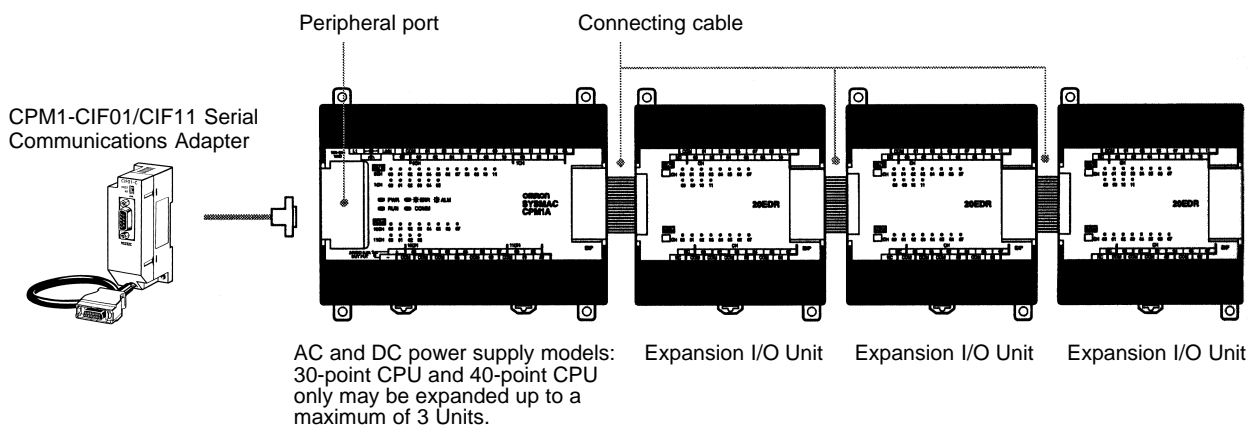# OMRON®

Micro Programmable Controller | CPM1A

The CPM1A series micro controllers solve both basic and semi-complex applications. The brick style models include AC inputs/relay outputs, DC inputs/transistor or relay outputs to meet your design requirements. The base I/O for the CPUs ranges from 10, 20, 30, and 40 I/O points with maximum expansion to 100 I/O. Specialized expansion modules include mixed analog I/O, temperature sensor inputs and serial communications

- 10, 20, 30 and 40 point I/O CPUs

- Expandable up to 100 I/O points

- Peripheral communications port built in

- AC or DC input models

- Analog expansion modules available

- Temperature sensor input expansion modules available

- Auxiliary 24 VDC supply (AC type only)

- Relay or Transistor outputs

- UL, CSA, CE approvals

Basic Configuration

Peripheral port   Connecting cable

CPM1-CIF01/CIF11 Serial Communications Adapter

AC and DC power supply models: 30-point CPU and 40-point CPU only may be expanded up to a maximum of 3 Units.   Expansion I/O Unit   Expansion I/O Unit   Expansion I/O Unit
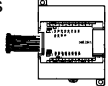
1

Ordering Information

■ CPU UNITS
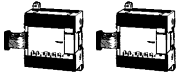
Number of I/O terminals	Inputs	Outputs	Power supply	Part number		
				Relay output	Transistor output	
					Sink type	Source type
10	6 DC points	4 points	AC	**CPM1A-10CDR-A**	CPM1A-10CDT-A	CPM1A-10CDT1-A
			DC	**CPM1A-10CDR-D**	CPM1A-10CDT-D	CPM1A-10CDT1-D
20	12 DC points	8 points	AC	**CPM1A-20CDR-A**	CPM1A-20CDT-A	CPM1A-20CDT1-A
			DC	**CPM1A-20CDR-D**	CPM1A-20CDT-D	CPM1A-20CDT1-D
30	18 DC points	12 points	AC	**CPM1A-30CDR-A**	CPM1A-30CDT-A	CPM1A-30CDT1-A
			DC	**CPM1A-30CDR-D**	CPM1A-30CDT-D	CPM1A-30CDT1-D
40	24 DC points	16 points	AC	**CPM1A-40CDR-A**	CPM1A-40CDT-A	CPM1A-40CDT1-A
			DC	**CPM1A-40CDR-D**	CPM1A-40CDT-D	CPM1A-40CDT1-D
20	12 AC points	8 points	AC	**CPM1A-20CAR-A**	—	—
32	20 AC points	12 points	AC	**CPM1A-32CAR-A**	—	—

■ EXPANSION I/O MODULES

Description	Max. number of modules	Inputs	Outputs	Part number
20 I/O points 12 inputs, 8 outputs	3 max. (See Note.)	24 VDC	Relays	**CPM1A-20EDR**
		24 VDC	Sinking transistors	**CPM1A-20EDT**
		24 VDC	Sourcing transistors	**CPM1A-20EDT1**
8 inputs		24 VDC	—	**CPM1A-8ED**
8 outputs		—	Relays	**CPM1A-8ER**
		—	Sinking transistors	**CPM1A-8ET**
		—	Sourcing transistors	**CPM1A-8ET1**

Note: A maximum of 3 expansion modules can be used with the following CPUs: 30-point and 40-point with DC inputs; 20-point and 32-point with AC inputs.

■ DEDICATED I/O MODULES

Description		Max. number of modules	Inputs	Outputs	Part number
Analog I/O Module 2 analog inputs (2 words) 1 analog output (1 word)		3 max.	2 analog inputs	1 analog output	**CPM1A-MAD01**
Temperature Sensor Input Modules	Thermocouple inputs	3 max.	2 inputs (Types J and K)	—	**CPM1A-TS001**
		1 max. (See Note.)	4 inputs (Types J and K)		**CPM1A-TS002**
	Platinum resistance thermometer inputs	3 max.	2 inputs (Pt100, JPt100)		**CPM1A-TS101**
		3 max.	2 inputs (Pt100, JPt100)	1 analog output	**CPM1A-TS101-DA**
		1 max. (See Note.)	4 inputs (Pt100, JPt100)	—	**CPM1A-TS102**
CompoBus/S I/O Link Module 8 inputs and 8 outputs		3 max.	8 bits (Inputs from the Master.)	8 bits (Outputs to the Master.)	**CPM1A-SRT21**
	Flat cable, 4-core, 0.75 mm^2; 100 m length				**SCA1-4F10**
	Twisted pair cable, 2-core, 0.75 mm^2; available commercially				Belden #9409 cable

Note: Only one CPM1A-TS002/TS102 Temperature Sensor Input Module can be connected to the CPU. If a CPM1A-TS002/102 is connected to the CPU, only one additional Special I/O Module (other than a CPM1A-TS002/102) or one Expansion I/O Module can be connected to the CPU.
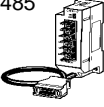
■ PERIPHERAL DEVICES

Product	Description	Part number
Programming console	Hand-held programming console with cable attached, 2 m length	**CQM1-PRO01–E**
	Hand-held programming console with back light (cable not included)	**C200H-PRO27-E**
Connecting cable	Connects C200H programming console to peripheral port, 2 m length	**C200H-CN222**
	Connects C200h programming console to peripheral port, 4 m length	**C200H–CN422**

■ SUPPORT SOFTWARE

Product	Functions	Part number
CX-Programmer Jr.	Windows-based programming software; reduced instruction set and networking commands. OS: Windows 95/98/NT	**WS02-CXPC1-EJR-V2.0**
CX-Programmer	Full programming software package programs micro, small and larger controllers.	**WS02-CXPC1-EV2.0**

