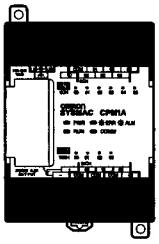
Contents

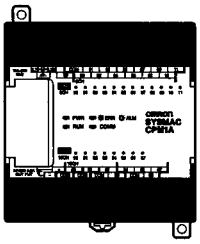
System Configuration

■ CPM1A Line-up

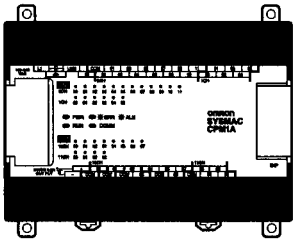
CPU with AC Power Supply • DC input • RY output



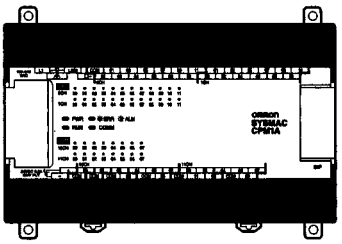
10 I/O points
(Expansion
not possible)



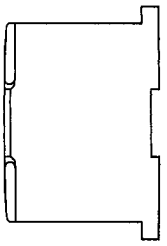
20 I/O points
(Expansion
not possible)



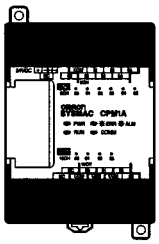
30 I/O points



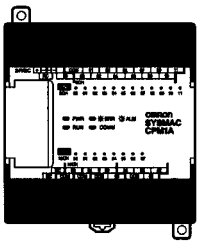
40 I/O points



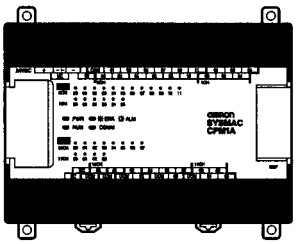
CPU with DC Power Supply • DC input • RY output / TR output (Only DC power supply can be used with TR-output type.)



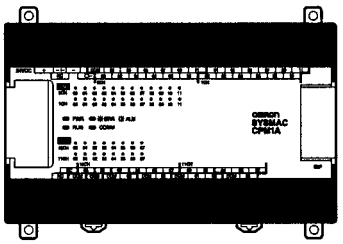
10 I/O points
(Expansion
not possible)



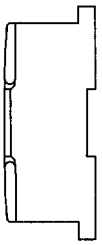
20 I/O points
(Expansion
not possible)



30 I/O points

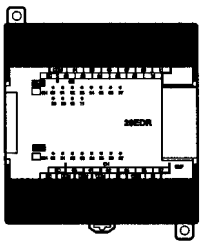


40 I/O points



Expansion I/O Unit

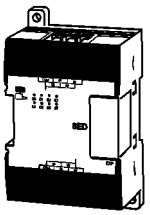
- DC input
- RY output / TR output



20 I/O points

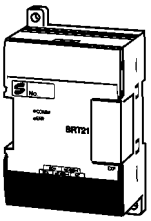
Expansion I/O Unit

- DC input
- RY output / TR output



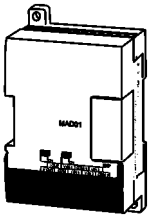
CompoBus/S I/O Unit

CPM1A-SRT21

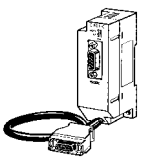


Analog I/O Unit

CPM1A-MAD01

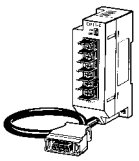


RS-232C Adapter



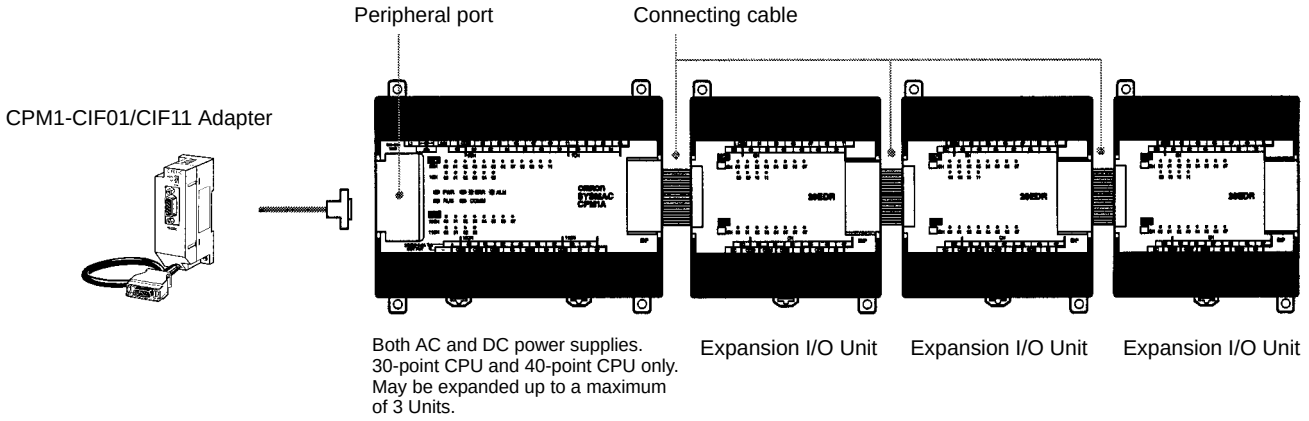
CPM1-CIF01

RS-422 Adapter

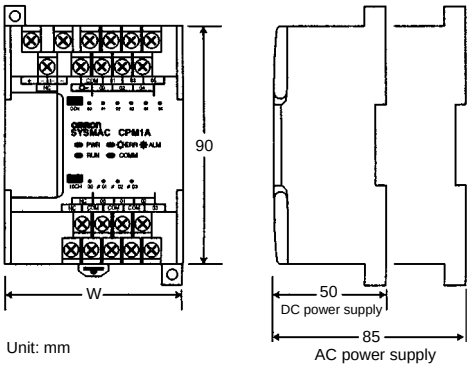


CPM1-CIF11

■ CPM1A System Configuration

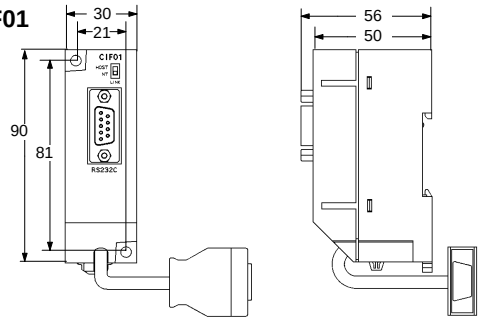


■ External Dimensions

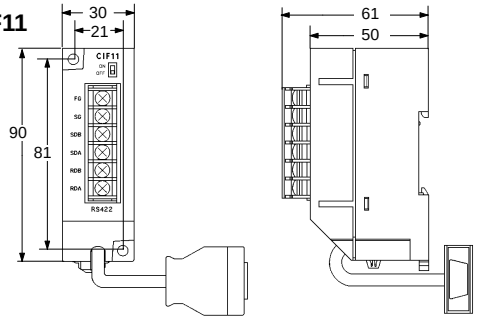


Unit: mm

CPM1-CIF01



CPM1-CIF11



Model	W (mm)
CPM1A-10CD□-A/D	66
CPM1A-20CD□-A/D	86
CPM1A-30CD□-A/D	130
CPM1A-40CD□-A/D	150
CPM1A-20ED□	86 (depth: 50 mm)
CPM1A-8E□/SRT21	66 (depth: 50 mm)
CPM1A-MAD01	66 (depth: 50 mm)

Specifications

■ General Specifications

Item		10-point I/O	20-point I/O	30-point I/O	40-point I/O
Power supply voltage/ frequency	AC power supply	100 to 240 VAC, 50/60 Hz			
	DC power supply	24 VDC			
Operating voltage range	AC power supply	85 to 264 VAC			
	DC power supply	20.4 to 26.4 VDC			
Power consumption	AC power supply	30 VAC max.		60 VAC max.	
	DC power supply	6 W max.		20 W max.	
Inrush current		30 A max.		60 A max.	
External power supply (AC only)	Power supply voltage	24 VDC			
	Power supply output capacity	200 mA		300 mA	
Insulation resistance		20 MΩ min. at 500 VDC between the AC terminals and the protective earth terminal.			
Dielectric strength		2,300 VAC at 50/60 Hz for one minute with a leakage current of 10 mA max. between all the external AC terminals and the protective earth terminal.			
Noise resistance		1,500 V (peak to peak) with a pulse width of 0.1 to 1 μs, and 1-ns rise time pulse (tested with a noise simulator)			
Vibration resistance		10 to 57 Hz with an amplitude of 0.075 mm, and 57 to 150 Hz with an acceleration of 9.8 m/s^2 in the X, Y, and Z directions for 80 minutes each (i.e. swept for 8 minutes, 10 times).			
Shock resistance		147 m/s^2 in the X, Y and Z directions 3 times each.			
Ambient temperature (operating)		0° to 55°C			
Ambient humidity (operating)		10% to 90% (no condensation)			
Ambient environment (operating)		With no corrosive gas			
Ambient temperature (storage)		–20° to 75°C			
Terminal screw size		M3			
Power supply holding time		10 ms min. for AC models, and 2 ms min. for DC models			
Weight		AC model: 400 g max. DC model: 300 g max.	AC model: 500 g max. DC model: 400 g max.	AC model: 600 g max. DC model: 500 g max.	AC model: 700 g max. DC model: 600 g max.

