN, BASIC-2, COBOL, and PL/3 (similar to PL/M). With BASIC-2, there is an interpreter and also a compiler which expands input/output control functions. Optionally, one can also use the (U.S.) Digital Research Company's CP/M operating system and MP/M. Also, one can use UCSD (University of California, San Diego) Pascal. ▶

## Ai Electronics ABC-20 Series

### ► SERVICE ORGANIZATION

Preventive maintenance is performed every two years. MTBF (Mean Time Between Failures) is 8000 operating hours. MTR (Mean Time To Repair) is 30 minutes, guaranteed.

Service is performed from 58 locations by Tanimura Shinko Service. There are representatives at various locations across the country.

### PRICING

The purchase price for the standard configurations of the ABC series (which includes keyboard/display, two floppy disk drives, BASIC-2 and FORTRAN language processors, and DOSKET-20) is 1.5 million yen for the ABC-20, 1.55 million yen for the ABC-21, 1.6 million yen for the ABC-24, 1.6 million yen for the ABC-25, and 2.1 million yen for the ABC-26.■





# Kanematsu Nixdorf EASY ONE

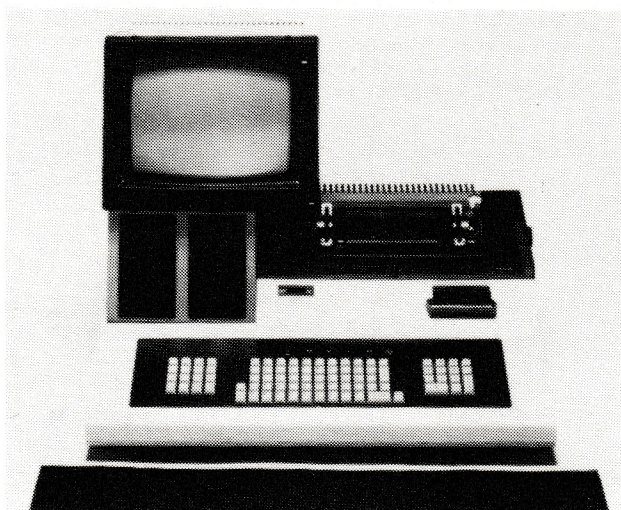
## MANAGEMENT SUMMARY

The Kanematsu Nixdorf computer uses the former small computer and on-line system of the West German Nixdorf Computer Company as its basis. The same company, on its own, further developed this computer to make it more appropriate for the Japanese market and began selling its System-K series in 1967. The EASY ONE is a desk top computer developed out of the experience gained from the System-K, and it is a stand-alone personal computer. However, it is equipped with the capabilities for serving as a terminal for a host computer.

The EASY ONE was designed for the following three applications: as a TSS terminal for an on-line systems, as a dispersed processing terminal, and finally, as a specialized computer for specific businesses or business applications.

Even beginners were taken into consideration because it is very easily operated for personal use. For example, the keyboard is divided into three sections: the function key section, the Kana/English/numbers section, and the 10-key numeric keypad section. In each of these sections, the keys are divided into five colors. In the Kana/English/numbers section, they are vertically aligned in the a-i-u-e-o syllabic order and in ABC alphabetical order.

The standard configuration includes an 8-bit micro-processor, a 64K-byte memory, a display of 2,000 characters, keyboard, two two-sided double-density mini-floppy disk drives, an 80-character/second matrix printer, and two RS-232-C ports. There is considerable flexibility in system configuration. For example, it is possible to substitute a graphic display or a POS/ECR flat display. It is also possible to exchange the mini-floppy disk unit for a standard IBM 8-inch floppy disk unit. Optionally, one can also select a pen-touch or finger-touch type keyboard. ➤



The EASY ONE includes a 12-inch display, two two-sided double-density mini-floppy disk drives, and an 80-cps matrix printer.

The Kanematsu Nixdorf computer EASY ONE is a personal, desk top computer. In the basic configuration, there is the CPU, a 64K-byte main memory, a keyboard in a-i-u-e-o syllabic order for Kana and ABC order for the alphabet, a 12-inch 2,000-character display, two 256KB two-sided double-density mini-floppy disk drives, an 80-cps dot matrix printer, and two RS-232-C ports. The programming language is business BASIC with various utilities. Price depends upon the number of units ordered, but ranges between 1.3 and 2 million yen.

## CHARACTERISTICS

**MODEL:** EASY ONE.

**MANUFACTURE-SALES:** Kanematsu Nixdorf Computer (Inc.), Nishi Gotanda 1-31-1, Shinagawa-ku, Tokyo 141, Japan (Nihon Seimei Bldg). Tel. (03) 490-1351.

**INTRODUCTION:** October 1979.

**SHIPMENT:** January 1980.

**NUMBER ORDERED:** 400 units, of which 200 have been installed (as of September 1980).

### DATA FORMATS

**BASIC UNITS:** 8-bit byte.

**FIXED DECIMAL OPERAND:** Integers (-32768 to +32767). Base 16 (maximum FFFF), base 8 (maximum 17,777).

**FLOATING DECIMAL OPERAND:** 6 or 16 digits, exponent to  $\pm 38$ .

**COMMANDS:** 158 types. However, user programs are in BASIC.

**INTERNAL CODE:** ASCII.

### MAIN MEMORY

**TYPE:** MOS, 16K-bit dynamic RAM.

**ACCESS TIME:** 660 ns.

**MEMORY CAPACITY:** 32K to 64KB.

**RESERVED MEMORY:** The upper 40KB of main memory is the system area, while the lowest 4KB is divided into two sections. The first 2KB are the CRT control area, and the remaining 2KB are used as the CRT buffer. When main memory is 64KB, the user area is about 20KB.

### CENTRAL PROCESSING UNIT

The processor is the (U.S.) Zilog Z80A microprocessor. The basic clock rate is 4MHz. Aside from main RAM to 64KB, there is a 4KB RAM for the character generator, and a 2KB ➤

## Kanematsu Nixdorf EASY ONE

▷ The programming language is business BASIC which runs under an operating system called ADOS. Applications include specialized business applications such as statistical computation, regression analysis, integral equations, differential equations, equation sets, and complex number calculation functions. Specific applications include personnel records management, customer records management, and various applications in general business management, including applications in beauty shops, newspaper sales outlets, inns, swimming clubs, and liquor stores.

EASY ONE is basically sold as multiple units sold at one time or by OEM sales. The price differs according to the number of units ordered, but it ranges between 1.3 and 2 million yen per unit. Manufacturing of the EASY ONE is by Alps Electric.□

► ROM for control memory. There are up to 16 priority interrupts. After turning on the power, a boot strap loader is used to automatically load the memory with a program from a floppy disk.

### INPUT/OUTPUT CONTROL

Inside the CPU, there are connections for a system bus, memory, real-time clock, floppy disk controller, printer controller, keyboard/CRT controller, and an RS-232-C interface.

### SYSTEM CONFIGURATION

The standard configuration of the EASY ONE includes an a-i-u-e-o order/ABC order keyboard, 12-inch CRT, two 5-inch floppy disk drives, an 80-column 80-cps printer, and two RS-232-C ports.

The keyboard is comprised of numeric keys, function keys, operational indicators, and a buzzer. The rest of the keyboard can be a-i-u-e-o order for syllabic alphabet and ABC order for the English alphabet, or a JIS arrangement with Kana and an ASCII arrangement without Kana. There are also four types of ITEM book "keyboards" (160 ITEM keys/page, 15 pages/book).

The CRT display shows 2,000 characters in 80-characters by 25-line format. The display color is green and characters are formed by a 5 x 7 dot matrix. There are 128 characters. The 4KB character-generator RAM is composed of a 2KB C.G. RAM for ASCII and a 2KB pattern generator portion for simple Kanji or graphics.

The floppy disks are 5-inch mini-floppy two-sided double-density disks. Capacity is 256KB, 35 tracks/side, 16 sectors per track, and 256 bytes/sector. The minimum seek time is 5 ms, head load time is 35 ms. Two units are standard, but expansion to four drives is possible. Instead of the 5-inch mini-floppy disks, it is possible to use two to four 8-inch floppy disks with a one-side normal-density (256KB) or a two-sided double-density (1MB) format.

The 80-cps wire dot matrix printer is standard. When necessary, 120 cps can be selected. Characters are 9 x 7 dot matrix with printing in both directions. Three copies,

including the original, (34kg/series) are possible. An optional connection is possible for a 132-cps, 132-character-line matrix printer. Six copies, including the original, are possible (34kg/series).

Other available peripherals include a paper tape reader/punch, a card reader/punch, cassette tape, magnetic tape, OCR, OMR, OCR wand, and a bar code reader.

**OPERATING REQUIREMENTS:** Power source: AC 100V/115V/220V ( $\pm 10\%$ ), 50 or 60Hz ( $\pm 0.3\text{Hz}$ ). Power source capacity must be about 400VA. The power cord must be a 3-pronged plug with ground, 3 meters long. During operation the ambient temperature should be between 16 and 32°C, relative humidity between 35% and 75%.

### COMMUNICATIONS CONTROL

There are two ports for RS-232-C, but these can be expanded to a maximum of 8. Asynchronous/synchronous communications in full- or half-duplex modes are supported at speeds from 50 to 9,600 bps. Character length is 5 to 8 bits, selectable by program. Error checking is parity check/overrun/framing.

### SOFTWARE

**OPERATING SYSTEM:** The system uses ADOS (Advanced Disk Operating System). With ADOS, both sequential and random access are possible. ADOS operates the IOCS (Input/Output Control System), the job scheduler, job controller, data management, and command processor.

**LANGUAGES:** The interpreter type of business BASIC is used. Line numbers can be designated up to a maximum of 65,529 steps. Line length is a maximum of 255 characters. Display capabilities include flash, reverse, dotted line, simple graphs, Kanji, and time display. Subroutine nesting is multiplexed so far as memory will permit. The business BASIC is by (U.S.) Microsoft.

### UTILITIES

**COPY:** Copies contents of one floppy disks to another. Business BASIC can copy file units.

**SORT:** Limited to fixed-length records in the file to be sorted. Records have a maximum length of 512 bytes. There are 8 blocking records per sector. Keys may ascend or descend to a maximum of 6 levels.

**DIAGNOSTICS:** This is for checking hardware and is comprised of a memory test, lamp test, keyboard test, CRT test, printer test, real-time clock test, RS-232-C test, floppy disk test, and comprehensive test.

### MAINTENANCE

There are 11 operations centers in Japan, and 36 service centers.

### PRICES

The standard configuration of EASY ONE includes a 64KB main memory, keyboard/display, two 5-inch floppy disk drives, and an 80-cps printer. The purchase price is between 1.3 and 2 million yen, depending upon the number of units purchased.■

# Logic Systems International iBEX 7000 Series

## MANAGEMENT SUMMARY

Logic Systems International was founded in October 1973. Initially, it was a consulting operation exclusively dealing with microcomputers. Later, it was purchased by (U.S.) ICOM and then by Pertec Computer Company. This, along with joint ventures, allowed them to begin marketing microcomputer peripherals. In September 1977, they joined with a French dealer to introduce the SANCO 6000 (SANCO is the name of iBEX's European plant). The SANCO 6000 was the predecessor to the iBEX 7000 series. The initial model in the 7000 series is the SANCO 7100 (iBEX 7100) which was introduced in Europe in April 1979.

At present, there are four models in the iBEX 7000 series: the 7100 and 7101, which feature mini-floppy disks, and the 7200 and 7201, which use 8-inch floppy disks.

The standard configuration includes a CPU with a 32K-byte main memory (7100 and 7200) or a 64K-byte main memory (7101 and 7201), a typewriter-type keyboard, a 1,920-character display on a 12-inch screen, and two 256KB two-sided double-density mini-floppy disks or two 1MB two-sided double-density 8-inch floppy disk drives. The differences in the four models lie in memory capacity and in type of floppy disk. There is a RS-232-C port as standard equipment on each model.

The operating system is CP/M from (U.S.) Digital Research. In addition to CP/M, there is a 4KB monitor and a BASIC interpreter. Options include a BASIC compiler, a FORTRAN compiler, and a COBOL compiler.

There are business application packages which include stock management, general finance, sales management, and salary management. Aside from the warehouse stock management program, there are also programs for mailing list management and English word processing. ➤



The iBEX 7101 has two two-sided, double-density mini-floppy disk drives integrated with the 12-inch display. The keyboard includes function keys and a numeric keypad.

The iBEX 7000 series systems are personal computers with 5-inch mini-floppy, or 8-inch floppy disk drives. In the iBEX 7100 and 7101, the two mini-floppy disk drives and the display are integrated while the printer is externally connected. In the iBEX 7200 and 7201, the display and the two 8-inch floppy disk drives are housed in separate modules, with a printer externally connectable. The operating system is CP/M, and standard equipment includes business BASIC. In Europe, the iBEX 7000 series is sold under the SANCO 7000 brand name. The lowest price, for the iBEX 7100, is 1.3 million yen.

## CHARACTERISTICS

**MODELS:** iBEX 7100, 7101, 7200, and 7201.

**MANUFACTURE-SALES:** Logic Systems International (Inc.), Mita 3-9-9, Minato-ku, Tokyo 108, Japan. Tel.: (03) 454-3261.

**INTRODUCTION:** iBEX 7100 and 7101, April 1979; iBEX 7200, 7201, October 1979.

**SHIPMENT:** iBEX 7100, 7101, September 1979; iBEX 7200, 7201, December 1979.

**NUMBER OF UNITS IN USE:** The total for the iBEX 7000 series is 1,659 units (30 in Japan, the remainder exported).

### DATA FORMATS

**BASIC UNIT:** 8-bit byte.

**FLOATING DECIMAL OPERAND:** The range for the exponent is from -38 to +38.

**COMMANDS:** The Z80 instruction set is used.

**CODE:** ASCII.

### CENTRAL PROCESSING UNIT

The (U.S.) Zilog Z80 8-bit microprocessor is used.

**ADDRESSING:** Direct access using a 16-bit address bus.

**REGISTER:** There are two groups of registers: the main register set and the auxiliary register set. Each of the register sets is composed of an 8-bit accumulator, 8-bit flag register, and six 8-bit general registers. The general registers are paired and used as 16-bit registers. The registers include an interrupt vector register (8 bits), memory refresh register (7 bits), two index registers (16 bits), stack pointer (16 bits), and program counter (16 bits).

**TYPES OF COMMANDS:** 158 types.

**CLOCK AND COMMAND IMPLEMENTATION TIME:** The clock is 2.5 MHz, command implementation time is between 1.6 and 9.2 microseconds. ➤

## Logic Systems International iBEX 7000 Series

- ▷ Prices for the iBEX 7000 series are 1.3 million yen for the 7100, 1.5 million yen for the 7101, 1.7 million yen for the 7200, and 1.9 million yen for the 7201. □

### ► SYSTEM CONFIGURATION

The standard configuration for the 7000 series includes the CPU, main memory (32KB for the 7100 and 7200 and 64KB for the 7101 and 7201), keyboard, display, and two floppy disk drives (7100 and 7101 have 5-inch floppy disks while the 7200 and 7201 have 8-inch floppy disks). In the 7200 and 7201, the 8-inch floppy disk drives are housed in separate boxes, while in the 7100 and 7101 they are integrated in one unit. The keyboard, however, is separate.

**KEYBOARD:** There are 128 characters (English letters, Kana notations). The keyboard includes a ten-key numeric section and a function key section. In the character key section, keys can be laid out to correspond with various languages. Four function arithmetic keys are also included.

**DISPLAY:** The display has high resolution and automatic scrolling capabilities. The screen is 12 inches. The video buffer is comprised of an 80-character by 24-line character portion and an 80-character by 24-line function portion. The function portion, by displaying 16 types of patterns, allows languages of various countries to be used. The display has cursor control, brightness, roll control, and half intensity capabilities.

**5¼-INCH MINI-FLOPPY DISK:** These are two-sided double-density disks with a capacity of 286KB per unit. Average access time is 248 ms. Data transfer rate is 250KB/s. Two units are standard in the 7100 and 7101; a maximum of four can be connected (maximum of two integrated in unit).

**8-INCH FLOPPY DISK:** These are two-sided double-density disks with a capacity of 1MB/unit. Average access time is 91 ms, data transfer speed is 500KB/s. Two units are standard in the 7200 and 7201; a maximum of four can be connected.

**PRINTER:** There are the Model P8300 (80 characters/line, 125 cps, 5 x 7 or 9 x 7 dot matrix) and the Model P1540 (136 characters/line, 125 cps, 5 x 7 or 9 x 7 dot matrix). Both can do expanded-character printing.

**STANDARD INTERFACES:** Serial and EIA standard RS-232-C interface (75 to 19,200 bps), parallel and ASCII, and Daro (East German Daro Company)/Centronix (U.S. Centronix Company) for printer.

### COMMUNICATIONS CONTROL

Half- and full-duplex, synchronous/asynchronous. Data transmission speed is 75 to 19,200 bps with one circuit capacity.

### SOFTWARE

**OPERATING SYSTEM:** (U.S.) Digital Research Company's CP/M.

**LANGUAGES:** BASIC interpreter (standard), (U.S.) Microsoft's disk BASIC. Can be used for composition of random files. BASIC allows direct access. A BASIC compiler (optional) from Microsoft is also available. Other languages include compilers for ANSI-74 COBOL, ANSI-74 FORTRAN (both from Microsoft) and other simple business languages, including an independent operating system with capabilities for 19-digit accuracy of computation and 21 types of command words.

**BUSINESS APPLICATIONS PROGRAMS:** The packages below are controlled by CP/M, and when loaded, a main memory capacity of more than 48KB is necessary. The word processing program is in machine language (8080 type). Others are in BASIC.

- Warehouse stock management program: Prepares lists of goods stocked, to control customer demand against goods stocked. Price is 150,000 yen.
- Purchase management program: Records various data concerning suppliers and manages the payment accounts, and prepares discount tables for goods. It also issues bills. Price is 150,000 yen.
- Sales Management Program: Prepares sales lists for sales analysis, and prepares the necessary daily records. Price is 150,000 yen.
- General financial processing program: Analyzes cash flow and balance. Prepares debt tables, daily totals, and funds records. Price is 150,000 yen.
- Salary management program: Manages salary records by month, quarter, and year. It can be referenced any time at will. Price is 150,000 yen.
- Address and name list program: Records names and addresses for mailings. Price is 100,000 yen.
- English word processor program: Has word composition and editing capabilities. Price is 200,000 yen.

### MAINTENANCE

Domestically, there is only the headquarters (Tokyo), but there are business outlets in Paris and Chicago.

### PRICES

The respective purchase prices for the iBEX 7100, 7101, 7200, and 7201 (see system configuration) are 1.3, 1.5, 1.7, and 1.9 million yen.

The price for two additional mini-floppy disk drives is 700,000 yen, and for two additional 8-inch floppy disk drives is 900,000 yen. The P8300 printer is 250,000 yen and the P1540 printer is 350,000 yen. ■

# Matsushita My Brain Series

## MANAGEMENT SUMMARY

In light of the needs of business to rationalize operations, the remarkable progress of semiconductor technology, and the appearance of the high capability microprocessor, Matsushita Tsushin Kogyo concentrated its efforts in the business field in developing an ultra-small business computer. They introduced the My Brain 700 in 1978, and this was followed by the My Brain 800, 740, and 840, as it developed into a whole series.

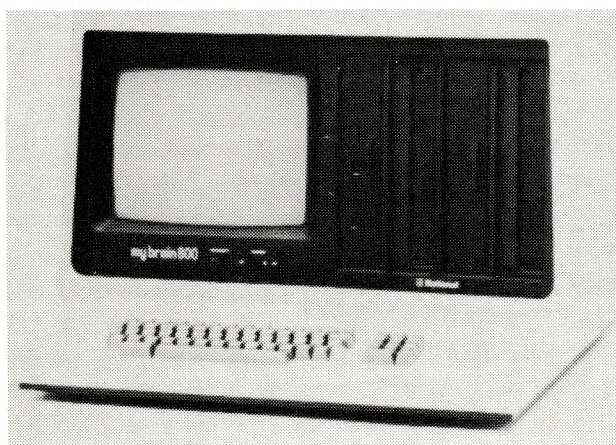
The My Brain is principally for business processing in mid-sized and small business, for dispersed processing, and as an on-line intelligent terminal.

The My Brain series is built around the Intel 8085A microprocessor and includes floppy disk drives and a CRT display. It has the following characteristics:

- It uses BASIC and in special applications, assembly language can be used under the CP/M operating system.
- It contains two floppy disk drives, and file processing is simple.
- It has three standard interfaces.
- It is capable of handling two data transmission modes: binary synchronous (BSC) and asynchronous (ASC).

There are 4 configurations in the My Brain Series:

- My Brain 700 with one-sided single-density 5-inch mini-floppy disks with 70K bytes per disk.
- My Brain 740 with two-sided double-density 5-inch mini-floppy disks with 280K bytes per disk. ➤



Standard equipment on the My Brain 800 includes a 12-inch display with two integrated floppy disk drives and a keyboard.

The My Brain Series is an ultra small business computer series designed for small scale businesses. Currently, there are four models (700, 740, 800, 840) and the standard configuration includes an 8-bit CPU, a 58K-byte memory, two floppy disks, CRT display, and keyboard. Prices are 1.73 million yen for the My Brain 700, 2.23 million yen for the My Brain 800, 2.10 million yen for the My Brain 740, and 2.48 million yen for the My Brain 840.

## CHARACTERISTICS

**MODELS:** My Brain 700, 740, 800, and 840.

**MANUFACTURER:** Matsushita Denki Sangyo, Data Control Division, Tsunashima 4-3-1, Kohoku-ku, Yokohama City, Kanagawa Prefecture 223, Japan. Tel. (045) 531-1231.

**MARKETING:** Matsushita Denki Sangyo, Oaza Kadoma 1006, Kadoma City, Osaka-fu 571, Japan. Tel. (06) 908-1121.

**INTRODUCTION:** October 1978, My Brain 700; April 1980, My Brain 740; May 1979, My Brain 800; and January 1980, My Brain 840.

**SHIPMENT:** Same dates as introduction.

### DATA FORMATS

**BASIC UNIT:** 8-bit byte.

**FIXED DECIMAL OPERAND:** Integers which can be handled by BASIC are -32,768 to +32,767. Base 16, base 8, and character data can be handled. Maximum of 255 characters of character data.

**FLOATING-POINT OPERAND:** Short floating decimal is effective to 6 digits (exponents: -38 to +38); long floating decimal point is effective to 16 digits (exponents: -38 to +38.)

**INTERNAL CODE:** JIS-based code.

### CENTRAL PROCESSING UNIT

**PROCESSOR:** 8-bit parallel CPU (Intel 8085A).

**ADDRESSING:** Direct addressing is possible for 64KB memory. Addressing modes are direct, register, indirect register, and immediate.

**REGISTERS:** There are 12 addressable 8-bit registers, of these 4 are paired as program counters and stack pointers.

**INTERRUPTS:** 4 vectored interrupts (of which one cannot be masked).

**COMMAND SETS:** About 200 instructions including variations (BASIC).

**COMMAND IMPLEMENTATION TIME:** 2 to 3 microseconds for addition and subtraction. ➤

## Matsushita My Brain Series

- ▷ • My Brain 800 with one-sided single-density 8-inch floppy disks with 250K bytes per disk.
- My Brain 840 with two-sided double-density 8-inch floppy disks with 1M bytes per disk.

The only difference between the various models is the type and capacity of the floppy disk drives.

The My Brain unit contains two floppy disk drives, a 56K-byte main memory, a 1,920-character (80 x 24-line) CRT display, and three I/O ports for RS-232-C. In addition to the JIS type of Kana keyboard, it has an independent ten-key numeric section and a set of function keys for special purposes. Options include two types of printers and a coupler.

Basic software includes (U.S.) Microsoft's BASIC interpreter, and (U.S.) Digital Research's CP/M operating system. CP/M is principally offered for use with the 8085A assembler, for faster and more detailed applications program development. System software is contained on system floppy disks and when put into the disk drives on My Brain with the power turned on, they are automatically read into the RAM. The My Brain series has five business applications packages.

Domestic marketing takes place through Matsushita Denki Sangyo's Special Equipment Operations Division. Regarding maintenance services, there is a one-year no-cost guarantee for the My Brain unit and the printer, with a nationwide service network.

### PRICES

Prices for the My Brain series are as follows: My Brain 700, 1.73 million yen; My Brain 740, 2.10 million yen; My Brain 800, 2.23 million yen; and My Brain 840, 2.48 million yen. □

### ▶ MAIN MEMORY

Equipped with a 56KB semiconductor RAM and a 2KB PROM. There is no error checking, and cycle time is 0.25 microseconds.

### INPUT/OUTPUT CONTROL

There are 3 ports for RS-232-C/CCITT-V24 interfaces. Transmission speeds are 110, 150, 300, 600, 1,200, 2,400 (BASIC supported), 4,800, and 9,600 bps.

### SYSTEM CONFIGURATION

**KEYBOARD:** Has 2-key rollover capability. Arrangement is the 59-key JIS arrangement (Kana characters), with 5 keys for cursor control, and 11 keys for numeric input. There are 21 function keys (15 PF keys and 6 PE keys).

**CRT DISPLAY:** 80 characters by 24 lines. It has a 12-inch screen and P39 is used as the fluorescent surface. Character composition is a 7 x 9 dot matrix.

**FLOPPY DISK:** There are 2 drives. Capacity of the My Brain 700's 5-inch mini-floppy disk is 70KB. The My Brain

740's 5-inch two-sided double-density mini-floppy disk stores 280KB. The My Brain 800's 8-inch floppy disk stores 250KB. And the My Brain 840's 8-inch two-sided double-density floppy disk stores 1MB. These are manufactured through a joint venture with the (U.S.) Shugart Company.

**OTHER PERIPHERAL UNITS:** Printer A (80 characters/line, 30 cps), Printer B (132 or 158 characters/line, 100 cps) acoustic coupler (300 bps), modems, etc. Both printers are of the dot matrix type. Data transmission speed is 1,200 bps. OCR wand, XY plotter, and other RS-232-C devices can be connected.