■ COMMUNICATIONS ADAPTERS AND CABLES

Description	Function	Part number
RS-232C adapter	Converts data communications from peripheral port for RS-232C devices.	**CPM1-CIF01**
RS-232C cable	RS-232C to RS-232C; PC connection for program download; cable length 2 m	**C200HS-CN220-EU**
	RS-232C to RS-232C for PLC communication; cable length 2 m	**C200H-CN320-EU**
RS-422/RS-485 adapter	Converts data communications from peripheral port for RS-422/RS-485 devices.	**CPM1-CIF11**

■ PROGRAM TRANSFER EQUIPMENT

Product	Description	Part number
Expansion Memory Unit	Uploads and downloads program and setup memory areas to and from the controller.	**CPM1-EMU01-V1**
EEPROM (256 kbits)	Used with the Expansion Memory Unit	**CPM1-EEPROM-EMU01**

■ MANUALS

Product	Description	Part number
Operation manual	CPM1A DC Input CPUs operation manual	**W317**
	CPM1A AC Input CPUs operation manual	**P12FAZ1**
Programming manual	CPM1/CPM1A programming manual	**W353**

Specifications

■ GENERAL SPECIFICATIONS

Input type		DC input				AC input	
CPU type		10-point I/O	20-point I/O	30-point I/O	40-point I/O	20-point I/O	32-point I/O
Power supply voltage/fre-quency	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 VA max.		60 VA max.		30 VA max.	60 VA max.
	DC power supply	6 W max.		20 W max.		—	
Inrush current		30 A max.		60 A max.		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		Conforms to IEC61000-4-4, 2 kV (power lines) 1500 Vp-p, pulse width 0.1 to 1 µs, rise time: 1 ns (via noise simulation)					
Vibration resistance		10 to 61.2 Hz with an amplitude of 0.075 mm, and 57 to 150 Hz with an acceleration of 1.5 G in the X, Y, and Z directions for 10 sweeps of minutes each.					
Shock resistance		147 m/s^2 in the X, Y and Z directions 3 times each.				20 G the X, Y and Z directions 3 times each.	
Ambient temperature	Operating	0°C to 55°C (32°F to 131°F)					
	Storage	–20°C to 75°C (–4°F to 167°F)					
Ambient humidity	Operating	10% to 90% RH no condensation					
Ambient environment	Operating	With no corrosive gas					
Terminal screw size		M3					
Power supply holding time		10 ms min. for AC models, and 2 ms min. for DC models					
Weight	AC models	400 g max.	500 g max..	600 g max..	700 g max.	500 g max.	575 g max.
	DC models	300 g max.	400 g max.	500 g max.	600 g max.	—	—

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

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■ CHARACTERISTICS

Input type	DC input				AC input	
CPU type	10-point I/O	20-point I/O	30-point I/O	40-point I/O	20-point I/O	32-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					
User data memory	1,024 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)	20 points (12 input/ 8 output points)	32 points (20 input/ 12 output points
	With Expansion I/O Module	—	—	Up to 90 points (54 input/ 36 output points)	Up to 100 points (60 input/ 40 output points)	Up to 80 points (48 input/ 32 output points)	Up to 92 points (56 input/ 36 output points)
Memory protection	Maintains the contents of the HR, AR, Counter and Data Memory Areas.					
Memory backup	Flash memory: User program, data memory (Read only) and PLC setup area are backed up without a battery. Super capacitor: Data memory (Read/Write), holding bits, auxiliary memory bits, counter values, error log area are backed up by a capacitor for 20-days 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)					
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.					
Interrupt processing: External interrupt	2 points (Response time of 0.3 ms max.)	4 points (Response time of 0.3 ms max.)			4 points (Response time of 5 ms max.)	
Analog settings	2 points: (0 to 200 BCD)					

■ I/O ALLOCATION

Input bits	00000 to 00915; words not used for input or output bits can be used for work bits.
Output bits	01000 to 01915; words not used for input or output bits can be used for work bits.
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)

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■ I/O SPECIFICATIONS

CPU Unit AC-Input

Item	Specification
Input voltage	120 VAC/DC nominal, range 85 to 132
Input impedance	17 kΩ AC @ 60Hz, 69kΩ DC
Input current	7.2 mA AC, 1.7 mA DC @ 120 V typical for: 　　CPM1A-20CAR-A, Inputs 00 to 11 　　CPM1A-32CAR-A, Ch 0 Inputs 00 to 11 and 　　CPM1A-32CAR-A, Ch 1 Inputs 00 to 03 1.9 mA AC or DC @ 120 V typical for: 　　CPM1A-32CAR-A, Ch 1 Inputs 04 to 07 only
ON voltage	65 VAC/DC
OFF voltage	25 VAC/DC
ON delay	1 to 128 ms max. Default: 8 ms (See Note.)
OFF delay	1 to 128 ms max. Default: 8 ms (See Note.)
Circuit configuration	

Note: Using the PLC Setup, 1, 2, 4, 8, 16, 32, 64, or 128 ms can be selected. When IN00000 through IN00002 are used as high-speed counter inputs, the delays are as shown in the following table. Typically for AC inputs, the delay is set at the default, 8 ms.

Input	Increment mode	Differential phase mode
IN00000 (A-phase)	20 Hz	20 Hz
IN00001 (B-phase)	Normal input	
IN00002 (Z-phase)	ON: 5 ms min.; OFF delay: 5 ms min.	

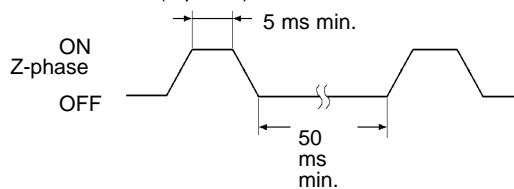The minimum delay is as follows.

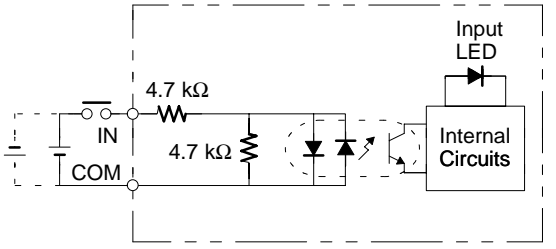**Increment Mode (20 Hz max.)**
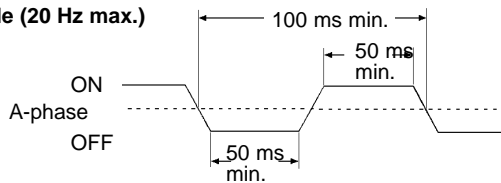
Differential Phase Mode (20 Hz max.)
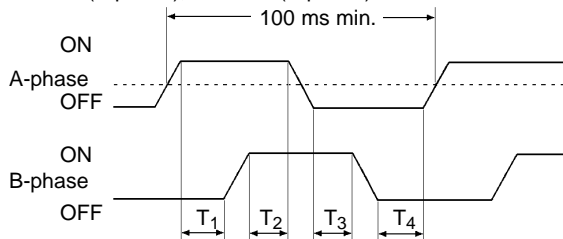
$T_1 T_2 T_3 T_4$: 20 ms min.