Note: 1. The specifications of the Expansion I/O Unit are the same as for the CPU except that the power is supplied from the CPU and the weight is 300 g.

2. TR output is only available to CPUs with DC power supply.

■ Performance Specifications

Item		10-point I/O	20-point I/O	30-point I/O	40-point I/O
Control method		Stored program method			
I/O control method		Combination of the cyclic scan and immediate refresh processing methods.			
Programming language		Ladder diagram			
Instruction word		1 step per instruction, 1 to 5 words per instruction			
Types of instructions	Basic instructions	14 types			
	Special instructions	79 types, 139 instructions			
Instruction execution time	Basic instructions	0.72 to 16.2 μs			
	Special instructions	MOV instruction = 16.3 μs			
Program capacity		2,048 words			
Maximum I/O points	CPU only	10 points (6 input/ 4 output points)	20 points (12 input/ 8 output points)	30 points (18 input/ 12 output points)	40 points (24 input/ 16 output points)
	With Expansion I/O Unit	---	---	90 points (54 input/ 36 output points)	100 points (60 input/ 40 output points)
Input bits		00000 to 00915 (Words 0 to 9)			
Output bits		01000 to 01915 (Words 10 to 19)			
Work bits (IR Area)		512: IR 20000 to IR 23115 (IR 200 to IR 231)			
Special bits (SR Area)		384: SR 23200 to SR 25515 (SR 232 to SR 255)			
Temporary bits (TR Area)		8: TR 0 to TR 7			
Holding bits (HR Area)		320: HR 0000 to HR 1915 (HR 00 to HR 19)			
Auxiliary bits (AR Area)		256: AR 0000 to AR 1515 (AR 00 to AR 15)			
Link bits (LR Area)		256: LR 0000 to LR 1515 (LR 00 to LR 15)			
Timers/Counters		128: TIM/CNT 000 to 127 100-ms timer: TIM 000 to TIM 127 10-ms timer: TIM 000 to TIM 127 Decremental counter, reversible counter			
Data memory	Read/Write	1,024 words (DM 0000 to DM 1023)			
	Read only	512 words (DM 6144 to DM 6655)			
Interrupt processing: External interrupt		2 points (Response time of 0.3 ms max.)	4 points (Response time of 0.3 ms max.)		
Memory protection		Maintains the contents of the HR, AR, Counter and Data Memory Areas.			
Memory backup		Flash memory: User program, data memory (Read only) (Non-battery powered storage) Super capacitor: Data memory (Read/Write), holding bits, auxiliary memory bits, counter (20-day storage at an ambient temperature of 25°C)			
Self-diagnostic function		CPU error (watchdog timer), memory errors, I/O bus errors			
Program check		No END instruction programming errors (constantly checked during operation)			
Pulse output		1 point: 2 kHz			
High-speed counter		1 point: Single phase at 5 kHz or two-phase at 2.5 kHz (linear counting method) Incremental mode: 0 to 65535 (16-bit) Decremental mode: –32767 to 32767 (16-bit) 1 point: Single phase at 5 kHz or two-phase at 2.5 kHz (linear counting method) Incremental mode: 0 to 65535 (16-bit) Decremental mode: –32767 to 32767 (16-bit)			
Quick-response inputs		Together with the external interrupt input (minimum pulse width of 0.2 ms)			
Input time constant		Can be set at 1 ms, 2 ms, 4 ms, 8 ms, 16 ms, 32 ms, 64 ms, or 128 ms.			
Analog settings		2 points: (0 to 200)			

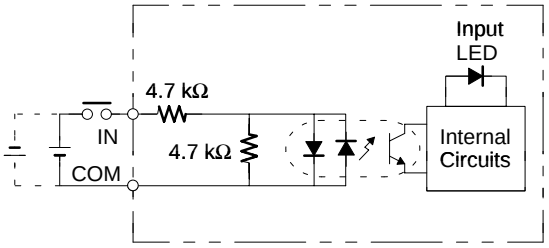
Note: Bits that are not used for the I/O bits can be used as work bits.

Specifications

■ I/O Specifications

Input Circuit

CPU

Item	Specifications	Circuit
Input voltage	24 VDC $^{+10\%}/_{-15\%}$	
Input impedance	IN0000 to IN0002: 2 kΩ Others: 4.7 kΩ	
Input current (typical)	IN0000 to IN0002: 12 mA Others: 5 mA	
ON voltage	14.4 VDC min.	
OFF voltage	5.0 VDC max.	
ON delay (see note 1)	1 to 128 ms max. (default: 8 ms) (see note 1)	
OFF delay (see note 1)	1 to 128 ms max. (default: 8 ms) (see note 1)	

Note The polarity of the input power supply can be either positive or negative.

Note: 1. The actual ON/OFF delay includes an input constant of 1, 2, 4, 8, 16, 32, 64, or 128 ms (default: 8 ms).

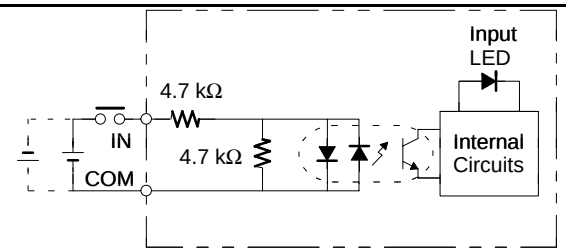
2. The delays for IN0000 to IN0002 are as follows when used for the high-speed counter.

Input	Increment mode	Differential phase mode
IN0000 (A-phase)	5 kHz	2.5 kHz
IN0001 (B-phase)	Normal input	
IN0002 (Z-phase)	ON: 100 μs max. OFF: 500 μs max.	

3. The delays for IN0003 to IN0006 are as follows when used for the high-speed counter.

Delay	0.3 ms max. (From the time of input ON until the interrupt subroutine is executed.)

Expansion I/O Unit

Item	Specifications	Circuit
Input voltage	24 VDC, $^{+10\%}/_{-15\%}$	
Input impedance	4.7 kΩ	
Input current (typical)	5 mA	
ON voltage	14.4 VDC min.	
OFF voltage	5.0 VDC max.	
ON delay	1 to 128 ms max. (default: 8 ms) (see note)	
OFF delay	1 to 128 ms max. (default: 8 ms) (see note)	

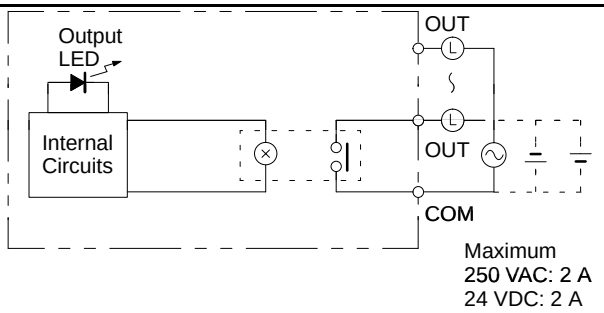
Note The polarity of the input power supply can be either positive or negative.

Note: The actual ON/OFF delay includes an input constant of 1, 2, 4, 8, 16, 32, 64, or 128 ms (default: 8 ms).