**EXTERNAL DIMENSIONS AND CONDITIONS:** The My Brain 700 and 740 are 550mm (W) x 365mm (H) x 590mm (D). The My Brain 800 and 840 are 580mm (W) x 390mm (H) x 630mm (D). Power source is AC 100V ±10%, 50/60 Hz. Operating temperatures between 5°C and 35°C; humidity between 35 and 80%.

### COMMUNICATIONS CONTROL

Both binary synchronous (BSC) and asynchronous (ASC) modes are possible. Transmission speed is a maximum of 9,600 bps for both synchronous and asynchronous communications.

### SOFTWARE

**PROGRAMMING LANGUAGE:** BASIC by the (U.S.) Microsoft Consumer Products Company and CP/M by the (U.S.) Digital Research Company.

BASIC allows the use of Kana characters in addition to basic functions, and is designed with additional capabilities for business. Characteristics are: Support for serial ports (RS-232-C), support for function (PF) keys, direct access to CPU I/O port, immediate implementation is possible, and error detection (trap) during implementation and user designated error processing are possible.

Support for sequential file processing by variable-length records, and random file processing capabilities are included. There are also format, copy, and sort utilities.

To implement BASIC, a system floppy disk is inserted, the power turned on, and the BASIC interpreter is read into RAM. This interpreter occupies about 24KB. The user range is about 32KB.

CP/M is offered chiefly for the use with the 8085A assembler for faster and more detailed programs. CP/M is disk-based and includes the assembler, an editor, a formatter, the system editor, a debugger, and media conversion software.

**APPLICATION PROGRAMS:** Business applications systems have been developed, and the following are being marketed.

- My Brain Taxi: Provides various statistical processing for drivers in small and mid-sized taxi companies, principally in salary computation (daily and monthly).
- My Brain Hotel: Performs accounting for small and mid-sized hotels and inns.
- My Brain FAMIS: A financial accounting system which was developed through guidance from tax accountants across the country.
- My Brain Score: Computes handicaps for golf according to the specifications of the Japan Golf Association, for handicap determination at golf courses. ▶

## Matsushita My Brain Series

- • My Brain 3741: Transmission procedures for on-line IBM 3741 emulation.

Aside from these, there are other packages developed by dealers and software houses.

### PRICES

My Brain 700	1.73 million yen
My Brain 740	2.10 million yen

My Brain 800	2.23 million yen
My Brain 840	2.4 million yen
Printer A	290,000 yen
Printer B	950,000 yen
My Brain Taxi	3.53 million yen (for 700)
My Brain Hotel	9.98 million yen (for 700)
My Brain FAMIS	2.55 million yen (for 700)
My Brain Score	2.5 million yen (for 800)■





# Oki Electric IF800

## MANAGEMENT SUMMARY

Oki Denki Kogyo developed the IF800 personal computer out of recognition of the needs of individuals for data manipulation in mid-sized and small businesses, professional practice, research facilities, and large industries on the division level.

Information necessary in business on an individual level includes figures, text, and graphics. The design philosophy behind the IF800 was to make it an efficient processor of these three types of information. To make the IF800 applicable to a variety of businesses, the computer includes a slot for ROM cartridges, provision for a light pen, and serial and parallel interfaces.

There are two IF800 models, the Model 10 and the Model 20. Model 10 has a JIS-arrangement keyboard and an 80-character/line dot matrix printer. Model 20 has a JIS-arrangement keyboard, a 12-inch display (color or green CRT), an 80-character/line dot matrix printer, and two two-sided double-density mini-floppy disk drives. The Model 20 is completely integrated in an "all in one" structure and includes programmable function keys (called super function keys). Both the Model 10 and 20 have a numeric keypad, a light pen interface, and a Hard Copy key as standard equipment.

Graphic functions are a characteristic of the IF800. Both the color and the green CRT can display 200 dots vertically and 640 horizontally for a high image resolution.

The normal software is OKI-BASIC. The OKI-CP/M operating system is optional and supports Assembler, FORTRAN, and Pascal. ➤



This IF800 Model 20 has a keyboard, matrix printer, 12-inch color display, two mini-floppy disk drives, and an optional light pen. Below the keyboard, at right front, there is a ROM cartridge slot.

The Oki Denki Kogyo IF800 personal computer has hardware and software that gives it abundant universality. The larger model, the Model 20, is built around a Z80 CPU and has a main memory of 64K bytes, I/O slot interface for connecting external equipment, an RS-232-C port, keyboard, 12-inch color or green display, 80 character/line dot matrix printer, and two two-sided double-density mini-floppy disk drives, all integrated in one unit. Software is OKI-BASIC which incorporates ISO standard BASIC. It is also possible to use the optional OKI-CP/M operating system. The standard configuration purchase price for the IF800 ranges between 370,000 yen and 1,480,000 yen.

## CHARACTERISTICS

**MODELS:** IF800 Model 10, Model 20.

**MANUFACTURE-SALES:** Oki Denki Kogyo, Information Processing Division, Shibaura 4-10-3 (building 3), Minato-ku, Tokyo 108, Japan. Tel. (03) 454-2111.

**INTRODUCTION:** May 7, 1980.

**SHIPMENT:** September 30, 1980 (Model 20).

**NUMBER OF MACHINES IN USE:** About 1,500 (Model 20) as of December 26, 1980.

### DATA FORMATS

**BASIC UNIT:** 8-bit byte.

**COMMANDS:** Normally, OKI-BASIC commands are used. OKI-BASIC handles data between -32,768 and +32,767 with fixed-decimal data, and exponents of -38 to +38 for 7- and 16-digit floating-point data. For the 7-digit accuracy, output is rounded off to 6 digits. For 16-digits accuracy, the data is displayed to 16 digits as is.

**INTERNAL CODE:** JIS C-6220.

### MAIN MEMORY

**TYPE:** Dynamic MOS RAM, 16K bits/chip.

**CYCLE TIME:** 375 nanoseconds.

**MEMORY CAPACITY:** 64KB.

### CENTRAL PROCESSING UNIT

The (U.S.) Zilog Z80A is used. Clock frequency is 3.9936MHz. The internal ROM (32KB) is used during IPL.

### INPUT/OUTPUT INTERFACE

In the Model 20, standard equipment includes a soft-key interface. Immediately below the display screen, there are 10 programmable keys, and the operating instructions for them appear on the screen at the bottom. The Model 20 also has a ➤

## Oki Electric IF800

▷ The Model 20 has more universal applications. Since it has communications capabilities, it can be used as a terminal. The Model 10, both in hardware and software, is a subset of the Model 20. However, since a printer is standard equipment, once the business program has been developed, the Model 10 is sufficient for many business applications. The price of the IF800 Model 20 is 1.48 million yen, the Model 10 is 370,000 yen. □

▶ light pen interface (40 x 200 area discrimination capabilities), a ROM cartridge interface (theoretically, it can be addressed to 1MB), an audio cassette tape interface (43 bytes/second), and an RS-232-C port. There are three interface slots for options.

The Model 10 has a black and white display interface (composite signals), light pen interface, ROM cartridge interface, and audio cassette tape interface as standard equipment. There are four I/O slots for options.

The I/O interface options include: RS-232-C serial interface (110, 150, 300, 600, 1,200, 2,400, 4,800, or 9,600 bps can be program selected), Centronix parallel interface (for XY-plotter, 132-character/line printer), IEEE-488 parallel interface (also known as GP-IB, HP-IB, used mainly for measuring instruments), AD converter (analog input  $\pm 10$  v, 4 input channels, input impedance 1M ohms), DA converter (analog output  $\pm 10$  v, 2 output channels, output impedance 10 ohms or below), color-display interface, green-display interface (connected with a specialized slot in the Model 10), black and white display interface (connected to a specialized slot and a composite signal is output for use with a commercially available black and white unit), an 8-inch floppy disk interface, and mini-floppy disk interface (on the Model 10, an external controller is necessary).

### SYSTEM CONFIGURATION

The standard configuration for the Model 20 includes CPU, main memory, and keyboard (JIS arrangement, with 10-key numeric pad and various control keys, editing keys, and programmable keys).

The keyboard has auto-repeat capabilities. There are also a 12-inch display (maximum of 80 characters by 20 lines, 5 x 7 dot character configuration, graphic capabilities of 640 x 200 dots, with scrolling capabilities, 8-color display or green display selection), ROM cartridge, two-sided double-density disk drives (280KB per unit, average access time is 240 ms, data transfer speed is 62.5KB/s), and serial printer (80 characters/line, 80 cps, 5 x 7 dot matrix, paper up to 254 mm wide, graphic print capability). A calendar clock capability (battery back-up included) is also standard.

Standard configuration for the Model 10 includes CPU, main memory, keyboard, printer, and ROM cartridge slot.

**EXTERNAL DIMENSIONS AND CONDITIONS:** The Model 20 is 510 mm wide, 683 mm in depth (the green display is 608 mm), and height is 505 mm. The Model 10 is 510 mm wide, 395 mm deep, and 132 mm high. Power source is 100V  $\pm 10$ V, 50/60Hz. Temperature range for the Model 20 is 10 to 35°C; for the Model 10, 5 to 35°C.

### COMMUNICATIONS CONTROL

With the RS-232-C asynchronous interface modem, the IF800 can be connected to public or dedicated lines. Data

transmission speeds are 110/150/300/600/1,200/2,400/4,800/9,600 bps.

### SOFTWARE

In the IF800 stand-alone system, there are two software systems: OKI-BASIC and OKI-CP/M.

**OKI-BASIC:** The standard software, this BASIC has several functions added to (U.S.) Microsoft BASIC-80 (Version 5.0). ISO standard BASIC is included. It can support random access, sequential access, programmable keys, light pen, and RS-232-C/IEEE-488 connections for asynchronous interrupt operations. It has support functions for Graphic Micro Language (GML), and hardware graphics capabilities. It is also equipped with capabilities for Music Micro Language (MML), double precision functions, and trace capabilities. Machine language subroutines can be called. In the Model 10, BASIC lacks the floppy disk related commands.

**OKI-CP/M:** This is the (U.S.) Digital Research CP/M operating system with additions for various serial/parallel interfaces and AD/DA converter support capabilities. There are both 8-inch floppy disk and mini-floppy disk capabilities. The OKI-CP/M has various capabilities for command processing, input/output control, and file management. OKI-CP/M supports Macro Assembler (for Z80, Intel 8080), BASIC, COBOL, FORTRAN (Microsoft), Pascal (Sorcim), Text Editor, and Graphics packages.

**BUSINESS APPLICATIONS:** Oki Denki Kogyo has concentrated on applications packages and will establish a system for distributing software which has been developed by Oki, dealers, and users. Currently, main packages under consideration include salary computation and other business computations, scientific and technological computations, measurement/control, and educational software packages.

### MAINTENANCE

There is a 6-month free warranty period. After that, there are four kinds of maintenance arrangements: bringing the unit to the store, service dispatch, periodic service, and on-call maintenance. Except for the on-call maintenance, the others are determined at the time of contract. There are 110 locations for performing maintenance including dealers, Oki Electric and its branch offices.

### PRICES

The purchase price for the IF800 Model 20 with color display is 1.48 million yen. With a green display, it is 1.28 million yen. The standard configuration for the Model 10 sells for 370,000 yen.

The 132-column printer is 248,000 yen, an 8-inch floppy disk drive is planned for 750,000 yen, a mini-floppy disk controller and drive for 280,000 yen, color display is 250,000 yen, green display is 45,000 yen, light pen is 75,000 yen, ROM cartridge price is as yet undetermined, RS-232-C interface is 75,000 yen (cables separate), IEEE-488 interface is 100,000 yen (cables separate), Centronix interface is 50,000 yen, AD and DA converters are 198,000 yen each, 8-inch floppy disk interface is 70,000 yen, color display interface is 70,000 yen, and green display interface is 10,000 yen.

OKI-CP/M is 70,000 yen, and the graphic package is scheduled to be 25,000 yen. ■

# Panafacom 15E Personal Computer

## MANAGEMENT SUMMARY

The Panafacom company was established in 1973 as a specialized manufacturer of minicomputers. In 1975, it ventured into the microcomputer market with the development of a 16-bit microcomputer, whereafter it commercialized chip type, board type, and system types. In 1977, it applied these products to an evolutionary, educational LKIT-16 computer. Next, this company, feeling the need for personal computers in the fields of measurement, control, and scientific calculations, introduced the Panafacom C-15 personal computer in 1978. The PFC-15E is an improved capability version of the PFC-15, and shipments of it began late in 1979.

The PFC-15E is an adaptation of the PFL-16A microcomputer, and is a personal computer for business use. It can also be used in the fields of measurement, control, scientific and technological computations, and in OEM products.

The PFC-15E uses BASIC (computation accuracy to 15 digits, 72 types of functions built in, overlay capabilities, and parallel processing capabilities) and has a maximum of 128K bytes of memory, a 64-character by 16-line CRT, a keyboard input unit and a cassette magnetic tape unit (which can optionally be expanded by one unit), and a thermal printer or an optional dot matrix printer. Other options include a digital input/output adapter, IEC bus adapter, and a serial interface adapter.

The PFC-15E has the following characteristics and capabilities:

- It uses a 16-bit MN1610A microprocessor. The 16K-bit RAM has a maximum capacity of 124K bytes. There is a 4K-byte ROM.
- The CRT display can display graphs and special characters via a mode selection switch.
- The keyboard is a non-contract type, with 69 JIS keys, 10-key numeric pad, function keys, and auto-repeat capabilities.



Standard equipment on the PFC-15E includes a CRT display, keyboard, digital cassette tape drive, and a thermal strip printer. A serial printer, left, and a second digital cassette drive, right, can be added.

The Panafacom C-15E resulted from improvements on the capabilities of the PFC-15 and is a personal computer. There are the Model 1 and Model 2. The standard configuration of the Model 1 includes 16-bit CPU, 96K-byte memory, 256K-byte cassette magnetic tape unit, CRT display, keyboard, and thermal printer. Price is 1.2 million yen.

## CHARACTERISTICS

**MODEL:** C-15E.

**MANUFACTURE-MARKETING:** Panafacom, Shinbashi 6-17-15 (National Building Annex), Minato-ku, Tokyo 105, Japan. Tel: (03) 438-0311. Fujitsu, Fuji Denki Seizo, Fuji Facom Seigyō, Matsushita Denki Sangyo, Matsushita Tsushin Kogyo, and Matsushita Denso Kiki are distributors.

**INTRODUCTION:** December 4, 1979.

**SHIPMENT:** December 4, 1979.

**UNITS INSTALLED:** 2,400 (as of January 1981).

### DATA FORMATS

- **BASIC UNIT:** 16-bit word, 32-bit word (BASIC).
- **FIXED-DECIMAL POINT OPERAND:** Binary fixed-decimal method. Binary data with BASIC, handles character row data and numerical data.
- **INTERNAL CODE:** JIS standard 8-bit.

### CENTRAL PROCESSING UNIT

- **PROCESSOR:** A 1-chip CPU (MN1610A) 16-bit parallel processor.
- **ADDRESSING:** Direct (0 to 255), instruction counter relative (-128 to 127), indirect, instruction counter relative indirect, index modification, indirect index modification.
- **REGISTERS:** Instruction counter (IC) instruction register (IR), stack pointer (SP), stack register (STR), and computation registers (R0-R4). Two of the computation registers (X0, X1) can be used as index registers. These registers cannot be accessed by the user.

**INTERRUPTS:** Program status word changeover type. Three levels of external interrupt. The mask on each level can be manipulated by the program.

**COMMAND SET:** 92 (BASIC).

**COMMAND IMPLEMENTATION TIME:** Register-register computation time is 1.5 microseconds.

### MAIN MEMORY

Composed of 16K-bit MOS RAM chips, memory capacity is 96K to 128K. Cycle time is 0.5 microseconds. Parity check for error checking. No memory protection.

## Panafacom 15E Personal Computer

- ▷ • There is a 21-column, 2-line/second thermal printer (English, numbers, Kana, symbols, and lower case letters).
- Digital ISO standard cassette magnetic tape unit.
- Expanded BASIC. Computation accuracy to 15 digits with BASIC V; BASIC IV is standard.
- There are 5 BASIC libraries: the scientific and technology computation library, statistical computation library (I), statistical computation library (II), data analysis library, and mathematical planning library.
- Applications include a learning analysis system using PFC-15E and OMR.

Maintenance for the PFC-15E is available from seven locations from Hokkaido to Kyushu in a service support network.

### PRICE

The PFC-15E Model 1 (96K-bytes) is 1.2 million yen, the PFC-15E Model 2 (128K bytes) is 1.4 million yen. □

### ► SYSTEM CONFIGURATION

**DISPLAY:** 1,024 characters (64-characters by 16 lines). Characters displayed: English, numbers, English symbols, Kana characters, Kana symbols. Graphic display: simple graphs, table graphs, and special characters. Screen display capabilities: scroll, line insert/delete, character insert/delete, blinking cursor.

**KEYBOARD:** Flat type, with 69 JIS keys (no symbol shift, 128 characters, graphic mode is possible), numeric keypad, function keys, editing keys (CRT screen editing), and auto repeat capability.

**CASSETTE TAPE UNIT:** 256KB capacity, data transfer speed is 1.5KB/s. A Philips-type digital data cassette, ISO standard.

**THERMAL PRINTER:** Heat sensitive type. Printing speed is 2 21-character lines per second. Printed characters: English, numbers, English symbols, Kana letters, Kana symbols.

**ADD-ON CASSETTE TAPE UNIT:** This is an optional Philips-type digital data cassette with a memory capacity of 256KB, 1.5KB/s data transfer speed.

**SERIAL PRINTER:** This optional dot matrix impact unit prints 80 characters/line at 60 characters/second. The character set includes English, numbers, symbols, and Kana.

### I/O INTERFACE

There are two expansion slots, and the items below can be incorporated:

**DIGITAL INPUT/OUTPUT ADAPTER:** Input 32 points, output 32 points, transmission units (16 points), transmission mode (TTL).

**IEC BUS ADAPTER:** IEEE-488 1975 standard.

**SERIAL INTERFACE ADAPTER:** 20mA current loop or RS-232-C interface, synchronous modulation.

### SOFTWARE

**PROGRAMMING LANGUAGE:** BASIC. Based on ANSI standard; 15-digit computation accuracy, subroutine function, 72 functions incorporated, defined functions, overlay capability, matrix capability, parallel processing capabilities. Hardware options all use BASIC.

**EDITOR:** Editing by screen and line units.

**DIAGNOSTIC PROGRAM:** Tests operation of various parts of the system.

**SYSTEM COPY PROGRAM:** A program for management of the master tape.

**SOFTWARE LIBRARY:** The following five libraries, written in BASIC, have been prepared:

- Scientific and technological computation library: subroutines primarily for scientific and technological computation, short and long accuracy computations are possible.
- Statistical computation library (I): For elementary and high variable statistical computations.
- Statistical computation library (II): For applications analysis of nonparametric statistics, experimental planning methods, and for statistical analysis.
- Data analysis library: Analytical methods for various data; processing is divided into time and frequency ranges.
- Mathematical planning library: A package for handling linear planning and transportation planning problems. Handles network and scheduling problems.

### PRICES

PFC-15E Model 1 (96K), 1.2 million yen; PFC-15E Model 2 (128K), 1.4 million yen.

Scientific and technological system configuration: 1.2 to 2.22 million yen (includes PFC-15E Model 1 with IEC bus adaptor or PFC-15E Model 2 with IEC bus adaptor plus one more cassette tape device and serial printer).

Measurement system configuration: 1.4 to 2.37 million yen (includes PFC-15E Model 1 with IEC bus adaptor or PFC-15E Model 2 with IEC bus adaptor plus serial printer and add-on cassette tape unit).

Control System configuration: 1.35 million yen plus (includes PFC-15E Model 1 with digital input/output adaptor or a PFC-15E Model 2 with digital input/output adaptor plus serial printer and add-on cassette tape unit). ■

# Seiko 8300 Personal Computer

## MANAGEMENT SUMMARY

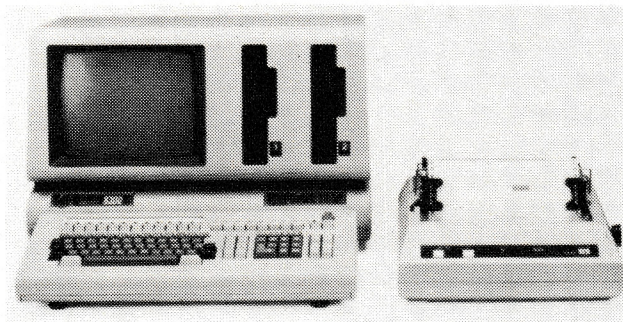
Since the introduction of the S-300 by Seikosha in 1968, they began developing a series of personal computers for scientific and technological computation applications including the S-301, S-500, 7000, 5500, and 5700. They are marketed by Uchida Yoko general marketing. In February 1979, they introduced the Seiko 8500 which used an expanded BASIC language (Seiko Super BASIC). In September 1980, they introduced the Seiko 8300 "Author" ultra small business computer with more complete hardware and software capabilities.

Currently, three models, Seiko 5900, Seiko 8500, and Seiko 8300 are being sold, but the Seiko 5900 and Seiko 8500 are intended for construction, measurement, and various technological computations, and for on-line processing or as a TSS intelligent terminal. The Seiko 8300 is sold for business use and as a retail service industry computer.

The Seiko 8300 is equipped with an 8-bit microprocessor, a 62K-main memory, two 1M-byte floppy disk drives, a 12-inch CRT capable of displaying 1,920 characters (80 x 24), a keyboard or keymat, and an 80- or 133-column dot matrix printer. Optional equipment includes an OCR wand, a screen printer, a cash drawer, and serial and parallel interfaces.

The Seiko 8300 has the following characteristics and capabilities:

- Two 1M-byte two-sided double-density floppy disk drives.
- The CRT can display 253 varieties of Kanji and Hiragana, and provides inverse, blinking, and enlarged characters, and bar graphs.
- Standard input devices are the keyboard and key mat, with the standard output unit being an 80- or 132-column printer. The 8300 is available in four configurations. ➤



The Seiko 8300 includes a 12-inch display with two integrated two-sided double-density floppy disk drives, and a keyboard. A matrix printer, right, is optional. ➤

The Seiko 8300 "Author" is an ultra small business computer with advanced hardware and software capabilities. The standard configuration costs 2.2 million yen and includes an 8-bit CPU, 62K-byte memory, two 1M byte floppy disk drives, CRT display, keyboard, and printer. Lease per month for a 5-year lease is about 50,000 yen.

## CHARACTERISTICS

**MODEL:** SEIKO 8300.

**MANUFACTURE:** Seikosha Business Machines Division, Taihei 4-1-1, Sumida-ku, Tokyo 130, Japan. Tel. (03) 624-7591.

**MARKETING:** Uchida Yoko, Electronic Computer Business Division, Arakawa 2-4-7, Chuo-ku, Tokyo 104, Japan. Tel: (03) 555-4137.

**INTRODUCTION:** September 1980.

**SHIPMENT:** November 1980.

### DATA FORMATS

**BASIC UNIT:** 8-bit byte.

**FIXED-POINT OPERAND:** Fixed decimal to 15 digits (base 10). In the case of packed decimal, 1 byte is two digits, maximum of 8 bytes. For unpacked decimal, 1 digit is 1 byte, maximum of 15 bytes. Character data is 1 character equals 1 byte, maximum 255 bytes.

**INTERNAL CODE:** EBCDIC.

### CENTRAL PROCESSING UNIT

The CPU is an 8-bit microprocessor (Intel 8085A-2). Data word length is 8 bits. Command word length is 8, 16, and 24 bits. There are 80 basic types of commands. Command implementation time is between 0.8 microseconds and 3.6 microseconds. Clock rate is 5 MHz. There is a 2KB ROM for firmware.

### MAIN MEMORY

The main memory is MOS, with a 62KB (parity bits included) memory capacity. Cycle time is 375 nanoseconds.

### INPUT/OUTPUT CONTROL

Input/output control is by program mode and DMA mode. Data transfer speed in the program mode is 100KB/s (maximum), in the DMA mode it is 1.25MB/s (maximum).

### SYSTEM CONFIGURATION

**DISPLAY:** A 12-inch non-glare green CRT display with brightness adjustment; 1,920 characters (80 x 24) can be displayed. Characters include English, numbers, Kana, symbols, Kanji, and Hiragana, up to 253 types. Character format is 7 x 11 dots for English, numbers, Kana, and symbols, and 15 x 16 dots for Kanji and Hiragana. Enlarged ➤

## Seiko 8300 Personal Computer

- ▷ • A variety of retail and service industry type application programs are available.
- Using business C-BASIC (SBOL), programming can be easily accomplished. Also, there is a Report Writer language available for handling forms. Other utilities are available for file preparation file, updating, and sort/merge.

Maintenance of the Seiko 8300 is available in nine locations; service outlets are in a network located in Sapporo, Aomori, Sendai, Tokyo, Nagano, Nagoya, Osaka, Hiroshima, and Fukuoka.

The price of the Seiko 8300 ranges between 2.2 and 3.5 million yen. □

- ▶ characters, lines, blink, inverse, and bar graphs can also be displayed.

**FLOPPY DISK:** IBM standard, two-sided double-density drives with 1MB capacity/drive. IBM record format is used. It is also possible to use one-sided single-density floppy disks.

**KEYBOARD:** There is a 4-stage shift keyboard based on JIS-C-6220. It also includes system control keys, program selection keys, function keys, and editing control keys, and a numeric keypad. External dimensions are 100 mm (H) by 540 mm (W) by 240 mm (D).

**KEYMAT:** There are 2,400 items of possible input (160 items x 15 pages). Book exchange up to 15 volumes is possible. It is comprised of system control keys, program selection keys, function keys, editing and screen control keys, numeric keypad, and character data input keys. External dimensions are 100 mm (H) by 600 mm (W) by 350 mm (D).

**PRINTER:** An 80-column dot matrix printer, the Model 8315 prints in both directions. Printing speed is 180 cps and character composition is 9 x 7 dots. There are 132 characters per line, and five copies including original can be printed. External dimensions are 253 mm (H) by 634 mm (W) by 629 mm (D).