When IN00003 through IN00006 are used as interrupt inputs, the delay is 0.3 ms max. The delay is measured from the time that the input goes ON until the interrupt subroutine is executed.
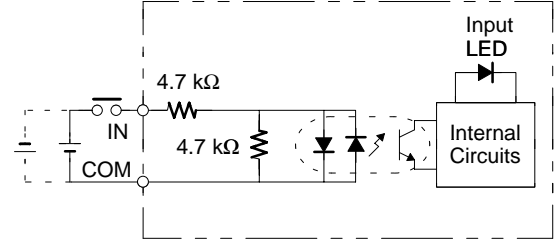
6

CPU Unit DC Input

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. When IN0000 to IN0006 are used for the high-speed counter inputs, the delays are as shown below:

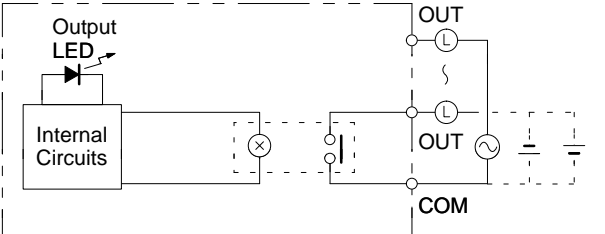| Input	Increment mode	Differential phase mode
IN0000 (A-phase)	5 kHz	2.5 kHz
IN0001 (B-phase)	Normal input	
IN0002 (Z-phase)	ON: 100 µs max. OFF: 500 µs max.	
IN0003 to IN0006	0.3 ms max. (From the time of input ON until the interrupt subroutine is executed.)	

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 SPECIFICATIONS (CPU UNIT AND EXPANSION I/O MODULES)

Relay Output

Item			Specifications	Circuit
Maximum switching capacity			2 A, 250 VAC (cos φ =1) 2 A, 24 VDC (4 A/common)	
Minimum switching capacity			10 mA, 5 VDC	
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.	

Maximum
250 VAC: 2 A
24 VDC: 2 A

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Transistor Output (Sink Type/Source Type)

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

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

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■ ANALOG I/O MODULE

Item		Specification	
Model		CPM1A–MAD01	
I/O type		Voltage	Current
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.

■ TEMPERATURE SENSOR MODULES

By connecting a Temperature Sensor Module (CPM1A-TS001/TS002/TS101/TS101A/TS102) to the CPM1A, inputs can be received from thermocouples or temperature-resistance thermometers. Inputs converted to binary data (4-digit hexadecimal) and stored in the IR area.
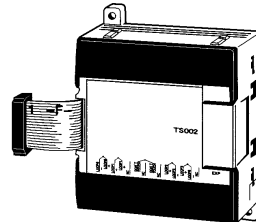
Specifications

Item	Specification		
Model	CPM1A-TS001/TS002	CPM1A-TS101/TS102	CPM1A-TS101-DA
Number of inputs	TS001: 2; TS002: 4	TS101: 2; TS102: 4	2
Input types (See Note 1)	Thermocouple types K or J, selectable	Platinum resistance thermometer types Pt100 and JPt1100, selectable	
Input resolution	0.1°C in 2's complement format	0.1°C in 2's complement format	
Input accuracy	±0.5% or ±2% of the stored value whichever is larger ±1 digit max. (See Note 2)	±0.5% or ±1% of the stored value whichever is larger ±1 digit max. (See Note 2)	1.0% max. full scale
Number of outputs	None	None	1
Output types	—	—	Voltage or current output
Output resolution	—	—	1/256 (0 to 10 V) 1/512 (–10 to +10 V) 1/256 (4 to 20 mA)
Output accuracy	—	—	1.0% max. full scale
Conversion cycle	250 ms for all points		60 ms max. for all points
Converted temperature data	Binary data (4-digit hexadecimal)		Binary data (8-digit hexadecimal)
Isolation method	Photocoupler isolation between I/O terminals and the PLC		

Note: 1. The same input type must be used for all inputs.
　　　 2. Accuracy for K thermocouples at temperatures less than –100°C: ±4°C ± 1 digit max.

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Input Temperature Ranges for CPM1A-TS001/TS002

The rotary switch can be used to make of the following range and input type settings for CPM1A-TS001/002 models.

Thermocouple input	Range (°C)	Range (°F)
Type K	−200 to 1300	−300 to 2300
	0.0 to 500.0	0.0 to 900.0
Type J	−100 to 850	−100 to 1500
	0.0 to 400.0	0.0 to 750.0

Input Temperature Ranges for CPM1A-TS101/TS101DA/TS102

The rotary switch can be used to make of the following range and input type settings for CPM1A-TS101/102 models.

Platinum RTD input	Range (°C)	Range (°F)
Pt100	−200.0 to 650.0	−300 to 1200.0
JPt100	−200.0 to 650.0	−300 to 1200.0

■ COMMUNICATIONS ADAPTER

RS-232C Adapter and RS-422 Adapter

Model		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 1 G in the X, Y and Z directions for 80 minutes each (i.e. for 8 minutes each, 10 times).	
Shock resistance		1.5 G in the X, Y and Z directions 3 times each.	
Ambient temperature	Operating	0°C to 55°C (32°F to 131°F)	0°C to 55°C (32°F to 131°F)
	Storage	−20°C to 75°C (−4°F to 167°F)	−20°C to 75°C (−4°F to 167°F)
Ambient humidity	Operating	10% to 90% RH (with no condensation)	
Ambient environment	Operating	With no corrosive gas	
Weight		200 g max.	

■ COMPOBUS/S I/O LINK MODULE

The CPM1A controller can function as a Slave to a CompoBus/S Master Module (or SRM1 CompoBus/S Master Control Module) when a CPM1A-SRT21 CompoBus/S I/O Link Module is connected. The CompoBus/S I/O Link Module establishes an I/O link of 8 inputs and 8 outputs between the Master Module and the CPM1A. Up to 3 Expansion I/O Modules or Expansion Modules can be connected to a CPM1A CPU Unit.

CompoBus/S Master Module (or SRM1 CompoBus/S Master Control Module)

CPM1A CPU Unit

CPM1A-SRT21 CompoBus/S I/O Link Module

CS1□, C200H□, CQM1 (H), or SRM1 PC

Flat cable SCA1-4F10 or twisted pair Belden #9409 cable

Up to 16 Slaves can be connected. (Up to 8 Slaves with the CQM1-SRM21-V1.)
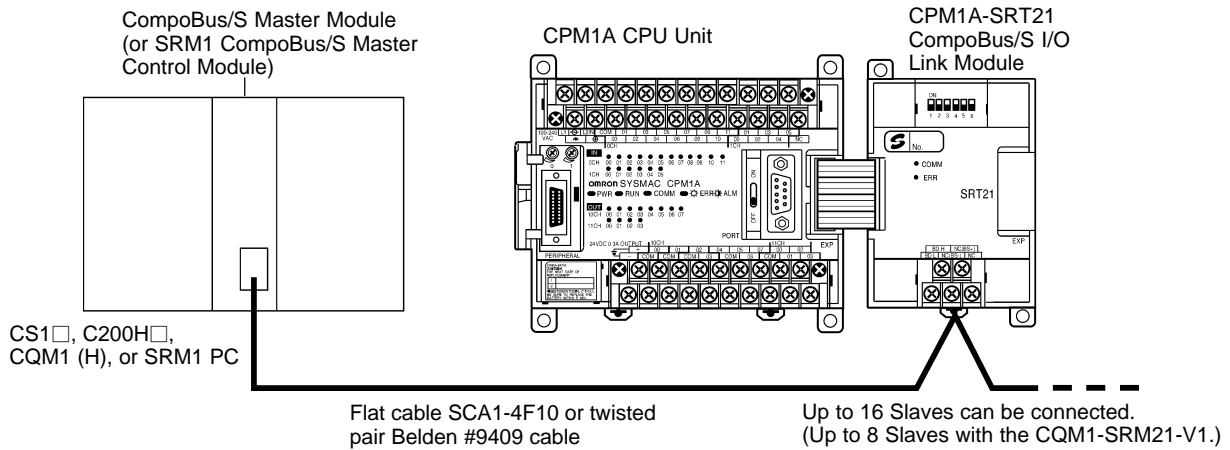
Specifications

Model	CPM1A-SRT21
Master/Slave	CompoBus/S Slave
Number of I/O bits	8 input bits, 8 output bits
Number of words occupied in CPM2A I/O memory	1 input word, 1 output word (Allocated in the same way as other Expansion I/O Modules or Expansion Modules)
Node number setting	Set using the DIP switch.