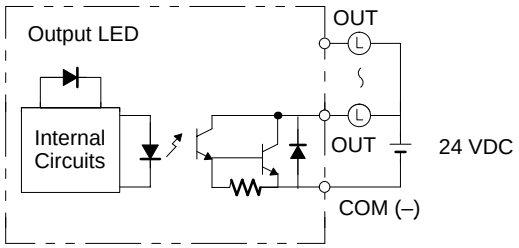
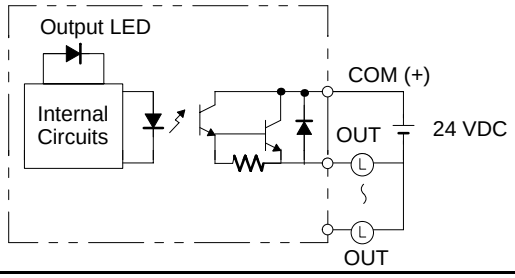
Output Circuit

CPU and Expansion I/O Unit

Relay Output

Item			Specifications	Circuit
Maximum switching capacity			250 VAC/2 A (cos φ =1) 24 VDC/2 A (4 A/common)	
Minimum switching capacity			5 VDC, 10 mA	
Relay service life	Electrical	Resistance load	300,000 times	
		Inductive load	100,000 times	
	Mechanical		10 million times	
ON delay			15 ms max.	
OFF delay			15 ms max.	

Transistor Output (Sink Type/Source Type) (CPU/Expansion I/O Unit)

Item	Specifications	Circuit
Maximum switching capacity	24 VDC $^{+10\%}/_{-15\%}$, 300 mA (see note 1)	**Sink Type** 
Leakage current	0.1 mA max.	
Residual voltage	1.5 V max.	**Source Type** 
ON delay	0.1 ms max.	
OFF delay	1 ms max. (see note 2)	

Note: 1. The maximum switching capacity of the CPM1A with transistor outputs (sink type and source type) are limited to the currents shown in the following table for the common and for the Unit.

Item	10CDT/ 10CDT1-D	20CDT-D/ 20CDT1-D	30CDT-D/ 30CDT1-D	40CDT-D/ 40CDT1-D	20EDT/ 20EDT1	CPM1A-8ET/ 8ET1
Max. switching capacity	0.9 A/Unit	0.9 A/common 1.8 A/Unit	0.9 A/common 2.7 A/Unit	0.9 A/common 3.6 A/Unit	0.9 A/common 1.8 A/Unit	

2. When using the pulse output function of the CPM1A with transistor outputs (sink type and source type):
The output current must be within a range from 100 to 200 mA when using the output 01000 or 01001 as a pulse output with the maximum frequency of 2 kHz. The outputs 01000 and 01001 will vary depending on the output current.

Load current	OFF delay
100 to 200 mA	0.2 ms max.
0 to 300 mA except for the above range	0.5 ms max.

Specifications

■ Analog I/O Unit

Item		Voltage I/O	Current I/O
Analog inputs	Number of inputs	2	
	Input signal range	0 to 10 V or 1 to 5 V	4 to 20 mA
	Maximum rated input	±15 V	±30 mA
	External input impedance	1 MΩ min.	250 Ω rated
	Resolution	1/256	
	Overall precision	1.0% of full scale	
	Converted A/D data	8-bit binary	
Analog output (See note 1.)	Number of outputs	1	
	Output signal range	0 to 10 V or –10 to 10 V	4 to 20 mA
	External output max. current	5 mA	---
	External output allowed load resistance	---	350 Ω
	Resolution	1/256 (1/512 when the output signal range is –10 to 10 V.)	
	Overall precision	1.0% of full scale	
	Data setting	8-bit binary with sign bit	
Conversion time (See note 2.)		10 ms/Unit max.	
Isolation method		Photocoupler isolation between I/O terminals and PC (There is no isolation between the analog I/O signals.)	

Note **1.** The voltage output and current output can be used at the same time, but the total output current cannot exceed 21 mA.

2. The conversion time is the total time for 2 analog inputs and 1 analog output.

■ CompoBus/S I/O Link Unit

Specifications

Item	Specification
Model number	CPM1A-SRT21
Master/Slave	CompoBus/S Slave
Number of I/O bits	8 input bits, 8 output bits
Number of words occupied in CPM1A I/O memory	1 input word, 1 output word (Allocated in the same way as other Expansion Units)
Node number setting	Set using the DIP switch.

Note: See the *CompoBus/S Catalog (Q103)* for more details on CompoBus/S communications.

■ Communications Adapter Specifications

RS-232C Adapter and RS-422 Adapter

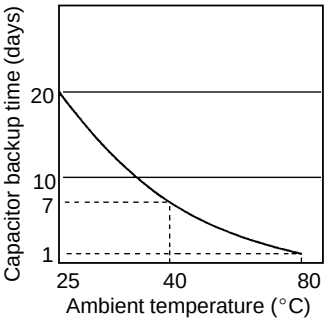
Item	Specifications	
	CPM1-CIF01	CPM1-CIF11
Functions	Level conversion between the CMOS level (CPU side) and the RS-232C (peripheral device side)	Level conversion between the CMOS level (CPU side) and the RS-422 (peripheral device side)
Insulation	The RS-232C (peripheral device side) is insulated by a DC/DC converter and photocoupler.	The RS-422 (peripheral device side) is insulated by a DC/DC converter and photocoupler.
Power supply	Power is supplied by the CPU.	
Power consumption	0.3 A max.	
Transmission speed	38.4 Kbits/s max.	
Vibration resistance	10 to 57 Hz with an amplitude of 0.075 mm, and 57 to 150 Hz with an acceleration of 9.8 m/s^2 in the X, Y and Z directions for 80 minutes each in accordance (i.e. swept for 8 minutes, 10 times).	
Shock resistance	147 m/s^2 in the X, Y and Z directions 3 times each.	
Ambient temperature (operating)	0° to 55°C	
Ambient humidity (operating)	10% to 90% (with no condensation)	
Ambient environment (operating)	With no corrosive gas	
Ambient temperature (storage)	–20° to 75°C	
Weight	200 g max.	

■ Memory Backup

The user program and memory area data in the CPU Unit are backed up by either one of the following methods.

- Flash Memory:
  User program, read-only DM area (DM 6144 to DM 6599), and PC Setup area (DM 6600 to DM 6655).
- Internal Capacitor:
  DM areas other than the above, HR area, AR area, and Counter area.

The capacitor provides backup for a power interruption lasting 20 days at room temperature. If the power is expected to remain OFF for a period exceeding this data backup period, consideration must be given to the design of the system so that no problems will occur when the set values become undefined ones. For further details, refer to *CPM1A Operation Manual (W317)*.

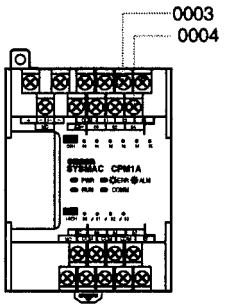


Functions

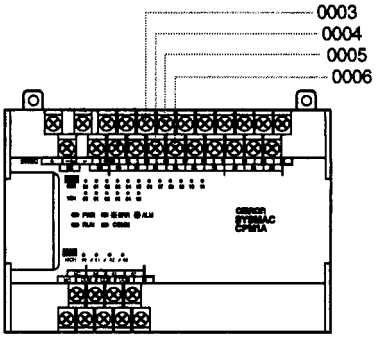
■ Input Interrupts

There are two input interrupts in the CPM1A 10-point I/O CPU and four in the 20-, 30-, and 40-point I/O CPUs. Input interrupts are available in two modes.

10-point I/O CPU



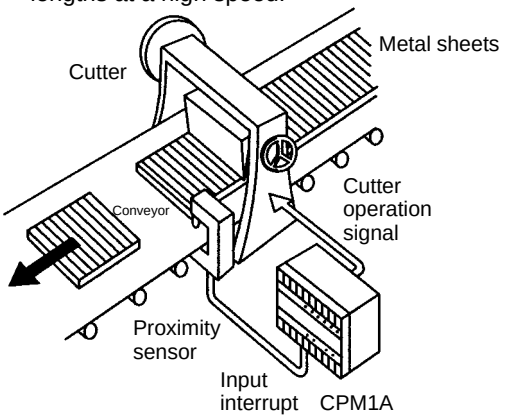
20-, 30-, and 40-point I/O CPU



Application Example:

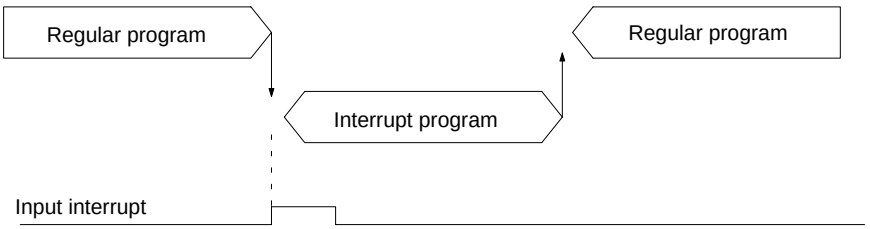
Cutting Metal Sheets to Specified Lengths

The proximity sensor detects the edge of a metal plate to operate the cutter. Metal sheets can be cut continuously to the specified lengths at a high speed.