Other peripheral equipment available includes an OCR wand, a screen printer, and a cash drawer.

### COMMUNICATIONS CONTROL

**COMMUNICATIONS CONTROL UNIT:** A micro-processor is used to support half-duplex synchronous and asynchronous circuits. Transmission code is 8-bit EBCDIC. Transmission speed is 1,200 to 2,400 bps. The standard protocol is BSC (binary synchronous communications). Also, a 100 to 300 bps coupler can be used.

Other interfaces include serial interfaces, and parallel interfaces.

### SOFTWARE

**CONTROL PROGRAM:** Consists of I/O control programs which operate through dialog with the operator to implement a job and to control the hardware, including job management, message management, and data management.

**WORD PROCESSING PROGRAM:** The basic system language is SBOL (Seiko Business Oriented Language). SBOL is an expanded BASIC language with business oriented functions added. It is composed of interpretive instructions, declarative statements, and implementation statements. Report Writer, a language which generates forms, is also provided.

**UTILITY PROGRAMS:** System Utility, Source Data Register (editor), Classification (sort/merge), File Data Compilation, File Data Update. The aforementioned are standard. Options include: Kanji pattern register, on-line utility.

**APPLICATION PROGRAM PACKAGES:** Currently, packages have been completed for hotels, accounting offices, bars, beauty shops, beauty aid stores, Japanese tailors, stores for bedding, gas stations, and dentists. Other packages are being developed.

### PRICES

Model A: 8300 unit with keyboard and 80-column printer is 2.2 million yen.

Model B: 8300 unit with keyboard and 132-column printer is 3.1 million yen.

Model C: 8300 unit with keymat and 80-column printer is 2.6 million yen.

Model D: 8300 unit with keymat and 132-column printer is 3.5 million yen. ■

# Sord M243 Series

## MANAGEMENT SUMMARY

Sord Computer Systems was founded in April of 1970. Initially, they were involved in the development and sale of microcomputer systems, but later they began marketing kit computers, display terminals, and paper tape reader/punches. Their debut in personal computers was in September 1977 with the M200 series. Later, a smaller type, the M100 series was introduced (May 1978). At the present time they are marketing serial printers, floppy disk units, Winchester disk units, various interfaces, micro-computer development systems, specialized use systems, and software.

Presently, there is the M200 series containing the M200 Mark III series (M203 Mark III, M223 Mark III), the M200 Mark VI series (M223 Mark VI), the M223L series, and the M243 series. In the M100 series, there is the M100 ACE III, and the M100-ACE IV.

The M243 series was introduced in September 1980 and is the top of the M200 line. About 10,000 units of the M200 series have been shipped, and user feedback was used to develop the M243 series. The M243 series has multi-job and multi-language capabilities and is a personal computer which can be connected to a workstation. It is adapted to business applications with multi-data entry, multi-billing processing, and can do real-time processing and measurement and control in science applications. Communications controller capabilities can be used to communicate with other computers.

The M243 series is composed of a mini-floppy disk in the Mark IV model, an 8-inch floppy disk in the Mark V model, and an 8-inch fixed disk in the Mark VI model. Main memory capacities range from 128K to a maximum of 1M bytes. The keyboard and display are integrated. The CPU is the (U.S.) Zilog Z80A, but the special computation processor is an AM9511. There are various I/O interfaces, including RS-232-C. ➤



This Sord M243 Mark VI includes an optional floppy disk drive integrated into the display and the standard 8-inch Winchester disk drive, right, in a separate enclosure.

The Sord M243 series is an advance over the former M200 series and is a personal computer with multi-job/multi-language capabilities. The CPU is the Z80A, but there is also an AM9511 for computations. The standard main memory is 128KB, maximum available is 1MB. The keyboard and the graphics-capable display are integrated into a desk-top unit. Mass storage units available include a mini-floppy disk, an 8-inch floppy disk, and an 8-inch fixed disk. Languages are BASIC, FORTRAN, Pascal, Assembler, and PIPS. Price starts at 1.65 million yen.

## CHARACTERISTICS

**MODELS:** SORD M243 Mark IV, V, and VI.

**MANUFACTURE-MARKETING:** Sord Computer Systems, Nishi Shinkoiwa 4042-12 (2nd Isoma Building), Katsushika-ku, Tokyo 124, Japan. Tel: (03) 696-6611.

**INTRODUCTION:** September 1980.

**SHIPMENT:** March 1981.

### DATA FORMATS

**BASIC UNIT:** 8-bit byte.

### MAIN MEMORY

**TYPE:** n channel dynamic MOS RAM, 64K bits/chip.

**CAPACITY:** Standard is 128KB, maximum of 1MB.

**ERROR CHECKING:** ECC possible with an external option.

**CONTROL MEMORY:** 2KB ROM for boot strap loader.

### CENTRAL PROCESSING UNIT

The Z80A CPU is used. Clock rate is 4MHz; real-time clock with a battery pack attached. For hardware computation functions, the AM9511 is standard. It is also possible to use the AM9512F option for floating-point computations.

### I/O INTERFACE

There are four RS-232-C serial ports. One of those can have an optional 20mA current loop. There is one parallel port which is Centronix compatible. Transmission rate is 50 to 19,200 bps (programmable). There are also four slots for the S100 bus and a variety of optional ports.

### SYSTEM CONFIGURATION

The configuration includes CPU, main memory, I/O control, JIS-arrangement keyboard, and display screen (12-inch green, 80 x 24, the 25th line is for system display use, character composition is 7 x 9 dots, graphic points are 640 x 400 dots). There is a 32KB memory for graphics, and a 2KB memory for character display (512 types of characters can be displayed). With a color option, 8 colors can be displayed. Mass storage units include a mini-floppy disk for the Mark IV, an 8-inch ➤

## Sord M243 Series

➤ Programming languages include BASIC, COBOL, FORTRAN, Pascal, Assembler, and in the M200 series, the universal information processing system, PIPS. □

▶ floppy disk for the Mark V, and an 8-inch Winchester-type disk for the Mark VI. Only the Mark IV has two integrated drives.

The Mark IV has two 720KB/drive two-sided double-density mini-floppy disk drives as standard. They are expandable up to four drives.

The Mark V has two 8-inch floppy disk drives with a 1.1MB/drive capacity. They are two-sided double-density. The Mark V can be expanded to four drives.

The Mark VI has a 9.3MB/drive 8-inch Winchester-type fixed-disk unit as standard equipment; it is expandable to four units.

**PHYSICAL SPECIFICATIONS AND CONDITIONS:** The basic unit (keyboard/display) has a width of 500 mm, depth of 590 mm, and height of 490 mm. Power is AC100V, 50/60Hz; AC115V, 220V or 240V may be designated at time of order. Temperature range is between 5 and 40°C, relative humidity between 10 and 85%.

### OTHER INPUT/OUTPUT UNITS

A dot matrix type 96-cps 80-column (SLP-150T) or 125-cps 139-column (SLP-120) printer is available. Using the I/O slots, various input/output units can be connected.

### SOFTWARE

**OPERATING SYSTEM:** It is equipped with MDOS (multi-job, multi-language operating system). Functions of MDOS are time management, job management, disk management, and file management.

Time management takes place via a real-time clock, and it has job start/stop functions. Jobs can be changed to manage I/O time.

Job management accomplishes memory control. The upper 4KB memory is used as the system area. The memory banks comprise 60KB. There are a maximum of 16 usable banks from Bank 0 to Bank 15. Bank 0 is the realm of MDOS. The MDOS accomplishes apportionment of jobs to the various banks. It is possible to accomplish parallel processing among banks which are using different language applications.

Disk management includes file OPEN and CLOSE, and controls access to floppy and magnetic disks.

File management accomplishes protection of the files. Joint file use functions are also possible.

**LANGUAGES USED:** Programming languages include Assembler, Macro Assembler, BASIC (Compiler, Interpreter), SBASIC (for scientific computations), MBASIC (for matrix computations), TBASIC (for communications), COBOL-74, FORTRAN IV, Pascal, and PIPS.

The file management system is the universal information processing system called PIPS (Pan Information Processing System). It is used in making tables (format file) with a maximum size of 72 characters by 50 lines. A search mode searches data using a reference file where search conditions are provided. There are a computation mode, (4-function arithmetic, integer computation, and function computation capabilities) for lines or columns on tables, and an edit mode which prepares and edits non-formatted files (with word processing capabilities). PIPS also has capacity for preprocessing data in INP command, a QUESTION command which handles decision tries, an AUTO command for command linking, a DOCK command for BASIC and PIPS data combination, a PSORT command for data alignment changes, and a TRANS command for data file conversion. PIPS can be used to generate bills, data analysis, and ABC analysis.

**UTILITIES:** Various utilities are available including an editor and a debugger and programs for file maintenance, media conversion, etc.

**BUSINESS APPLICATIONS PACKAGES:** There are packages for data entry, word processing (English), and communications.

**COMMUNICATIONS CONTROL PROGRAM:** Using the optional RS-232-C modem, communications with other computers is possible. With TBASIC, asynchronous 300 to 1,200 bps communications are possible. There is a communications macro for BSC.

### PRICES

Standard configuration purchase prices:

M243 Mark IV	1.65 million yen
M243 Mark V	1.98 million yen
M243 Mark VI	2.65 million yen

The SLP-150T printer is 198,000 yen; the SLP-120 is 350,000 yen. Maintenance is free the first year, and 100,000 yen/year minimum thereafter. ■



# Toshiba BP-100 Business Personal Computer

## MANAGEMENT SUMMARY

The Tokyo Shibaura Denki company developed the BP-100 business personal computer to obtain a table-top, easily used computer for business applications.

The market for office computers to computerize sales, warehouse stocks, accounting, etc. has increased rapidly. With more demand for systems that can process Kanji and provide multi-workstation capabilities, the market for such equipment is growing and the equipment prices are dropping. However, there is a limit to the degree that costs for office computers can be reduced. The BP-100 has eliminated superfluous functions such as graphics capabilities and communications capabilities to follow the natural direction in developing personal computers for business applications.

The BP-100 is different from the so-called "hobby" computers in that it is a business computer which is equipped with indexed file processing and an applications-specific keyboard. But it does not have expansion capability. On the other hand, a variety of business applications packages are available, and it is notable because it is a completely turnkey system.

The main memory is 48K bytes, and there are two two-sided double-density mini-floppy disk units for data storage. A printer is also standard, and the display is



The BP-100 business personal computer features a special, applications-specific touch keyboard, a 9-inch display, two two-sided double-density mini-floppy disk drives, and a 125-cps printer.

The Toshiba BP-100 business personal computer was developed principally as a turnkey system for business applications. Standard equipment includes CPU, main memory of 48K bytes, two two-sided double-density floppy disk drives, printer, keyboard, and display. The language used is business BASIC, and it is possible to have indexed sequential files. Normally, the system is sold with a special touch keyboard related to a specific applications package. At the present time, various packages are available including sales management, warehouse stock management, salary computation, as well as home electricity sales business, and sports wholesaler business applications packages. The purchase price for the system with a package begins at 1.47 million yen.

## CHARACTERISTICS

MODEL: BP-100.

MANUFACTURE-MARKETING: Tokyo Shibaura Denki, Personal Computer Business Division, Tora-no-mon 1-26-5 (17th Mori Building), Minato-ku, Tokyo 105, Japan. Tel: (03) 507-6554.

INTRODUCTION: October 1980.

SHIPMENT: January 1981.

### DATA FORMATS

BASIC UNIT: 8-bit byte.

### MAIN MEMORY

TYPE: MOS.

MEMORY CAPACITY: 48KB.

### CENTRAL PROCESSING UNIT

Since the BP-100 is a packaged system, there is no need for inner structure information.

### SYSTEM CONFIGURATION

CPU, main memory, keyboard, display, and two floppy disk drives. The printer is placed atop the basic unit, and there are no provisions for system expansion because low cost was a development objective.

PHYSICAL SPECIFICATIONS AND RESTRICTIONS: Width is 480 mm, depth is 700 mm, height is 440 mm (including the printer). Power is AC 100V, 50/60Hz, and it is usable in normal office environments.

### MASS STORAGE

The BP-100 is equipped with two two-sided double-density mini-floppy disk drives. Capacity (formatted) is 280KB/drive.

## Toshiba BP-100 Business Personal Computer

▷ incorporated into a module which stacks in two levels to save space on a table top. There are plans for applications packages for various applications which would eliminate the need for user-written programs.

The marketing objectives for the BP-100 are for mid-sized and small businesses with a capitalization of 10 million yen or under, and for individual use in large businesses. In other words, it is hard to realistically view this low priced computer (monthly lease is 30,000 to 40,000 yen) as having markets wider than for these specific applications.

Marketing is accomplished using an already established office equipment marketing route, but Toshiba is also trying to establish a new marketing network. Maintenance for the first year is free, after that it is about 70,000 yen per year.

Purchase price for the BP-100 without applications packages is from 1.31 million yen. A system with packages begins at 1.47 million yen. Five-year leasing is possible. □

### ▶ INPUT/OUTPUT UNITS

**KEYBOARD:** Touch-select or typewriter type may be chosen. With the touch-select type, 100 items/page are available, with a maximum of 8 pages. Automatic page finding capabilities and a numeric keypad are included. The typewriter model has an ASCII arrangement for English and numbers, and normal 50-syllable arrangement for Kana. There are 6 program function keys and a numeric keypad.

**DISPLAY:** 9-inch monochrome, 40 characters by 13 lines.

**PRINTER:** Impact dot matrix type, 80 columns, 125 cps. Four copies including original are possible.

### SOFTWARE

Intermediate level business BASIC is the basic software. Business BASIC is the sole programming language. It has a base-10 floating-point computation method. It is possible to abbreviate key words (statements and commands).

With regard to file processing, there are sequential, relative, and indexed files. File protection for classified documents and access protection for user programs are provided.

**BUSINESS APPLICATIONS PACKAGES:** Business applications packages include sales management, inventory management, salary computation, accounting, funds management, bank draft management, and assets management as well as systems for individual types of businesses such as home electric appliance sales, sports equipment wholesalers, steel sales, construction materials sales, city gas supply, food wholesalers, etc.

For the present, sales are aimed at selling the BP-100 with a package as a turnkey system.

### PRICES

BP-100 purchase prices:

**NON-PACKAGED SYSTEM:** From 1.31 million yen.

**WITH BUSINESS APPLICATION PACKAGE:** From 1.47 million yen. ■

# Small Business Computer Specifications

Japanese small business computers haven't sold very well in the export market because, in the past, they have required potential users to commit themselves to the vendor's software. Even though the vendor may be large and the software excellent, there is something scary about betting the future of your company on the continued interest of a vendor on the other side of the Pacific Ocean.

On the other hand, Japanese peripherals have been successful in the export market because they are basically interchangeable with equipment from other vendors. Hence, the users are not locked in and feel free to take advantage of Japanese quality and competitive pricing.

But the complete systems may soon be as interchangeable as the peripherals, turning them into serious competitors with locally built systems. Recent announcements by major U.S. vendors such as IBM, Xerox, and Hewlett-Packard have made it obvious that, for very small computers at least, systems and applications software will come from third parties and therefore be vendor-independent.

So it's interesting to note that some of the newer Japanese systems are built around standard microprocessors and use CP/M, fast becoming a standard operating system.

If the Japanese are successful in mass producing personal computers to run standard applications software under CP/M, it's obvious they will next turn their attention to producing standard small business computers to run standard applications software under CP/M.

**This report presents the salient characteristics, functions, and capacities of 124 currently marketed small business computer models provided by 31 Japanese vendors. The information was abstracted from *Nikkei Datapro Computer Files*, a four-volume loose-leaf information service published in Japan.**

And some of the Japanese systems offer features not generally available in the West. Some of them can handle thousands of Kanji (Chinese) characters, a capability that would allow them to store, manipulate, and print thousands of individual symbols including scientific notations, multiple foreign alphabets, special graphics, even a company's logo.

Another feature offered by some of the systems is interchangeable "keyboards" for up to 15 different applications, each requiring 200 input options. Turn a page in a "book," and like the fast-food cash registers with "hamburger" and "cheeseburger" keys, you could have "accounts payable" and "accounts receivable" keys.

You will find, if you discount the software problem, that the 124 small business and office computers presented in this report could be competitive in the export market. □

### Small Business Computer Specifications

MANUFACTURER	Bantech Data Science	Bantech Data Science	Canon	Canon	Canon
SYSTEM	Pentry	Pentry	Canonac 51	Canonac 51	Canonac
MODEL	ECO	Elphin	Model F Series	Model R, J, JL	Model 25, 50, 100
HARDWARE PACKAGING	Stand-alone, desk-type	Stand-alone, desk-type	Stand-alone, desk-top	Stand-alone, desk-top	Small-scale WS, cabinet
SYSTEM CHARACTERISTICS					
Kanji & Kana processing capability	None	None	Yes, 48	Yes, 48	None
Multiterminal work stations	None	None	None	None	Maximum 4
Terminal functions	None	None	None	None	Yes
PROCESSOR					
Processor type (word length)	LSI (16)	LSI (16)	LSI (8)	LSI (8)	LSI (8)
Main storage (cycle time)	MOS (666 ns)	MOS (666 ns)	nMOS	nMOS	nMOS
Main storage capacity (bytes); error checking	32/64K, parity	32/64K parity	32K, parity	32K, parity	128 ~ 192K, parity
Input/output port/channel	I/O bus	I/O bus	Serial (1)	Serial (1)	Serial, parallel*1
MASS STORAGE					
Integrated units (capacity)	8-inch floppy disk drive (1.2M x 2)	FDD (1.2M x 2)	FDD (256K)	FDD (256K)	FDD (1M) fixed DD25/50/100M
Optional units (capacity)	Fixed disk drives (4.8/9.6M) cartridge DD (9.6M), CMT	FDD (1.2M x 2)	None	None	OMT
KEYBOARD/CRT WORKSTATION					
Screen size, colors	12 inch, green	12 inch, green	12 inch, green	12 inch, green	20 inch, green
Characters/line by number of lines	80 x 24	64 x 16	80 x 25 (39 x 16)	80 x 25 (39 x 16)	80 x 25
Character sets	English, Kana	English, Kana	English, Kana, Kanji	English, Kana, Kanji	English, Kana
Keyboard arrangement/type	JIS, book*1	Pentouch*1, book*2	Push button (128 items, 16 pages)	Typewriter model	Typewriter model
Numeric keypad, function keys	Yes	Yes, Yes	Yes, Yes	Yes, Yes	Yes, yes
STANDARD PRINTER					
Type, characters/line	9 x 7 matrix 80/136	9 x 7 matrix, 80/136	9 x 9 (9 x 18) matrix, 136 (68)	9 x 9 (9 x 18) matrix, 136 (68)	7 x 9 matrix, 136
Speed	125/170 cps	125/170 cps	180 (90) cps	180 (90) cps	180 cps
Characters sets	—	English, Kana	English, Kana, Kanji	English, Kana, Kanji	English, Kana
OTHER PERIPHERALS	PTR, PTP Inserter English, Kana	—	None	None	None
COMMUNICATION CONTROL UNIT					
Mode, code	Half-duplex, JIS	Half-duplex, JIS	None	None	Half-duplex/full duplex, 8 units Packet
Protocols	Synchronous	Synchronous	None	None	
Maximum no. of lines, speed (bits per second)	1 line, 1200 bps	1 line, 1200 bps	None	None	16, 48K bps
SOFTWARE					
Operating systems	PDOS	PDOS	OS5 (conversational, interrupt) Comet, Assembler	OS5 (conversational, interrupt) Comet, Assembler	OS9 (multi, conversational, interrupt) Comet, Assembler
Programming languages	PROLL	PROLL			
Data communication protocols	IBM 3740	IBM 3740	—	—	—
File management/data base function	—	—	SAM, ISAM	SAM, ISAM	SAM, ISAM, IR
Utilities	Debug, copy, sort	Debug, copy, sort	Editor, debugger, sort-merge, Forgen	Editor, debugger, sort-merge, Forgen	Editor, debugger, sort-merge
APPLICATIONS	Payroll, finance/accounting, inventory control	Payroll, finance/accounting, inventory control	Sales—inventory mgmt., purch. mgmt., finance—payroll mgmt., indust. class. pkg. (hotel, liquor sales, apparel, construc., prtg., transp. September, 1980	Sales—inventory mgmt., purch. mgmt., Finance—payroll mgmt., indust. class. pkg. (hotel, liquor sales, apparel (construc., prtg., transp. September, 1980	Sales—inventory, purch., fin., payroll, construc. process management, various reference systems
AVAILABILITY & PRICING					
Date introduced in Japan	—	—	September, 1980	September, 1980	March, 1980
First shipment in Japan	April, 1977	September, 1978	September, 1980	September, 1980	June, 1980
Price of minimum configuration (yen)	123,000/month (5 year lease)	100,000/month (5 year lease)	3,400,000	3,150,000	10,980,000
Price of standard configuration (yen)	—	—	3,400,000	3,150,000	13,780,000
COMMENTS	*1book (112 items, 10 pages)	*1(384 items, 10 pages) *2(112 items, 10 pages)			*1Serial, parallel mixed, max. 4 units

ABBREVIATIONS: b (bit), B (byte), bps (bits per second), CMT (cassette magnetic tape), CP (card punch), cps (characters per second), CR (card reader), FDD (8-inch floppy disk drive), JP (journal printer), LP (line printer), lpm (lines per minute), MCR (mark card reader), MSR (mark sheet reader), MT (9-track magnetic tape drive), OCR (optical character reader), OMT (open reel magnetic tape), PTP (paper tape punch), PTR (paper tape reader), SP (serial printer), spm (sheets per minute), WS (workstation)

### Small Business Computer Specifications

MANUFACTURER	Canon	Canon	Canon	Canon	Canon
SYSTEM	Canonac	Canonac 71S	Canonac 71	Canonac 71	Canonac 350
MODEL	Super Printer	Model S-SL	F-2, 2D Series	Model 2.2D	Model 30-35
HARDWARE PACKAGING	Stand-alone, cabinet	Stand-alone, cabinet	Stand-alone, desk-type	Stand-alone, desk-type	Stand-alone, desk-type
SYSTEM CHARACTERISTICS					
Kanji & Kana processing capability	Yes, 3828	Yes, 256, max. 512	Yes, 46	Yes, 46	None
Multiterminal work stations	Yes	None	None	None	None
Terminal functions	Yes	Yes	Yes	Yes	None
PROCESSOR					
Processor type (word length)	LSI (8)	LSI (8)	LSI (8)	LSI (8)	LSI (8)
Main storage (cycle time)	nMOS	nMOS	nMOS	nMOS	nMOS (350 ns)
Main storage capacity (bytes); error checking	32K, parity	32K, parity	32K, parity	32K, parity	96K~160K, parity
Input/output port/channel	Serial (2), common pass	Serial (2), common pass	Serial (2), common pass	Serial (2), common pass	Serial (1)
MASS STORAGE					
Integrated units (capacity)	FDD (1M)	FDD (1M)	FDD (1M)	FDD (1M)	CMT
Optional units (capacity)	Fixed D.D. OMT	Fixed DD, OMT	Fixed DD, OMT	Fixed DD, OMT	None
KEYBOARD/CRT WORKSTATION					
Screen size, colors	12 inch, green	12 inch, green	12 inch, green	12 inch, green	4 inch, orange
Characters/line by number of lines	80 x 20	80 x 20 (39 x 16)	80 x 20 (39 x 16)	80 x 20 (39 x 16)	20 x 4
Character sets	English, Kana	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji	English, Kana
Keyboard arrangement/type	Typewriter model**1	Typewriter model	Push button (128 items, 16 pages)	Typewriter model	Typewriter model
Numeric keypad, function keys	Yes	Yes, yes	Yes, yes	Yes, yes	Yes, yes
STANDARD PRINTER					
Type, characters/line	Semiconductor laser beam	7 x 13 (16 x 16), 136 (88)	9 x 9 (9 x 18), 136 (68)	9 x 9 (9 x 18), 136 (68)	Print, 136
Speed	10 sheets/minute (A-4 size)	120 (40) cps	180 (90) cps	180 (90) cps	54.5 cps
Characters sets	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji	English, Kana
OTHER PERIPHERALS	PTR, PTP, OMR	PTR, PTP, OMR	PTR, PTP, OMR	PTR, PTP, OMR	PTP
COMMUNICATION CONTROL UNIT					
Mode; code	Half-duplex/full duplex, JIS, 8 units	Half-duplex/full duplex, 8 units	Half-duplex/full duplex, 8 units	Half-duplex/full duplex, 8 units	Half-duplex/full duplex, 8 units
Protocols	Synchronous	Synchronous	Synchronous	Synchronous	Synchronous
Maximum no. of lines, speed (bits per second)	4 lines, 200 ~ 9600 bps	4 lines, 200 ~ 9600 bps	4 lines, 200 ~ 9600 bps	4 lines, 200 ~ 9600 bps	1 line, 200 ~ 9600 bps
SOFTWARE					
Operating systems	OS7-LBP (conversational, inter.)	OS7 (conversational, interrupt)	OS7 (conversational, interrupt)	OS7 (conversational, interrupt)	SP (conversational)
Programming languages	Comet, Assembler	Comet, Assembler	Comet, Assembler	Comet, Assembler	Comet (interpreter)
Data communication protocols	—	—	—	—	—
File management/data base function	SAM, ISAM	SAM, ISAM	SAM, ISAM	SAM, ISAM	SAM
Utilities	Editor, debugger, sort-merge CRT/LBP	Editor, debugger, sort-merge, Forgen	Editor, debugger, sort-merge, Forgen	Editor, debugger, sort-merge, Forgen	Editor, sort-merge
APPLICATIONS	Sales—inventory, purchase, finance, payroll, other special purpose operations	Sale—inventory adm., purch. adm., finance—payroll adm., industrial—class. pkg. (hotel, liquor sales, apparel, construc., printing	Sales—inventory adm., purch. adm., finance—payroll adm., industrial—class. pkg. (hotel, liquor sales, apparel, construc., printing	Sales—inventory adm., purch. adm., finance—payroll adm., indust. class. pkg. (hotel, liquor sales, apparel, construc., printing, transportation, stor.	Sales—Mgmt. sys., purch. mgmt. sys., finance—payroll adm., industrial class. pkg., (hotel, liquor, apparel, construction, prtng.)
AVAILABILITY & PRICING					
Date introduced in Japan	September, 1979	September, 1980	September, 1979	September, 1979	April, 1978
First shipment in Japan	March, 1980	November, 1980	September, 1979	September, 1979	May, 1978
Price of minimum configuration (yen)	9,980,000	5,500,000	6,300,000	4,950,000	3,300,000
Price of standard configuration (yen)	9,980,000	5,500,000	6,300,000	5,400,000	3,300,000
COMMENTS	**1Push putton (128 items, 16 pages)				