Note: See the CompoBus/S section of Omron's *Remote I/O and Wiring Solutions Catalog (GC RIO1)* for more details on CompoBus/S communications.

Dimensions ─────────────────────────────

Unit: mm (inch)

■ CPU, EXPANSION I/O AND SPECIAL I/O MODULES

90 (3.54)

W

50 (1.97) DC power supply

85 (3.35) AC power supply
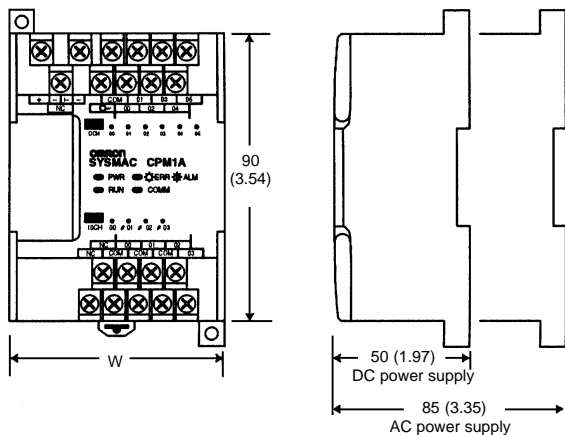
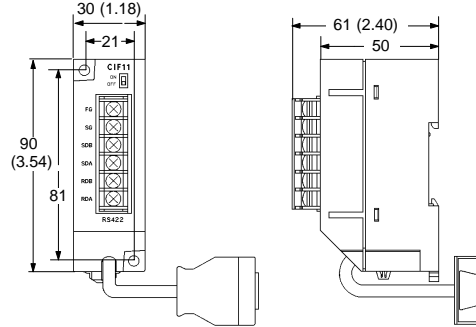| Model	W
CPM1A-10CD□-A/D	66 (2.60)
CPM1A-20CD□-A/D	86 (3.39)
CPM1A-30CD□-A/D	130 (5.12)
CPM1A-40CD□-A/D	150 (5.91)
CPM1A-20CAR-A	130 (51.2)
CPM1A-32CAR-A	150 (5.91)
CPM1A-20ED□	86 (3.39)
CPM1A-8E□	66 (2.60)
CPM1A-SRT21	66 (2.60)
CPM1A-MAD01	66 (2.60)
CPM1A-TS□□□	86 (3.39)

11

Unit: mm (inch)

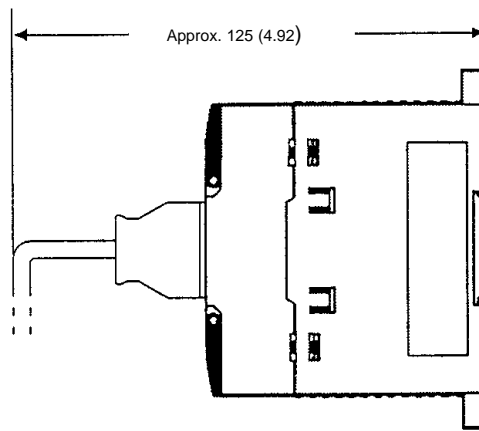### ■ COMMUNICATION ADAPTER MODULES
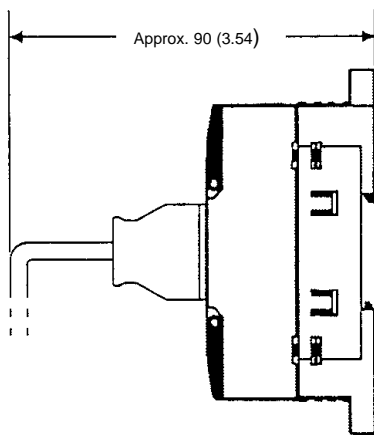
CPM1-CIF01
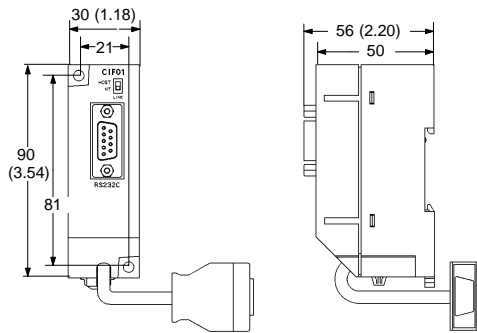
CPM1-CIF11

■ DIMENSIONS WITH PERIPHERAL DEVICES ATTACHED

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Functions

■ CONFIGURATION

The CPM1A CPU units feature a compact, one-piece construction that includes 10, 20, 30 or 40 built-in I/O terminals. Three output models are available: Relay outputs, sinking (NPN) transistor output and sourcing (PNP) transistor output.

Expansion

Up to three Expansion I/O Modules can be connected to a 30-point or 40-point CPU Unit to add an extra 8 or 20 I/O points for each, for a maximum of up to 100 I/O points.

Dedicated I/O Modules

Up to 3 Analog I/O Modules or Temperature Sensor Input Modules can be used with 30-point and 40-point CPU Units. Each analog I/O module provides 2 analog inputs and 1 analog output, so a maximum of 6 analog inputs and 3 analog outputs can be achieved by connecting 3 Analog I/O Modules. Each Temperature Sensor Module provides two temperature sensor inputs from either thermocouples or platinum resistance thermometers. Up to 6 inputs can be connected.
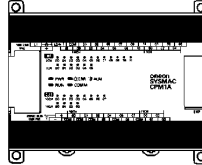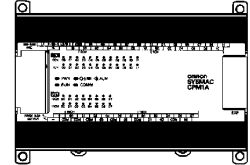
CPM1A-10CD□-□
(10 I/O terminals)

CPM1A-20CD□-□
(20 I/O terminals)
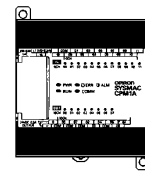
CPM1A-30CD□-□
(30 I/O terminals)

CPM1A-40CD□-□
(40 I/O terminals)

■ INTERRUPT INPUTS

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.. In addition to normal interrupt inputs, the CPM1A has a counter mode that counts high-speed input signals and triggers interrupts at fixed count multiples.

10 point I/O CPU

0003
0004

20, 30, and 40 point I/O CPU

0003
0004
0005
0006
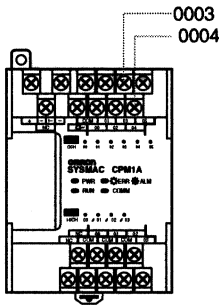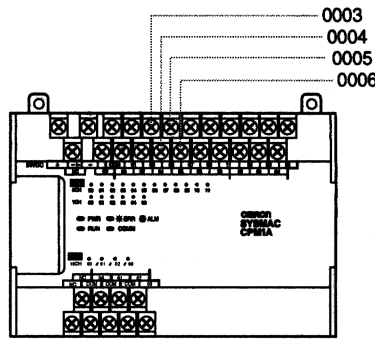
Application Example:

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.