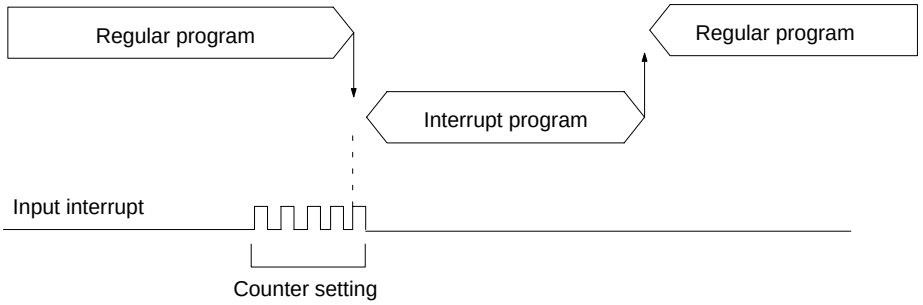
Input Interrupt Mode

If an input interrupt occurs, the regular program shuts down irrelevant of the cycle time, and the interrupt processing program is executed immediately.



Counter Mode

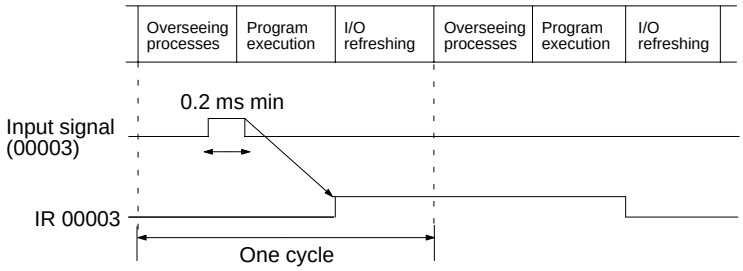
When the number of external signals counted at high speed reaches a specified number of counts, the regular program shuts down, and the interrupt processing program is executed at fixed counts. The count can be set between 0 and 65535.



■ Quick-response Inputs

There are two quick-response inputs for the CPM1A 10-point I/O CPU and four for the 20-, 30-, and 40-point I/O CPU (shared with the interrupt inputs). Since an internal buffer is provided, the quick-response input function can even detect signals modified within one cycle.

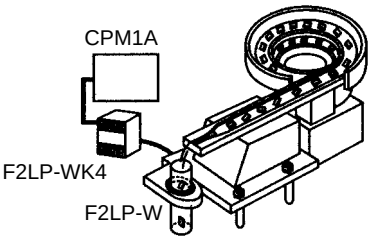
CPU	Input no.	Minimum input pulse width
10-point I/O CPU	00003 to 00004	0.2 ms
20-point, 30-point, 40-point I/O CPU	00003 to 00006	



Application Example:

Calculating the Number of Chips

The metal sensor counts the number of parts that have passed. Steady counting can be achieved even when the input-ON time is short.

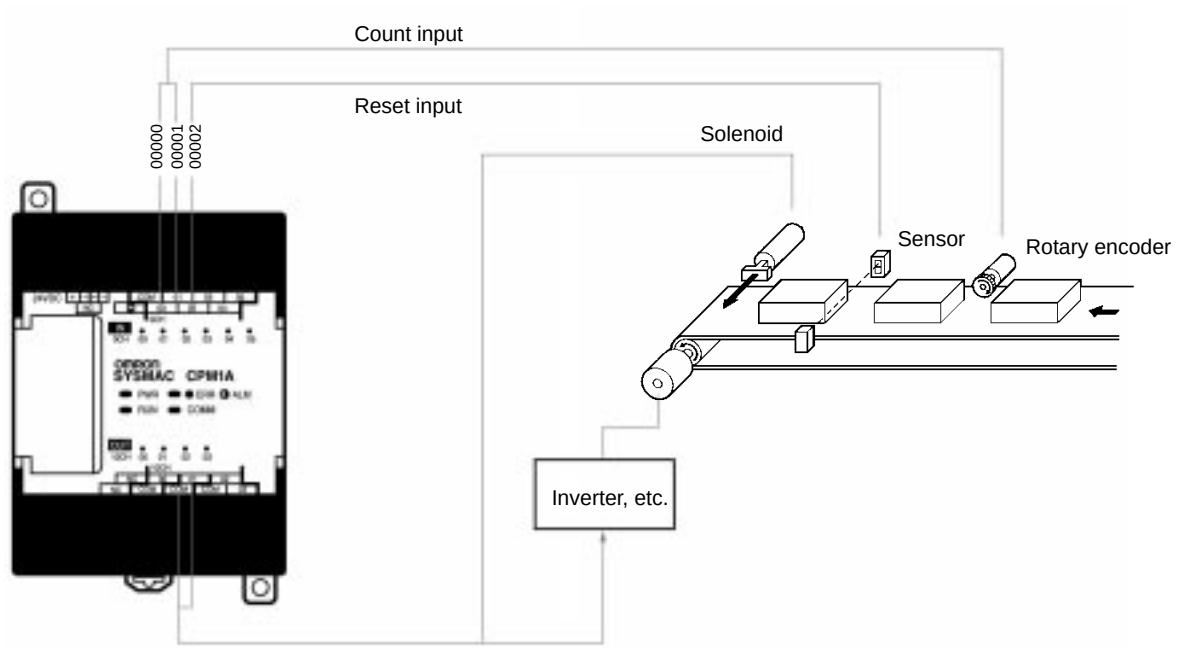


■ High-speed Counter

The CPM1A has a high-speed counter function that can be used in the incrementing and up/down mode. Using this function together with the input interrupts enables zone comparison control or target value control irrelevant of the cycle time.

Item		Incrementing mode	Up/Down mode
Input no.	00000	Count input	A-phase input
	00001	---	B-phase input
	00002	Reset input	Z-phase input
Input method		Single-phase input	Phase-difference, 4× inputs
Count frequency		5.0 kHz	2.5 kHz
Count range		0 to 65535	–32767 to 32767

Note: When using in the incrementing mode, the input 00001 can be used as an input contact.

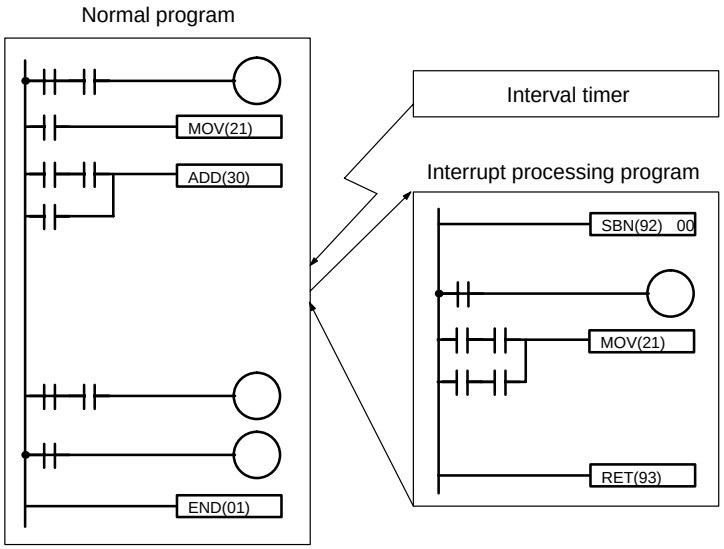


Functions

■ Interval Timer Interrupts

The CPM1A has one interval timer. The interval timer shuts down the regular program irrelevant of the point in the cycle once the time is up, and immediately executes an interrupt processing program. Interval timers are used in the following two modes.

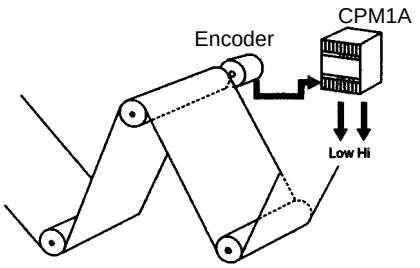
Item	One-shot mode	Scheduled interrupt mode
Operation	An interrupt is executed only once when the time is up.	Interrupts are executed repeatedly at fixed periods.
Setting time	0.5 ms to 319,968 ms (0.1-ms units)	



Application Example:

Computing the Sheet Speed

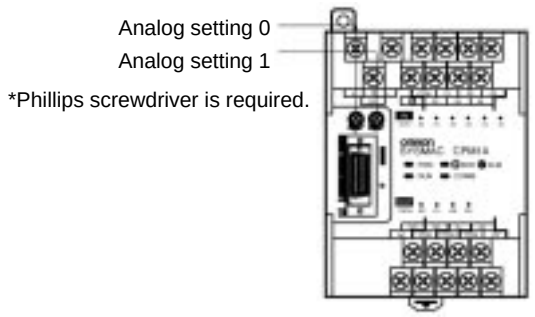
The number of pulse inputs is computed in the interrupt mode at a fixed time to calculate the speed.