ABBREVIATIONS: b (bit), B (byte), bps (bits per second), CMT (cassette magnetic tape), CP (card punch), cps (characters per second), CR (card reader), FDD (8-inch floppy disk drive), JP (journal printer), LP (line printer), lpm (lines per minute), MCR (mark card reader), MSR (mark sheet reader), MT (9-track magnetic tape drive), OCR (optical character reader), OMT (open reel magnetic tape), PTP (paper tape punch), PTR (paper tape reader), SP (serial printer), spm (sheets per minute), WS (workstation)

### Small Business Computer Specifications

MANUFACTURER	Casio Computer	Casio Computer	Casio Computer	Casio Computer	Casio Computer
SYSTEM	Σ-8700	Σ-8700	Σ-8700	Σ-8700	Σ-7500
MODEL	Model 15	Model 25	Model 35	Model 45	—
HARDWARE PACKAGING	Stand-alone, desk-type	Stand-alone, desk-type	Stand-alone, desk-type	Stand-alone, desk-type	Stand-alone, desk-type
SYSTEM CHARACTERISTICS					
Kanji & Kana processing capability	None	None	Yes, 7332	Yes, 7332	None
Multiterminal work stations	None	None	None	None	None
Terminal functions	None	None	None	None	None
PROCESSOR					
Processor type (word length)	LSI (8)	LSI (8)	LSI (8)	LSI (8)	LSI (8)
Main storage (cycle time)	MOS (380ns/2 byte)	MOS (380 ns/2 byte)	MOS (380ns/2 byte)	MOS (380ns/2 byte)	MOS (380 ns/2 byte)
Main storage capacity (bytes); error checking	144K, parity	144K, parity	144K, parity	144K, parity	144K, parity
Input/output port/channel	—	—	—	—	—
MASS STORAGE					
Integrated units (capacity)	FDD (1M x 2)	FDD (1M x 2)	FDD (1M x 2)	FDD (1M x 2)	FDD (243K x 2)
Optional units (capacity)	FDD (1M), CMT	FDD (1M), CMT	FDD (1M), CMT	FDD (1M), CMT	CMT (243K)
KEYBOARD/CRT WORKSTATION					
Screen size, colors	14 inch, green	14 inch, green	14 inch, green	14 inch, green	14 inch, green
Characters/line by number of lines	80 x 20	80 x 20	80 x 20 (40 x 10)	80 x 20 (40 x 10)	80 x 20
Character sets	English, Kana	English, Kana	English, Kana, Kanji	English, Kana, Kanji	English, Kana
Keyboard arrangement/type	Typewriter model	Book (2400)	Typewriter model	Book (2400)	Typewriter model/book
Numeric keypad, function keys	Yes, yes	Yes, yes	Yes, yes	Yes, yes	Yes, yes
STANDARD PRINTER					
Type, characters/line	9 x 7, 132	9 x 7, 132	9 x 13 (16 x 15) 136 (90)	9 x 13 (16 x 15), 136 (90)	7 x 9, 132
Speed	20 cps	120 cps	120 (40) cps	120 (40) cps	120 cps
Characters sets	English, Kana	English, Kana	English, Kana, Kanji	English, Kana, Kanji	English, Kana
OTHER PERIPHERALS	LP, CR, Inserter	LP, CR, PTR, inserter	LP, CR, PTR, Inserter	LP, CR, PTR, Inserter	—
COMMUNICATION CONTROL UNIT					
Mode; code	Half-duplex	Half-duplex	Half-duplex	Half-duplex	Half-duplex
Protocols	Asynchronous, BSC	Asynchronous, BSC	Asynchronous, BSC	Asynchronous, BSC	Asynchronous, BSC
Maximum no. of lines, speed (bits per second)	1 line, max 9600 bps	1 line, max 9600 bps	1 line, max 9600 bps	1 line, max 9600 bps	1 line, max 9600 bps
SOFTWARE					
Operating systems	CaioS-5	CAIOS-5	CAIOS-5	CAIOS-5	CAIOS-5
Programming languages	CSL, Hero	CSL, Hero	CSL, Hero	CSL, Hero	CSL, HERO
Data communication protocols	—	—	—	—	—
File management/data base function	SAM	SAM	SAM	SAM	—
Utilities	Chinese char. proc., debug., editor, sort	Chinese char. proc., debug., editor, sort	Chinese char. proc. debug., editor, sort	Chinese char. proc. debug., editor, sort	Debugger, editor, sort merge
APPLICATIONS	Sales administration, general accounting, payroll	Sales Administration, general accounting, payroll	Sales administration, general accounting, payroll	Sales administration, general accounting, payroll	Sales administration, general accounting, payroll
AVAILABILITY & PRICING					
Date introduced in Japan	May, 1979	May, 1979	May, 1979	May, 1979	October, 1980
First shipment in Japan	September, 1979	September, 1979	September, 1979	September, 1979	October, 1980
Price of minimum configuration (yen)	5,150,000	5,500,000	5,700,000	6,050,000	2,980,000
Price of standard configuration (yen)	—	—	—	—	—
COMMENTS					

ABBREVIATIONS: b (bit), B (byte), bps (bits per second), CMT (cassette magnetic tape), CP (card punch), cps (characters per second), CR (card reader), FDD (8-inch floppy disk drive), JP (journal printer), LP (line printer), lpm (lines per minute), MCR (mark card reader), MSR (mark sheet reader), MT (9-track magnetic tape drive), OCR (optical character reader), OMT (open reel magnetic tape), PTP (paper tape punch), PTR (paper tape reader), SP (serial printer), spm (sheets per minute), WS (workstation)

### Small Business Computer Specifications

MANUFACTURER	Casio Computer	Casio Computer	Dodwell & Company, Ltd.	Dodwell & Company, Ltd.	Fujitsu
SYSTEM	Σ-8900	Σ-8900	Dodwell System 80A	Dodwell System 80A	Facom V830
MODEL	Model 40	Model 60	Model 130, 230 KG	Super 90, 900	—
HARDWARE PACKAGING	Small scale WS desk-type	Small scale WS desk-type	Stand-alone, desk-type	Small-scale WS, desk-type	Large-scale WS, cabinet
SYSTEM CHARACTERISTICS					
Kanji & Kana processing capability	Yes, 7332	Yes, 7332	Yes	Yes, 1000, max 6349	Yes, 8000
Multiterminal work stations	Maximum 4	Maximum 8	None	Maximum 3	Maximum 16
Terminal functions	Yes	Yes	None	None	Yes
PROCESSOR					
Processor type (word length)	LSI (16)	LSI (16)	Z80 (8)	Z80 (8)	LSI (16)
Main storage (cycle time)	MOS (333 ns/2 byte)	MOS (333ns 2 byte)	nMOS (1000 ns)	nMOS	MOS (400 ns/2 bytes)
Main storage capacity (bytes); error checking	192K ~ 384K, parity	224K ~ 512K, parity	32K, parity	64K, parity	256K ~ 768K, parity
Input/output port/channel	Port (8)	Port (8)	Serial-parallel	Serial-parallel, *1	DMA, parallel (6)
MASS STORAGE					
Integrated units (capacity)	8 inch DD (10M/20M) FDD (1M x 1)	8 inch DD (20M 40M) FDD (1M x 1)	FDD (256K x 2)	FDD (256K x 2)	Fixed DD (40M ~ 100M) FDD (256K/1M)
Optional units (capacity)	8 inch DD (10M/20M) FDD (1M), CMT	8 inch DD (20M/40M) FDD (1M x 1), CMT	None	Fixed DD	FDD (256K/1M), fixed DD (40M ~ 100M), cartridge DD (10M), MT
KEYBOARD/CRT WORKSTATION					
Screen size, colors	15 inch, green	15 inch, green	9 inch, green	14 inch, green	12 inch, green
Characters/line by number of lines	80 x 23 (40 x 23)	80 x 23 (40 x 23)	32 x 14	80 x 24 (32 x 12)	80 x 24 (40 x 24)
Character sets	English, Kana, Kanji	English, Kana, Kanji	English, Kana	English, Kana, Kanji	English, Kana, Kanji
Keyboard arrangement/type	Typewriter model	Typewriter model	JIS, AIEUO (Japanese alphabet)	JIS, book method	Typewriter model
Numeric keypad, function keys	Yes, yes	Yes, yes	Yes, yes	Yes, yes	Yes, yes
STANDARD PRINTER					
Type, characters/line	13 x 9 (16 x 15), 136 (90)	13 x 9 (16 x 15), 136 (90)	9 x 7 (13 x 21), 136 (68)	9 x 7 (16 x 16), 136 (68)	Type, 136
Speed	120 (40) cps	120 (40) cps	180 cps	180 cps	390 lpm
Character sets	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji
OTHER PERIPHERALS	Chinese char. LP (350/180 lpm CR)	Chinese character LP (350/180 lpm)	PTP-PTR, CR, OCR, LP, Inserter	PTP, PTR, Inserter CR, LP, OCR	SP, CR, PTR
COMMUNICATION CONTROL UNIT					
Mode; code	Half-duplex	Half-duplex	Half-duplex/full-duplex, ASCII*1	Half-duplex/full-duplex, ASCII*2	Half-duplex/full-duplex, EBCDIC
Protocols	Asynchronous, BSC	Asynchronous, BSC	Synchronous, asynchronous, BSC	Synchronous/asynchronous, BSC	Synchronous/start-stop, BSC
Maximum no. of lines, speed (bits per second)	1 line, max 9600 bps	1 line, max 9600 bps	1 line, max 4800 bps	2 lines, max 4800 bps	1 ~ 4 lines, max 9600 bps
SOFTWARE					
Operating systems	CAIOS-7 (multi-processing, conver. spool) CSL, HERO, QUICK	CAIOS-7 (multi-processing, conver. spool) CSL, HERO, QUICK	Monitor (multiproc. function/file mgmt.) PLOC, Assembler	Monitor (multiproc. func./file mgmt.) PLOC, Assembler	UNIOS F 4
Programming languages	FTP	FTP	PLOC, internal instruction	PLOC, internal instruction	COBOL FORTRAN
Data communication protocols	Multi ISAM, SAM J. proc., debugger	Multi: ISAM, SAM J. proc., debugger	ISAM, multiple key-file prog. devel. tool	ISAM, multiple key-file prog. devel. tool	PRG. TASK FORCE
File management/data base function	Editor, sort merge	Editor, sort merge	debug	debug	File transmission, RJE, DSC DCM
Utilities					SAM, DAM, ISAM, DBM prog. devel. Japanese entry
APPLICATIONS	Sales administration, general accounting, payroll	Sales administration, general accounting, payroll	B/S master-financial accounting, S/I master, sales inventory	B/S master, financial accounting, S/I master, sales inventory	Sales adm., finan. acctg., production mgmt., personnel-payroll diagram proc., estimate, proj. adm., align. planning, NC
AVAILABILITY & PRICING					
Date introduced in Japan	October, 1980	October, 1980	—	—	April, 1979
First shipment in Japan	December, 1980	March, 1981	—	3/1980; 9/1980	August, 1979
Price of minimum configuration (yen)	6,700,000	8,600,000	—	—	15,860,000
Price of standard configuration (yen)	—	—	—	—	530,000/month (rental)
COMMENTS	Printer can be connected to each work station, also inserter can be used	Printer can be connected to each work station	*1Also EBCDIC	*1Other than DMA, *2also EBCDIC	*1Key file (160 x 10) *2Also DRS

ABBREVIATIONS: b (bit), B (byte), bps (bits per second), CMT (cassette magnetic tape), CP (card punch), cps (characters per second), CR (card reader), FDD (8-inch floppy disk drive), JP (journal printer), LP (line printer), lpm (lines per minute), MCR (mark card reader), MSR (mark sheet reader), MT (9-track magnetic tape drive), OCR (optical character reader), OMT (open reel magnetic tape), PTP (paper tape punch), PTR (paper tape reader), SP (serial printer), spm (sheets per minute), WS (workstation)

## Small Business Computer Specifications

MANUFACTURER	Fujitsu	Fujitsu	Fujitsu	Fujitsu
SYSTEM	Facom Bm	Facom System 80	Facom V	Facom V850
MODEL	D, DII, P, K,	Model 5/7	—	—
HARDWARE PACKAGING	Small-scale WS, desk-type	Small-scale WS, desk-type	Large-scale WS, cabinet	Large-scale WS, cabinet
SYSTEM CHARACTERISTICS				
Kanji & Kana processing capability	Yes, 127	Yes, 1000, max 8000	Yes, 7314	Yes, 7314
Multiterminal work stations	Maximum 2	Maximum 8	Maximum 28	Maximum 32
Terminal functions	Yes	Yes	Yes (M series)	Yes (M Series)
PROCESSOR				
Processor type (word length)	MSISSI (16)	LSI (16)	LSI (16)	LSI (16)
Main storage (cycle time)	MOS (1000ns/2 bytes)	MOS (450, 600 ns/2 bytes)	MOS (600ns)	MOS (400ns)
Main storage capacity (bytes); error checking	32K ~ 64K, parity	192K ~ 512K, parity	128K ~ 1240K, ECC	256K ~ 1280K, ECC
Input/output port/channel	DMA, parallel (3)	DMA, parallel (5)	Channel (7)* <sup>1</sup>	Channel (7)* <sup>1</sup>
MASS STORAGE				
Integrated units (capacity)	FDD (500K/256K)	Fixed DD (10M ~ 100M) FDD (256K/1M)	—	—
Optional units (capacity)	FDD (500K/256K) cartridge DD (10M)	FDD (243K/1M)	FDD (243K/985K/1.2M) cartridge DD (39.7M), fixed DD* <sup>2</sup>	FDD (243K/985K/1.2M) cartridge DD (39.7M), fixed DD* <sup>2</sup>
KEYBOARD/CRT WORKSTATION				
Screen size, colors	9 inch, green	12 inch, green	14 inch, green* <sup>3</sup>	14 inch, green* <sup>3</sup>
Characters/line by number of lines	40 x 16	80 x 24 (40 x 24)	80 x 24 (40 x 24)	80 x 24 (40 x 24)
Character sets	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji
Keyboard arrangement/type	JIS, key mat* <sup>1</sup>	Typewriter model* <sup>1</sup>	Typewriter, Book* <sup>4</sup>	Typewriter, book* <sup>4</sup>
Numeric keypad, function keys	Yes, yes	Yes, yes	Yes, yes	Yes, yes
STANDARD PRINTER				
Type, characters/line	9 x 7, 136	9 x 13 (15 x 16), 136 (68)	9 x 11 (16 x 16), 132 (90)	9 x 11 (16 x 16), 132 (90)
Speed	120 cps	165 (40) cps	120 (30) cps	120 (30) cps
Characters sets	English, Kana	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji
OTHER PERIPHERALS				
	LP (340 lpm)	LP (340 lpm), CR, PTR	LP (~ 1100 lpm, CR, PTR, PTP)	LP (~ 1100 lpm), CR, PTR PTP
COMMUNICATION CONTROL UNIT				
Mode; code	Half-duplex, EBCDIC	Half-duplex, EBCDIC	Half/duplex, ISO, etc.	Half/duplex, ISO, etc.
Protocols	Synchronous, BSC	Synchronous, BSC	Synchronous, asynchronous* <sup>5</sup>	Synchronous, asynchronous* <sup>5</sup>
Maximum no. of lines, speed (bits per second)	One line, max 2400 bps	1 ~ 2 lines, max 9600 bps	32 lines, max 9600 bps	32 lines, max 9600 bps
SOFTWARE				
Operating systems	—	CPS 80	UNIOS/F 5 (Multi- proc. conver. type)	UNIOS/F5 (Multi- proc. conver. type)
Programming languages	COBOL, BOL-1	COBOL, CAPG	COBOL, RPG, FORTRAN FTL	COBOL, RPG, FORTRAN FTL
Data communication protocols	File transmission	File transmission	6 DSC (IBM 3270)	9525 LDSC (IBM)
File management/data base function	SAM, multiple ISAM, etc.	SAM, Multi ISAM	Data base document editing	Data base document editing
Utilities	Service utilities sys. util.	Prog. devel. util.	CHARM, EMS, Sort	J. support, JUST, CHARM, EMS, Sort
APPLICATIONS	Sales adm., finan. acctg., production administration, personnel-payroll	Japanese entry Sales administration, financial accounting, production management, personnel/payroll	Fin. acctg., asset mgmt., personnel, payroll, prod. mgmt., time-anal. based forecast	Fin. acctg., asset mgmt., personnel-payroll, production mgmt., time-anal. based forecast, alignment planning
AVAILABILITY & PRICING				
Date introduced in Japan	December, 1975	April, 1979	January, 1977	June, 1980
First shipment in Japan	April, 1976	October, 1979	October, 1977	unknown
Price of minimum configuration (yen)	3,900,000	56,230,000	19,880,000	—
Price of standard configuration (yen)	3,900,000	5,720,000	—	—
COMMENTS	*1 (80 items, 30 pages)	*1 Key file (160 x 10), key mat (160 x 15)	*1 Burst (3), Multiplexers (4) *2 (80.4/105.9M) *3 Color & colors *4 (160 items, 10 pages) *5 HDLC, BSC	*1 Burst (3), multiplexers (4) *2 (80.4/108.9M) *3 Color (7 colors) *4 (160 items, 10 pages) *5 HDLC, BSC

ABBREVIATIONS: b (bit), B (byte), bps (bits per second), CMT (cassette magnetic tape), CP (card punch), cps (characters per second), CR (card reader), FDD (8-inch floppy disk drive), JP (journal printer), LP (line printer), lpm (lines per minute), MCR (mark card reader), MSR (mark sheet reader), MT (9-track magnetic tape drive), OCR (optical character reader), OMIT (open reel magnetic tape), PTP (paper tape punch), PTR (paper tape reader), SP (serial printer), spm (sheets per minute), WS (workstation)



Small Business Computer Specifications

MANUFACTURER	Hitachi Medico	Hitachi Medico	Hitachi (Co. Ltd.)	Hitachi (Co. Ltd.)	Hitachi (Co. Ltd.)
SYSTEM	Himec-10	Himec-2L	Hitac L-320	Hitac L-320	Hitac L-320
MODEL	Medical Supplies System	—	2-9	30H	50H
HARDWARE PACKAGING	Small-scale WS, desk-type	Stand-alone, desk-type	Stand-alone, desk-type	Small-scale WS, cabinet	Small scale WS, cabinet
SYSTEM CHARACTERISTICS					
Kanji & Kana processing capability	None	None	Yes (192)* <sup>1</sup>	Yes, 8000	Yes, 8000
Multiterminal work stations	Max. 6 stations	None	None	Maximum 4	Maximum 8
Terminal functions	—	None	Yes (M Series)	Yes (M Series)	Yes (M Series)
PROCESSOR					
Processor type (word length)	8085 (8)	8080 (8)	LSI (16)	LSI (16)	LSI (16)
Main storage (cycle time)	—	MOS	MOS (610ns)	nMOS (610ns)	nMOS (610 ns)
Main storage capacity (bytes); error checking	—	—	32K ~ 64K	28K-60K (user area)	60K (user area)
Input/output port/channel	—	—	—	—	—
MASS STORAGE					
Integrated units (capacity)	Cartridge DD, FDD	FDD	FDD (243K/1M)	FDD (1M x 2)	FDD (1M x 2)
Optional units (capacity)	—	—	FDD (243K/1M x 3) fixed DD (0.2M x 2)	FDD (1M x 2) fixed DD (36M x 2)	FDD (1M x 2), fixed DD (36M x 2)
KEYBOARD/CRT WORKSTATION					
Screen size, colors	9 inch, green	9 inch, green	Plasma/9 or 14 in.	14 in., green/color	14 in., green/color
Characters/line by number of lines	40 x 20	40 x 20	40 x 2/40 x 16/80 x 24	80 x 24	80 x 24
Character sets	English, Kana	English, Kana	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji
Keyboard arrangement/type	Key-set	Key-mat	JIS/AIUEO* <sup>2</sup>	JIS/AIUEO* <sup>1</sup>	JIS/AIUEO* <sup>1</sup>
Numeric keypad, function keys	Yes, yes	Yes, yes	(Japanese alphabet) Yes, yes	(Japanese alphabet) Yes, yes	(Japanese alphabet) Yes, yes
STANDARD PRINTER					
Type, characters/line	Print, 80	Print, 80	9 x 7/print, 132	None	None
Speed	84 lines/minute	84 lines/minute	120/40 cps	None	None
Characters sets	English, Kana	English, Kana	English, Kana	None	None
OTHER PERIPHERALS	—	—	LP (110 lpm), CR (100 cpm) PTR (80 cps), PTP (20 cps)	SP (130 cps)* <sup>2</sup> , Kanji SP, LP (110 lpm), CR (100 cpm), PTR (80 cps)	SP (130 cps)* <sup>2</sup> , Kanji SP, LP (110 lpm), CR (100 cpm) PTR (80 cps)
COMMUNICATION CONTROL UNIT					
Mode; code	—	—	Half-duplex, EBCDIC	Half-duplex, EBCDIC	Half-duplex, EBCDIC
Protocols	—	—	Synchronous, HSC	Synchronous/HSC	Synchronous/HSC
Maximum no. of lines, speed (bits per second)	—	—	1 line, max 4800 bps	1 line, max 4800 bps	1 line, max 4800 bps
SOFTWARE					
Operating systems	Exclusive OS	Exclusively OS	L-320 PS	L-320 HPS	L-320 HPS
Programming languages	PL/M, Assembler, MRPL	Assembler	RFD, Expanded RPG	Expanded RFD, expanded RPG	Expanded RFD, Expanded PFD
Data communication protocols	—	—	CTM, remote, batch	CTM, Remote-batch	CTM, remote-batch
File management/data base function	ISAM	ISAM	—	—	—
Utilities	—	—	Sort, merge, file allocator & others	Sort, merge, file, allocator, docu. proc.	Sort, merge, file, allocator, doc. proc.
APPLICATIONS	Patient registration, cashier, reception registrations, statistic chart preparation	Patient registration, cashier, receipt preparation, statistic chart preparation	Administration, accounting, payroll, possible use for other operation	Sales administration, accounting, payroll, possible use for other operations	Sales administration, accounting, payroll, possible use for other operations
AVAILABILITY & PRICING					
Date introduced in Japan	August, 1978	1974	—	October, 1980	October, 1980
First shipment in Japan	October, 1978	1975	—	March, 1981	March, 1981
Price of minimum configuration (yen)	—	—	—	—	—
Price of standard configuration (yen)	20,000,000	5,800,000	—	—	—
COMMENTS			* <sup>1</sup> Chinese characters display only and no printing possible * <sup>2</sup> Data entry is available	* <sup>1</sup> Data entry is available * <sup>2</sup> Horizontal inserter is attached	* <sup>1</sup> Data entry is available * <sup>2</sup> horizontal inserter is attached

ABBREVIATIONS: b (bit), B (byte), bps (bits per second), CMT (cassette magnetic tape), CP (card punch), cps (characters per second), CR (card reader), FDD (8-inch floppy disk drive), JP (journal printer), LP (line printer), lpm (lines per minute), MCR (mark card reader), MSR (mark sheet reader), MT (9-track magnetic tape drive), OCR (optical character reader), OMT (open reel magnetic tape), PTP (paper tape punch), PTR (paper tape reader), SP (serial printer), spm (sheets per minute), WS (workstation)

