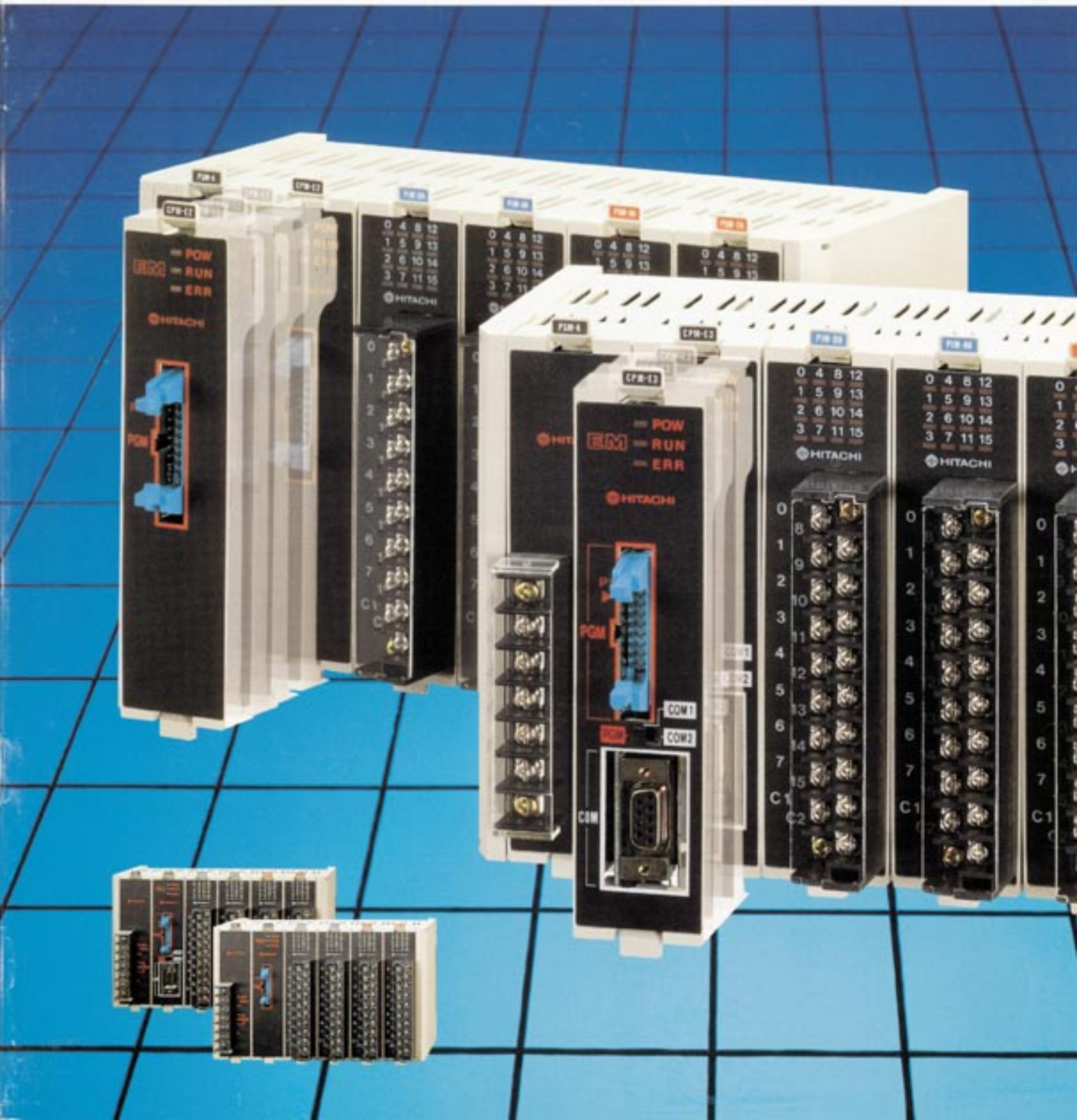
HITACHI

HITACHI PROGRAMMABLE CONTROLLER

EM-II series Modular Type



EM-II Provides an Increased Processing Speed the Next Generation FA/CIM.

High processing speed of 1.5 μs/basic instruction and large program capacity of 3,997 words.
A personal computer is directly connectable, and real time clock control is available for further enhancing a small-scale FA.

EM-II series fully equipped with high processing speed and large program capacity is now available for meeting the next generation FA/CIM needs.
A high processing speed of 1.5 μs/basic instruction and a large program capacity of 3,997 words are realized. Further, an RS232C communication port is provided with CPM-E3 type CPU for direct connection with a personal computer, and a real time clock is incorporated as well.
Various efficient functions are incorporated to permit controlling sophisticated numerical operations, and mounting analog I/O modules applicable to temperature or flow control, etc.
EM-II series is an up-to-date controller most applicable to a small-scale FA.

1 1.5 μs/basic instruction: High processing speed

The extremely high processing speed of 1.5 μs/basic instruction realizes high-speed machine control such as for printing machines, packaging machines and so on.

2 3,997 words: Large program capacity

Three kinds of memory packs are available – EEPROM (925 words, 3,997 words) and EPROM (3,997 words) – according to the control needs.

3 RS232C interface: Direct connection with a personal computer possible

RS232C interface is provided with CPM-E3 type CPU module. A personal computer is directly connectable without any other external interface.

4 Real time clock

A real time clock is available with CPM-E3 type CPU module. It does not stop even if the power is off.

5 89 arithmetic and application instructions

EM-II has a total of 89 arithmetic and application instructions in order to meet the complicated and diversified control needs.

6 I/O linkage, Remote I/O

An I/O linkage module and remote I/O modules realize FA even in a small-scale control area. I/O data linkage of 128 points (max. 8 stations) is possible and remote I/O can increase max. external I/O points up to 300 or more (limited by internal output points).

7 Analog I/O, High speed counter

Analog I/O modules, thermo coupler module and a high speed counter module develop applications such as the control of temperature, humidity, speed and water flow and simple positioning.

8 Removable terminal: Easy maintenance

A removable terminal type is available with a 16 I/O module. The I/O module can be replaced without rewiring for easy maintenance.