Cutter

Metal sheets

Cutter operation signal

Conveyor

Proximity sensor

Input interrupt   CPM1A
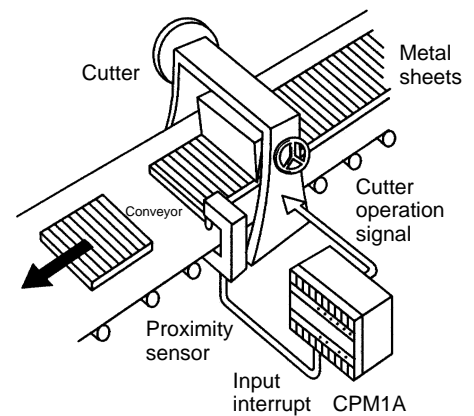
Input Interrupt Mode

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

Regular program

Regular program

Interrupt program

Input interrupt

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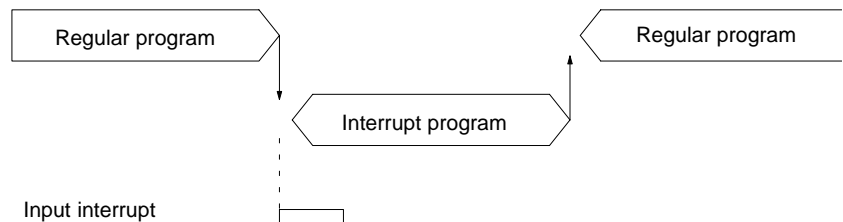
Counter Mode

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.
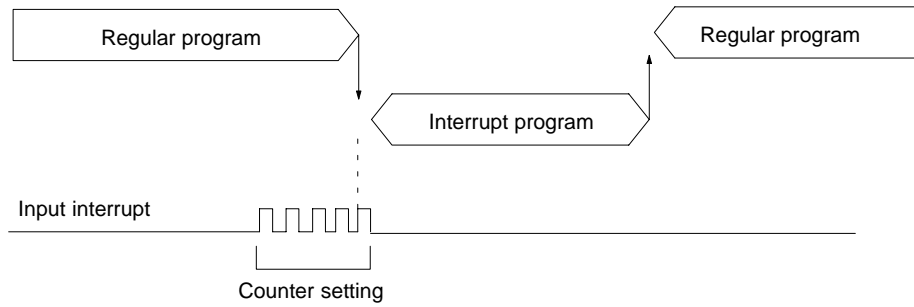
■ QUICK-RESPONSE INPUTS

Quick-response inputs can detect input signals with a pulse width as short as 0.2 ms regardless of their timing during the scan cycle. Quick-response inputs and interrupt inputs use the same input terminals.

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	
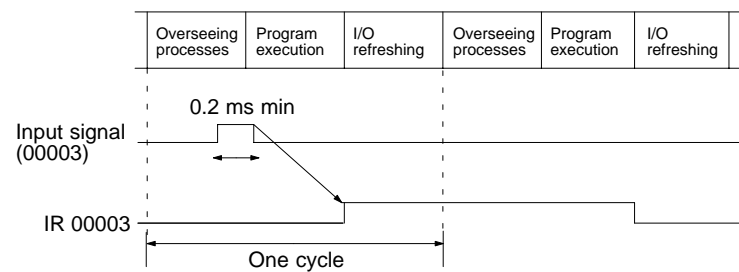
Application Example:

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.
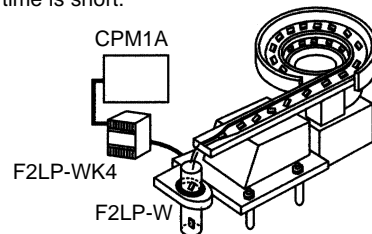
■ HIGH-SPEED COUNTER

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.

Counting mode		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.
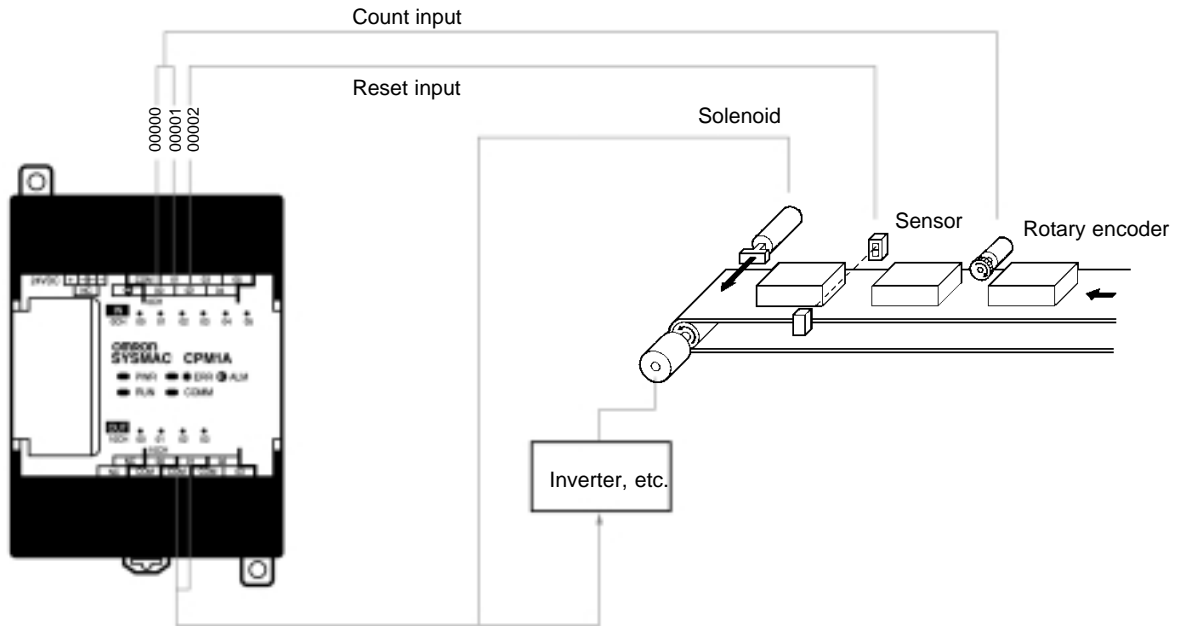
■ INTERVAL TIMER INTERRUPTS

The CPM1A has one interval timer. The interval timer shuts down the regular program regardless 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)	
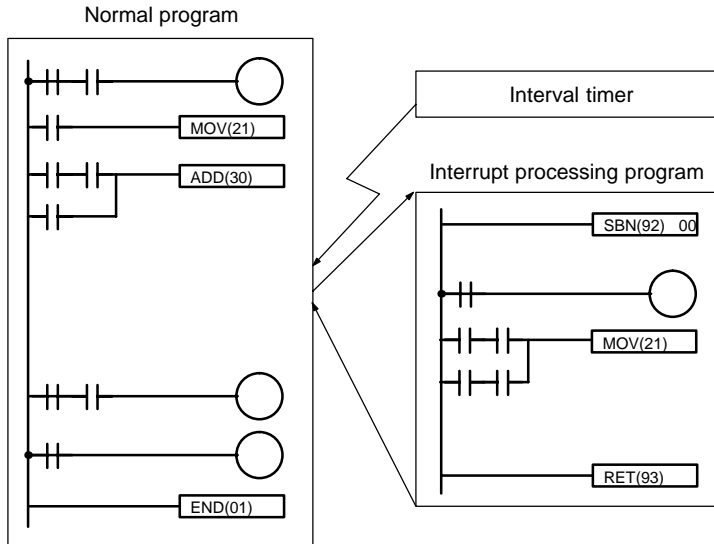
Application Example:

Computing the Sheet Speed

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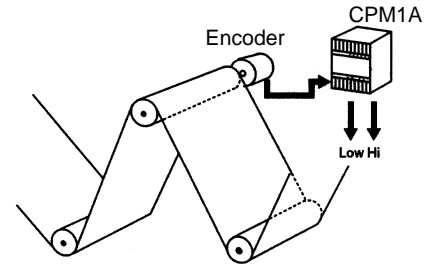
■ ANALOG SETTING

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	

Analog setting 0
Analog setting 1
*Phillips screwdriver is required.
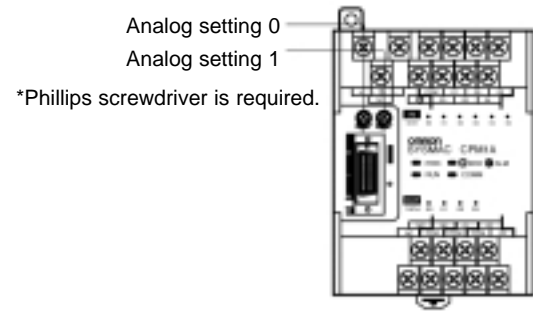
Application Example:

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.