### Small Business Computer Specifications

MANUFACTURER	Hitachi	Hitachi	Maruzen	Maruzen	Matsushita
SYSTEM	Hitac L-330	Hitac L-330	MM-1000	MM-2000	BC-5000
MODEL	3	4	—	—	—
HARDWARE PACKAGING	Small-scale WS, cabinet	Large-scale WS, cabinet	Small-scale WS, desk-type	Small-scale WS, desk-type	Stand-alone, desk-top
SYSTEM CHARACTERISTICS					
Kanji & Kana processing capability	Yes 8000	Yes, 8000	Yes, 3200	Yes, 3200	Yes, 2650
Multiterminal work stations	Maximum 8	Maximum 16	Maximum 2	Maximum 8	None
Terminal functions	Yes (M Series)	Yes (M Series)	Yes	Yes	None
PROCESSOR					
Processor type (word length)	H-8030 (8)	H-8030	8086 (16)	8086 (16)	8085 x 3, (8)
Main storage (cycle time)	nMOS (660 ns)	nMOS (660ns)	MOS (400ns)	MOS (500 ns)	MOS (375 ns)
Main storage capacity (bytes); error checking	128K ~ 512K	128K ~ 512K	128K ~ 256K, parity	128K ~ 256K, parity	48K ~ 64K, parity
Input/output port/channel	—	—	Port (4 ~ 8)	Port (8 ~ 12)	Serial (2)
MASS STORAGE					
Integrated units (capacity)	None	None	FDD (1MB) (1 ~ 2) fixed DD (10 ~ 40M)	FDD (1MB) (1-2) Fixed DD (10 ~ 40M)	FDD (1M 8 x 2)
Optional units (capacity)	FDD (1M x 2), fixed DD (140M), magnetic tape	FDD (1M x 2), pack DD (200M)	—	Cartridge DD	—
KEYBOARD/CRT WORKSTATION					
Screen size, colors	14 in., green/color	14 in., green/color	12 inch, green	13 inch, green	12 inch, green
Characters/line by number of lines	80 x 24	80 x 24	80 x 24 (40 x 24)	128 x 40	80 x 20 (40 x 20)
Character sets	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji
Keyboard arrangement/type	JIS	JIS	Typewriter model	Typewriter, model	Key-mat model
Numeric keypad, function keys	Yes, yes	Yes, yes	Yes, yes	Yes, yes	Yes, yes
STANDARD PRINTER					
Type, characters/line	None	None	9 x 7 (16 x 16), 139 (90)	9 x 7 (16 x 16), 136 (90)	9 x 7 (14 x 13), 136 (68)
Speed	None	None	120 (40 cps)	120 (40) cps	125 (25) cps
Characters sets	None	None	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji
OTHER PERIPHERALS					
	Kanji SP, LP (165 ~ 1000 lpm), CR (800 cpm), CP (20 ppm), plotter	Print SP, LP (165 ~ lpm), CR (8000 cpm), CP (20CPM), plotter	LP	LP	CR, PTR
COMMUNICATION CONTROL UNIT					
Mode; code	Full duplex/half-duplex	Full duplex/half-duplex	Half-duplex/full duplex, 5 ~ 8 units	Half-duplex/full duplex, 5 ~ 8 units	Half-duplex, 8 units
Protocols	Synchronous/HSC	Synchronous/HSC	Synchronous, asynchronous, BSC	Synchronous, asynchronous, BSC	Asynchronous, synchronous
Maximum no. of lines, speed (bits per second)	4 lines, max 9600 bps	7 lines, max 9600	2 lines, max 9600	110 ~ 9600 bps	2 lines, max 9600 bps
SOFTWARE					
Operating systems	VOSO	VOSO	MOS (multi-conversational) E-B-BASIC	MOS (multi-conversational) E-B-BASIC	Monitor I (conversational) MUST, Assembler
Programming languages	COBOL, NHELP, Expanded RPG, etc.	COBOL, NHELP, Expanded RPG, etc.	Yes	Yes	—
Data communication protocols	CTM, remote-batch	CTU Remote batch	Yes	Yes	—
File management/data base function	PDM	PDM	DBMS	DBMS	SAM, ISAM
Utilities	Sort, merge, datafile source-entry, screen	Sort, merge, data-file/source entry	Data-file, Chinese char. support, sort	Data-file, change processing support,	Sort, editor, IS utility, debug
APPLICATIONS	General use for manufacturers, construction & service industries	General use for manufacturers, construction, service industries	Sales management, payroll, accounting, MAIL (Maruzen library)	Management, payroll, accounting, MAIL (Maruzen library)	Appliances sales, high-pressure liq. gas sales, auto-repairs, sales, fin., payroll, prod. cont., serv. stations., nutrition calculating
AVAILABILITY & PRICING					
Date introduced in Japan	June, 1979	June 1979	February, 1981	May, 1980	April, 1979
First shipment in Japan	October, 1979	October, 1979	April, 1981	August, 1980	October, 1979
Price of minimum configuration (yen)	—	—	4,770,000	6,600,000	—
Price of standard configuration (yen)	—	—	5,680,000	6,600,000	4,950,000
COMMENTS					

ABBREVIATIONS: b (bit), B (byte), bps (bits per second), CMT (cassette magnetic tape), CP (card punch), cps (characters per second), CR (card reader), FDD (8-inch floppy disk drive), JP (journal printer), LP (line printer), lpm (lines per minute), MCR (mark card reader), MSR (mark sheet reader), MT (9-track magnetic tape drive), OCR (optical character reader), OMT (open reel magnetic tape), PTP (paper tape punch), PTR (paper tape reader), SP (serial printer), spm (sheets per minute), WS (workstation)

### Small Business Computer Specifications

MANUFACTURER	Miroku Keiri	Miroku Keiri	Miroku Keiri	Miroku Keiri	Miroku Keiri
SYSTEM	Mikroku Mutan	Miroku Professional	Mirkou Profes- sional Japanese	Miroku BIG 5	Miroku Power Z
MODEL	—	Model 10-20-30	Model 10-20-30	—	—
HARDWARE PACKAGING	Small-scale WS, desk-type	Stand-alone, desk- type	Stand-alone, desk- type	Stand-alone, desk top	Stand alone, desk top
SYSTEM CHARACTERISTICS					
Kanji & Kana processing capability	None	None	Yes, 6835, max x 7135	None	Yes, 1024
Multiterminal work stations	Maximum 7	None	None	None	None
Terminal functions	Yes	None	None	None	None
PROCESSOR					
Processor type (word length)	Z80 (8)	Z80 (8)	Z80 (8)	Z80 (8)	Z80
Main storage (cycle time)	MOS (1000 ns)	MOS (1000 ns)	MOS (1000 ns)	MOS (1000 ns)	cMOS
Main storage capacity (bytes); error checking	96K, parity	64K ~ 256K, parity	352K, parity	64K, parity	64K, parity
Input/output port/channel	Channel (16)	Channel (7)	Channel (7)	Channel (7)	System bus
MASS STORAGE					
Integrated units (capacity)	Fixed DD (20M), FDD (256K)	FDD (256K)	FDD (256K)	FDD (256K)	Mini FDD
Optional units (capacity)	Fixed DD (20M), CMT	None	None	None	None
KEYBOARD/CRT WORKSTATION					
Screen size, colors	14 inch green	14 inch, green	14 inch, green	12", green	12", green
Characters/line by number of lines	80 x 24	80 x 24	80 x 24	80 x 24	80 x 25
Character sets	English, Kana	English, Kana	English, Kana	English, Kana	English, Kana, Kanji
Keyboard arrangement/type	Book (300 items, 20 pages)*1	Book (300 items, 20 pages)*1	Book/300 items, 20 pages)*1	Book (160 items, 15 page)	Book (160 items, 15 pages)
Numeric keypad, function keys	Yes, yes	Yes, yes	Yes, yes	Yes, yes	Yes
STANDARD PRINTER					
Type, characters/line	9 x 7, 136	9 x 7.136	9 x 7, 136	9 x 7, 136	7 x 5, 80
Speed	180 cps	180 cps	180 cps	180 cps	120 cps
Characters sets	English, Kana	English, Kana	English, Kana	English, Kana	English, Kana
OTHER PERIPHERALS	SP, LP	LP	None	None	None
COMMUNICATION CONTROL UNIT					
Mode; code	Full duplex	None	None	None	None
Protocols	Asynchronous	—	—	None	—
Maximum no. of lines, speed (bits per second)	7 lines, 1200 ~ 4800 bps	—	—	None	—
SOFTWARE					
Operating systems	System 05	System 02	System 03	System 01	A-DOS
Programming languages	EAPL, PGS	EAPL, PGS	EAPL, PGS	EAPL	BASIC, Assembler
Data communication protocols	None	None	None	None	None
File management/data base function	SAM direct	SAM, direct	SAM, direct	SAM, direct	—
Utilities	Debugger, editor, sort, merge	Debugger, editor, sort, merge	Debugger, editor, sort, merge	Debug, editor, sort, merge	Initialize, copy, sort-merge
APPLICATIONS	Finance, accounting, draft, depreciation, safes, purchase in- ventory, construction, school ac- counting system	General accounting, payroll, sales, purchase, inventory, draft, depreciation management; other systems	General accounting, payroll, sales pur- chase, inventory draft, depreciation management, & other systems	Accounting, payroll, sales, purchasing, stock control, con- structions, dentists, social insurances, labor management	Accounting, payroll, sales, purchase, stock systems for businesses, business systems for specific businesses (hotels, industries, etc.)
AVAILABILITY & PRICING					
Date introduced in Japan	June, 1979	September, 1980	—	Mar. 1980	Oct. 1980
First shipment in Japan	September, 1979	November, 1980	—	July, 1980	Nov. 1980
Price of minimum configuration (yen)	8,900,000	6,300,000	—	2,980,000	1,496,000
Price of standard configuration (yen)	8,900,000	6,300,000	—	1,980,000	1,496,000
COMMENTS	*1Full keys (cus- tom arrangement possible)	*1Full keys (custom arrangement poss- ible)	*1Full keys (cus- tom arrangement possible)	A complete pack- age system	

ABBREVIATIONS: b (bit), B (byte), bps (bits per second), CMT (cassette magnetic tape), CP (card punch), cps (characters per second), CR (card reader), FDD (8-inch floppy disk drive), JP (journal printer), LP (line printer), lpm (lines per minute), MCR (mark card reader), MSR (mark sheet reader), MT (9-track magnetic tape drive), OCR (optical character reader), OMT (open reel magnetic tape), PTP (paper tape punch), PTR (paper tape reader), SP (serial printer), spm (sheets per minute), WS (workstation)

### Small Business Computer Specifications

MANUFACTURER	Miroku Keiri	Mitsubishi Denki	Mitsubishi Electric	Mitsubishi Electric	Mitsubishi Electric
SYSTEM	Miroku	MELCOM 80	MELCOM 80	MELCOM 80	MELCOM A-C
MODEL		Japanese Model 18	Japanese Model 28	Japanese Model 38	—
HARDWARE PACKAGING	Stand-alone, desk-top	Stand alone, desk model	Small-WS, desk model	Large-scale WS, cabinet	Stand-alone, desk top
SYSTEM CHARACTERISTICS					
Kanji & Kana processing capability	None	Yes, 128, max. 35000	Yes, 128, max 35000	Yes, 128; max 35000	Yes
Multiterminal work stations	None	None	Max 8 stations	Maximum 32	None
Terminal functions	None	Yes	Yes	Yes	Yes
PROCESSOR					
Processor type (word length)	Z80 (8)	LSI (16)	LSI (16)	LSI (16)	LSI (8)
Main storage (cycle time)	cMOS	MOS (600 ns/2 bytes)	MOS (600 ns/2 bytes)	MOS (600 ns/2 byte)	MOS (1600 ns)
Main storage capacity (bytes); error checking	32K	192K, parity	192K ~ 256K, parity	256K ~ 512K, parity	32K, parity
Input/output port/channel	—	Channel (4)	Channel (5)	Channel (5)	—
MASS STORAGE					
Integrated units (capacity)	Mini FDD	Fixed DD (10M), FDD (256K/1M x 2)	Cartridge DD (20M), Fixed DD (20M), FDD (256K/1M) Fixed DD (20M), MT	*1Fixed DD (10M ~ 60M)	FDD (250K x 2)
Optional units (capacity)	None	None		Pack DD (50M ~ 300)	—
KEYBOARD/CRT WORKSTATION					
Screen size, colors	13 digits	14", green	14", green	14 inch, green	12 inch, green
Characters/line by number of lines	14	80 x 25 (40 x 25)	80 x 25 (40 x 25)	80 x 25 (40 x 25)	64 x 16 (32 x 16)
Character sets	English	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji
Keyboard arrangement/type	Book (150 items)	Typewriter*1	Typewriter*1	Typewriter Model*	Key-mat (208 items)
Numeric keypad, function keys	Yes, yes	Yes, yes	Yes, yes	Yes, yes	Yes, yes
STANDARD PRINTER					
Type, characters/line	7 x 5, 80	7 x 18 (24 x 24), 132 (88)	18 x 7 (24 x 24), 132 (88)	18 x 7 (24 x 24), 132 (88)	9 x 7, 132
Speed	80 cps	156 (60) cps	150 (60) cps	150 (60) cps	200 cps
Characters sets	—	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji	English, Kana
OTHER PERIPHERALS	None	Insertor	LP, MCR	LP, MCR, Insertor, PTP, PTR	None
COMMUNICATION CONTROL UNIT					
Mode; code	None	Half-duplex/full duplex, 5 ~ 8 units)	Half-duplex/full duplex, 5 ~ 8 units	Half-duplex/full duplex, 5 ~ 8 units	Half-duplex EBCDIC
Protocols	—	Synch contention	Synch, Cententron	Synchronous, contention	Synchronous, asynchronous
Maximum no. of lines, speed (bits per second)	—	—	—	16 lines, max 19,200 bps	One line, max 19200
SOFTWARE					
Operating systems	DOS	DPS III (conversational, easy manip.)	DPS III (multi batch, conversational)	DPS III (multi batch, conver.)	Firmware
Programming languages	Assembler	Progress II, COBOL, Business BASIC	Progress II, COBOL, Business BASIC	Progress II, COBOL, FORTRAN	COOL, Assembler
Data communication protocols	None	OCP	OCP	DCP	—
File management/data base function	—	Multiindexing/ DMS-3	Multi-indexing/ DMS-3	Multi indexing/ DMS-3	—
Utilities	Copy (V x F), Initialize	J. proc., APP, file mgmt., utility	J. proc., APP, File-manage, utility	J. proc., APP proc. filing mgmt.	Sort, medium exchange debug, tool
APPLICATIONS	Finance, payroll, sales, collections, retail stock control, dentists, nurseries, liquor stores	Sales, stock control, inventory—accounting, payroll, production control	Sales, stock control, inventory, accounting, payroll, production control	Sales, inventory management, material management, accounting, payroll, administration information, overall production manage-	Special packaged programs
AVAILABILITY & PRICING					
Date introduced in Japan	Jun 1979	Mar. 1980	Mar. 1980	March, 1980	May, 1979
First shipment in Japan	Aug. 1979	May 1980	May 1980	May, 1980	May, 1979
Price of minimum configuration (yen)	888,000	172,000 (5 yr. lease)	220,000 (5 yr lease)	303,000 (5 year lease)	—
Price of standard configuration (yen)	888,000	172,000 (5 yr. lease)	220,000 (5 yr lease)	303,000 (5 year lease)	1,200,000
COMMENTS		*1Book (208 items, 15 pages), keymat	*1Book (208 items, 15 pages), keymat	*Book (208 items, 15 pages) key mat is also available	

ABBREVIATIONS: b (bit), B (byte), bps (bits per second), CMT (cassette magnetic tape), CP (card punch), cps (characters per second), CR (card reader), FDD (8-inch floppy disk drive), JP (journal printer), LP (line printer), lpm (lines per minute), MCR (mark card reader), MSR (mark sheet reader), MT (9-track magnetic tape drive), OCR (optical character reader), OMT (open reel magnetic tape), PTP (paper tape punch), PTR (paper tape reader), SP (serial printer), spm (sheets per minute), WS (workstation)

## Small Business Computer Specifications

MANUFACTURER	Mitsubishi Electric	Mitsubishi Electric	Mitsubishi Electric	Mitsubishi Electric	Mitsubishi Electric
SYSTEM	MELCOM A-R	MELCOM 80	MELCOM 80	MELCOM 80	MELCOM 80
MODEL	—	Model 8	Model 18	Model 28	Model 38
HARDWARE PACKAGING	Stand-alone, desk-top	Stand-alone, desk-type	Stand-alone, desk-type	Small-scale WS, desk-type	Large-scale WS, desk-type
SYSTEM CHARACTERISTICS					
Kanji & Kana processing capability	Yes	Yes	Yes	Yes, 64	Yes
Multiterminal work stations	None	None	None	Maximum 8	Maximum 32
Terminal functions	Yes	Yes	Yes	Yes	Yes
PROCESSOR					
Processor type (word length)	LSI (8)	LSI (8)	LSI (16)	LSI (16)	LSI (16)
Main storage (cycle time)	MOS (1600 ns)	MOS (1600 ns)	MOS (6000 ns/2 byte)	MOS (600 ns/2 byte)	MOS (600 ns/2 byte)
Main storage capacity (bytes); error checking	32K, parity	48K, parity	128K, parity	128K ~ 256K, parity	128K ~ 512K, parity
Input/output port/channel	—	—	Channel (4)	Channel (5)	Channel (5)
MASS STORAGE					
Integrated units (capacity)	FDD (500K x 2)	FDD (1M x 2)	Fixed DD (10M), FDD (256K/1M x 2)	Cartridge DD, fixed DD (20M), FDD (256K/1M x 2)	Cartridge DD (10M x 8) FDD (256K x 2), fixed DD
Optional units (capacity)	—	FDD (1M X 2)	None	Cartridge DD (20M), FDD (256K/1M), fixed DD (20M), MT, etc.	Disk pack DD (50M x 8), MT (800/1600 bpi)
KEYBOARD/CRT WORKSTATION					
Screen size, colors	12 inch, green	12 inch, green	14 inch, green	14 inch, green	14 inch, green
Characters/line by number of lines	64 x 16	64b x 16 (32 x 16)	80 x 25 (40 x 25)	80 x 25 (40 x 25)	80 x 25 (40 x 25)
Character sets	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji
Keyboard arrangement/type	Key mat (208 items)	JIS arrangement	Typewriter model	Typewriter model	Typewriter model
Numeric keypad, function keys	Yes, yes	Yes, yes	Yes, yes	Yes, yes	Yes, yes
STANDARD PRINTER					
Type, characters/line	9 x 7, 132	9 x 7, 132	9 x 7, 132	9 x 7, 132	9 x 7, 132
Speed	200 cps	200 cps	200 cps	200 cps	200 cps
Characters sets	English, Kana	English, Kana	English, Kana	English, Kana	English, Kana
OTHER PERIPHERALS	Knsrter	SP, Inserter	Inserter	LP, MCR, Inserter, SP	LP, MCR, Inserter, SP
COMMUNICATION CONTROL UNIT					
Mode; code	Half-duplex, EBCDIC	Half-duplex, EBCDIC	Half/duplex/full duplex, 5 ~ 8 units	Half-duplex/full duplex, 5 ~ 8 units	Half-duplex/full duplex, 5 ~ 8 units
Protocols	Synchronous, asynchronous	Synchronous, asynchronous	Synchronous, contention	Synchronous, contention	Synchronous, contention
Maximum no. of lines, speed (bits per second)	1 line, max 19,200 bps	1 line, max 19,200 bps	1 line, max 19,200 bps	16 lines, max 19,200 bps	16 lines, max 19,200 bps
SOFTWARE					
Operating systems	Firmware	Firmware	DPS II (Conversat., easy manipulation)	DPS II (multi batch, job menu)	DPS II (multi batch, job menu)
Programming languages	COOL, Assembler	COOL, Assembler	Progress II, COBOL, Convers. simple lan. OCP	Progress II, COBOL, BASIC for office use DCP	Progress II, COBOL, FORTRAN, OCP
Data communication protocols	—	—	—	—	—
File management/data base function	—	—	Multi indexing, seq. index. APP, file	Multi-indexing/DMS-3 APP proc., file mgmt., vol. mgmt.	Multi-indexing/DMS-3 APP proc., file mgmt., vol. mgmt.
Utilities	Sort, medium exch. debug, tool	Sort, medium exch. debug, tool	Sales, inventory, material management, accounting, payroll, production managing system	Sales, inventory, material management, accounting, payroll, general production mgmt.	Sales, inventory, material management, accounting, payroll, general production management system
APPLICATIONS	Special packaged programs	Payroll system, accounting system, others			
AVAILABILITY & PRICING					
Date introduced in Japan	May, 1979	July, 1976	April, 1979	January, 1979	January, 1979
First shipment in Japan	May, 1979	December, 1976	May, 1979	May, 1979	May, 1979
Price of minimum configuration (yen)	3,980,000	—	—	—	—
Price of standard configuration (yen)	—	5,580,000	167,000 (5 year lease)	178,000 (5 year lease)	287,000 (5 year lease)
COMMENTS					

ABBREVIATIONS: b (bit), B (byte), bps (bits per second), CMT (cassette magnetic tape), CP (card punch), cps (characters per second), CR (card reader), FDD (8-inch floppy disk drive), JP (journal printer), LP (line printer), lpm (lines per minute), MCR (mark card reader), MSR (mark sheet reader), MT (9-track magnetic tape drive), OCR (optical character reader), OMT (open reel magnetic tape), PTP (paper tape punch), PTR (paper tape reader), SP (serial printer), spm (sheets per minute), WS (workstation)

### Small Business Computer Specifications

MANUFACTURER	Nagano Nihon	Nagano Hihon	Nippon ICS	Nippon ICS	Nippon ICS
SYSTEM	Musen	Musen	ICS FF Series	ICS FF Series	ICS FF Series
MODEL	NAC-720	NAC-820	FF-14	FF-25	FF-33
HARDWARE PACKAGING	Stand-alone, desk-top	Stand-alone desk-top	Stand-alone, desk-top	Stand-alone, desk model	Stand-alone, desk model
SYSTEM CHARACTERISTICS Kanji & Kana processing capability	None	Yes	Yes, 512	Yes, 1024	Yes, 1024
Multiterminal work stations	None	None	None	None	None
Terminal functions	None	None	None	None	None
PROCESSOR					
Processor type (word length)	8085 (8)	8085 (8)	280A (8)	Z80A (8)	Z80A (8)
Main storage (cycle time)	MOS (450 ns)	MOS (450 ns)	cMOS	cMOS	cMOS
Main storage capacity (bytes); error checking	13K	36K, parity	40K ~ 58K, parity	78K ~ 130K, parity	78K ~ 130K, parity
Input/output port/channel	Parallel (5)	Parallel (8)	Channel (6)	Channel (6)	Channel (6)
MASS STORAGE					
Integrated units (capacity)	FDD	FDD	FDD	FDD	FDD
Optional units (capacity)	CMT	CMT	FDD	FDD	FDD
KEYBOARD/CRT WORKSTATION					
Screen size, colors	Plasma display	Fluorescent, green*1	12", green	12", green	12", green
Characters/line by number of lines	10 x 1	10 x 2	64 x 24 (40 x 12)	64 x 24 (40 x 12)	64 x 24 (40 x 12)
Character sets	English	English	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji
Keyboard arrangement/type	Special	Special*2	Typewriter	Pushbutton (256)*1	Pushbutton (256)*1
Numeric keypad, function keys	Yes, Yes	Yes, Yes	Yes	Yes	Yes
STANDARD PRINTER					
Type, characters/line	9 x 7, 80	9 x 9 (9 x 9)*3	9 x 7 (12 x 12), 136 (68)	9 x 7 (12 x 12), 136 (68)	9 x 12 (12 x 12), 136 (68)
Speed	180 cps	180 (180) cps	150 (70) cps	750 (70) cps	150 (70) cps
Characters sets	English, Kana	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji
OTHER PERIPHERALS	None*1	44*3	PTR	PTR	PTR
COMMUNICATION CONTROL UNIT					
Mode; code	None	None	None	None	None
Protocols	None	None	None	None	None
Maximum no. of lines, speed (bits per second)	None	None	None	None	None
SOFTWARE					
Operating systems	Conversational	(Conversational)	C-DOS	C-DOS	C-DOS
Programming languages	Assembler	Assembler	COBOL, BASIC	COBOL, BASIC	COBOL, BASIC
Data communication protocols	None	None	None	None	None
File management/data base function	Multi NAC 707	Multi NAC 804	None	None	None
Utilities	—	—	Utilities in general	Utilities in general	Utilities in general
APPLICATIONS	Fixed 12 varieties sales, inventory management, liquor tax report*2	Fixed 26 varieties, sales, accounting management, inventory, liquor tax report, direct mail process	Finance-accounting, payroll, etc.	Finance-accounting, payroll, etc.	Finance-accounting, payroll
AVAILABILITY & PRICING					
Date introduced in Japan	April, 1978	August, 1980	January, 1980	January, 1980	January, 1980
First shipment in Japan	—	—	April, 1980	April, 1980	April, 1980
Price of minimum configuration (yen)	2,200,000	4,000,000	1,900,000 (0, 6.5%)	2,800,000 (0, 6.5%)	3,700,000 (0, 6.5%)
Price of standard configuration (yen)	3,000,000	4,800,000	2,500,000 (0, 6.5%)	3,700,000 (0, 6.5%)	4,300,000 (0, 6.5%)
COMMENTS	*1Register function contained *2Program fixed	*1Optional customer display *2Key tile *3132 lines (132 lines) *4Register function		*1Keyboard has 16 keys vertically and 16 horizontally with total of 256 items. Item key input. 1 key activates 2 items. Max. 512 items possible.	*1Keyboard has 16 keys vertically and 16 horizontally with a total of 256 items. Item key input. 1 key activates 2 items. Max. 512 items

ABBREVIATIONS: b (bit), B (byte), bps (bits per second), CMT (cassette magnetic tape), CP (card punch), cps (characters per second), CR (card reader), FDD (8-inch floppy disk drive), JP (journal printer), LP (line printer), lpm (lines per minute), MCR (mark card reader), MSR (mark sheet reader), MT (9-track magnetic tape drive), OCR (optical character reader), OMT (open reel magnetic tape), PTP (paper tape punch), PTR (paper tape reader), SP (serial printer), spm (sheets per minute), WS (workstation)