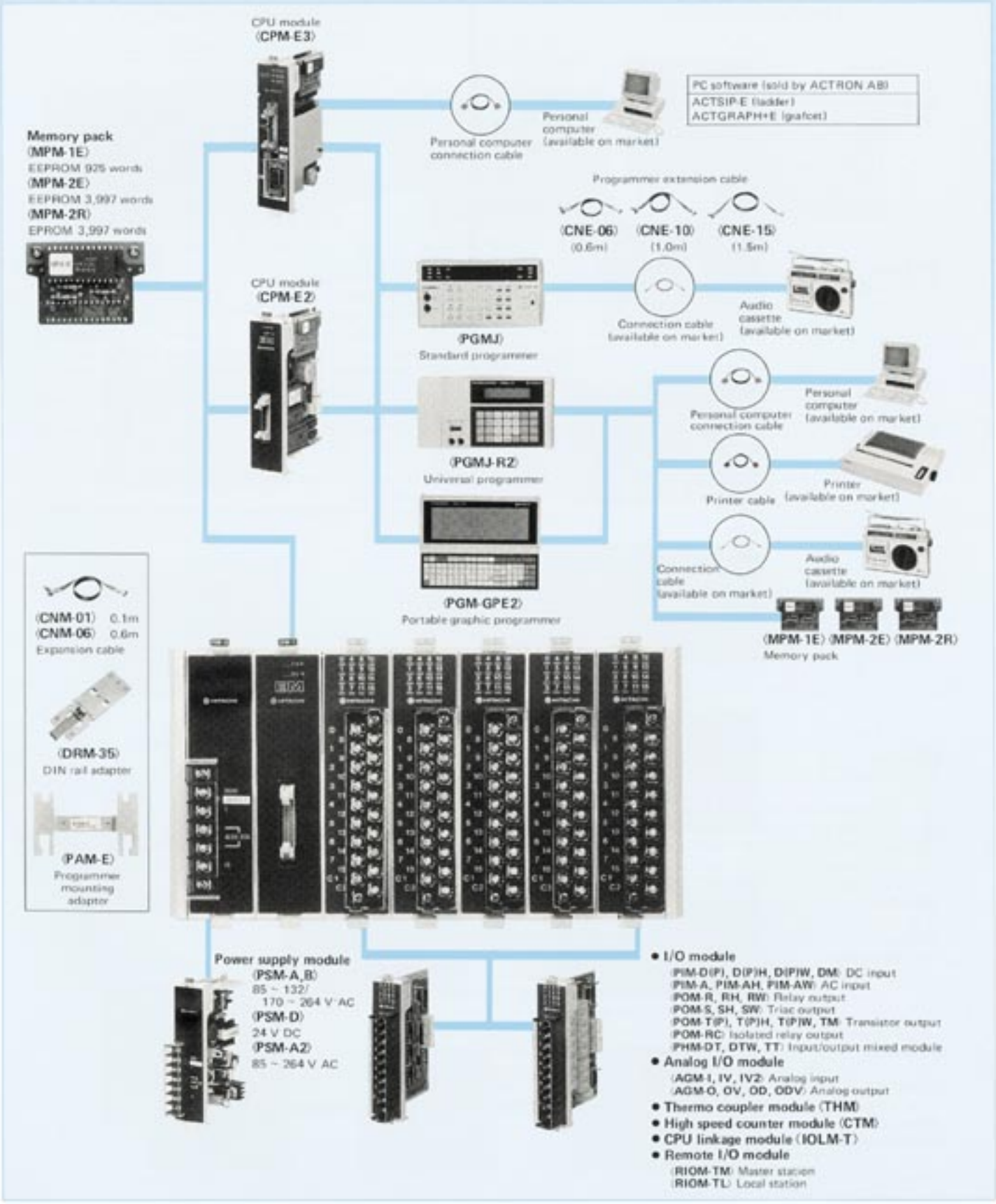
9 EEPROM memory: No battery required

EEPROM is utilized for the user memory so it's not necessary to maintain the battery. But program change can be made as with a RAM memory.

10 Free I/O location system

EM-II has adopted a free I/O location system. The system can be expanded efficiently as required.

and Program Capacity for Meeting



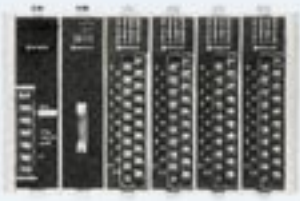
Flexible Expandability with Higher Functions

Available I/O points

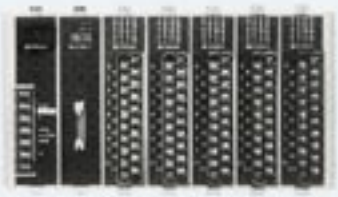
BSM-3A
16–32 points

BSM-4A
24–48 points

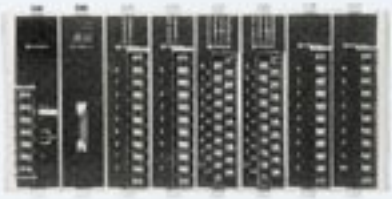
BSM-5A
32–64 points



BSM-6A
40–80 points



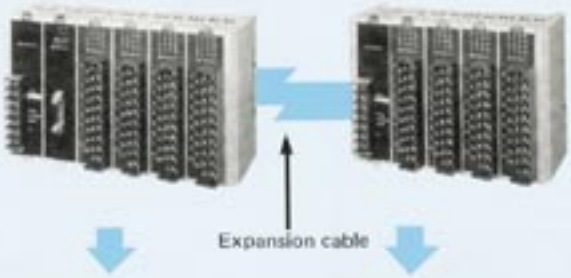
BSM-7A
48–96 points



BSM-6A
+
BSM-5A
80–160 points

BSM-5A
+
BSM-3A
+
BSM-3A
80–160 points

< EM-II system configulation >



Basic system

1. Power supply module x 1
2. CPU module x 1
3. Memory pack x 1
4. Input module x n1
5. Output module x n2
6. Rack unit x 1