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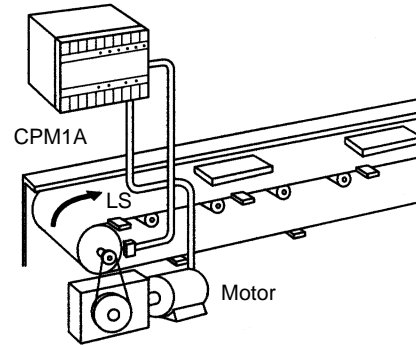
Program Example

1. Analog timer for 0.0 to 20.0 seconds

```
    A
 ──┤├──────────────( TIM )  250
                    ( 000 )
                              ┊
                              └─ ─  Value of the analog
                                    setting 0 (0 to 200)
```

2. Analog timer for 0.0 to 60.0 seconds

```
25313(ON)
 ──┤├────────┌──────────┐   BCD multiplication
             │ MUL(32)  │
             │      250 │- - - -  Value of the analog setting 0
             │    #0003 │- - - -  (0 to 200)
             │   DM0500 │- - - -  Triples the above value
             └──────────┘
                                  Multiplication result (0 to 600)
    B
 ──┤├──────────────( TIM )  DM 0500
                    ( 001 )
```

■ PULSE OUTPUT FUNCTION

The CPM1A transistor output models have an output function capable of outputting a pulse of 20 Hz to 2 kHz (single-phase output).

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

Application Example

Changing the speed of the Stepping Motor.

Output point
01000 or 01001

Stepping Motor Driver   Stepping Motor

Program Example

```
1 scan turns ON.
25315
 ──┤├───┬────┌──────────┐      Sets the number of output pulses as
        │    │ MOV(21)  │      25,000 (times) in the data memory area.
        │    │    #5000 │
        │    │  DM 0000 │
        │    └──────────┘
        │
        ├────┌──────────┐
        │    │ MOV(21)  │
        │    │    #0002 │
        │    │  DM 0001 │
        │    └──────────┘
        │
        └────┌──────────┐      Sets the initial frequency to
             │ MOV(21)  │      2,000 pulses/second.
             │    #0200 │
             │  DM 0100 │
             └──────────┘
25315
 ──┤├────────┌──────────┐      Pulse rate setting
1 scan turns ON.
             │ PULS(65) │
             │      000 │
             │      000 │
             │  DM 0000 │- -   Pulse rate (BCD 8 digits)
             └──────────┘
00200
 ──┤├───┬────┌──────────┐      Frequency conversion:
        │    │ @SPED(64)│
15000   │    │      000 │- -   Output port (output point 01000)
 ──┤├───┘    │      000 │- -   Output mode (single)
             │  DM 0100 │- -   Frequency data (x 10 Hz)
             └──────────┘
Speed change limit switch
00001
 ──┤├───┬────┌──────────┐      Changes to 200 Hz when the
        │    │ MOV(21)  │      limit switch is turned ON.
        │    │    #0020 │
        │    │  DM 0100 │
        │    └──────────┘
        │
        └──────────────( 15000 )
```
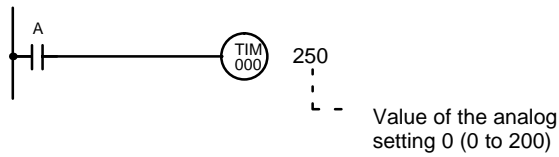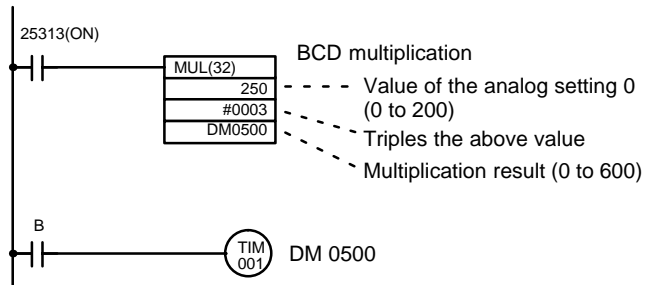
Sets the number of output pulses as 25,000 (times) in the data memory area.

DM 0001				DM 0000			
0	0	0	2	5	0	0	0

Output
frequency   1 khz ─

200 Hz ─ ─ ─

25,000 pulses

Pulse rate

00000 turns ON   0001 turns ON (limit switch)

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Communications ——————————————

■ NT LINK FOR PROGRAMMABLE TERMINALS

Use Omron's high-speed NT Link for real-time communications between the CPM1A and a Programmable Terminal.

Programmable Terminal

RS-232C Adapter

Communication Cable
C200H-CN320-EU (2 m)
C200H-CN520-EU (5 m)

CPM1A CPU

■ 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.
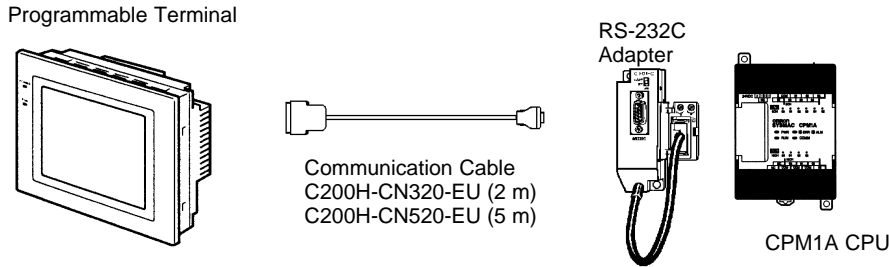
1:1 Host Link Communications

Command

Response

C200HS-CN220-EU cable (2 m)

RS-232C Adapter

CPM1A CPU

1:N Host Link Communications

Computer with a RS-422/RS-485 communications port

Command

Response

RS-422 Adapter   CPM1A CPU   RS-422 Adapter   CPM1A CPU   RS-422 Adapter   CPM1A CPU