### Small Business Computer Specifications

MANUFACTURER	Nippon Business Computer	Nippon Business Computer	Nippon Business Computer	Nippon Business Computer	Nippon Business Computer
SYSTEM	JBC 100 Series	JBC 100 Series	JBC 100 Series	JBC New 1st Series	JBC New 1st Series
MODEL	System 101	System 102	System 103	System-1 Chinese	*1
HARDWARE PACKAGING	Small-WS, cabinet	Small-WS, cabinet	Larage-WS, cabinet	Stand-alone, desk model	Stand-alone, desk model
SYSTEM CHARACTERISTICS					
Kanji & Kana processing capability	Yes, 3200	Yes, 3200	Yes, 3200	Yes, 3200	None
Multiterminal work stations	Max. 4 stations	Max. 8	Max. 16	None	None
Terminal functions	Yes	Yes	Yes	Yes (JBC 100 series)	Yes (JBC 100 Series)
PROCESSOR					
Processor type (word length)	NWS 1010 (16)	MWS 1020 (16)	MWS 1030 (16)	JTS-160	JTS-160
Main storage (cycle time)	MOS (540 ns)	MOS (450 ns)	Bipolar (100 ns)	(750 ns)	(750 ns)
Main storage capacity (bytes); error checking	64K ~ 128K	128K ~ 384K	256K ~ 1M	64K	64K
Input/output port/channel	Channel (24)	Channel (32)	Channel (64)	Channel (16)	Channel (16)
MASS STORAGE					
Integrated units (capacity)	Fixed DD (19/37/74M), FDD	Fixed DD (19/37/74M)	FDD (1M)	FDD (1M x 2)	FDD (1M x 2)
Optional units (capacity)	Cartridge DD (20/40M), fixed DD (19, 37, 74M) mixed 2	Cartridge DD (20/40M), fixed DD (19/37/74M), mixed 2	Fixed DD (19/37/74M) cartridge DD (20/40M) mixed 8	FDD (1M x 2), MT, CMT	FDD (1M x 2), MT, CMT
KEYBOARD/CRT WORKSTATION					
Screen size, colors	14", green	14", green	14", green	14", green	14", green
Characters/line by number of lines	80 x 24 (40 x 24)	80 x 24 (40 x 24)	80 x 24 (40 x 24)	80 x 24 (40 x 24)	80 x 24
Character sets	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji	English, Kana
Keyboard arrangement/type	JIS/Bikku*1	JIS/Book*1	JIS/Book*1	JIS, Book*3	Book (160 items, 15 pages)
Numeric keypad, function keys	Yes, Yes	Yes, Yes	Yes	Yes, Yes	Yes, Yes
STANDARD PRINTER					
Type, characters/line	9 x 7 (24 x 24), 136 (88)	9 x 7 (24 x 24), 136 (88)	9 x 7 (24 x 24), 136 (88)	9 x 7*1, 136	9 x 7, 136
Speed	150 (60) cps	150 (60) cps	150 (60) cps	150*2 cps	170 cps
Characters sets	English, Kana, Kanji	English, Kana	English, Kana, Kanji	English, Kana, Kanji	English, Kana
OTHER PERIPHERALS	LP, MCR, PTR	LP, MCR, PTR	LP, MCR, PTR	LP, MCR, Hand OCR	LP, MCR, Hand OCR
COMMUNICATION CONTROL UNIT					
Mode; code	Full-duplex/half-duplex, JIS	Full-duplex/half-duplex, JIS	Full-duplex/half-duplex, JIS	Full-duplex/half-duplex, JIS	Full-duplex/half-duplex, JIS
Protocols	Synchronous, asynchronous	Synchronous, Asynchronous	Synchronous, Asynchronous	Synchronous, Asynchronous	Synchronous, Asynchronous
Maximum no. of lines, speed (bits per second)	4 lines, max. 9600 bps	8 lines, max. 9600 bps	16 lines, max. 9600 bps	1 line, max. 4800 bps	1 line, max. 4800 bps
SOFTWARE					
Operating systems	STORK-100 (multi)	STORK-100 (multi)	STORK-100 (multi)	STORK-1	STORK-1
Programming languages	—	COBOL, EXCEL, MAP	COBOL, EXCEL, MAP	HOPE-1-Chinese, Assembler	HOPE-1, Assembler
Data communication protocols	ISO, BSC	ISO, BSC	ISO, BSC	ISO, BSC	ISO, BSC
File management/data base function	DMS-100	DMS-100	DMS-100	—	—
Utilities	File support, prog., sort, merge	File support, sort-merge	File support, sort-merge	File support, sort-merge	File support, sort-merge
APPLICATIONS	Sales, stock control, production control, finance/BASKET	Sales, stock, production control, finance/BASKET	Sales, stock, production control, finance/BASKET	Sales, accounting, payroll	Sales, accounting, payroll
AVAILABILITY & PRICING					
Date introduced in Japan	April, 1978	April, 1978	April, 1979	April, 1980	April, 1980
First shipment in Japan	June, 1978	June, 1978	August, 1979	May, 1980	May, 1980
Price of minimum configuration (yen)	220,000/mo. & up	250,000/mo. and up	350,000/mo. and up	—	—
Price of standard configuration (yen)	—	—	—	145,000/mo. and up	135,000/mo. and up
COMMENTS	*1(165 items, 15 pages)	*1(160 items, 15 pages)	*1(160 items, 15 pages)	*116 x 23, 18 x 16, 24 x 24 *237, 45, 60-cps *3(160 items, 15 pages)	*1System-1 touch coder

ABBREVIATIONS: b (bit), B (byte), bps (bits per second), CMT (cassette magnetic tape), CP (card punch), cps (characters per second), CR (card reader), FDD (8-inch floppy disk drive), JP (journal printer), LP (line printer), lpm (lines per minute), MCR (mark card reader), MSR (mark sheet reader), MT (9-track magnetic tape drive), OCR (optical character reader), OMT (open reel magnetic tape), PTP (paper tape punch), PTR (paper tape reader), SP (serial printer), spm (sheets per minute), WS (workstation)

### Small Business Computer Specifications

MANUFACTURER	Nippon Business Computer	Nippon Digital Laboratories	Nippon Digital Laboratories	Nippon Densanki	Nippon Densanki
SYSTEM	JBC New 1st Series	JDL 208	JDL 208	System	System
MODEL	System-1	Model 11	Model 5	Model V	Model III
HARDWARE PACKAGING	Stand-alone, desk model	Stand-alone, desk model	Stand-alone, desk-top	Stand-alone, desk-top	Stand-alone, desk-top
SYSTEM CHARACTERISTICS					
Kanji & Kana processing capability	None	Yes	None	None	Yes
Multiterminal work stations	None	None	None	None	None
Terminal functions	Yes (JBC 100 Series)	Yes	Yes	None	None
PROCESSOR					
Processor type (word length)	JTS-160	LSI (8)	LSI (8)	Z80A (8)	Z80A (8)
Main storage (cycle time)	(750 ns)	MOS (400 ns)	MOS	MOS (200 ns/byte)	MOS (200 ns/byte)
Main storage capacity (bytes); error checking	64K	64K	32K	32K ~ 128K	32K ~ 128K
Input/output port/channel	Channel (16)	Program bus		—	
MASS STORAGE					
Integrated units (capacity)	FDD (1M x 2)	FDD (512K x 2)	FDD (256K x 2)	FDD (1M x 2)	FDD (1M x 2)
Optional units (capacity)	FDD (1M x 2), MT, CMT	FDD (512K)	FDD (256K x 2)	MT, CMT 8" DD (20 ~ 60M)	MT, CMT, 8" DD (20 ~ 60M)
KEYBOARD/CRT WORKSTATION					
Screen size, colors	14", green	12", green	12", green	14", color	14", green
Characters/line by number of lines	80 x 24	80 x 17	80 x 17	80 x 24	80 x 24 (40 x 24)
Character sets	English, Kana	English, Kana	English, Kana	English, Kana	English, Kana, Kanji
Keyboard arrangement/type	JIS	JIS, etc.	JIS, etc.	JIS	JIS
Numeric keypad, function keys	Yes, Yes	Yes, Yes	Yes, Yes	Yes, Yes	Yes, Yes
STANDARD PRINTER					
Type, characters/line	9 x 7, 136	9 x 7, 132	9 x 7, 132	9 x 7, 132	9 x 7 (24 x 24), 136 (90), 100 (40) cps
Speed	170 cps	110 cps	100 cps	100 cps	
Characters sets	English, Kana	English, Kana	English, Kana	English, Kana	English, Kana, Kanji
OTHER PERIPHERALS	LP, MCR, Hand OCR	16 units, various types	None	LP, CP, Video printer	LP, CP
COMMUNICATION CONTROL UNIT					
Mode; code	Full-duplex/half-duplex, JIS	—	—	Half-duplex, ASCII	Half-duplex, ASCII
Protocols	Synchronous, Asynchronous	—	—	Synchronous	Synchronous
Maximum no. of lines, speed (bits per second)	1 line, max. 4800 bps	1 line, 1200 bps	1 line, 1200 bps	2 lines, max. 9600 bps	2 lines, max. 9600 bps
SOFTWARE					
Operating systems	STORK-1	—	—	NDOS	NDOS
Programming languages	HOPE-1, Assembler	RPG	—	Business compiler, FORTRAN	Business compiler, FORTRAN
Data communication protocols	ISO, BSC	—	—	IBM 3780 Protocol, IBM 3270 Protocol	IBM 3780 Protocol, IBM 3270 Protocol
File management/data base function	—	—	—	IS, ISF	IS, JSF
Utilities	File support, sort-merge	—	—	Screen control, auto operating, system	Screen control, auto. operating sys.
APPLICATIONS	Sales, accounting, payroll	Finance, graphic	Finance	Finance, acct'g., payroll, sales, sales mgmt. for various business types, stock, budget, reservations	Finance, acct'g., payroll, sales, sales mgmt. for various business types, stock, budget, reservations
AVAILABILITY & PRICING					
Date introduced in Japan	April, 1980	September, 1979	January, 1980	October, 1980	October, 1980
First shipment in Japan	May, 1980	October, 1979	January, 1980	March, 1981	April, 1981
Price of minimum configuration (yen)	130,000/mo. and up	5,200,000	1,980,000	3,480,000	3,280,000
Price of standard configuration (yen)	—	5,200,000	1,980,000	3,980,000	3,780,000
COMMENTS		Finance management use only	Finance management use only		

ABBREVIATIONS: b (bit), B (byte), bps (bits per second), CMT (cassette magnetic tape), CP (card punch), cps (characters per second), CR (card reader), FDD (8-inch floppy disk drive), JP (journal printer), LP (line printer), lpm (lines per minute), MCR (mark card reader), MSR (mark sheet reader), MT (9-track magnetic tape drive), OCR (optical character reader), OMT (open reel magnetic tape), PTP (paper tape punch), PTR (paper tape reader), SP (serial printer), spm (sheets per minute), WS (workstation)



### Small Business Computer Specifications

MANUFACTURER	Nippon Densanki	Nippon Univac	Nippon Univac	Nippon Electric (NEC)	Nippon Electric (NEC)
SYSTEM	System	Series 8	Series 8	NEAC System 50	NEAC System 50
MODEL	Model II	Model 20	Model 30	II	II Japanese
HARDWARE PACKAGING	Stand-alone, desk-top	Small-WS, desk	Large-WS, cabinet	Stand-alone, desk-top	Stand-alone, desk-top
SYSTEM CHARACTERISTICS Kanji & Kana processing capability	None	Yes, 6802, max. 35000	Yes, 6802, max. 35000	None	Yes, max. 4000
Multiterminal work stations	None	Max. 8 stations	32 stations	None	None
Terminal functions	None	Yes, (Univac 1100 series)	Yes (Univac 1100 series)	Yes (ACOS system 100)	Yes (ACOS system 100)
PROCESSOR					
Processor type (word length)	Z80A (8)	LSI, (16)	LSI, (16)	LSI (16)	LSI (16)
Main storage (cycle time)	MOS (200 ns/byte)	MOS (600 ns/2 bytes)	MOS (600 ns/2 byte)	MOS (800 ns/byte)	MOS (800 ns/2 byte)
Main storage capacity (bytes); error checking	24K ~ 64K	131K ~ 262K, parity	131K ~ 524K, parity	24K ~ 152K	48K ~ 112K
Input/output port/channel	—	Parallel (10)	Parallel (14)	Baud (4)	Baud (3)
MASS STORAGE					
Integrated units (capacity)	FDD (1M x 2) FDD (256K x 2)	Cartridge DD (20M x 4), fixed DD (10/20/40/60M), FDD	Cart. DD (10, 20M x 8), fixed DD (10/20/40/60M x 8) etc.	FDD (1.2M x 4)	FDD (1.2M x 4)
Optional units (capacity)	MT, CMT, 8" DD (20M ~ 60M)	MT, CMT	MT (800, 1600 bpi x 4) CMT (800 bpi x 2)	—	—
KEYBOARD/CRT WORKSTATION					
Screen size, colors	12", green	14 inch, green	14 inch, green	14 inch, green	14 inch, green
Characters/line by number of lines	80 x 24	80 x 25 (40 x 25)	80 x 25 (40 x 25)	80 x 25	80 x 25 (40 x 16)
Character sets	English, Kana	English, Kana, Kanji	English, Kana, Kanji	English, Kana	English, Kana, Kanji
Keyboard arrangement/type	JIS	Typewriter model*1	Typewriter model*1	JIS, Book*1	JIS, Book*1
Numeric keypad, function keys	Yes, Yes	Yes, Yes	Yes, Yes	Yes, Yes	Yes, Yes
STANDARD PRINTER					
Type, characters/line	9 x 7, 132	9 x 7 (24 x 24), 132 (66)	9 x 7 (24 x 24), 132 (66)	Printing type, 136, 9 x 7, 136	10 x 12 (24 x 24), 132 (90)
Speed	100 cps	200 (60 cps)	200 (60) cps	55 cps, 125 cps	60 lpm
Characters sets	English, Kana	English, Kana, Kanji	English, Kana, Kanji	English, Kana	English, Kana, Kanji
OTHER PERIPHERALS	LP, CP	CR, OMR, PTR, PTP, LP	CR, OMR, PTR, PTP, LP	Hand OCR	Hand OCR
COMMUNICATION CONTROL UNIT					
Mode; code	Half-duplex, ASCII	Half-duplex/full-duplex, EBCDIC	Half-duplex, full-duplex, EBCDIC	Half-duplex/full-duplex, JIS	Half-duplex/full-duplex, JIS
Protocols	Synchronous	HDL, BSC	HDL, BSC	Nonsynchronous/synchronous	Nonsynchronous, synchronous
Maximum no. of lines, speed (bits per second)	2 lines, max. 9600 bps	3 lines, max. 19200 bps	16 lines, max. 19,200 bps	1 line, max. 4800 bps	1 line, max 4800 bps
SOFTWARE					
Operating systems	NDOS	DPSII/III (multi, conversational, interrupt)	DPS II/III (multi, conv. inter., batch)	ITOS (dialogue, multi, priority inter. SMART, COBOL	ITOS (dialogue, multi, priority inter. SMART, COBOL
Programming languages	Business compiler FORTRAN	COBOL, RPG II, Progress II	FORTRAN, RPG II, COBOL Progress II		
Data communication protocols	IBM 3780 Protocol IBM 3270 Protocol IS, ISF	2780, 3740 emulators	2780, 3740 emulators	Disperse utility	Disperse utility
File management/data base function		J. proc., one-touch, guidance	J. proc., one-touch guidance, Source editor, sort-merge	ISAM, seq. file data manipulation	ISAM
Utilities	Screen control, auto. operating system	Sort-merge, source editor	Sort-merge, source editor, sort-merge	Formatting, etc.	J. proc., prog., formatting, data
APPLICATIONS	Finance, acct'g., payroll, sales, sales mgmt. for various business types, stock, budget, reservations	Sales, inventory, accounting, payroll, for exchange, production control, mortgages, insurance, computation center, hotel	Sales, inventory, acct'g., payroll, for. exchange, regional finance, production control	Sales, stock, inventory, personnel, payroll, finance, petro-distributorship, hire-taxi, auto-repairs, jewelry, etc.	Sales, stock, inventory, personnel-payroll, petro-distributorship, hire-taxi, auto-repairs, hotel, jeweler, etc.
AVAILABILITY & PRICING					
Date introduced in Japan	June, 1980	August 1979	August, 1979	Nov. 1979 (Apr. 80)	December, 1979
First shipment in Japan	October, 1980	October, 1979	October, 1979	Feb. 1980 (Aug. 80)	March 1980
Price of minimum configuration (yen)	1,980,000	7,130,000 (4,000/mo.)	8,400,000	4,303,000 (151,000 month)	7,053,000 (264,000/month)
Price of standard configuration (yen)	2,480,000	7,780,000 (4,000/mo.)	12,100,000	—	—
COMMENTS		*1One-touch book keyboard (208 items x 16 pages), one-touch screen keyboard (160 items x 20 pages), tablet, (selective listing)	*1One-touch book keyboard (200 items x 16 pages), one-touch screen keyboard (160 items x 20 pages), tablet	The same OS is used for Model 100 and 150 *1(160 items, 10 pages)	The same OS is used for model 100 and 150 *1(160 items, 10 pages)

ABBREVIATIONS: b (bit), B (byte), bps (bits per second), CMT (cassette magnetic tape), CP (card punch), cps (characters per second), CR (card reader), FDD (8-inch floppy disk drive), JP (journal printer), LP (line printer), lpm (lines per minute), MCR (mark card reader), MSR (mark sheet reader), MT (9-track magnetic tape drive), OCR (optical character reader), OMT (open reel magnetic tape), PTP (paper tape punch), PTR (paper tape reader), SP (serial printer), spm (sheets per minute), WS (workstation)

### Small Business Computer Specifications

MANUFACTURER	Nippon Electric (NEC)	Nippon Electric (NEC)	Nippon Electric (NEC)	Nippon Electric (NEC)	Obikku
SYSTEM	NEAC System 100	NEAC System 100	NEAC System 100	NEAC System 150	Office 80
MODEL	Model 40 II	Model 60 II	Model 80 II	55	
HARDWARE PACKAGING	Small-WS, desk	Single, desk type	Small-WS, desk model	Large-WS, cabinet	Stand-alone, desk model
SYSTEM CHARACTERISTICS					
Kanji & Kana processing capability	Yes, max. 8000	None	Yes, max. 8000	Yes, 8000	Yes, 128
Multiterminal work stations	2 stations	None	Max. 8 stations	Max. 16 stations	None
Terminal functions	Yes (ACOS, IBM etc.)	Yes (ACOS, IBM etc.)	Yes (ACOS, IBM etc.)	Yes (ACOS series)	Yes (MELCOM 80)
PROCESSOR					
Processor type (word length)	LSI	LSI	LSI (16)	LSI (8)	8085 (8)
Main storage (cycle time)	MOS (800 ns/2 byte)	MOS (800 ns/2 byte)	MOS (600 ns/2 byte)	MOS (600 ns)	MOS (2000 ns/2 byte)
Main storage capacity (bytes); error checking	192K ~ 256K, parity	192K ~ 256K, parity	192K ~ 512K, parity	512K ~ 1024K	412K, parity
Input/output port/channel	Baud (9)	Port (5)	Port (9)	Special/general port (10)	DMA
MASS STORAGE					
Integrated units (capacity)	FDD (1.2M x 4)	Fixed DD (16M/32M) FDD (1.2M x 2)	Fixed DD (16, 32, 64M x 4), FDD (1.2M x 4) CMT	FDD (1M), Fixed DD (64M)	FDD (1M x 1)
Optional units (capacity)	Fixed DD (16M/32M), cart. DD (4.9M, 9.8M) MT	Cartridge DD (4.9, 9.8M)	MT cartridge DD (4.9/9.8M) CMT	FDD (1M), Fixed DD (64M x 3) Cartridge DD (9.8M), MT	None None, None
KEYBOARD/CRT WORKSTATION					
Screen size, colors	14 inch, green	14 inch, green	14 inch, green	14 inch, green	9 inch, green
Characters/line by number of lines	80 x 24 (40 x 16)	80 x 24	80 x 25 (40 x 16)	80 x 24 (40 x 16)	40 x 16 (20 x 16)
Character sets	English, Kana, Kanji	English, Kana	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji*1
Keyboard arrangement/type	JIS, Book*1	JIS, Book*1	JIS, Book*1	JIS/Keymat*1	JIS
Numeric keypad, function keys	Yes, Yes	Yes, Yes	Yes, Yes	Yes, Yes	Yes, Yes
STANDARD PRINTER					
Type, characters/line	9 x 7, 136	9 x 7, 136 digits, printing type 136	Belt drive, 136	9 x 7 (24 x 24) printing type	9 x 7, 136
Speed	125 cps	125 cps/55 cps	100/200/400/530 lpm	125/55 cps (60 lpm)	120 ~ 150 cps
Characters sets	English, Kana	English, Kana	English, Kana	English, Kana, Kanji	English, Kana
OTHER PERIPHERALS	Kanji SP (60 lpm) SP (55 cps) CR, MCR, MSR	Hand OCR	(Kanji SP (60 lpm) SP (55/125/180 cps) CR, MCR, MSR	LP (110 ~ 530 lpm), SP Chinese characters LP (60 lpm), CR, MSR, PTR, PTP	Kanji SP (60 cps), OCR POS auto-reader
COMMUNICATION CONTROL UNIT					
Mode; code	Half-duplex/full-duplex, JIS	Half-duplex/duplex, JIS	Half-duplex/full-duplex, JIS	Half-duplex/full-duplex*2	Half-duplex, EBCDIC
Protocols	Nonsynch., synch., NEC standard	Nonsynch., synch., NEC Standard	Nonsynch., synch., NEC standard	Synchronous, non-synchronous, BSC	Synch., Asynch., BSC
Maximum no. of lines, speed (bits per second)	1 line, max. 4800 bps	1 line, max. 4800 bps	8 lines, max. 9600 bps	8 line, max. 19,200 bps	1 line, max. 9600 bps
SOFTWARE					
Operating systems	ITOS (dialogue, multi, prior. inter. COBOL, FORTRAN*2	ITOS (dialogue, multi, priority inter.) COBOL, FORTRAN*2	ITOS (dialogue, multi, priority inter.) COBOL, FORTRAN*2	ITOS (multi-console, dialogue) COBOL, FORTRAN, SMART	Input-output interrupt 2 multiple
Programming languages	COBOL, FORTRAN*2	COBOL, FORTRAN*2	COBOL, FORTRAN*2	GTOS, IBM 3780/3740, batch trans. SAM, ISAM	Business, BASIC, Assembler
Data communication protocols	Disperse utility	Disperse utility	Disperse utility		JIS contention
File management/data base function	—	Multi indexed seq. order data organiza. Prog. format., data manipulation	Multi indexed seq. order data organiza. Formatting data manipulation	Operations control, data manipulation	IR function debug, editor (standard)
Utilities	—	Sales, personnel-payroll, finance control, food wholesale, textiles, petro-distributorship, auto-repairs, print.,	Sales, personnel-payroll, finance control, food wholesale, textiles, construction, printing	Sales, personnel-payroll, finance control, food wholesale, printing	Sales, stock control, finance-accounting, personnel-payroll, cash-teller transactions, dentists, doctors, 138 bus.
APPLICATIONS					
AVAILABILITY & PRICING					
Date introduced in Japan	October, 1979	October, 1979	October 1979	—	August, 1980
First shipment in Japan	October, 1979	October, 1979	October 1979	—	September, 1980
Price of minimum configuration (yen)	—	—	—	14,903,000	4,300,000
Price of standard configuration (yen)	—	—	—	—	4,300,000
COMMENTS	The same OS is used for System 100 and 150 *1(160 items, 10 pages) *2SMART	ITOS is common to all models *1(160 items, 10 pages) *2SMART	*1(160 items, 10 pages) *2SMART	*1(160 items x 10 pages) *2EBCDIC	*1Display of 128 Chinese characters possible with the standard model. Expansion to 1000.

ABBREVIATIONS: b (bit), B (byte), bps (bits per second), CMT (cassette magnetic tape), CP (card punch), cps (characters per second), CR (card reader), FDD (8-inch floppy disk drive), JP (journal printer), LP (line printer), lpm (lines per minute), MCR (mark card reader), MSR (mark sheet reader), MT (9-track magnetic tape drive), OCR (optical character reader), OMT (open reel magnetic tape), PTP (paper tape punch), PTR (paper tape reader), SP (serial printer), spm (sheets per minute), WS (workstation)

Small Business Computer Specifications

MANUFACTURER	OKI Electric	OKI Electric	OKI Electric	OKI Electric	OKI Electric
SYSTEM	OKITAC System 9	OKITAC System 9	OKITAC System 9	OKITAC System 9	OKITAC System 9
MODEL	30	50, 55, 60, 70	Pentouch 30	Pentouch 50, 55, 60, 70	Kanji series K30
HARDWARE PACKAGING	Small-WS, desk model	Small-WS, desk model	Small-WS, desk model	Small-WS, desk model	Small-WS, desk model
SYSTEM CHARACTERISTICS	None	None	None	None	Yes, 6349
Kanji & Kana processing capability					
Multiterminal work stations	Max. 2 stations	8 stations	Max. 2 stations	8 stations	2 stations
Terminal functions	Yes (system 50)	Yes (System 50)	Yes (system 50)	Yes, (system 50)	Yes, (system 50)
PROCESSOR					
Processor type (word length)	LSI (8)	LSI (8)	LSI (8)	LSI (8)	LSI (8)
Main storage (cycle time)	MOS (510 ns)	MOS (510 ns)	MOS (510 ns)	MOS (510 ns)	MOS (510 ns)
Main storage capacity (bytes); error checking	32K ~ 128K, parity	64K ~ 256K, parity	32K ~ 128K, parity	64K-256K, parity	128K, parity
Input/output port/channel	Program bus/DMA	Program bus/DMA	Program; bus/DMA	Program bus/DMA	Program bus/DMA
MASS STORAGE					
Integrated units (capacity)	FDD (1M x 2)	FDD (1M x 2), Fixed DD (10/20/40M)*1 cartridge DD (10M)*2	FDD (1M x 2)	FDD (1M x 2), fixed DD (10, 20, 40M),*1 cartridge DD (10M)*2	FDD (1M x 2)
Optional units (capacity)	FDD (1M), fixed DD (10/20/40M) cartridge DD (10M), MT	FDD (1M), Fixed DD (10/20/40M), cartridge DD (10M) MT	FDD (1M), fixed DD (10, 20, 40M) cartridge DD (10M), MT	Cartridge DD (10M), MT FDD (1M), Fixed DD (10/20/40M)	FDD (1M), fixed DD (10, 20, 40M), cartridge DD (10M), MT
KEYBOARD/CRT WORKSTATION					
Screen size, colors	9 inch, green	9 inch, green	9", green	9", green	14", green
Characters/line by number of lines	48 x 20	48 x 20	48 x 20	48 x 20	80 x 18 (40 x 18)
Character sets	English, Kana	English, Kana	English, Kana	English, Kana	English, Kana, Kanji
Keyboard arrangement/type	JIS/A.I.U.E.O. (Japanese alphabet)	JIS/AIUEO (Japanese alphabet)	Pentouch*1	Pentouch*3	Pentouch*1
Numeric keypad, function keys	Yes, Yes	Yes, Yes	Yes, Yes	Yes, Yes	Yes, Yes
STANDARD PRINTER					
Type, characters/line	9 x 7/132	9 x 7/132	9 x 7/Chi. OCR, 132	9 x 7/Chi. OCR, 132	18 x 7 (24 x 24), 132 (88)
Speed	200 80 cps	200 80 cps	200, 80 cps	200, 80 cps	150 (60) cps
Characters sets	English, Kana	English, Kana	English, Kana	English, Kana	English, Kana, Kanji
OTHER PERIPHERALS	LP (110, 170, 380 lpm), CR, PTR, PTP, SR, inserter, OCR	LP (110, 170, 380 lpm), CR, PTR, PTP, MSR, inserter, OCR	LP (110/170/380 lpm), CR, PTR, PTP, MSR, inserter, OCR	LP (110/170/380 lpm), CR, PTR, PTP, MSR, inserter, OCR	LP (110/170/380 lpm), CR, PTR, PTP, MSR, inserter, OCR
COMMUNICATION CONTROL UNIT					
Mode; code	Half-duplex/full-duplex, JIS	Half-duplex/full-duplex, JIS	Half-duplex/full-duplex, JIS	Half-duplex/full-duplex, JIS	Half-duplex/full-duplex, JIS
Protocols	Synch., Asynch., BSC	Synch., Asynch., BSC	Synch., Asynch., BSC	Synch., Asynch., BSC	Synch., Asynch., BSC
Maximum no. of lines, speed (bits per second)	1 line, max. 9600 bps	5 lines, max. 9600 bps	1 line, max. 9600 bps	5 lines, max. 9600 bps	1 line, max. 9600 bps
SOFTWARE					
Operating systems	BOS/F (multi, conv.)	BOS/D (Multi, conv.)	BOS/F (multi, conversational)	BOS/D (multi, conver.)	BOS/D (multi, conver.)
Programming languages	BPL, COBOL	BPL, COBOL	DPL, COBOL	BPL, COBOL	BPL, COBOL
Data communication protocols	MTAM, BTAM, HTA, M	MTAM, BTAM, HTA, M	MTAM, BTAM, HTA, M	MTAM, BTAM, HTA, M	MTAM, BTAM, HTA, M
File management/data base function	SAM, ISAM, DAM	SAM, ISAM, DAM	SAM, ISAM, DAM	SAM, ISAM, DAM	SAM, ISAM, DAM
Utilities	File, volume sort-merge, debug	File, volume sort-merge, debug	File, volume, sort-merge, debug	File, volume, sort-merge, debug	File, volume, sort-merge, debug
APPLICATIONS	Sales, stock control, finance, payroll, liquor retail, auto-repairs, regional trucking, construc., swimming, food	Sales, stock control, finance, payroll, liquor retail, auto-repairs, regional trucking, construction, swimming,	Sales-stock control, accounting, payroll, liquor retailers, auto-repairs, regional trucking, constructions, swimming	Sales-stock control, accounting, payroll, liquor retailers, auto-repairs, regional trucking, constructions, swimming	Sales-stock control, payroll accounting, auto-repairs, regional trucking, constructions, swimming
AVAILABILITY & PRICING					
Date introduced in Japan	May, 1979	May, 1979	July, 1979	July, 1979	May, 1979
First shipment in Japan	September, 1979	September, 1979	September, 1979	September, 1979	February, 1980
Price of minimum configuration (yen)	5,380,000	5,680,000	5,630,000	5,930,000	6,380,000
Price of standard configuration (yen)	5,380,000	5,680,000	5,630,000	5,930,000	6,380,000
COMMENTS		*1Model 50, 60, 70 *2Model 55	*1(240 items x 12 pages)	*1Model 50, 60, 70 *2Model 55 *3(240 items, 12 pages)	*1(240 items, 12 pages)