The number of required slots
= 1 + n1 + n2

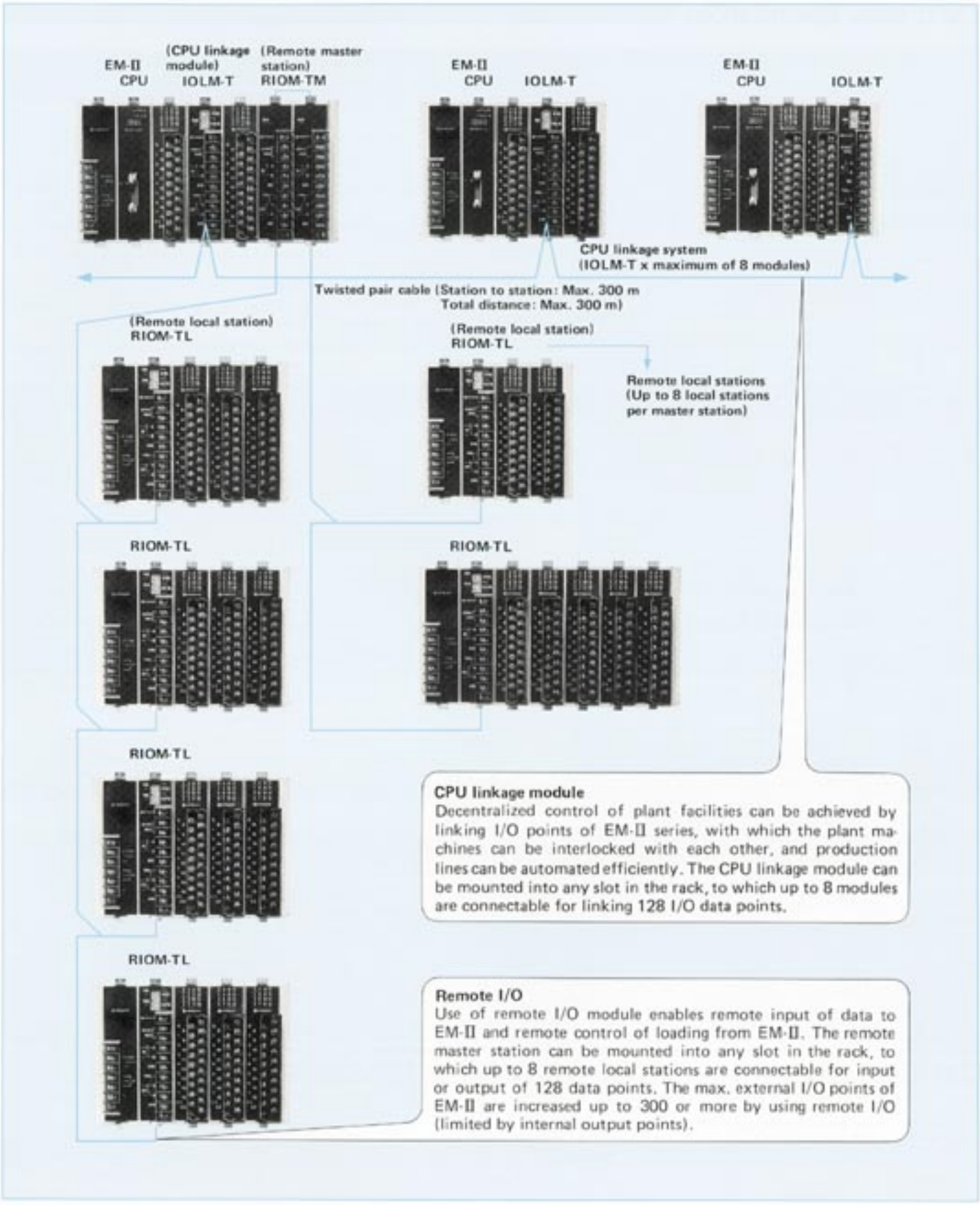
Expansion system

1. Expansion cable x 1
2. Power supply module x 1
3. Input module x n3
4. Output module x n4
5. Rack unit x 1

The number of required slots
= n3 + n4

Power supply module is not object of the number of required slots.

Examples of Use of CPU Linkage and Remote I/O Modules



EM-II Basic Specifications

Item			EM-II		EM (reference)
			CPM-E2	CPM-E3	CPM-E
Control specifications	Control method		Stored program cyclic processing		
	Processing speed		1.5 μs/basic instruction		Average 5 μs/basic instruction
	Memory		EEPROM, EPROM		
	Program capacity		EEPROM (925 words)		EEPROM (925 words)
			EEPROM (3,997 words)		EEPROM (1,949 words)
			EPROM (3,997 words)		EPROM (1,949 words)
Instructions	Basic instruction		12 kinds		12 kinds
	Arithmetic/application instruction		89 kinds		44 kinds
I/O processing specifications	I/O assignment		Free location		
	No. of external I/O points		160 points max. for 16-point I/O module, 320 points max. for 32-point I/O module (PHM-TT). In both cases, max. I/O points are increased by using remote I/O.		
	No. of internal output points	Without memory retention at power failure	256 points		
		With memory retention at power failure	256 points (Note 1)		
		Special function	12 points + 4 words		24 points
	Timer/counter	Counting method	Incremental		
		No. of points	Total of 96 points		
		Time base	0.01, 0.1, and 1 s		0.1 and 1 s
		Preset value	4 digits (for max. of 10 points), 3 digits (Note 2)		
	External input		24 V DC, 110/220/230/240 V AC, analog		
	External output		Relay, transistor, Triac and analog		
Peripheral function	Peripheral equipment		PGMJ, PGMJ-R2, PGM-GPE2 (Note 3)		PGMJ, PGMJ-R, PGM-GPE
	Monitoring function		Bit monitoring, word monitoring		Bit monitoring
	Monitoring speed (using PGM-GPE2)		0.3 to 0.5 s		1 to 2 s
Communication function	Personal computer linkage		Via PGMJ-R, PGMJ-R2	Personal computer directly connectable (RS232C built-in)	Via PGMJ-R, PGMJ-R2
	CPU linkage		CPU linkage module (IOLM-T)		
	Remote I/O		Remote I/O module (RIOM-TM, TL)		
Clock function			–	Real time clock	–
Maintenance function	Self-diagnosis		Watchdog timer, sum check, undefined instruction check		
	RUN signal output		Programmable (one point of output module to be specified with program)		
	Operation control input		Programmable (one point of input module to be specified with program)		
General specifications	Power voltage		220/230/240 V AC (170 ~ 264 V)/110 V AC (85 ~ 132 V) or 24 V DC (19.2 ~ 30 V)		
	Noise immunity	AC power supply	NEMA ICS3-304 Noise simulator: 1,500 Vp-p, 1 μs (based on Hitachi method)		
		DC power supply	Noise simulator: 500 Vp-p, 1 μs (based on Hitachi method)		
	Insulation resistance		20 MΩ min. between external terminal and frame ground terminal (FG) (at 500 V DC)		
	Dielectric strength		1 min. at 1,500 V AC between power supply, output terminal and frame ground terminal (FG)		
	Anti-vibration		Vibration frequency 16.7 Hz, amplitude 3 mm, 2 hr in X, Y and Z directions		
	Anti-shock		10 G, 2 times in X, Y and Z directions		
	Ambient temperature		0 ~ 55°C		
	Ambient humidity		30 ~ 90%RH (non-condensing)		
	Storage temperature		−10 ~ 65°C		
	Using ambient atmosphere		No corrosive gas or dust		
	Structure		Wall mounting type		

(Note 1) For the CPM-E3, 240 points are available since 16 points are used for real time clock.
(Note 2) 10 points ranging from T/C0 to T/C9 are settable in 4 digits. If a 0.01 s timer is used, the settable value is limited to 3 digits.
(Note 3) Peripheral equipments of EM-II include the PGMJ, PGMJ-R2 and PGM-GPE2. PGMJ-R and PGM-GPE are also usable except for:
(1) Programming of instruction exclusive for EM-II
(2) Printout of instruction exclusive for EM-II
(3) Programming in excess of 2 k-words
(4) CMT, ROM writer and printout in excess of 2 k-words

Power Supply Module Specifications

Item \ Model		PSM-A	PSM-A2	PSM-B	PSM-D
Input	Voltage	85 to 132 V AC (changeable) 170 to 264 V AC	85 to 264 V AC	85 to 132 V AC (changeable) 170 to 264 V AC	19.2 to 30 V DC
	Frequency	47 ~ 63 Hz	45 ~ 63 Hz	47 ~ 63 Hz	–
	Current	0.6 A or less	0.6 A or less	0.6 A or less	1.6 A or less
Output current rating	CH1 (5 V)	1 A	1 A	1.7 A	1 A
	CH2 (24 V)	0.3 A	Total 0.7 A	0.5 A	0.3 A
	CH3 (24 V)	0.45 A		0.25 A (Note 1)	1 A (Note 2)

(Note 1) Current suppliable from external unit by switchover (max. 1 A).
(Note 2) Current to be supplied from external unit.