■ Analog Setting

The CPM1A contains two analog setting controls that can be used for a broad range of analog timer and counter settings. Turning the setting control stores values of 0 to 200 (BCD data) in the SR area.

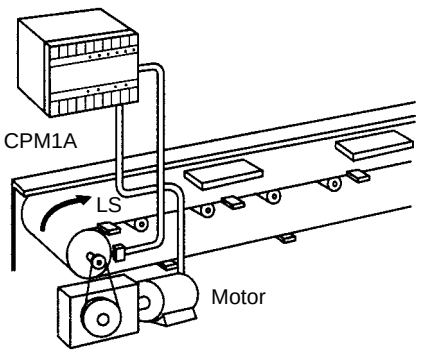
Analog setting	Storage area	Setting value (BCD)
Analog setting 0	SR 250	0000 to 0200
Analog setting 1	SR 251	



Application Example:

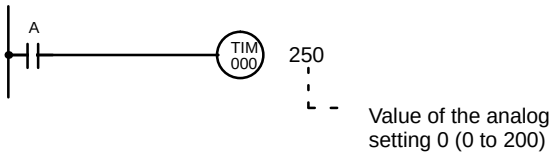
Tact Operation Control of Conveyor Lines

A conveyor can be stopped temporarily as required for assembly processes. When the timer function and limit switches are used in a combination, conveyors can be stopped for a fixed time or can be run at a constant speed for a fixed distance. Fine adjustment of the stopping time can be easily done by using the analog setting controls.

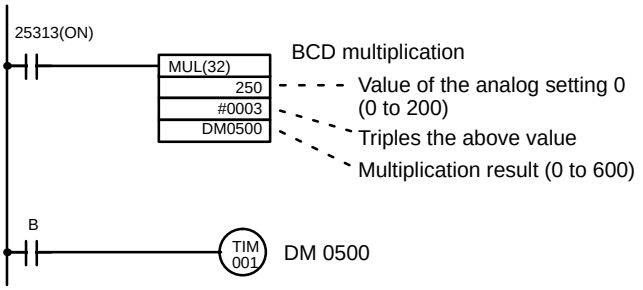


Program Example

1. Analog timer for 0.0 to 20.0 seconds



2. Analog timer for 0.0 to 60.0 seconds



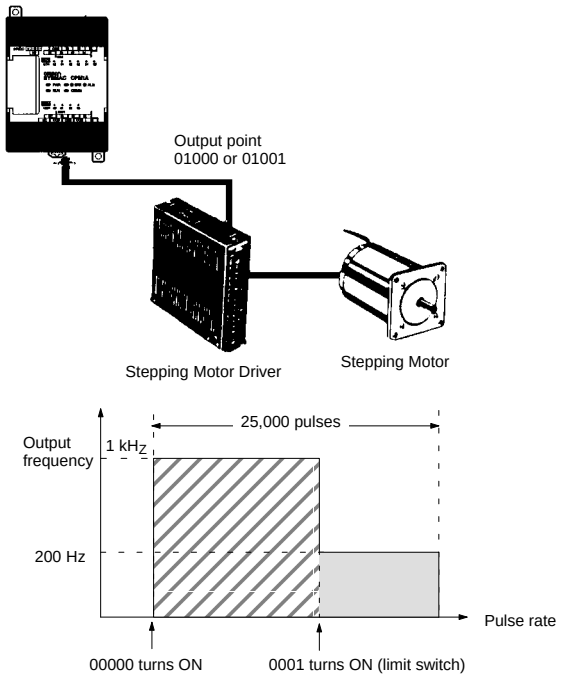
■ Pulse Output Function

The CPM1A with transistor output has a function that is capable of outputting a pulse of up to 2 kHz.

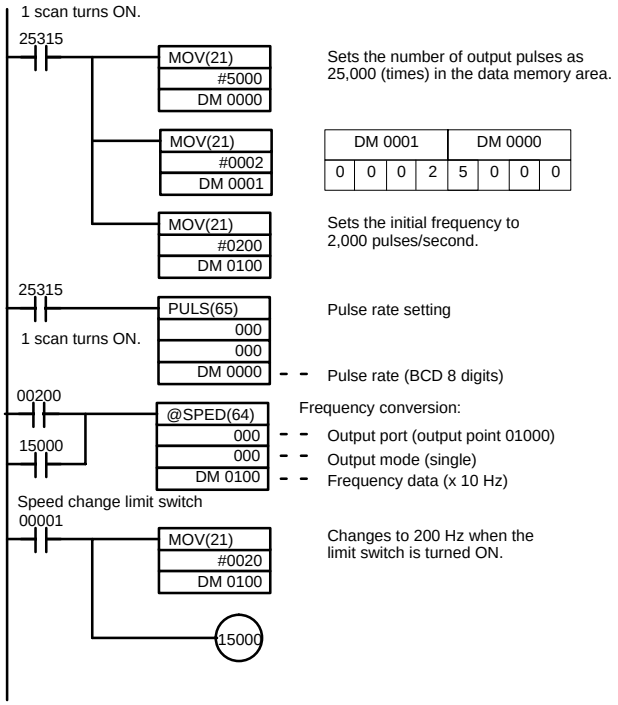
When used in combination with a Stepping Driver or Servodriver, positioning can be easily performed.

Application Example

Changing the speed of the Stepping Motor.



Program Example



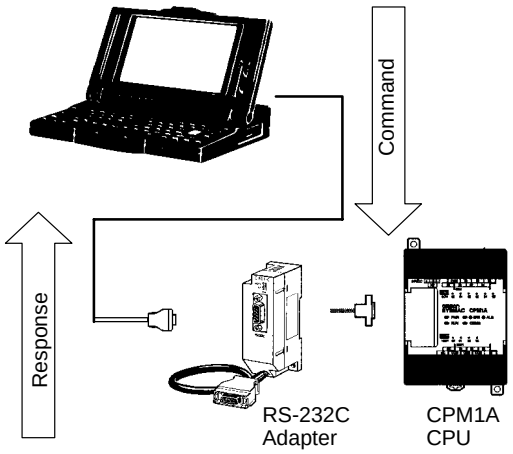
Functions

■ Communications

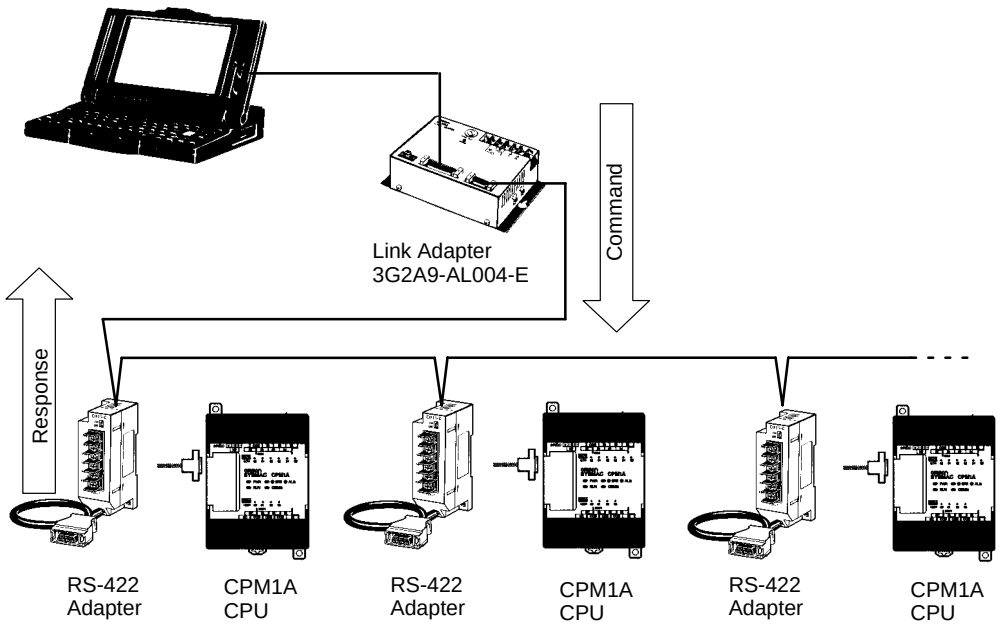
Host Link Communications

CPM1A host link communications consist of interactive procedures whereby the CPM1A returns a response to a command sent from the IBM PC/AT or compatible computer. These communications allow the IBM PC/AT or compatible computer to read and write in the CPM1A's I/O Areas and Data Memory Areas as well as in areas containing the status of various settings.