ABBREVIATIONS: b (bit), B (byte), bps (bits per second), CMT (cassette magnetic tape), CP (card punch), cps (characters per second), CR (card reader), FDD (8-inch floppy disk drive), JP (journal printer), LP (line printer), lpm (lines per minute), MCR (mark card reader), MSR (mark sheet reader), MT (9-track magnetic tape drive), OCR (optical character reader), OMT (open reel magnetic tape), PTP (paper tape punch), PTR (paper tape reader), SP (serial printer), spm (sheets per minute), WS (workstation)

### Small Business Computer Specifications

MANUFACTURER	OKI Electric	OKI Electric	OKI Electric	OKI Electric	Osawa Joho Center
SYSTEM	OKI TAC system	OKI ME Terminal	OKI ME Terminal	OKI ME Terminal	Receptor
MODEL	Kanji Series K50, 55, 60, 70	150K	150 150p.150PB	150 150C, 150CB	5500
HARDWARE PACKAGING	Small-WS, desk model	Small-WS, desk model	Standalone, desk model	Standalone, desk model	Standalone, desk model
SYSTEM CHARACTERISTICS					
Kanji & Kana processing capability	Yes, 6349	Yes, 6349	None	None	None
Multiterminal work stations	Max. 4 stations	Max. 2 stations	None	None	None
Terminal functions	Yes, (system 50)	None	None	None	None
PROCESSOR					
Processor type (word length)	LSI (8)	LSI (8)	LSI (8)	LSI (8)	TMS 9900 (8)
Main storage (cycle time)	MOS (510 ns)	MOS (510 ns)	MOS (510 ns)	MOS (510 ns)	IC
Main storage capacity (bytes); error checking	128K~256K, Parity	256K	192K	192K	64K
Input/output port/channel	Program bus/DMA	Program bus, DMA	Program bus, DMA	Program bus, DMA	System bus
MASS STORAGE					
Integrated units (capacity)	FDD (1Mx2), Fixed DD (10 20 40M)*1, cartridge DD, (10M)*2	FDD (1M), Fixed DD (400M)	FDD (1M x 4)	FDD (1M x 4)	FDD (500K x 2)
Optional units (capacity)	FDD (1M), Fixed DD (10 20 40M), cartridge DD (10M), MT				FDD (500K x 2)
KEYBOARD/CRT WORKSTATION					
Screen size, colors	14", green	14", green	Plasma, green	14", green	12", green
Characters/line by number of lines	80 x 18 (40 x 18)	80 x 18 (40 x 18)	40 x 2	80 x 24	40 x 16
Character sets	English, Kana, Kanji	English, Kana, Kanji	English, Kana	English, Kana	English, Kana
Keyboard arrangement/type	Pentouch*3	Pentouch*1	AIUEO, Pentouch*1 (Japanese alphabet)	AIUEO, Pentouch*1 (Japanese alphabet)	Pentouch (4800)
Numeric keypad, function keys	Yes, yes	Yes, yes	Yes, yes	Yes, yes	Yes
STANDARD PRINTER					
Type, characters/line	18 x 7 (24 x 24), 132 (88)	12 x 24 (24 x 24)*2	Chi. OCR, 132	Chi. OCR, 132	Chi, 80
Speed	150 (60) cps	90 (60) cps	80 cps	80 cps	80 cps
Characters sets	English, Kana, Kanja	English, Kana, Kanji	English, Kana	English, Kana	English, Kana
OTHER PERIPHERALS	LP (110/170/380 lpm), CR, PTR, PTP, MSR, Inserter, OCR		None	None	JP, SP (136 digits)
COMMUNICATION CONTROL UNIT					
Mode, code	Half-duplex/Full duplex, JIS	None	None	None	None
Protocols	Sync, Async, BSC	None	None	None	None
Maximum no. of lines, speed (bits per second)	5 lines, max 9600 bps	None	None	None	None
SOFTWARE					
Operating systems	BOS/D (multi, conver.)	(Conversational)	(Conversational)	(Conversational)	HOPE
Programming languages	BPL, COBOL		—	—	Easy lang. (SPLINT-II)
Data communication protocols	MTAM, BTAM, HTA, M		—	—	None
File management/data base function	SAM, ISAM, DAM	SAM, ISAM, DAM	SAM, ISAM, DAM	SAM, ISAM, DAM	SAM
Utilities	Sort-merge, debug, editor	Sort-merge, volume, debug, editor	Sort-merge, volume, debug, editor	Sort-merge, volume, debug, editor	Debug, editor, sort, DAMP, etc.
APPLICATIONS	Sales-stock, Accounting, Payroll, Liquor retail, Auto-repairs, Regional trucking, Constructions, Swimming schools	Receipt-regist. system, Cashier-teller transactions, Daily and monthly journals	Receipts, cash-teller transactions, daily journals, monthly journals	Receipts, cashier-teller transactions, daily journals, monthly journals	Insurance invoicing, dentist-record system, pharmacist-record system, medicine inventory, payroll
AVAILABILITY & PRICING					
Date introduced in Japan	May 1979	Feb 1981	Nov 1980	Nov 1980	Jul 1980
First shipment in Japan	Feb 1980	June 1982	Dec 1980	Jan 1981	Jul 1980
Price of minimum configuration (yen)	6,680,000	8,300,000	6,500,000	6,980,000	5,700,000 (0.5%)
Price of standard configuration (yen)	6,680,000	—	—	—	5,700,000 (0.5%)
COMMENTS	*1 Model 50, 60, 70 *2 Model 55 *3 240 items, 12 pages	*1 240 items, 12 pages *2 132 (88) digits	*1 240 items, 12 pages	*1 240 items, 12 pages	

ABBREVIATIONS: b (bit), B (byte), bps (bits per second), CMT (cassette magnetic tape), CP (card punch), cps (characters per second), CR (card reader), FDD (8-inch floppy disk drive), JP (journal printer), LP (line printer), lpm (lines per minute), MCR (mark card reader), MSR (mark sheet reader), MT (9-track magnetic tape drive), OCR (optical character reader), OMT (open reel magnetic tape), PTP (paper tape punch), PTR (paper tape reader), SP (serial printer), spm (sheets per minute), WS (workstation)

### Small Business Computer Specifications

MANUFACTURER	Osawa Joho Center	Pentel	Pentel	Ricoh	Ricoh
SYSTEM	Dentei	PS 810	PS 3000D	RICOM 2000 Series	RICOM 2000 Series
MODEL	500K			System 2400 Kanji	2400/2200
HARDWARE PACKAGING	Standalone, desk model	Standalone, desk top	Standalone, desk model	Small-WS, desk mode	Small-WS, desk model
SYSTEM CHARACTERISTICS					
Kanji & Kana processing capability	Yes	None	None	Yes, 6800	Yes, 6800
Multiterminal work stations	None	None	None	Max 2 stations	Max 2 stations
Terminal functions	None	None	None	Yes	Yes
PROCESSOR					
Processor type (word length)	Z80A (8)	LSI (8)	8080 (8)	LSI	LSI
Main storage (cycle time)	MOS (1000 ns)	16K DRAM	nMOS	(410 ns)	MOS (410 ns)
Main storage capacity (bytes); error checking	64K	64K	32KB~64K, Parity	64K~160K	64K~160K
Input/output port/channel	System bus	Serial (2)	System bus, DMA	Channel (16)	Channel (16)
MASS STORAGE					
Integrated units (capacity)	FDD (500K x 2)	8" DD (2)	FDD (1M x 2)	FDD (1M/500K/256K x 3)	FDD (1M/500K/256K x 3)
Optional units (capacity)	FDD (500K x 2)	8" DD (2)	FDD (1M x 2)	—	—
KEYBOARD/CRT WORKSTATION					
Screen size, colors	14", green	14", green	Plasma display	14", green	12", green
Characters/line by number of lines	80 x 24	80 x 24	32 x 8	80 x 24 (40 x 24)	80 x 24
Character sets	English, Kana, Kanji	English, Kana	English, Kana	English, Kana, Kanji	English, Kana
Keyboard arrangement/type	Book (160 items, 15 pages)	Pentouch*1	Pentouch, (6 pages)	Typewriter style*1	Typewriter style*1
Numeric keypad, function keys	Yes, yes	None, none	Yes, yes	Yes, yes	Yes, yes
STANDARD PRINTER					
Type, characters/line	9 x 11 (24 x 24)*1	9 x 7, 80 digits	9 x 7, 132 digits	9 x 7 (24 x 22), 132 (88)	9 x 7, 132 digits
Speed	35 cps	180 cps	165 cps	120 (30) cps	120 cps
Characters sets	English, Kana, Kanji	128 types	English, Kana	English, Kana, Kanji	English, Kana
OTHER PERIPHERALS	SP (80)		OCR, SP, PTR, PTP	PTR (200 cps), PTP (70 cps)	PTR (200 cps), PTP (70 cps)
COMMUNICATION CONTROL UNIT					
Mode; code	None	Half-duplex/Full-duplex	ASCII, etc.	Half-duplex/Full-duplex	Half-duplex/Full-duplex
Protocols	None	Asynch	Synch., asynch, BSC	Synch., asynch.	Synch., asynch.
Maximum no. of lines, speed (bits per second)	None	1 line, max 9600 bps	1 line, max 4800 bps	1 line, 150~9600 bps line	1 line, 150~9600 bps
SOFTWARE					
Operating systems	None	CP/M	—	COMPOS (multi.)	COMPOS (multi.)
Programming languages	Assembler	BASIC	Assembler	ANSI '74 COBOL, Easy lang., RAPID	ANSI '74 COBOL, Easy lang. RAPID
Data communication protocols	None	BSC II 2400~4800 (option)	BSO	Emulator IBM 2740, 3780, 3740	Emulator IBM 2780, 3780, 3740
File management/data base function	SAM		SAM	JCL functions, Program, Menu	JCU functions, Program, Menu
Utilities	Debug, editor, sort, DAMP, etc.	Sort merge, spool	—	—	—
APPLICATIONS	Insurance invoicing, dentist-reception system	Sales-inventory control, finance-accounting	Inventory control, personnel-payroll, sales management	RICOM package: Sales, Finance, Personnel-payroll and for various business operations (SAPORT)	RICOM package: Sales, Finance, Personnel-payroll, and for various business operations (SAPORT)
AVAILABILITY & PRICING					
Date introduced in Japan	Nov 1979	June 1980	May 1978	Dec 1980	Dec 1979
First shipment in Japan	Jan 1980	Oct 1980	Jul 1978	Dec 1980	Jan 1980
Price of minimum configuration (yen)	5,500,000	1,500,000	—	5,480,000	3,980,000
Price of standard configuration (yen)	5,500,000	2,200,000	6,000,000	6,180,000	4,280,000
COMMENTS	*1136 (90) digits	High operational power with pentouch input capacity for 2048 or 5000 items. *1258 items, 8 pages		*1Pentouch (432 items, 8 pages), Push-button (200 items, 10 pages)	*1Pentouch (432 items, 8 pages), Push-button (200 items, 10 pages)

ABBREVIATIONS: b (bit), B (byte), bps (bits per second), CMT (cassette magnetic tape), CP (card punch), cps (characters per second), CR (card reader), FDD (8-inch floppy disk drive), JP (journal printer), LP (line printer), lpm (lines per minute), MCR (mark card reader), MSR (mark sheet reader), MT (9-track magnetic tape drive), OCR (optical character reader), OMT (open reel magnetic tape), PTP (paper tape punch), PTR (paper tape reader), SP (serial printer), spm (sheets per minute), WS (workstation)

### Small Business Computer Specifications

MANUFACTURER	Sharp	Sharp	Shinshu Seiki	Shinshu Seiki	Shinshu Seiki
SYSTEM MODEL	HAYAC-6000	HAYAC-3800	EPSON KX-1	EPSON X-1	EPSON EX-1
HARDWARE PACKAGING	Small-WS, desk model	Small-WS, desk model	Standalone, desk-top	Standalone, desk model	Standalone, desk model
SYSTEM CHARACTERISTICS					
Kanji & Kana processing capability	Yes, 3400	Yes, 3400	Yes, 500	None	Yes, 23
Multiterminal work stations	Yes	Yes	None	None	None
Terminal functions	Yes	Yes (HAYAC-6000)	None	None	None
PROCESSOR					
Processor type (word length)	LSI (8)	LSI (8)	Z80 (8)	Z80 (8)	Z80 (8)
Main storage (cycle time)	nMOS (600ns)	nMOS (6000 ns)	MOS (500 ns)	MOS (500ns)	MOS (500ns)
Main storage capacity (bytes); error checking	32K~256K, Parity	64K~96K, Parity	48K	32K	32K
Input/output port/channel	Program bus	Program bus, DMA	DMA	DMA	DMA
MASS STORAGE					
Integrated units (capacity)	Fixed DD (10/20/40M), FDD (1M)	Fixed DD (10M, FDD (1M)	mini FDD (320K x 2)	FDD (243K x 2)	FDD (243K x 2)
Optional units (capacity)	MT, CMT, Cartridge DD	CMT	None	None	None
KEYBOARD/CRT WORKSTATION					
Screen size, colors	14", green	12", green	9", green	LCD, green	Plasma display*1
Characters/line by number of lines	80 x 24 (40 x 18)	80 x 25 (40 x 19)	32 characters x 16	32 x 2	16 x 4
Character sets	English, Kana, Kanji	English, Kana, Kanji	English, Kana	English, Kana	English, Kana
Keyboard arrangement/type	JIS*1	JIS	Typewriter	Typewriter	Typewriter
Numeric keypad, function keys	Yes, yes	Yes, yes	Yes, yes	Yes, yes	Yes, yes
STANDARD PRINTER					
Type, characters/line	9 x 7 (16 x 15), 136 (90)	9 x 7 (16 x 15)	9 x 7, 80	7 x 5, 80	Belt, 80
Speed	120, (40) cps	120 (40 cps)	80 (20) cps	1.2 lps	1.4 lps
Characters sets	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji	English, Kana	English, Kana, Kanji
OTHER PERIPHERALS	OCR, LP, emboss CR, PTR, PTP	OCR, Emboss CR, Hand OCR	Chi. SP (160 cps)	None	LP*2, PTR, PTP
COMMUNICATION CONTROL UNIT					
Mode; code	Half-duplex	Half-duplex/Full-duplex	None	None	None
Protocols	Synch., asynch.	Asynch, Synch, HDLC	None	None	None
Maximum no. of lines, speed (bits per second)	8 lines, max 9600 bps	11 lines, max 75 bps	None	None	None
SOFTWARE					
Operating systems	(multi. functions)	—	None	None	None
Programming languages	COBOL, COLT, APPLE S	COBOL, SCHPOL	No programming	No programming	No programming
Data communication protocols	Various Kinds	Various kinds	None	None	None
File management/data base function	SAM, ISAM, DAM, Library maint.	SAM, ISAM, DAM	None	None	None
Utilities	File-conversion, sort debug, etc.	System-generation-program catalog sort,	None	None	None
APPLICATIONS	Payroll, Accounting, Sales, Inventory, Production control, Customer services	Payroll, Accounting, sales, Inventory, Production control, Customer services	Finance-accounting	(Gasoline) service stations, Accounting	Finance-accounting
AVAILABILITY & PRICING					
Date introduced in Japan	May 1978	May 1980	Mar 1980	Jan 1979	Mar 1978
First shipment in Japan	May 1978	June 1980	May 1980	Jan 1979	Jun 1978
Price of minimum configuration (yen)	7,680,000*2	5,550,000	1,950,000 (0, 7%)	2,800,000 (0, 5.5%)	4,300,000 (0, 5.5%)
Price of standard configuration (yen)	—	—	1,950,000 (0, 7%)	Same	Same
COMMENTS	*1Key-mat (2048 items) *29,330,000 yen for model with Chinese set	—	Cordless key type available for 2,005,000 yen	SX-1 (a lower level model) available for 2,400,000 yen (Main memory: 24KB with 600 customer-capacity) JX-1 can handle 1,200 customer entries.	Cordless key type available for 4,500,000 yen *1Color is red. *2Graphic printer.

ABBREVIATIONS: b (bit), B (byte), bps (bits per second), CMT (cassette magnetic tape), CP (card punch), cps (characters per second), CR (card reader), FDD (8-inch floppy disk drive), JP (journal printer), LP (line printer), lpm (lines per minute), MCR (mark card reader), MSR (mark sheet reader), MT (9-track magnetic tape drive), OCR (optical character reader), OMT (open reel magnetic tape), PTP (paper tape punch), PTR (paper tape reader), SP (serial printer), spm (sheets per minute), WS (workstation)

### Small Business Computer Specifications

MANUFACTURER	Shinshu Seiki	Taisei Denshi	Taisei Denshi	Taisei Denshi	Tanimura Shinko
SYSTEM	EPSON EX-2	DECOM System-710	DECOM System-710	DECOM System-710	Seisakusho
MODEL		Model 10	Model 20	Model 30	SCT 801
HARDWARE PACKAGING	Standalone, desk model	Small-WS, desk mode	Small-WS, desk mode	Large-WS, desk model	Small-WS, desk model
SYSTEM CHARACTERISTICS					
Kanji & Kana processing capability	Yes, 24	Yes, 1024, max 8000	Yes, 1024, max 8000	Yes, 1024, max 8000	None
Multiterminal work stations	None	Max 8 stations	Yes, max 8 stations	Yes, max 16 stations	None
Terminal functions	None	Yes	Yes	Yes	Yes
PROCESSOR					
Processor type (word length)	Z80 (80)	Z80 x 3 (8)	Z80 x 3 (8)	Z80 x 5 (8)	Z80 x 2 (8)
Main storage (cycle time)	MOS (500ns)	(400ns/byte)	(400ns/byte)	(400ns/byte)	MOS (375ns)
Main storage capacity (bytes); error checking	48K	64K~512K	196K~512K	316K~1024K	64K, none
Input/output port/channel	DMA	Channel (16)	Channel (16)	Channel (16)	Channel (16)
MASS STORAGE					
Integrated units (capacity)	FDD (512K x 2)	FDD (1.2M x 2)	FDD (1.2M x 3)	FDD (1.2M x 1), 8" fixed DD (20M~100M)	FDD (256K~1M x 4)
Optional units (capacity)	None	8" fixed DD (10~200M), CMT, FDD (1.2M x 2)	8"-fixed DD (10M~20M), CMT, FDD (1.2M x 2)	Add-on 8"-fixed DD, FDD (1.2MB x 3), CMT	Cartridge DD (12M~48M)
KEYBOARD/CRT WORKSTATION					
Screen size, colors	9", green	14", green	14", green	14", green	9/12/14", green
Characters/line by number of lines	32 x 16	80 x 24 (40 x 24)	80 x 24 (40 x 24)	80 x 24 (40 x 24)	40 x 16/80 chars. x 24 lines
Character sets	English, Kana	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji	English, Kana
Keyboard arrangement/type	Keymat	AIUEO (Japanese alphabet)	AIUEO (Japanese alphabet)	AIUEO (Japanese alphabet)	Typewriter/Book*1
Numeric keypad, function keys	Yes, yes	Yes, yes	Yes, yes	Yes, yes	Yes, yes
STANDARD PRINTER					
Type, characters/line	Belt, 80	13 x 9 (16 x 15)*1	16 x 15 (13 x 9) 90	16 x 15 (13 x 9) 90	9 x 7, 132
Speed	1.4 lps	120 (40) cps	40 (120)	40 (120)	120 cps
Characters sets	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji	English, Kana
OTHER PERIPHERALS	LP*1, PTR, PTP	Lamp guide system SP	—	—	LP, (500 lpm) PTR, PTP
COMMUNICATION CONTROL UNIT					
Mode; code	None	Half-duplex, ASCII	Half-duplex, ASCII	Half-duplex, ASCII	Half-duplex/Full-duplex, JIS
Protocols	None	Asynch.	Asynch.	Asynch.	Asynch, Basic
Maximum no. of lines, speed (bits per second)	None	2 lines, max 9600 bps	2 lines, max 9600 bps	2 lines, max 9600 bps	1 lines, max 2400 bps
SOFTWARE					
Operating systems	None	CP/M V2.2, MP/M, OS "7"	CP/MV2.2, MP/M, OS "7"	CP/MV2.2 MP/M OS "7"	DPOS (overlapping, remote batch)
Programming languages	No programming	COBOL, BASIC (CP/M), PolyFORTH	COBOL, BASIC, ASM, Poly FORTH	COBOL, BASIC (CP/M) ASM	Simple languages (parameter marking)
Data communication protocols	None	—	—	—	—
File management/data base function	None	—	Multi ISAM	Multi ISAM	ISAM
Utilities	None	Chinese macro, Screen editing macro	Multi analysis, acctg. reporter	Multi-analysis, acctg. reporter	File maintenance language support
APPLICATIONS	Medical affairs records	Cost analysis, Finance, Receiving orders, credit sales, Ordering control, Processing Chinese possible	Cost control, Finance-accounting, Receiving order, Credit sales, Ordering, Internal progress management, Inventory, Stock control, Personnel-	Cost control, Finance-accounting, Receiving orders, Credit sales, Ordering, Internal progress management, Inventory, Stock control, Personnel-	Data entry, Invoicing, Stock-ording control, financial records, payroll etc.
AVAILABILITY & PRICING					
Date introduced in Japan	Apr 1979	Jan 1981	Jan 1981	Jan 1981	Oct 1980
First shipment in Japan	May 1979	Mar 1981	Mar 1981	Mar 1981	Apr 1981
Price of minimum configuration (yen)	5,300,000 (0, 5%)	4,200,000 (OS included)	5,400,000 (with basic OS)	7,400,000 (with basic OS)	3,600,000
Price of standard configuration (yen)	Same	—	6,000,000 (with accounting)	8,000,000 (with accounting)	—
COMMENTS	*1Graphic printer.	—	—	—	*1Book with keyboard 160 items/page, 5~15 pages available.