Input Module Specifications

Item \ Model		PIM-D(P)	PIM-D(P)H, *D(P)W	PIM-DM	PIM-A	PIM-AH, *AW
Input specification		DC input			AC input	
Nominal voltage		24 V DC			110/220/230/240 V AC	
Input voltage		21.6 ~ 26 V DC			85 ~ 264 V AC	
Input current		9 mA (when input and common terminals are short-circuited)		5 mA	7 mA (100 V AC)	
Operational specification	ON	19 V or more (Resistance 300 Ω or less)			85 V AC or more	
	OFF	7 V or less (Resistance 200 kΩ or more)			30 V AC or less	
Input delay time	ON → OFF	4 ms or less			16 ms or less	
	OFF → ON	4 ms or less			16 ms or less	
No. of input points		8 points/module	16 points/module	32 points/module	8 points/module	16 points/module
Common input connection		8 points/common terminal			8 points/common terminal	
Polarity		PIM-D DH, DW ... Common terminal ⊖ PIM-DP, DPH, DPW, DM ... Common terminal ⊕			–	
Insulation method		Photocoupler			Photocoupler	

* "W" stands for removable terminal type.

Output Module Specifications

Item \ Model		POM-R	POM-RH, *RW	POM-RC	POM-S	POM-SH, *SW	POM-T(P)	POM-T(P)H, *POM-T(P)W	POM-TM
Output specification		Relay output			Triac output		Transistor output		
Nominal voltage		110/220/230/240 V AC, 24 V DC			110/220/230/240 V AC		24 V DC		
Output voltage		85 ~ 264 V AC, 21 ~ 27 V DC			85 ~ 264 V AC		3 ~ 26 V DC		5 ~ 27 V DC
Max. load current	1 circuit	2 A			1 A		0.5 A		0.1 A
	4 circuits	–		–	2 A		1.25 A (Note)		–
	8 circuits	4 A		–	4 A		2.5 A (Note)		–
Min. load current		10 mA (5 V DC)			50 mA		10 mA (24 V DC)		1 mA (24 V DC)
Max. leakage current		–			3 mA (220 V AC)		0.1 mA (24 V DC)		50 μA (24 V DC)
Max. rush current		6 A (100 ms)			20 A (20 ms)		3 A (20 ms)		1 A (10 ms)
Max. output delay time	ON → OFF	4 ms			11 ms		1 ms		
	OFF → ON	5 ms			11 ms		1 ms		
No. of output points		8 points	16 points	8 points	8 points	16 points	8 points	16 points	32 points
Common output connection		8 points/common terminal		1 point/common terminal	8 points/common terminal		8 points/common terminal		
Polarity		–			–		POM-T, TH, TW, TM ... Common terminal ⊖ POM-TP, TPH, TPW ... Common terminal ⊕		
Insulation method		Relay			Photocoupler		Photocoupler		

* "W" stands for removable terminal type.

Analog Input/Output Module Specifications

Item \ Model	AGM-I	AGM-O	AGM-OD
Input/output specifications	Analog current input	Analog current output	
Current range	4 ~ 20 mA	4 ~ 20 mA	
Input impedance	220 Ω	–	
Load impedance	–	0 ~ 500 Ω	
Resolution	8 bits	8 bits	
Conversion time	1 ms	1 ms	
Overall accuracy	±1% + 1 bit	±1%	
No. of points	8 points	4 points	2 points
Insulation method	Photocoupler (No insulation between inputs)	Photocoupler (No insulation between inputs)	

Analog Input/Output Module Specifications

Item \ Model	AGM-IV	AGM-OV	AGM-ODV
Input/output specifications	Analog voltage input	Analog voltage output	
Voltage range	0 ~ 10 V DC	0 ~ 10 V DC	
Input impedance	100 kΩ	–	
Load impedance	–	10 kΩ or more	
Resolution	8 bits	8 bits	
Conversion time	1 ms	1 ms	
Overall accuracy	±1% + 1 bit	±1%	
No. of points	8 points	4 points	2 points
Insulation method	Photocoupler (No insulation between inputs)	Photocoupler (No insulation between inputs)	

Analog Input Module Specifications

Item \ Model	AGM-IV2
Input specifications	Analog current/voltage input
Input range	4 ~ 20 mA or 0 ~ 10 V DC
Input impedance	100 kΩ
Resolution	12 bits
Conversion time	5 ms
Overall accuracy	± 0.5%
No. of inputs	8 points
Insulation method	Photocoupler (No insulation between inputs)

Thermo Coupler Module Specifications

Item \ Model		THM
Input specifications		Thermo coupler J, K, T (selectable)
No. of inputs		8 points
Measuring temperature range	J	−210 to 760°C
	K	−270 to 1,372°C
	T	−270 to 400°C
Conversion time		100 μs/point
Overall accuracy		±1% + 1°C
Insulation method		Photocoupler (No insulation between inputs)

Input/Output Mixed Module Specifications

Item \ Model		PHM-DT,*DTW	
I/O specification		DC input	Transistor output
Nominal voltage		24 V DC	24 V DC
Input/output voltage		21.6 ~ 26 V DC	5 ~ 27 V DC
Input current		9 mA	–
Operational specification	ON	300 Ω or less	–
	OFF	200 kΩ or more	–
Max. load current	1 circuit	–	0.5 A
	4 circuits	–	1.25 A
	8 circuits	–	2.5 A
Max. leakage current		–	0.1 mA (24 V DC)
Max. inrush current		–	3 A (20 ms)
Input/output delay time	ON→OFF	4 ms or less	1 ms or less
	OFF→ON	4 ms or less	1 ms or less
No. of I/O points		8 points (0 ~ 7)	8 points (8 ~ 15)
Common I/O connection		8 points/ common terminal	8 points/ common terminal
Polarity		Common ... ⊖	Common ... ⊖
Insulation method		Photocoupler	Photocoupler

* "W" stands for removable terminal type.