1:1 Host Link Communications



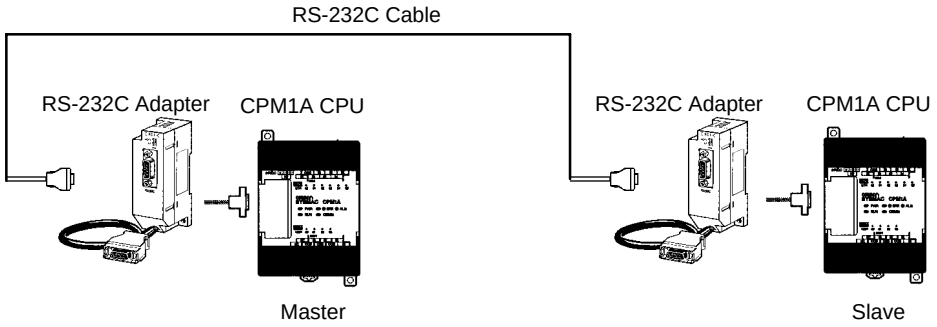
1:n Host Link Communications

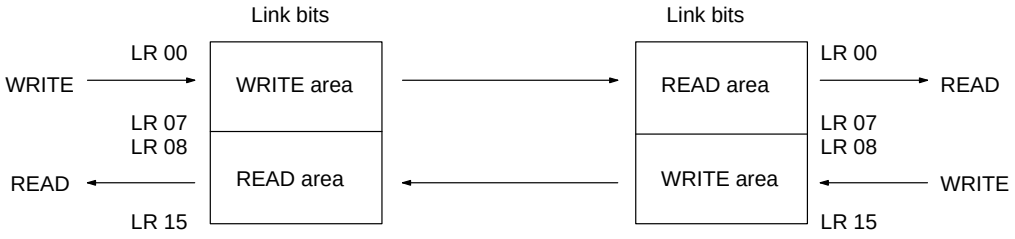


1:1 Links

With a 1:1 link, two CPM1As or a CPM1A and CQM1 or C200H□ are connected 1:1 with one side as the Master and the other as the Slave to provide an I/O link of a maximum of 256 points (LR 0000 to LR 1515).

Example of a 1:1 Link between CPM1As



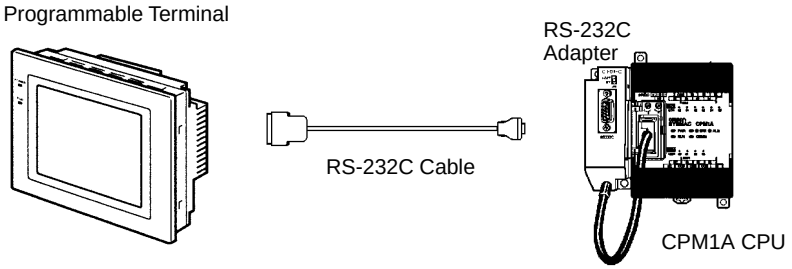


Limitations of the CPM1A 1:1 Link

CPM1A I/O links are limited to 16 words (LR 00 to LR 15). Therefore, use these 16 words (LR 00 to LR 15) on the CQM1 or C200H□ side when forming 1:1 links with a CQM1 or C200H□.

NT Links

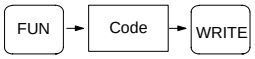
High-speed communications can be achieved by providing a direct access through the use of the NT Link between the CPM1A and Programmable Terminal.



Programming Instructions

Summary of Programming Instructions

■ Function Code Chart

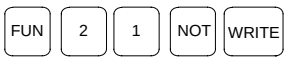
Table symbols	Details	Key operations for specifying programming instructions
○	Allocated to instruction keys on the Programming Console. These need not be specified with function codes.	---
Code	Special instructions specified with function codes.	

■ Differentiated Instructions

Differentiated instructions can sometimes be used for CPM1A special instructions. Instructions marked with (@) in the mnemonics can also be used as differentiated instructions. Here the input rise time (shift from OFF to ON) is used to execute the instruction in just one cycle.

To specify an instruction, press the NOT Key after the function code.

Example: Specifying the @MOV (21) instruction



■ Sequence Instructions

Sequence Input Instructions

Instruction	Mnemonic	Code	Function
LOAD	LD	○	Connects an NO condition to the left bus bar.
LOAD NOT	LD NOT	○	Connects an NC condition to the left bus bar.
AND	AND	○	Connects an NO condition in series with the previous condition.
AND NOT	AND NOT	○	Connects an NC condition in series with the previous condition.
OR	OR	○	Connects an NO condition in parallel with the previous condition.
OR NOT	OR NOT	○	Connects an NC condition in parallel with the previous condition.
AND LOAD	AND LD	○	Connects two instruction blocks in series.
OR LOAD	OR LD	○	Connects two instruction blocks in parallel.

Note: ○: Instruction keys allocated to the Programming Console.

Sequence Output Instructions

Instruction	Mnemonic	Code	Function
OUTPUT	OUT	○	Outputs the result of logic to a bit.
OUT NOT	OUT NOT	○	Reverses and outputs the result of logic to a bit.
SET	SET	○	Force sets (ON) a bit.
RESET	RSET	○	Force resets (OFF) a bit.
KEEP	KEEP	11	Maintains the status of the designated bit.
DIFFERENTIATE UP	DIFU	13	Turns ON a bit for one cycle when the execution condition goes from OFF to ON.
DIFFERENTIATE DOWN	DIFD	14	Turns ON a bit for one cycle when the execution condition goes from ON to OFF.

Note: ○: Instruction keys allocated to the Programming Console.

Sequence Control Instructions

Instruction	Mnemonic	Code	Function
NO OPERATION	NOP	00	---
END	END	01	Required at the end of the program.
INTERLOCK	IL	02	If the execution condition for IL(02) is OFF, all outputs are turned OFF and all timer PVs reset between IL(02) and the next ILC(03).
INTERLOCK CLEAR	ILC	03	ILC(03) indicates the end of an interlock (beginning at IL(02)).
JUMP	JMP	04	If the execution condition for JMP(04) is ON, all instructions between JMP(04) and JME(05) are treated as NOP(00).
JUMP END	JME	05	JME(05) indicates the end of a jump (beginning at JMP(04)).

■ Timer/Counter Instructions

Instruction	Mnemonic	Code	Function
TIMER	TIM	○	An ON-delay (decrementing) timer.
COUNTER	CNT	○	A decrementing counter.
REVERSIBLE COUNTER	CNTR	12	Increases or decreases PV by one.
HIGH-SPEED TIMER	TIMH	15	A high-speed, ON-delay (decrementing) timer.

Note: ○: Instruction keys allocated to the Programming Console.

■ Step Instructions

Instruction	Mnemonic	Code	Function
STEP DEFINE	STEP	08	Defines the start of a new step and resets the previous step when used with a control bit. Defines the end of step execution when used without a control bit.
STEP START	SNXT	09	Starts the execution of the step when used with a control bit.

■ Increment/Decrement Instructions

Instruction	Mnemonic	Code	Function
INCREMENT	(@)INC	38	Increments the BCD content of the specified word by 1.
DECREMENT	(@)DEC	39	Decrements the BCD content of the specified word by 1.