ABBREVIATIONS: b (bit), B (byte), bps (bits per second), CMT (cassette magnetic tape), CP (card punch), cps (characters per second), CR (card reader), FDD (8-inch floppy disk drive), JP (journal printer), LP (line printer), lpm (lines per minute), MCR (mark card reader), MSR (mark sheet reader), MT (9-track magnetic tape drive), OCR (optical character reader), OMT (open reel magnetic tape), PTP (paper tape punch), PTR (paper tape reader), SP (serial printer), spm (sheets per minute), WS (workstation)

### Small Business Computer Specifications

MANUFACTURER	Tanimura Shinko	Toko	Tokyo Denki	Tokyo Denki	Tokyo Shibauro Denki (Toshiba)
SYSTEM	Seisakusho	TAC-8/System III	OFCONACE T-860	MYTEC T-555	BP-100*1
MODEL	SCT 300	TOKOM830	Model 20T	Model 20T	—
HARDWARE PACKAGING	Small-WS, desk model	Stand alone, desk model	Stand alone, desk model	Stand alone, desk top	Stand alone, desk top
SYSTEM CHARACTERISTICS Kanji & Kana processing capability	None	None	Yes, 256	Yes, 40	None
Multiterminal work stations	None	None	None	None	None
Terminal functions	None	None	None	None	None
PROCESSOR					
Processor type (word length)	Z80 (8)	Z80 x 2 (8)	LSI (8)	LSI (8)	LSI (8)
Main storage (cycle time)	MOS (400 ns)	Wire, MOS (750 ns)	MOS (500 ns)	MOS (500 ns)	MOS
Main storage capacity (bytes); error checking	64K, none	64K, parity	48K	48K	48K
Input/output port/channel	Channel (8)	System bus, port (1)	None	None	—
MASS STORAGE					
Integrated units (capacity)	FDD (256K ~ 1M x 2)	FDD (1.2M x 2)	FDD (1M x 2)	Mini FDD (286K x 2)	Mini FDD (280KB x 2)
Optional units (capacity)	8" DD (10M), CMT	FDD (1.2M)	—	—	—
KEYBOARD/CRT WORKSTATION					
Screen size, colors	12", green	14", green	12", green	12", green	9", green
Characters/line by number of lines	80 x 24	80 x 25	64 x 32	80 x 25	40 x 13
Character sets	English, Kana	English, Kana	English, Kana, Kanji	English, Kana, Kanji*1	English, Kana
Keyboard arrangement/type	Typewriter	—	JIS, book*1	Keymat*2/JIS	JIS
Numeric keypad, function keys	Yes, yes	Yes, yes	Yes	Yes, yes	Yes
STANDARD PRINTER					
Type, characters/line	Char./9 x 7, 132	9 x 9, 136	9 x 7, 132	9 x 7, 132	9 x 7
Speed	120 cps	180 cps	130 cps	130 cps	125 cps
Characters sets	English, Kana	English, Kana	English, Kana	English, Kana	English, Kana
OTHER PERIPHERALS	LP (500 lpm), PTR, PTP, MCR	Multi-purpose printer	—	—	None
COMMUNICATION CONTROL UNIT					
Mode; code	Half-duplex, JIS	Full duplex, EBCDIC	Half-duplex	Half-duplex, EBCDIC	None
Protocols	Asynch, Basic	BSC	Synch., asynch	Synch, asynch.	None
Maximum no. of lines, speed (bits per second)	2 lines, max 9600 bps	1 line, max 9600 bps	1 line, max 4800 bps	1 line, max 4800 bps	None
SOFTWARE					
Operating systems	None	DAP 80 (conversational)	TOS80	TOS 80	—
Programming languages	BASIC	Assembler	Assembler, RWG FMG, APOP	Assembler, RWGFMG	Business BASIC
Data communication protocols	None	None	—	—	—
File management/data base function	Random access	Sequential formation, divided for-Editor, disk utility	SF, IRF, TF	SF, ISF, IRT, TF, CF, etc.	SF, ISF
Utilities	Dialogue type reporter	Accounting, payroll	System utility service utility Sales, payroll, finance	System utility, service utility Finance, payroll sales, stock control, hotels, liquor retail, auto-repairs, elect. appliance, etc.	—
APPLICATIONS	Data entry, invoicing, stock-ordering control, financial records, payroll etc.				Sales, ordering, accounting, payroll, etc.
AVAILABILITY & PRICING					
Date introduced in Japan	Jul, 1979	Aug, 1980	Jun, 1980	Aug, 1980	Oct, 1980
First shipment in Japan	Dec 1979	Sept, 1980	Jun, 1980	Aug, 1980	Jan, 1981
Price of minimum configuration (yen)	2,800,000	—	5,180,000	2,200,000	1,310,000
Price of standard configuration (yen)	3,500,000	3,500,000	—	—	1,470,000
COMMENTS			*1Guidebook 1 volume 2240 items, max 16 volumes	*1Graphic function *2(80 keys x 2 shifts/sheet, 16 sheets)	*1Business personal computer BP-100

ABBREVIATIONS: b (bit), B (byte), bps (bits per second), CMT (cassette magnetic tape), CP (card punch), cps (characters per second), CR (card reader), FDD (8-inch floppy disk drive), JP (journal printer), LP (line printer), lpm (lines per minute), MCR (mark card reader), MSR (mark sheet reader), MT (9-track magnetic tape drive), OCR (optical character reader), OMT (open reel magnetic tape), PTP (paper tape punch), PTR (paper tape reader), SP (serial printer), spm (sheets per minute), WS (workstation)



### Small Business Computer Specifications

MANUFACTURER	Tokyo Shibaura Denki (Toshiba)	Tokyo Shibaura Denki (Toshiba)	Tokyo Shibaura Denki (Toshiba)	Tokyo Shibaura Denki (Toshiba)	Tokyo Shibaura Denki (Toshiba)
SYSTEM	TOSBAC RT-810	TOSBAC System 15	TOSBAC System 15	TOSBAC System 15	TOSBAC System 15
MODEL	—	Model 15	Model 25	Model 35	Model 45
HARDWARE PACKAGING	Stand alone, desk top	Stand alone, desk model	Stand alone, desk model	Stand alone, desk model	Stand alone, desk model
SYSTEM CHARACTERISTICS					
Kanji & Kana processing capability	None	None	None	None	None
Multiterminal work stations	None	None	None	None	None
Terminal functions	None	Yes (T-15/60)	Yes (T-15/60, etc.)	Yes (T-15/60 etc.)	Yes (T-15/60 etc.)
PROCESSOR					
Processor type (word length)	LSI (8)	LSI (8)	LSI (8)	LSI (8)	LSI (8)
Main storage (cycle time)	MOS	MOS	MOS	MOS	MOS
Main storage capacity (bytes); error checking	K, parity	32K * 64K	64K	64K	64K
Input/output port/channel	—	—	—	—	—
MASS STORAGE					
Integrated units (capacity)	FDD	FDD (243K x 2 ~ 4)	FDD (972K ~ 4)	Fixed DD (10M) FDD (243K x 1 ~ 4)	Fixed DD (30M) FDD (243K x 1 ~ 4)
Optional units (capacity)	—	CMT Fixed DD (10, 30M)	CMT Fixed DD (10, 30M)	CMT	CMT
KEYBOARD/CRT WORKSTATION					
Screen size, colors	9", green	12", green	12", green	12", green	12", green
Characters/line by number of lines	40 x 22	40 x 16	40 x 16	40 x 16	40 x 16
Character sets	English, Kana	English, Kana	English, Kana	English, Kana	English, Kana
Keyboard arrangement/type	AIUEO (Japanese alphabet)	JIS	JIS	JIS	JIS
Numeric keypad, function keys	Yes, yes	Yes, yes	Yes, yes	Yes, yes	Yes, yes
STANDARD PRINTER					
Type, characters/line	Kanji, 80	9 x 9, 136	9 x 9, 136	9 x 9, 136	9 x 9, 136
Speed	80 lpm	150 cps	150 cps	150 cps	150 cps
Characters sets	English, Kana	English, Kana	English, Kana	English, Kana	English, Kana
OTHER PERIPHERALS	—	CR, LP PTP, PTR, OCR	CR, LP PTP, PTR, OCR	CR, LP PTP, PTR, OCR	CR, LP PTP, PTR, OCR
COMMUNICATION CONTROL UNIT					
Mode; code	—	Half-duplex/JIS	Half-duplex/JIS	Half-duplex/JIS	Half-duplex/JIS
Protocols	—	Synch, asynch	Synch, asynch	Synch, asynch	Synch, asynch
Maximum no. of lines, speed (bits per second)	—	1 line, max 2400 bps	1 line, max 2400 bps	1 line, max 2400 bps	1 line, max 2400 bps
SOFTWARE					
Operating systems	—	MIGHTY-1	MIGHTY-1	MIGHTY-1	MIGHTY-1
Programming languages	—	SCOPE-1	SCOPE-1	SCOPE-1	SCOPE-1
Data communication protocols	—	—	—	—	—
File management/data base function	Exclusive file management	SF, ISF	SF, ISF	SF, ISF	SF, ISF
Utilities	Debug, editor, sort, merge, etc.	Program, mainten- ance, data file org.	Program, mainten- ance, data file org.	Program, mainten- ance, data file org.	Program mainten- ance, data file org.
APPLICATIONS	Hospital accounting, pharmaceutical ac- counting, daily, monthly statistics of pharmaceutical dispensation, pa- tients records,	Sales, accounting, personnel-payroll, production control	Sales, accounting, personnel-payroll, production control	Sales, accounting, personnel-payroll, production control	Sales, accounting, personnel-payroll, production control
AVAILABILITY & PRICING					
Date introduced in Japan	—	Jan, 1981	Dec, 1980	Dec, 1980	Dec, 1980
First shipment in Japan	—	Jan, 1981	Dec, 1980	Dec, 1980	Dec, 1980
Price of minimum configuration (yen)	—	—	—	—	—
Price of standard configuration (yen)	120,000 (mo) 288,000 (year)	4,000,000	5,000,000	6,400,000	6,800,000
COMMENTS	For small hospitals and clinics. Module configuration for hardware and soft- ware				

ABBREVIATIONS: b (bit), B (byte), bps (bits per second), CMT (cassette magnetic tape), CP (card punch), cps (characters per second), CR (card reader), FDD (8-inch floppy disk drive), JP (journal printer), LP (line printer), lpm (lines per minute), MCR (mark card reader), MSR (mark sheet reader), MT (9-track magnetic tape drive), OCR (optical character reader), OMT (open reel magnetic tape), PTP (paper tape punch), PTR (paper tape reader), SP (serial printer), spm (sheets per minute), WS (workstation)

### Small Business Computer Specifications

MANUFACTURER	Tokyo Shibaura Denki (Toshiba)	Tokyo Shibaura Denki (Toshiba)	Tokyo Shibaura Denki (Toshiba)	Tokyo Shibaura Denki (Toshiba)	Tokyo Shibaura Denki (Toshiba)
SYSTEM	TOSBAC System	TOSBAC System	TOSBAC System	TOSBAC System	TOSBAC Chinese
MODEL	15 Touch Book Model 15	15 Touch Book Model 25	15 Touch Book Model 35	15 Touch Book Model 45	System 15 Model 15
HARDWARE PACKAGING	Stand alone, desk model	Stand alone, desk model	Stand alone, desk model	Stand alone, desk model	Stand alone, desk model
SYSTEM CHARACTERISTICS					
Kanji & Kana processing capability	None	None	None	None	Yes, 3418 (max 3543)
Multiterminal work stations	None	None	None	None	None
Terminal functions	Yes (T-15/60 etc.)	Yes (T-15/60 etc.)	Yes (T-15/60 etc.)	Yes (T-15/60 etc.)	Yes (T-15/60 etc.)
PROCESSOR					
Processor type (word length)	LSI (8)	LSI (8)	LSI (8)	LSI (8)	LSI (8)
Main storage (cycle time)	MOS	MOS	MOS	MOS	MOS
Main storage capacity (bytes); error checking	32K ~ 64K	64K	64K	64K	64K
Input/output port/channel	—	—	—	—	—
MASS STORAGE					
Integrated units (capacity)	FDD (243 x 2 ~ 4)	FDD (972KB x 2 ~ 4)	Fixed DD (10M) FDD (243 x 1 ~ 4)	Fixed DD (30M) FDD (243K x 1 ~ 4)	FDD (243K x 2 ~ 4)
Optional units (capacity)	CMT Fixed DD (10, 30M)	CMT Fixed DD (10, 30M)	CMT	CMT	Fixed DD (10, 30M) CMT
KEYBOARD/CRT WORKSTATION					
Screen size, colors	12", green	12", green	12", green	12", green	14", green
Characters/line by number of lines	40 x 16	40 x 16	40 x 16	40 x 16	80 x 24 (40 x 24)
Character sets	English, Kana	English, Kana	English, Kana	English, Kana	English, Kana, Kanji
Keyboard arrangement/type	Book (192 items, 14 pages)	Book (192 items, 14 pages)	Book (192 items, 14 pages)	Book (192 items, 14 pages)	Book (102 items, 14 pages)
Numeric keypad, function keys	Yes, yes	Yes, yes	Yes, yes	Yes, yes	Yes, yes
STANDARD PRINTER					
Type, characters/line	9 x 9, 136	9 x 9, 136	9 x 9, 136	9 x 9, 136	16 x 11 (24 x 24), 136 (90)
Speed	150 cps	150 cps	150 cps	150 cps	120 (63) cps
Characters sets	English, Kana	English, Kana	English, Kana	English, Kana	English, Kana, Kanji
OTHER PERIPHERALS	CR, LP PTP, PTR, OCR	CR, LP, PTP, PTR, OCR	CR, LP, PTR, PTP, OCR	CR, LP PTR, PTP, OCR	LP, OCR, PTR, PTP, CR
COMMUNICATION CONTROL UNIT					
Mode, code	Half-duplex/JIS	Half-duplex/JIS	Half-duplex/JIS	Half-duplex/JIS	Half-duplex/JIS
Protocols	Synch, asynch	Synch, asynch	Synch, asynch	Synch., asynch	Synch., asynch
Maximum no. of lines, speed (bits per second)	1 line, max 2400 bps	1 line, max 2400 bps	1 line, max 2400 bps	1 line, max 2400 bps	1 line, max 2400 bps
SOFTWARE					
Operating systems	MIGHTY-1	MIGHTY-1	MIGHTY-1	MIGHTY-1	MIGHTY-1
Programming languages	SCOPE-1	SCOPE-1	SCOPE-1	SCOPE-1	SCOPE-1
Data communication protocols	—	—	—	—	—
File management/data base function	SF, ISF	SF, ISF	SF, ISF	SF, ISF	SF, ISF
Utilities	Program, mainten- ance, data file org. Sales, accounting, personnel-payroll, production control	Program, mainten- ance, data file org. Sales, accounting, personnel-payroll, production control	Program, mainten- ance, data file org. Sales, accounting, personnel-payroll, production-control	Program, mainten- ance, data file org. Sales, accounting, personnel-payroll, production control	Japanese document, program, maint. Sales, accounting, personnel-payroll, production control
APPLICATIONS					
AVAILABILITY & PRICING					
Date introduced in Japan	Jan, 1981	Dec, 1980	Dec, 1980	Dec, 1980	Jun, 1980
First shipment in Japan	Jan, 1981	Dec, 1980	Dec, 1980	Dec, 1980	Jul, 1980
Price of minimum configuration (yen)	—	—	—	—	—
Price of standard configuration (yen)	4,200,000	5,200,000	6,600,000	7,000,000	5,900,000
COMMENTS					

ABBREVIATIONS: b (bit), B (byte), bps (bits per second), CMT (cassette magnetic tape), CP (card punch), cps (characters per second), CR (card reader), FDD (8-inch floppy disk drive), JP (journal printer), LP (line printer), lpm (lines per minute), MCR (mark card reader), MSR (mark sheet reader), MT (9-track magnetic tape drive), OCR (optical character reader), OMT (open reel magnetic tape), PTP (paper tape punch), PTR (paper tape reader), SP (serial printer), spm (sheets per minute), WS (workstation)

### Small Business Computer Specifications

MANUFACTURER	Tokyo Shibaura Denki (Toshiba)	Tokyo Shibaura Denki (Toshiba)	Tokyo Shibaura Denki (Toshiba)	Tokyo Shibaura Denki (Toshiba)	Tokyo Shibaura Denki (Toshiba)
SYSTEM	TOSBAC Chinese System 15	TOSBAC Chinese System 15	TOSBAC Chinese System 15	TOSBAC System 15	TOSBAC System 65
MODEL	Model 25	Model 35	Model 45	Model 60	—
HARDWARE PACKAGING	Stand-alone, desk model	Stand-alone, desk model	Stand-alone, desk model	Small-WS, cabinet	Large-WS, cabinet
SYSTEM CHARACTERISTICS					
Kanji & Kana processing capability	Yes, 6802 (max 7836)	Yes, 6802 (max 8337)	Yes, 6802 (max 8337)	Yes, 6800 (max 11186)	Yes, 6349
Multiterminal work stations	None	None	None	Max 8 stations	Max 32 stations
Terminal functions	Yes, (T-15/60 etc.)	Yes (T-15/60 etc.)	Yes (T-15/60 etc.)	Yes	Yes
PROCESSOR					
Processor type (word length)	LSI (8)	LSI (8)	LSI (8)	LSI (16)	LSI (16)
Main storage (cycle time)	MOS	MOS	MOS	MOS	MOS
Main storage capacity (bytes); error checking	64K	64K	64K	64K ~ 256K	256K ~ 1M
Input/output port/channel	—	—	—	—	—
MASS STORAGE					
Integrated units (capacity)	FDD (972K x 2 ~ 4)	Fixed DD (10M) FDD (972K x 1 ~ 4)	Fixed DD (30M) FDD (972K x 1 ~ 4)	Fixed DD (30M ~ 60M) FDD (1M x 2)	DD (80M), FDD
Optional units (capacity)	Fixed DD (10, 30M), CMT	CMT	CMT	CMT, MT	DD (80M ~ 640M), MT
KEYBOARD/CRT WORKSTATION					
Screen size, colors	14"	14"	14"	14", green	14", green
Characters/line by number of lines	80 x 24 (40 x 24)	80 x 24 (40 x 24)	80 x 24 (40 x 24)	80 x 25 (40 x 25)	80 x 25 (40 x 25)
Character sets	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji
Keyboard arrangement/type	Book (192 items, 14 pages)	Book (192 items, 14 pages)	Book (192 items, 14 pages)	JIS, Book*1	JIS, Book*1
Numeric keypad, function keys	Yes, yes	Yes, yes	Yes, yes	Yes, yes	Yes, yes
STANDARD PRINTER					
Type, characters/line	16 x 11 (24 x 24), 136 (90)	16 x 11 (24 x 24), 136 (90)	16 x 11 (24 x 24), 136 (90)	9 x 9 (24 x 24), 136 (92)	9 x 9 (24 x 24), 136 (92)
Speed	120 (63) cps	120 (63) cps	120 (63) cps	150 cps, 120 cps (63 cps)*2	150 cps, 120 cps (63 cps)*2
Characters sets	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji
OTHER PERIPHERALS	LP, OCR, PTR, PTP, CR	CR, LP, PTR, PTP, OCR	CR, LP, PTR, PTP, OCR	LP (240 lpm) CR (400 cpm) OCR, PTR/PTP	LP (240/400/800 lpm), CR, OCR, PTR
COMMUNICATION CONTROL UNIT					
Mode; code	Half-duplex/JIS	Half-duplex/JIS	Half-duplex/JIS	Half-duplex/JIS	Half-duplex/JIS
Protocols	Synch., asynch	Synch., asynch	Synch., asynch.	Synch., Asynch	Synch, asynch
Maximum no. of lines, speed (bits per second)	1 line, max 2400 bps	1 line, max 2400 bps line	1 line, max 2400 bps	2 lines, max 9600 bps	4 lines, max 9600 bps
SOFTWARE					
Operating systems	MIGHTY-1	MIGHTY-1	MIGHTY-1	MIGHTY-1/MW8	[multi, max 32 multi & batch join]
Programming languages	SCOPE-1	SCOPE-1	SCOPE-1	COBOL, SCOPE-2, FRIEND	COBOL, SCOPE-2, FRIEND
Data communication protocols	—	—	—	Yes	—
File management/data base function	SF, ISF	SF, ISF	SF, ISF	SF, RF, IF	SF, RF, IF, DBMS
Utilities	Japanese document, program, maint.	Japanese document, program, maint.	Japanese document, program, maint.	Japanese processing, screen editing	Japanese processing, screen editing
APPLICATIONS	Sales, accounting, personnel-payroll, production control	Sales, accounting, personnel-payroll, production control	Sales, accounting, personnel-payroll, production control	Sales, accounting, finance, personnel-payroll, production control	Sales, accounting, finance, production control, personnel-payroll
AVAILABILITY & PRICING					
Date introduced in Japan	Jun, 1980	Jun, 1980	Jun, 1980	Apr, 1979	Nov, 1979
First shipment in Japan	Jul, 1980	Jul, 1980	Jul, 1980	Aug, 1979	Jul, 1980
Price of minimum configuration (yen)	—	—	—	8,500,000	1,500,000
Price of standard configuration (yen)	6,500,000	7,900,000	8,300,000	14,000,000	2,800,000
COMMENTS				*1(192 items, 14 pages) *2The number at left is for exclusive use of Kana, and the one at right is for Kanji	*1(192 items, 14 pages) *2When a dot printer for Kana is used the speed is 150 cps.

ABBREVIATIONS: b (bit), B (byte), bps (bits per second), CMT (cassette magnetic tape), CP (card punch), cps (characters per second), CR (card reader), FDD (8-inch floppy disk drive), JP (journal printer), LP (line printer), lpm (lines per minute), MCR (mark card reader), MSR (mark sheet reader), MT (9-track magnetic tape drive), OCR (optical character reader), OMT (open reel magnetic tape), PTP (paper tape punch), PTR (paper tape reader), SP (serial printer), spm (sheets per minute), WS (workstation)

### Small Business Computer Specifications

MANUFACTURER	Uchida Yoko	Uchida Yoko	Uchida Yoko	Y. E. Data	Y.E. Data
SYSTEM	USAC System 11	USAC System 7	USAC 820 G Series	YD-8100	YD-8100
MODEL	—	—	GK, GM, GR	—	—
HARDWARE PACKAGING	Small-WS, desk model	Stand alone, desk model	Small-WS, desk model	Stand alone, desk top	Small-WS, desk model
SYSTEM CHARACTERISTICS					
Kanji & Kana processing capability	Yes, 1024, max 8000	Yes, 1024, max 8000	Yes, 128	Yes, 1800	Yes, 6400
Multiterminal work stations	Max 8 stations	None	Max 3 stations	None	Max. 4 stations
Terminal functions	Yes	Yes (System 11, etc.)	Yes, (system 11, etc.)	Yes	Yes
PROCESSOR					
Processor type (word length)	LSI (16)	LSI (16)	LSI	8086 (16)	8086 x 2 (16)
Main storage (cycle time)	MOS (450 ns)	MOS	MOS (1000 ns)	nMOS (375 ns)	nMOS (375 ns)
Main storage capacity (bytes); error checking	192K ~ 512K, ECC	192K ~ 320K, ECC	32K ~ 64K	64K ~ 256K, parity serial	128K ~ 512K, parity
Input/output port/channel	Port (8), Channel (3)	—	3	Serial (2),*1	Serial (2)*1
MASS STORAGE					
Integrated units (capacity)	8"-DD (25M~100M), FDD (1.2M x 1)	8"; DD (10/20M), FDD (1.2M x 1)	FDD (256K x 2, 512K)	FDD (1.2M x 2)	FDD (1.2M x 4)
Optional units (capacity)	CMT	CMT	Cartridge DD (10M x 2)	CMT	CMT
KEYBOARD/CRT WORKSTATION					
Screen size, colors	12", green	12", green	9", green	9", green	12", green
Characters/line by number of lines	80 x 24 (80 x 12)	80 x 25 (40 x 25)	40 x 16	80 x 22 (40 x 22)	80 x 22 (40 x 22)
Character sets	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji	English, Kana, Kanji
Keyboard arrangement/type	Typewriter style*1	Typewriter style*1	Typewriter style*1	Typewriter*2	Pentouch (450 items, 16 pages)
Numeric keypad, function keys	Yes, yes	Yes, yes	Yes, yes	Yes, yes	Yes, yes
STANDARD PRINTER					
Type, characters/line	9 x 7 (16 x 16), 136 (68)	9 x 7 (16 x 16), matrix 136 (68)	9 x 7 matrix, 136	9 x 7 matrix, 136	16 x 15 matrix, 136
Speed	120 cps (50 cps)	120 (50) cps	120 cps	170 cps	120 (40) cps
Characters sets	English, Kana, Kanji	English, Kana, Kanji	English, Kana	English, Kana	English, Kana, Kanji
OTHER PERIPHERALS	LP, OCR, Chinese character cut form printer	LP, Chinese character cut form printer	LP, MCR, oMR, PTR, PTP	ID card reader, LP	LP
COMMUNICATION CONTROL UNIT					
Mode; code	Half-duplex, BSC, FTS	Half-duplex, BSC, FTS	BSC	Half duplex/full duplex	Half-duplex/full duplex
Protocols	Synch	—	—	Asynch, BSC	Asynch, BSC
Maximum no. of lines, speed (bits per second)	2 lines, max 9600 bps	1 line, max 9600 bps	2 lines, 2400 bps	2 lines, 110 ~ 9600 bps	2 lines, 110 ~ 9600 bps
SOFTWARE					
Operating systems	OS/ACE (multi dialogue interrupt)	OS/ACE (dialogue interrupt, spool,	—	None	None
Programming languages	COBOL, REPORTER	COBOL, REPORTER	SIMPLE-II, COBOL	Assembler, BASIC, Simple language	Assembler, simple language
Data communication protocols	—	—	—	None	None
File management/data base function	Multi indexed file	Multi indexed file	MFG	SAM	SAM
Utilities	Dialogue type reporter, J. proc.	Dialogue type reporter, J. proc.	System utilities, service utilities	Debug, editor, sort-merge	Debug, editor, sort-merge
APPLICATIONS	Finance, personnel-payroll, sales, stock control, inventory U-PACK	Finance, personnel-payroll, sales, stock control, inventory, U-PACK	Finance, personnel-management, sales, stock control, inventory, U-PACK	Finance-accounting, medical records, auto-repairs, golf centers, sales	Finance-accounting, medical records, auto-repairs, purchase-sales-stock control, payroll, check management
AVAILABILITY & PRICING					
Date introduced in Japan	Apr, 1979	May, 1980	Sept, 1979	May, 1980	Sept, 1980
First shipment in Japan	Sept, 1979	Sept, 1980	Oct, 1979	Sept 1980	Nov, 1980
Price of minimum configuration (yen)	—	—	3,750,000	2,000,000	3,000,000
Price of standard configuration (yen)	—	—	—	3,500,000	6,000,000
COMMENTS	*1Keymat (160 keys/page, 15 pages), keyfile (160 keys/page, 10 pages)	*1Keymat (160 keys/page, 15 pages)	*1Keymat (160 keys/page, 15 pages)	*1Parallel (1) also available *2Pentouch (450 items, 16 pages)	*1Parallel (1) also available

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