Item \ Model		PHM-TT	
I/O specification		TTL level input	TTL level output (open collector)
Input/output voltage		4 ~ 27 V DC	4 ~ 27 V DC
Input current		6 mA (5 V DC)	–
Operational specification	ON	Less than 1.5 V (5 V DC)	–
	OFF	More than 3.5 V (5 V DC)	–
Max. load current		–	20 mA/point
Max. leakage current		–	50 μA
Input/output delay time	ON→OFF	1 ms or less	1 ms or less
	OFF→ON	1 ms or less	1 ms or less
No. of I/O points		16 points/module	16 points/module
Common I/O connection		16 points/common	8 points/common
Polarity		Common ... ⊖	Common ... ⊖
Insulation method		Photocoupler	Photocoupler
ON/OFF indicator		Nothing	Nothing

High Speed Counter Module Specifications

Item \ Model			CTM
Input signal	Input pulse frequency		10 kHz max.
	Input pulse voltage level	ON	0 ~ 2 V
		OFF	5 ~ 12 V
	Input pulse width		20 μs min.
	Marker pulse width		20 μs min.
	Input resistance		Approx. 11 kΩ
	Insulation system		Photocoupler
	No. of pulse input points		3 (A,B,M)
	Polarity		Common ... ⊖
	2-phase input pulse	Count up (add state)	
		Count down (subtract state)	
	Power supply output for input sensing		12 V DC ± 10%, 50 mA max.

Item \ Model		CTM
Output signal	Output voltage	10 ~ 27V DC
	Load current	0.5 A max./point, 1.25 A max./4-circuit
	Output system	Transistor (open collector)
	Min. load current	1 mA
	Output delay time OFF→ON	1 ms max.
	Output delay time ON→OFF	1 ms max.
	ON-time voltage drop	1.5 V max. (0.5 A)
	Insulation system	Photocoupler
	Output point	4 points (OUT0, OUT1, OUT2, OUT3)
	Leakage current	0.1 mA max.
	Polarity	Common ... ⊖
	Power source for output circuit devices	10 ~ 27 V DC (50 mA is required) not withstanding output states
Dielectric strength		500 V DC, 1 min between external terminals and FG terminal
Ambient temperature		0 ~ 55°C
Ambient humidity		20 ~ 90% TH (no condensing)
Count range		0 ~ 9999 times with carry/borrow

CPU Linkage and Remote I/O Module Specifications

Item \ Model		CPU linkage module IOLM-T	Remote I/O module RIOM-TM (master station)	Remote I/O module RIOM-TL (local station)
Current consumption (average)	CH1 (5 V)	150 mA	130 mA	150 mA
	CH2 (24 V)	20 mA	20 mA	20 mA
	CH3 (24 V)	5 mA	5 mA	5 mA
No. of connectable modules		8 modules	8 local stations per master station	
No. of linkage/remote points		8 words (128 points)	Total of 128 input/output points (for 8 slots)	
Baud rate		768 kbps		
Refresh time		10 ms x no. of stations	Approx. 5 ms	
Error check		Inverted dual transmission		

Easy Programming, Easy Operation

Programmer

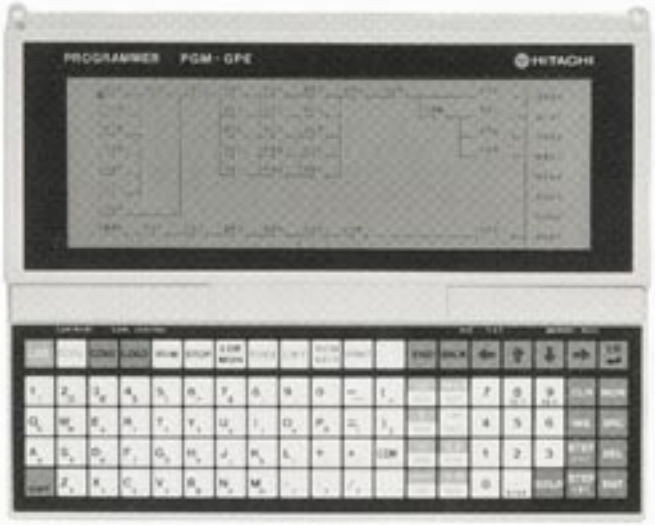
With combination of the sequence instruction and process inching IF instruction, even complicated control can easily be programmed. In addition, the programmer is provided with test and monitoring functions which facilitate test run and debugging, and also an input/output no. check function, ensuring easy use by anyone.

(PGMJ-R2)
Universal programmer

(PGMJ)
Standard programmer

■Programmer Specifications

Item \ Model		PGMJ	PGMJ-R2
Programming function	Writing	Writing for each step (writing in EEPROM)	
	Reading	Reading by specification of step no. Reading by specification of output no. Reading by specification of contact no.	
		All clear	
Editing function		Rewriting, inserting, deleting	
Test function		Forced output	
Monitoring		Monitoring of input/output status (ON/OFF status), monitoring of timer and counter (ON/OFF status, current value)	
Check function		Syntax check, key-in procedure check, input/output no. check, sum check	
Peripheral equipment		Audio cassette deck interface built in	RS232C serial port (personal computer/printer interface, ROM writer function, audio cassette interface built in)
Display		7-segment numeral display x 6 digits, LED indication of command, kind of data/step and mode	Liquid crystal display



(PGM-GPE2)
Portable graphic programmer

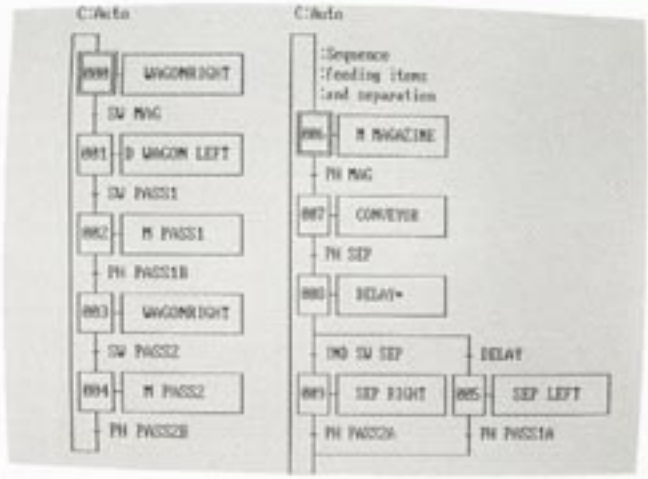
■Programmer Specifications

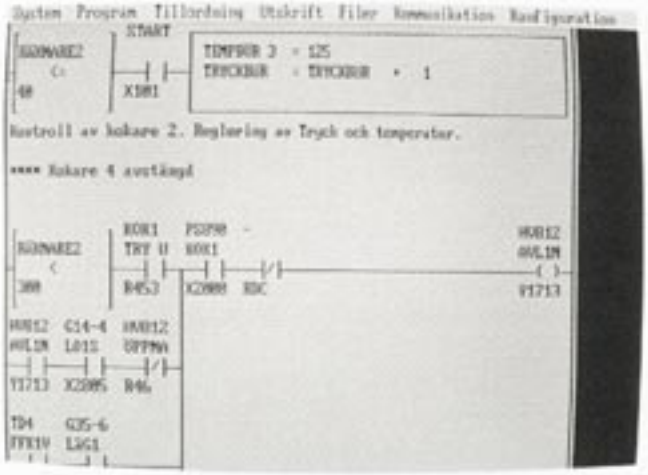
Item			Specification
Functional specifications	Display function	Display	Full dot matrix liquid crystal panel
		Ladder display	(9 contacts + 1 coil) x 8 lines/screen
		Display of instruction word	22 lines/screen
		Memory capacity	795 lines (on ladder display)
	Programming function		Offline/online programming
			Programming by use of ladder diagram or mnemonic instructions
			Insert, delete and rewrite
			Search
	Operating and controlling functions		Run, stop
			Forced output, forced set/reset
			Change of timer/counter preset value during operation
			Ladder diagram monitor
	Printout function (with RS232C connector)		Ladder diagram and mnemonic instruction list
			Cross reference
	ROM writer function		Write program in memory pack, read program from memory pack, verify
	CMT function		Recording, reproduction and check by means of audio cassette tape
	External memory function (with RS232C connection)		Program and label ⇄ Floppy disk in personal computer