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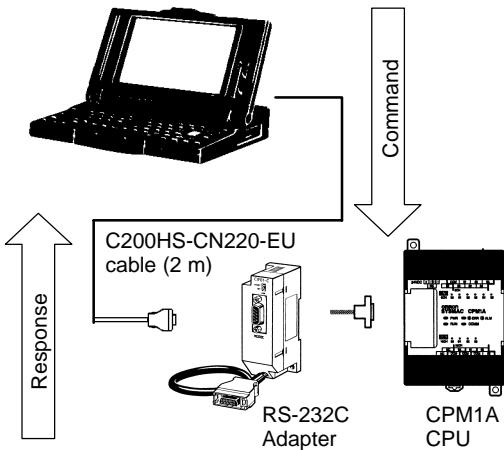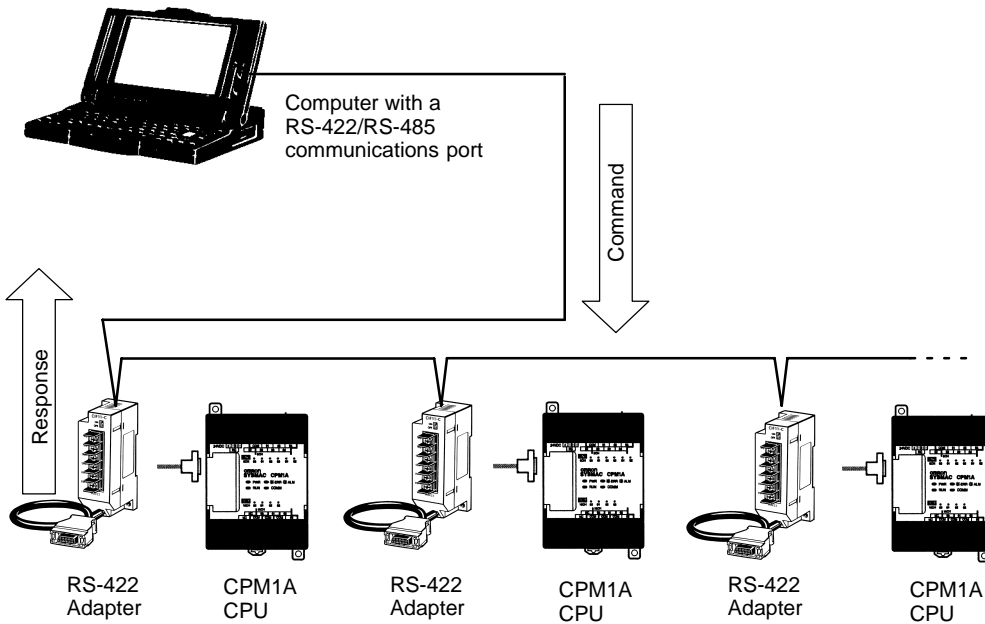
■ 1:1 CONNECTIONS FOR DATA EXCHANGE

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

Communication Cable C200H-CN320-EU (2 m)

RS-232C Adapter   CPM1A CPU   RS-232C Adapter   CPM1A CPU

Master   Slave

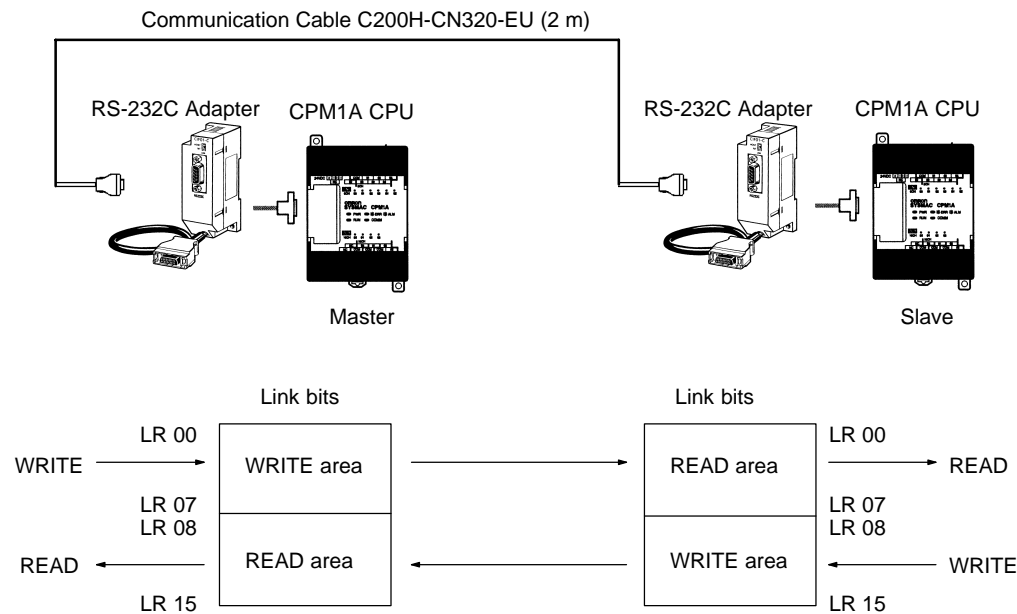Link bits   Link bits

LR 00   WRITE area   →   READ area   LR 00   → READ
WRITE →
LR 07   LR 07
LR 08   READ area   ←   WRITE area   LR 08
READ ←   ← WRITE
LR 15   LR 15

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□.

■ PROGRAM TRANSFER UNIT

Use Omron's EEPROM program transfer unit to update programs in machines or program multiple controllers with the same program. The CPM1-EMU01-V1 Expansion Memory Unit connects to the peripheral port of micro and small PLCs.

Uploading

Downloading

EEPROM

Omron SRM1, CPM1A, CPM2A, CPM2B, CPM2C and CQM1H programmable controllers

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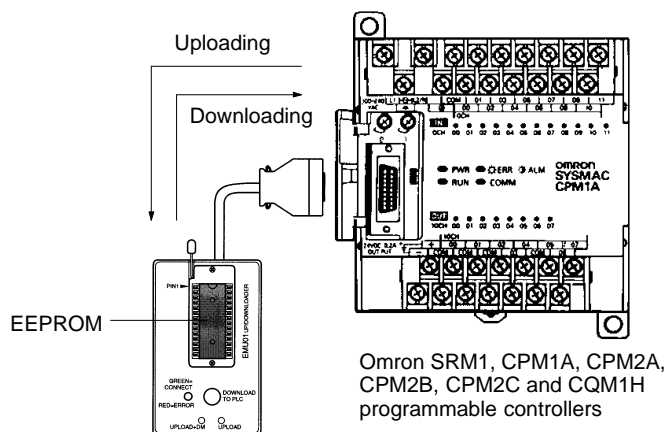
Instruction Set

■ SEQUENCE INSTRUCTIONS

Sequence Input Instructions

Instruction	Mnemonic	Code
LOAD	LD	○
LOAD NOT	LD NOT	○
AND	AND	○
AND NOT	AND NOT	○
OR	OR	○
OR NOT	OR NOT	○
AND LOAD	AND LD	○
OR LOAD	OR LD	○

Sequence Output Instructions

Instruction	Mnemonic	Code
OUTPUT	OUT	○
OUT NOT	OUT NOT	○
SET	SET	○
RESET	RSET	○
KEEP	KEEP	11
DIFFERENTIATE UP	DIFU	13
DIFFERENTIATE DOWN	DIFD	14

Sequence Control Instructions

Instruction	Mnemonic	Code
NO OPERATION	NOP	00
END	END	01
INTERLOCK	IL	02
INTERLOCK CLEAR	ILC	03
JUMP	JMP	04
JUMP END	JME	05

■ TIMER/COUNTER INSTRUCTIONS

Instruction	Mnemonic	Code
TIMER	TIM	○
COUNTER	CNT	○
REVERSIBLE COUNTER	CNTR	12
HIGH-SPEED TIMER	TIMH	15

■ STEP INSTRUCTIONS

Instruction	Mnemonic	Code
STEP DEFINE	STEP	08
STEP START	SNXT	09

■ INCREMENT/DECREMENT

Instruction	Mnemonic	Code
INCREMENT	INC(@)	38
DECREMENT	DEC(@)	39

■ DATA CONVERSION INSTRUCTIONS

Instruction	Mnemonic	Code
BCD TO BINARY	BIN(@)	23
BINARY TO BCD	BCD(@)	24
4 TO 16 DECODER	MLPX(@)	76
16 TO 4 DECODER	DMPX(@)	77
ASCII CODE CONVERT	ASC(@)	86