■ BCD/Binary Calculation Instructions

Instruction	Mnemonic	Code	Function
BCD ADD	(@)ADD	30	Adds the content of a word (or a constant).
BCD SUBTRACT	(@)SUB	31	Subtracts the content of a word (or constant) and CY from the content of a word (or constant).
BCD MULTIPLY	(@)MUL	32	Multiplies the contents of two words (or constants).
BCD DIVIDE	(@)DIV	33	Divides the content of a word (or constant) by the content of a word (or constant).
BINARY ADD	(@)ADB	50	Adds the contents of two words (or constants) and CY.
BINARY SUBTRACT	(@)SBB	51	Subtracts the content of a word (or constant) and CY from the content of a word (or constant).
BINARY MULTIPLY	(@)MLB	52	Multiplies the contents of two words (or constants).
BINARY DIVIDE	(@)DVB	53	Divides the content of a word (or constant) by the content of a word and obtains the result and remainder.
DOUBLE BCD ADD	(@)ADDL	54	Add the 8-digit BCD contents of two pairs of words (or constants) and CY.
DOUBLE BCD SUBTRACT	(@)SUBL	55	Subtracts the 8-digit BCD contents of a pair of words (or constants) and CY from the 8-digit BCD contents of a pair of words (or constants).
DOUBLE BCD MULTIPLY	(@)MULL	56	Multiplies the 8-digit BCD contents of two pairs of words (or constants).
DOUBLE BCD DIVIDE	(@)DIVL	57	Divides the 8-digit BCD contents of a pair of words (or constants) by the 8-digit BCD contents of a pair of words (or constants).

■ Data Conversion Instructions

Instruction	Mnemonic	Code	Function
BCD TO BINARY	(@)BIN	23	Converts 4-digit BCD data to 4-digit binary data.
BINARY TO BCD	(@)BCD	24	Converts 4-digit binary data to 4-digit BCD data.
4 TO 16 DECODER	(@)MLPX	76	Takes the hexadecimal value of the specified digit(s) in a word and turns ON the corresponding bit in a word(s).
16 TO 4 DECODER	(@)DMPX	77	Identifies the highest ON bit in the specified word(s) and moves the hexadecimal value(s) corresponding to its location to the specified digit(s) in a word.
ASCII CODE CONVERT	(@)ASC	86	Converts the designated digit(s) of a word into the equivalent 8-bit ASCII code.

Data Comparison Instructions

Instruction	Mnemonic	Code	Function
COMPARE	CMP	20	Compares two four-digit hexadecimal values.
DOUBLE COMPARE	CMPL	60	Compares two eight-digit hexadecimal values.
BLOCK COMPARE	(@)BCMP	68	Judges whether the value of a word is within 16 ranges (defined by lower and upper limits).
TABLE COMPARE	(@)TCMP	85	Compares the value of a word to 16 consecutive words.

Programming Instructions

■ Data Movement Instructions

Instruction	Mnemonic	Code	Function
MOVE	(@)MOV	21	Copies a constant or the content of a word to a word.
MOVE NOT	(@)MVN	22	Copies the complement of a constant or the content of a word to a word.
BLOCK TRANSFER	(@)XFER	70	Copies the content of a block of up to 1,000 consecutive words to a block of consecutive words.
BLOCK SET	(@)BSET	71	Copies the content of a word to a block of consecutive words.
DATA EXCHANGE	(@)XCHG	73	Exchanges the content of two words.
SINGLE WORD DISTRIBUTE	(@)DIST	80	Copies the content of a word to a word (whose address is determined by adding an offset to a word address).
DATA COLLECT	(@)COLL	81	Copies the content of a word (whose address is determined by adding an offset to a word address) to a word.
MOVE BIT	(@)MOVB	82	Copies the specified bit from one word to the specified bit of a word.
MOVE DIGIT	(@)MOVD	83	Copies the specified digits (4-bit units) from a word to the specified digits of a word.

■ Logic Instructions

Instruction	Mnemonic	Code	Function
COMPLEMENT	(@)COM	29	Turns OFF all ON bits and turns ON all OFF bits in the specified word.
LOGICAL AND	(@)ANDW	34	Logically ANDs the corresponding bits of two words (or constants).
LOGICAL OR	(@)ORW	35	Logically ORs the corresponding bits of two words (or constants).
EXCLUSIVE OR	(@)XORW	36	Exclusively ORs the corresponding bits of two words (or constants).
EXCLUSIVE NOR	(@)XNRW	37	Exclusively NORs the corresponding bits of two words (or constants).

■ Shift Instructions

Instruction	Mnemonic	Code	Function
SHIFT REGISTER	SFT	○/10	Copies the specified bit (0 or 1) into the rightmost bit of a shift register and shifts the other bits one bit to the left.
WORD SHIFT	(@)WSFT	16	Creates a multiple-word shift register that shifts data to the left in one-word units.
ASYNCHRONOUS SHIFT REGISTER	(@)ASFT	17	Creates a shift register that exchanges the contents of adjacent words when one is zero and the other is not.
ARITHMETIC SHIFT LEFT	(@)ASL	25	Shifts a 0 into bit 00 of the specified word and shifts the other bits one bit to the left.
ARITHMETIC SHIFT RIGHT	(@)ASR	26	Shifts a 0 into bit 15 of the specified word and shifts the other bits one bit to the right.
ROTATE LEFT	(@)ROL	27	Moves the content of CY into bit 00 of the specified word, shifts the other bits one bit to the left, and moves bit 15 to CY.
ROTATE RIGHT	(@)ROR	28	Moves the content of CY into bit 15 of the specified word, shifts the other bits one bit to the right, and moves bit 00 to CY.
ONE DIGIT SHIFT LEFT	(@)SLD	74	Shifts a 0 into the rightmost digit (4-bit unit) of the shift register and shifts the other digits one digit to the left.
ONE DIGIT SHIFT RIGHT	(@)SRD	75	Shifts a 0 into the leftmost digit (4-bit unit) of the shift register and shifts the other digits one digit to the right.
REVERSIBLE SHIFT REGISTER	(@)SFTR	84	Creates a single or multiple-word shift register that can shift data to the left or right.

Note: ○: Instruction keys allocated to the Programming Console.

■ Special Calculation Instruction

Instruction	Mnemonic	Code	Function
BIT COUNTER	(@)BCNT	67	Counts the total number of bits that are ON in the specified block of words.

■ Subroutine Instructions

Instruction	Mnemonic	Code	Function
SUBROUTINE ENTER	(@)SBS	91	Executes a subroutine in the main program.
SUBROUTINE ENTRY	SBN	92	Marks the beginning of a subroutine program.
SUBROUTINE RETURN	RET	93	Marks the end of a subroutine program.
MACRO	MCRO	99	Calls and executes the specified subroutine, substituting the specified input and output words for the input and output words in the subroutine.

■ Interrupt Control Instructions

Instruction	Mnemonic	Code	Function
INTERVAL TIMER	(@)STIM	69	Controls interval timers used to perform scheduled interrupts.
INTERRUPT CONTROL	(@)INT	89	Performs interrupt control, such as masking and unmasking the interrupt bits for I/O interrupts.

■ Peripheral Device Control Instructions

I/O Unit Instructions

Instruction	Mnemonic	Code	Function
7-SEGMENT DECODER	(@)SDEC	78	Converts the designated digit(s) of a word into an 8-bit, 7-segment display code.
I/O REFRESH	(@)IORF	97	Refreshes the specified I/O word.

Display Instruction

Instruction	Mnemonic	Code	Function
MESSAGE	(@)MSG	46	Reads up to 8 words of ASCII code (16 characters) from memory and displays the message on the Programming Console or other Peripheral Device.

High-speed Counter Control Instructions

Instruction	Mnemonic	Code	Function
MODE CONTROL	(@)INI	61	Starts and stops counter operation, compares and changes counter PVs, and stops pulse output.
PV READ	(@)PRV	62	Reads counter PVs and status data.
COMPARE TABLE LOAD	(@)CTBL	63	Compares counter PVs and generates a direct table or starts operation.

Pulse Output Control Instructions

Instruction	Mnemonic	Code	Function
SPEED OUTPUT	(@)SPED	64	Outputs pulses at the specified frequency. The output frequency can be changed while the pulses are being output.
SET PULSES	(@)PULS	65	Outputs the specified number of pulses at the specified frequency. The pulse output cannot be stopped until the specified number of pulses have been output.