Programming with Personal Computer

Programming/monitoring of EM-II with IBM PC or compatible PC is possible directly with CPM-E3 type CPU or through universal programmer (PGMJ-R2). The personal computer near yourself will turn into peripheral equipment of PLC for easy operation. ACTSIP-E is for ladder programming and ACTGRAPH+E is for grafcet programming. These software packages are sold by ACTRON AB.

Software for IBM PC or compatible PC is available.
(ACTSIP-E, ACTGRAPH+E)





Basic Instruction

Instruction	Symbol	Function	Object	No. of words	Change in register			
					AR	ER	C	Acc
ORG		Connection of normally open contacts ("a" contacts) to bus	X, Y, M	1	●	●	●	↕
ORG NOT		Connection of normally closed contacts ("b" contacts) to bus	T/C 0~95	1	●	●	●	↕
STR		Start of branching normally open contacts ("a" contacts)	X, Y, M	1	●	●	●	↕
STR NOT		Start of branching normally closed contacts ("b" contacts)	T/C 0~T/C95	1	●	●	●	↕
AND		Serial connection of normally open contacts ("a" contacts)	X, Y, M	1	●	●	●	↕
AND NOT		Serial connection of normally closed contacts ("b" contacts)	T/C 0 ~ T/C95	1	●	●	●	↕
OR		Parallel connection of normally open contacts ("a" contacts)	X, Y, M	1	●	●	●	↕
OR NOT		Parallel connection of normally closed contacts ("b" contacts)	T/C 0 ~ T/C95	1	●	●	●	↕
AND STR		Serial connection of logic block	None	1	●	●	●	↕
OR STR		Parallel connection of logic block		1	●	●	●	↕
OUT		Output of calculation result	Y, M T/C0 ~ T/C95 (with preset value)	1	●	●	●	●
OUT NOT		Inverted output of calculation result	Y, M	1	●	●	●	●

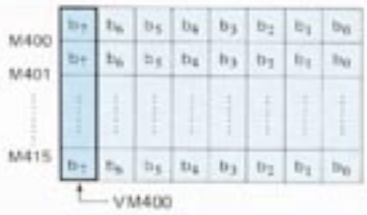
Application Instruction

Kind	Instruction	Symbol	Name	Function	Object	No. of words	Change in register			
							AR	ER	C	Acc
Edge	FUN 00	DIF	Rising edge	Detect rising edge of signal ( )	M	1	●	●	●	●
	FUN 01	DFN	Trailing edge	Detect trailing edge of signal ( )	M	1	●	●	●	●
IF	FUN 02	IF	IF	Specifies process stepping IF instruction	None	1	●	●	●	●
	FUN 03	IFR	IF reset	Resettable IF instruction		1	●	●	●	●
Master control	FUN 04	MCS	Master control set	Sets the master control	None	1	●	●	●	●
	FUN 05	MCR	Master control reset	Reset the master control		1	●	●	●	●
Jump	FUN 06	JMP	Jump	Jumps the program specified by JMP and JEND	None	1	●	●	●	●
	FUN 07	JEND	Jump end			1	●	●	●	●
	FUN 08	AJMP	Addressed jump	Jumps to the address No. specified by AJEND	Address No. (0~63)	2	●	●	●	●
	FUN 09	AJEND	Addressed jump end			2	●	●	●	●
Branch	FUN 28	BRANCH	Branch	Stores Acc data	None	1	●	●	●	●
	FUN 29	RETURN	Return	Returns the stored Acc data	None	1	●	●	●	●
Up/Down counter	FUN 40	UDC	Up/Down counter	Up/Down counter	VM (Note1)	1	●	●	●	●
Nop	FUN 41	NOP	No operation	No operation	None	1	●	●	●	●

Note 1: VM is the vertical 16 points like M400 to M415 shown in the following figure.

Kind	Instruction	Symbol	Name	Function	Object	No. of words	Change in register			
							AR	ER	C	Acc
Latch	FUN 45	LATCH	Latch	Latch (Priority is given to reset)	M	1	●	●	●	●
Shift register	FUN 47	SFR	Shift register	16 bit shift register	VM (Note1)	1	●	●	●	●
Set/Reset	FUN 88	SET	Set	Y or M is ON when Acc is ON	Y, M	1	●	●	●	●
	FUN 89	RES	Reset	Y or M is OFF when Acc is ON	Y, M	1	●	●	●	●
Start/End	FUN 98	STA	Start	Starts operation	None	1	●	●	●	●
	FUN 99	END	End	Ends program	None	1	—	—	—	—

Note 1: VM is the vertical 16 points like M400 to M415 shown in the following figure.



Arithmetic Instruction

Kind	Instruction	Symbol	Name	Function	Object	No. of words	Change in register			
							AR	ER	CR	Acc
Load	FUN 0	LOADI	Load immediate	Constant → AR	Constant (0000H~9999H)	2	↕	●	●	●
	FUN 10	LOADW	Word load	I/O → AR	WX, WY, WM, T/C100~295	2	↕	●	●	●
	FUN 20	LOADB	Bit data→ word	I/O → AR	VX, VY, VM, T/C0~95	2	↕	●	●	●
	FUN 50	LBYTI	Load byte immediate	1 byte constant → AR_L (lower 8 bits)	Constant (0~FF)	2	↕	●	●	●
	FUN 60	BLOAD	Load byte immediate	I/O → AR_L (lower 8 bits)	WX, WY, WM, T/C100~295	2	↕	●	●	●
Out	FUN 21	OUTW	Word out	AR → I/O	WY, WM, T/C100~295	2	●	●	●	●
	FUN 22	OUTB	Out bit	AR → I/O	VY, VM	2	●	●	●	●
	FUN 71	BOUT	Out byte	AR_L → I/O (lower 8 bits)	WY, WM, T/C100~295	2	●	●	●	●
Addition	FUN 1	ADDI	ADD immediate	AR B+ constant → AR	Constant (0000H~9999H)	2	↕	●	↕	●
	FUN 11	ADD	BCD ADD	AR B+ I/O → AR	WX, WY, WM, T/C100~295	2	↕	●	↕	●
	FUN 51	ABYTI	ADD BIN immediate	AR + constant → AR	Constant (0~FFFF)	2	↕	●	↕	●
	FUN 61	ADBNR	ADD BIN	AR + I/O → AR	WX, WY, WM, T/C100~295	2	↕	●	↕	●
Subtraction	FUN 2	SUBI	SUB immediate	AR B– constant → AR	Constant (0000H~9999H)	2	↕	●	↕	●
	FUN 12	SUB	BCD SUB	AR B– I/O → AR	WX, WY, WM, T/C100~295	2	↕	●	↕	●
	FUN 52	SBYTI	SUB BIN immediate	AR – constant → AR	Constant (0~FFFF)	2	↕	●	↕	●
	FUN 62	SUBNR	SUB BIN	AR – I/O → AR	WX, WY, WM, T/C100~295	2	↕	●	↕	●
Multiplication	FUN 3	MULI	MUL immediate	AR B* constant → AR	Constant (0000H~9999H)	2	↕	●	↕	●
	FUN 13	MUL	BCD MUL	AR B* I/O → AR	WX, WY, WM, T/C100~295	2	↕	●	↕	●
	FUN 53	MBYTI	MUL BIN immediate	AR* constant → AR	Constant (0~FFFF)	2	↕	↕	↕	●
	FUN 63	MUBNR	MUL BIN	AR* I/O → AR	WX, WY, WM, T/C100~295	2	↕	↕	↕	●