Data Comparison Instructions

Instruction	Mnemonic	Code
COMPARE	CMP	20
DOUBLE COMPARE	CMPL	60
BLOCK COMPARE	BCMP(@)	68
TABLE COMPARE	TCMP(@)	85

■ BCD/BINARY CALCULATION

Instruction	Mnemonic	Code
BCD ADD	ADD(@)	30
BCD SUBTRACT	SUB(@)	31
BCD MULTIPLY	MUL(@)	32
BCD DIVIDE	DIV(@)	33
BINARY ADD	ADB(@)	50
BINARY SUBTRACT	SBB(@)	51
BINARY MULTIPLY	MLB(@)	52
BINARY DIVIDE	DVB(@)	53
DOUBLE BCD ADD	ADDL(@)	54
DOUBLE BCD SUBTRACT	SUBL(@)	55
DOUBLE BCD MULTIPLY	MULL(@)	56
DOUBLE BCD DIVIDE	DIVL(@)	57

■ DATA MOVEMENT INSTRUCTIONS

Instruction	Mnemonic	Code
MOVE	MOV(@)	21
MOVE NOT	MVN(@)	22
BLOCK TRANSFER	XFER(@)	70
BLOCK SET	BSET(@)	71
DATA EXCHANGE	XCHG(@)	73
SINGLE WORD DISTRIBUTE	DIST(@)	80
DATA COLLECT	COLL(@)	81
MOVE BIT	MOVB(@)	82
MOVE DIGIT	MOVD(@)	83

Note: ○: Instruction keys allocated to the Programming Console.
(@): Instruction can be differentiated using input rise time to execute the instruction in just one cycle.

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■ LOGIC INSTRUCTIONS

Instruction	Mnemonic	Code
COMPLEMENT	COM(@)	29
LOGICAL AND	ANDW(@)	34
LOGICAL OR	ORW(@)	35
EXCLUSIVE OR	XORW(@)	36
EXCLUSIVE NOR	XNRW(@)	37

■ SHIFT INSTRUCTIONS

Instruction	Mnemonic	Code
SHIFT REGISTER	SFT	○/10
WORD SHIFT	WSFT(@)	16
ASYNCHRONOUS SHIFT REGISTER	ASFT(@)	17
ARITHMETIC SHIFT LEFT	ASL(@)	25
ARITHMETIC SHIFT RIGHT	ASR(@)	26
ROTATE LEFT	ROL(@)	27
ROTATE RIGHT	ROR(@)	28
ONE DIGIT SHIFT LEFT	SLD(@)	74
ONE DIGIT SHIFT RIGHT	SRD(@)	75
REVERSIBLE SHIFT REGISTER	SFTR(@)	84

■ SPECIAL CALCULATION INSTRUCTION

Instruction	Mnemonic	Code
BIT COUNTER	BCNT(@)	67

■ SUBROUTINE INSTRUCTIONS

Instruction	Mnemonic	Code
SUBROUTINE ENTER	SBS(@)	91
SUBROUTINE ENTRY	SBN	92
SUBROUTINE RETURN	RET	93
MACRO	MCRO	99

■ INTERRUPT CONTROL INSTRUCTIONS

Instruction	Mnemonic	Code
INTERVAL TIMER	STIM(@)	69
INTERRUPT CONTROL	INT(@)	89

■ PERIPHERAL DEVICE CONTROL

I/O Unit Instructions

Instruction	Mnemonic	Code
7-SEGMENT DECODER	SDEC(@)	78
I/O REFRESH	IORF(@)	97

Display Instruction

Instruction	Mnemonic	Code
MESSAGE	MSG	46

High-speed Counter Control Instructions

Instruction	Mnemonic	Code
MODE CONTROL	INI(@)	61
PV READ	PRV(@)	62
COMPARE TABLE LOAD	CTBL(@)	63

Pulse Output Control Instructions

Instruction	Mnemonic	Code
SPEED OUTPUT	SPED(@)	64
SET PULSES	PULS(@)	65

■ DAMAGE DIAGNOSIS INSTRUCTIONS

Instruction	Mnemonic	Code
FAILURE ALARM	FAL(@)	06
SEVERE FAILURE ALARM	FALS	07

■ SPECIAL SYSTEM INSTRUCTIONS

Instruction	Mnemonic	Code
SET CARRY	STC(@)	40
CLEAR CARRY	CLC(@)	41

Note: ○: Instruction keys allocated to the Programming Console.
(@): Instruction can be differentiated using input rise time to execute the instruction in just one cycle.

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■ SUMMARY OF FUNCTION CODES

The following table lists the CPM1A instructions that have fixed function codes. Each instruction is listed by mnemonic and by instruction name. Use the numbers in the leftmost column as the left digit and the number in the column heading as the right digit of the function code.

Left digit	Right digit									
	0	1	2	3	4	5	6	7	8	9
0	NOP No operation	END End	IL Interlock	ILC Interlock clear	JMP Jump	JME Jump end	FAL(@) Failure alarm and reset	FALS Severe failure alarm	STEP Step define	SNXT Step start
1	SFT Shift register	KEEP Keep	CNTR Reversible counter	DIFU Differentiate up	DIFD Differentiate down	TIMH High-speed timer	WSFT(@) Word shift	ASFT(@) Asynchronous shift register	---	---
2	CMP Compare	MOV(@) Move	MVN(@) Move not	BIN(@) BCD to binary	BCD(@) Binary to BCD	ASL(@) Shift left	ASR(@) Shift right	ROL(@) Rotate left	ROR(@) Rotate right	COM(@) Complement
3	ADD(@) BCD add	SUB(@) BCD subtract	MUL(@) BCD multiply	DIV(@) BCD divide	ANDW (@) Logical AND	ORW(@) Logical OR	XORW (@) Exclusive OR	XNRW (@) Exclusive NOR	INC(@) Increment	DEC(@) Decrement
4	STC(@) Set carry	CLC(@) Clear carry	---	---	---	---	MSG(@) Message display	---	---	---
5	ADB(@) Binary add	SBB(@) Binary subtract	MLB(@) Binary multiply	DVB(@) Binary divide	ADDL(@) Double BCD add	SUBL(@) Double BCD subtract	MULL(@) Double BCD multiply	DIVL(@) Double BCD divide	---	---
6	CMPL Double compare	INI(@) Mode control	PRV(@) High-speed counter PV read	CTBL(@) Comparison table load	SPED(@) Speed output (See Note)	PULS(@) Set pulses (See Note)	---	BCNT(@) Bit counter	BCMP(@) Block compare	STIM(@) Interval timer
7	XFER(@) Block transfer	BSET(@) Block set	---	XCHG(@) Data exchange	SLD(@) One digit shift left	SRD(@) One digit shift right	MLPX(@) 4-to-16 decoder	DMPX(@) 16-to-4 encoder	SDEC(@) 7-segment decoder	---
8	DIST(@) Single word distribute	COLL(@) Data collect	MOVB(@) Move bit	MOVD(@) Move digit	SFTR(@) Reversible shift register	TCMP(@) Table compare	ASC(@) ASCII convert	---	---	INT(@) Interrupt control
9	---	SBS(@) Subroutine entry	SBN Subroutine define	RET Subroutine return	---	---	---	IORF(@) I/O refresh	---	MCRO (@) Macro

Note: Only for the CPM1A transistor output models.

NOTE: DIMENSIONS SHOWN ARE IN MILLIMETERS. To convert millimeters to inches divide by 25.4.