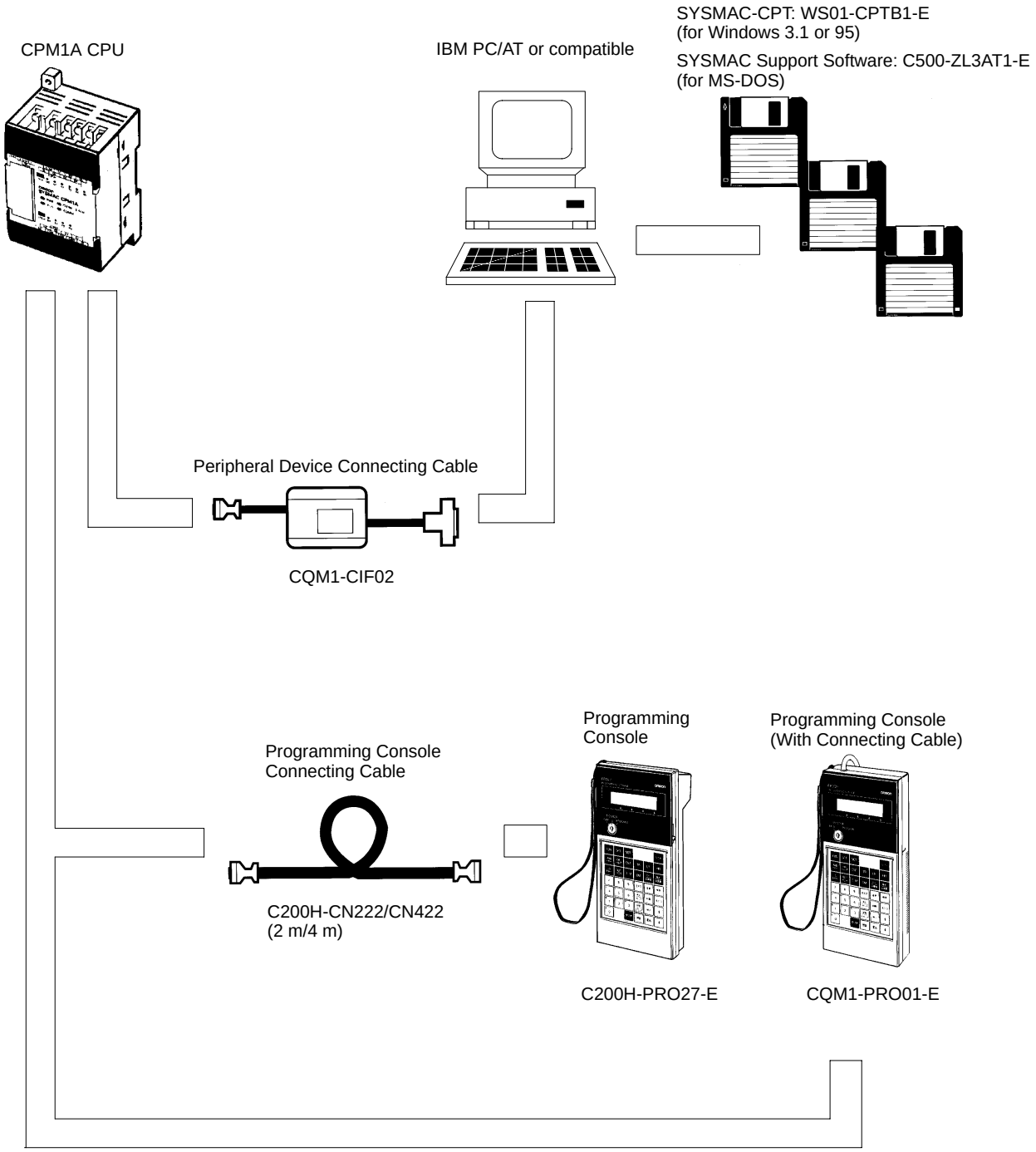
■ Damage Diagnosis Instructions

Instruction	Mnemonic	Code	Function
FAILURE ALARM	(@)FAL	06	Generates a non-fatal error when executed. The Error/Alarm indicator flashes and the CPU continues operating.
SEVERE FAILURE ALARM	FALS	07	Generates a fatal error when executed. The Error/Alarm indicator lights and the CPU stops operating.

■ Special System Instructions

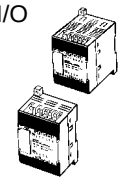
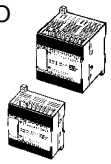
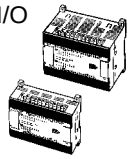
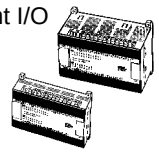
Instruction	Mnemonic	Code	Function
SET CARRY	(@)STC	40	Sets Carry Flag 25504 to 1.
CLEAR CARRY	(@)CLC	41	Sets Carry Flag 25504 to 0.

Peripheral Devices

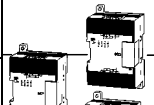
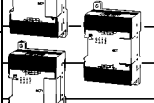
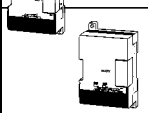


Standard Models

■ CPU

Name	Power supply	Output method	Input points	Output points	Model	Standards
10-point I/O 	AC power supply	Relay output	6 points	4 points	CPM1A-10CDR-A	U, C, N, L
	DC power supply	Relay output			CPM1A-10CDR-D	
		Transistor output (sink type)			CPM1A-10CDT-D	U, C, CE
		Transistor output (source type)			CPM1A-10CDT1-D	
20-point I/O 	AC power supply	Relay output	12 points	8 points	CPM1A-20CDR-A	U, C, N, L
	DC power supply	Relay output			CPM1A-20CDR-D	
		Transistor output (sink type)			CPM1A-20CDT-D	U, C, CE
		Transistor output (source type)			CPM1A-20CDT1-D	
30-point I/O 	AC power supply	Relay output	18 points	12 points	CPM1A-30CDR-A	U, C, N, L
	DC power supply	Relay output			CPM1A-30CDR-D	
		Transistor output (sink type)			CPM1A-30CDT-D	U, C, CE
		Transistor output (source type)			CPM1A-30CDT1-D	
40-point I/O 	AC power supply	Relay output	24 points	16 points	CPM1A-40CDR-A	U, C, N, L
	DC power supply	Relay output			CPM1A-40CDR-D	
		Transistor output (sink type)			CPM1A-40CDT-D	U, C, CE
		Transistor output (source type)			CPM1A-40CDT1-D	

■ Expansion I/O Unit

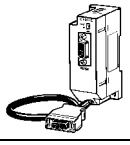
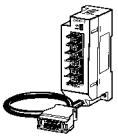
Expansion Unit	Max. number of Units	Output type	Inputs	Outputs	Model	Standards
Expansion I/O Units	3 Units max. (See note.)	Relay	12	8	 CPM1A-20EDR1	U, C, CE
		Transistor (sinking)			CPM1A-20EDT	U, C, CE
		Transistor (sourcing)			CPM1A-20EDT1	U, C, CE
		---	8	---	 CPM1A-8ED	U, C, CE
		Relay	---	8	CPM1A-8ER	U, C, CE
		Transistor (sinking)	---	8	 CPM1A-8ET	U, C, CE
		Transistor (sourcing)			CPM1A-8ET1	
Analog I/O Unit	3 Units max. (See note.)	Analog	2	1	 CPM1A-MAD01	U, C, CE
CompoBus/S I/O Link Unit	3 Units max. (See note.)	---	I/O Link of 8 input bits and 8 output bits		 CPM1A-SRT21	U, C, CE

Note: Only one Expansion Unit can be connected if an NT-AL001 Adapter is connected to the CPU Unit's RS-232C port.

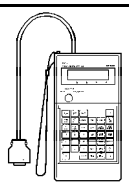
- U: UL, C: CSA, N: NK, L: Lloyd, CE: EC Directives
  Please contact OMRON representative for application conditions.

Standard Models

■ RS-232C Adapter, RS-422 Adapter, Connecting Cable, Link Adapter

Name	Function	Model	Standards
RS-232C Adapter 	Converts peripheral port levels.	CPM1-CIF01	U, C, N, L, CE
RS-422 Adapter 		CPM1-CIF11	
Connecting Cable	3.3-m cable used to connect IBM PC/AT or compatible personal computers.	CQM1-CIF02	U, C, N, L, CE
Link Adapter	Converts RS-232C and RS-422 levels.	3G2A9-AL004-E	---

■ Programming Console

Name	Function	Model	Standards
Programming Console 	With a 2-m cable	CQM1-PRO01-E	U, C, N, CE
	---	C200H-PRO27-E	U, C, CE
	2-m Connecting Cable for C200H-PRO27-E	C200H-CN222	---
	4-m Connecting Cable for C200H-PRO27-E	C200H-CN422	---

■ Programming Software

Name	Operating system	Operating environment	Model
SYSMAC-CPT	Windows 3.1 or 95	Used in IBM PC/AT or compatible personal computers (i486DX/Pentium)	WS01-CPTB1-E
SYSMAC Support Software	MS-DOS Ver. 5.0 or later	Used in IBM PC/AT or compatible personal computers (i386/i486/Pentium)	C500-ZL3AT1-E

- U: UL, C: CSA, N: NK, L: Lloyd, CE: EC Directives
  Please contact OMRON representative for application conditions.

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Note: Specifications subject to change without notice.

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