Kind	Instruction	Symbol	Name	Function	Object	No. of words	Change in register			
							AR	ER	CR	Acc
Division	FUN 4	DIVI	DIV immediate	AR B/constant → AR	Constant (0000H~9999H)	2	↕	•	↕	•
	FUN 14	DIV	BCD DIV	AR B/I/O → AR	WX, WY, WM, T/C100~295	2	↕	•	↕	•
	FUN 54	DBYTI	DIV BNR immediate	AR/constant → AR	Constant (0~FFFF)	2	↕	↕	↕	•
	FUN 64	DIBNR	DIV BNR	AR/I/O → AR	WX, WY, WM, T/C100~295	2	↕	↕	↕	•
Logic	FUN 5	ANDI	AND immediate	AR AND constant → AR	Constant (0000H~9999H)	2	↕	•	•	•
	FUN 15	AND	Word AND	AR AND I/O → AR	WX, WY, WM, T/C100~295	2	↕	•	•	•
	FUN 55	BANDI	AND byte immediate	AR_L AND I/O → AR_L	WX, WY, WM, T/C100~295	2	↕	•	•	•
	FUN 6	ORI	OR immediate	AR OR constant → AR	Constant (0000H~9999H)	2	↕	•	•	•
	FUN 16	OR	Word OR	AR OR I/O → AR	WX, WY, WM, T/C100~295	2	↕	•	•	•
	FUN 56	BORI	OR byte immediate	AR_L OR I/O → AR_L	WX, WY, WM, T/C100~295	2	↕	•	•	•
	FUN 66	EXOR	Exclusive OR	AR EOR I/O → AR	WX, WY, WM, T/C100~295	2	↕	•	•	•
	FUN 85	WNOT	Word not	$\overline{AR}$ → AR	None	1	↕	•	•	•
Compare	FUN 7	CPEHI	CPEH immediate	AR ≧ constant 1 → C	Constant (0000H~9999H)	2	•	•	↕	•
	FUN 17	CPEH	CMP equal high	AR ≧ I/O 1 → C	WX, WY, WM, T/C100~295	2	•	•	↕	•
	FUN 57	BCPHI	CPH byte immediate	AR_L ≧ constant 1 → C	Constant (00~FF)	2	•	•	↕	•
	FUN 8	CPEI	CPE immediate	AR = constant 1 → C	Constant (0000H~9999H)	2	•	•	↕	•
	FUN 18	CPE	CMP equal	AR = I/O 1 → C	WX, WY, WM, T/C100~295	2	•	•	↕	•
	FUN 58	BCPEI	CPE byte immediate	AR_L = constant 1 → C	Constant (00~FF)	2	•	•	↕	•
	FUN 9	CPLI	CPL immediate	AR < constant 1 → C	Constant (0000H~9999H)	2	•	•	↕	•
	FUN 19	CPL	CMP low	AR < constant I/O 1 → C	WX, WY, WM, T/C100~295	2	•	•	↕	•
	FUN 59	BCPLI	CPL byte immediate	AR_L < constant 1 → C	Constant (00~FF)	2	•	•	↕	•
Carry	FUN 23	OUC	OUT carry	C → I/O	Y, M	1	•	•	•	•
	FUN 83	CLC	Clear carry	C ← "0"	None	1	•	•	0	•
	FUN 84	SEC	SET carry	C ← "1"	None	1	•	•	1	•
Conversion	FUN 24	BCD	BCD conversion	BCD conversion	None	1	↕	•	↕	•
	FUN 25	BNR	BIN conversion	BIN conversion	None	1	↕	•	↕	•
	FUN 74	SEG	Segment	Decodes AR_{LL} to segments	None	1	↕	•	•	•
	FUN 75	ASC	ASCII	Converts AR_{LL} to ASCII code	None	1	↕	•	•	•
	FUN 78	ENCOD	Encode	16 to 4	None	1	↕	•	↕	•
	FUN 79	DECOD	Decode	4 to 16	None	1	↕	•	↕	•
Shift	FUN 26	LSFR	Left shift	Shifts to left	None	1	↕	•	↕	•
	FUN 27	RSFR	Right shift	Shifts to right	None	1	↕	•	↕	•
	FUN 76	ROL	Roll left	Rotates to left	None	1	↕	•	↕	•
	FUN 77	ROR	Roll right	Rotates to right	None	1	↕	•	↕	•

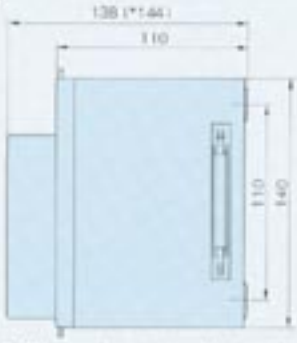
Kind	Instruction	Symbol	Name	Function	Object	No. of words	Change in register			
							AR	ER	CR	Acc
Mask	FUN 72	MASKL	Mask left	Masks AR by the specified bits from the left	None	2	↕	●	●	●
	FUN 73	MASKR	Mask right	Masks AR by the specified bits from the right	None	2	↕	●	●	●
Exchange	FUN 80	SWAP	Swap	$AR_H \rightleftarrows AR_L$	None	1	↕	●	●	●
	FUN 81	BSWAP	Swap byte	$AR_{LH} \rightleftarrows AR_{LL}$	None	1	↕	●	●	●
	FUN 82	XCG	Exchange	$AR \rightleftarrows ER$	None	1	↕	↕	●	●
Extract	FUN 48	EX	Extract		None	1	↕	●	●	●
Distribute	FUN 49	DB	Distribute		None	1	●	●	●	●
Refresh	FUN 91	REFX	Refresh input	Refreshes the specified input	X	1	●	●	●	●
	FUN 92	REFX	Refresh output	Refreshes the specified output	Y	1	●	●	●	●
Interrupt	FUN 93	INT	Interrupt	Argument 2 / Constant interruption by 10ms	Argument 2	2				
	FUN 94	RTI	Return interrupt	Returns from interrupt	None	1	Value before the interruption			
	*(Note2) FUN 97	MODE	Mode	Sets external interrupt function	Argument 11 or 12	2	●	●	●	●
Subroutine	FUN 42	CALL	Call subroutine	Calls subroutine	Argument 0~63					
	FUN 43	SB	Subroutine	Defines subroutine	Argument 0~63					
	FUN 44	RTS	Return subroutine	Returns subroutine	None					

(Note 2) FUN 97 is reserved for the future enhancement.

Dimensions

EM-II

■ **Basic system and expansion system**

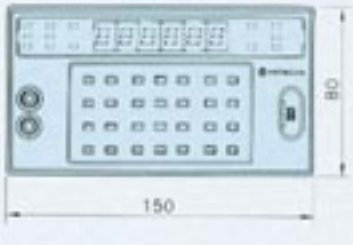


Model	L_1 (mm)	L_2 (mm)	Weight (kg)
BSM-3A	160	80	0.6
BSM-4A	195	120	0.7
BSM-5A	230	160	0.8
BSM-6A	265	200	0.9
BSM-7A	300	240	1.0
BSM-9B	370	310	1.3

* When using removable terminal type module

Programmer

■ **Standard programmer (PGMJ)**



■ **Universal programmer (PGMJ-R2)**

EM-II Component List

Item	Model	Specifications	
CPU module	CPM-E2	Without memory	
	CPM-E3	Without memory, with RS232C interface and real time clock	
Memory pack	MPM-1E	925-word EEPROM	
	MPM-2E	3,997-word EEPROM	
	MPM-2R	3,997-word EPROM	
Power supply module	PSM-A	Selectable between 85 ~ 132 V AC and 170 ~ 264 V AC, output current 1 A 5 V DC	
	PSM-A2	Wide range 85 ~ 264 V AC, output current 1A 5 V DC	
	PSM-B	Selectable between 85 ~ 132 V AC and 170 ~ 264 V AC, output current 1.7 A 5 V DC	
	PSM-D	Power source voltage 24 V DC	
Rack unit	BSM-3A	3 slots (The unit permits use of 2 slots in addition to power supply and CPU modules)	
	BSM-4A	4 slots (The basic unit permits use of 3 slots in addition to power supply and CPU modules)	
	BSM-5A	5 slots (The basic unit permits use of 4 slots in addition to power supply and CPU modules)	
	BSM-6A	6 slots (The basic unit permits use of 5 slots in addition to power supply and CPU modules)	
	BSM-7A	7 slots (The basic unit permits use of 6 slots in addition to power supply and CPU modules)	
	BSM-9B	9 slots (The basic module permits use of 8 slots in addition to power supply and CPU modules)	
Input module	PIM-D(P)	DC input 8 points PIM-D ... source type (negative logic), PIM-DP(H ... sink type (positive logic)	
	PIM-A	AC input 8 points	
	PIM-D(P)H	DC input 16 points PIM-DH ... source type (negative logic), PIM-DPH ... sink type (positive logic)	
	PIM-D(P)W	DC input 16 points, removable terminal type PIM-DW ... source type (negative logic), PIM-DPW ... sink type (positive logic)	
	PIM-AH	AC input 16 points	
	PIM-AW	AC input 16 points, removable terminal type	
	PIM-DM	DC input 32 points (connector type)	
Output module	POM-R	Relay output 8 points	
	POM-S	Triac output 8 points	
	POM-T(P)	Transistor output 8 points POM-T ... sink type (negative logic), POM-TP ... source type (positive logic)	
	POM-RH	Relay output 16 points	
	POM-SH	Triac output 16 points	
	POM-T(P)H	Transistor output 16 points POM-TH ... sink type (negative logic), POM-TPH ... source type (positive logic)	
	POM-RW	Relay output 16 points, removable terminal type	
	POM-SW	Triac output 16 points, removable terminal type	
	POM-T(P)W	Transistor output 16 points, removable terminal type POM-TW ... sink type (negative logic), POM-TPW ... source type (positive logic)	
	POM-RC	Isolated relay output 8 points	
	POM-TM	Transistor output 32 points (connector type)	
Analog module	AGM-I(V)1	Analog input 8 points (8 bits) AGM-I ... current type, AGM-IV ... voltage type	
	AGM-IV2	Analog input 8 points (12 bits), current/voltage selectable	
	AGM-O(V)1	Analog output 4 points (8 bits) AGM-O ... current type, AGM-OV ... voltage type	
	AGM-OD(V)	Analog output 2 points (8 bits) AGM-OD ... current type, AGM-ODV ... voltage type	
I/O mixed module	PHM-DT	DC input 8 points, source (negative logic) Transistor output 8 points, sink (negative logic)	
	PHM-DTW	DC input 8 points, Transistor output 8 points, source (negative logic) Removable terminal type, sink (negative logic)	
	PHM-TT	TTL input 16 points TTL output 16 points	
Counter module	CTM	2 phase input pulse 10 kHz Count 16 bits	
Thermo coupler module	THM	Thermo coupler input, 8 points −210 to 760°C/−270 to 1,372°C/−270 to 400°C selectable	
CPU linkage module	IOLM-T	For CPU linkage	
Remote I/O module	RIOM-TM	For remote I/O (master station)	
	RIOM-TL	For remote I/O (local station)	
Expansion cable	CNM-01	Cable for connecting expansion unit	0.1 m
	CNM-06	Cable for connecting expansion unit	0.6 m
Extension cable	CNE-06	Cable for programmer extension	0.6 m
	CNE-10		1 m
	CNE-15		1.5 m
Cover	CVM	Cover for unoccupied slot	
Peripheral equipment: Programmer	PGMJ	With audio cassette tape recorder interface	
Peripheral equipment: Universal programmer	PGMJ-R2	With audio cassette tape recorder interface, ROM writer function, RS232C interface	
Peripheral equipment: Portable graphic programmer	PGM-GPE2	Ladder circuit programming with wide LCD screen	
Peripheral equipment: Software package for personal computer programming	ACTSIP-E ACTGRAPH+E	ACTSIP-E (ladder), ACTGRAPH+E (grafcet)/Software for IBM PC or compatible PC, sold by ACTRON AB	
	EILEM PROGRAMMER	Software for IMB compatible PC, sold by LOGITEK	
Peripheral equipment: Programmer mount	PAM-E	Programmer mounting adapter (for PGMJ, PGMJ-R2)	
DIN rail adapter	DRM-35	35 mm DIN rail adapter	

(Alteration reserved.)

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Printed in Japan (H) **SI-E092Q** 0997