

The CPM2A brick-style controllers offer one of the most powerful, small-scale control solutions in the industry today. They provide 20, 30, 40 or 60 I/O point CPUs, pulse I/O for position control, multiple communications ports and a powerful instruction set.

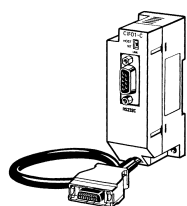


- Expandable up to 120 I/O points
- Peripheral and RS-232C ports standard for direct connection to serial devices and programming tools
- Removable terminals
- Synchronized pulse control coordinates input devices with control devices
- Auxiliary 24 VDC supply (AC type only)
- Relay or Transistor outputs
- Analog I/O expansion modules available
- Temperature sensor input expansion modules available
- Real-time clock
- 20 kHz high-speed counter input
- Two, 10 kHz pulse outputs for position control applications

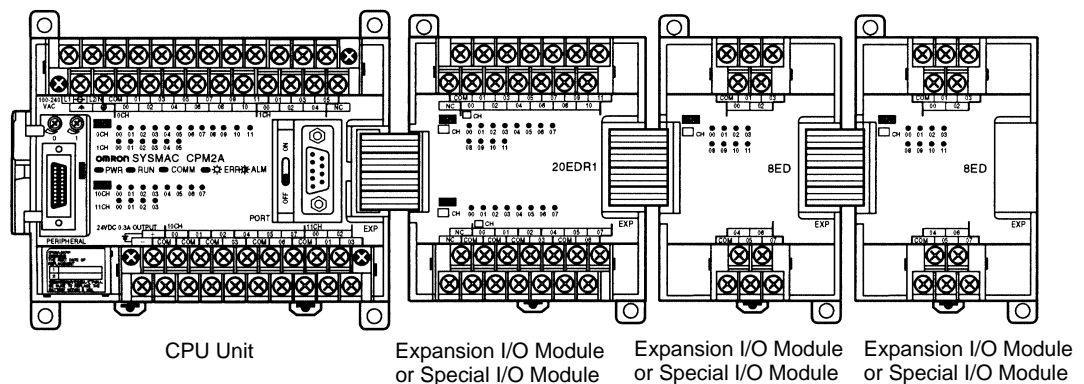


### Basic Configuration

Up to three Expansion I/O Modules or Special I/O Modules can be connected to any CPM2A CPU Unit. The mounting order does not affect the number of modules that can be mounted.

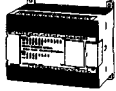
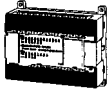
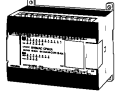
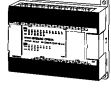
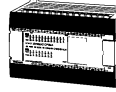
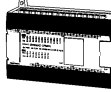
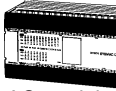
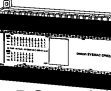


Optional Serial Communications Adapters CPM1-CIF01/CIF11 modify the Peripheral Port for use as an additional serial port.

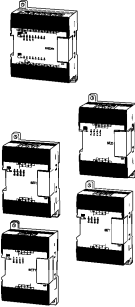

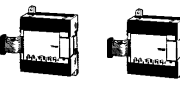



# Ordering Information

## ■ CPU UNITS

Description	Input points	Output points	Power supply	Part number		
				Relay outputs	Transistor outputs	
					NPN	PNP
CPU Units with 20 I/O points   AC model      DC models	12	8	AC	CPM2A-20CDR-A	—	—
			DC	CPM2A-20CDR-D	CPM2A-20CDT-D	CPM2A-20CDT1-D
CPU Units with 30 I/O points   AC model      DC models	18	12	AC	CPM2A-30CDR-A	—	—
			DC	CPM2A-30CDR-D	CPM2A-30CDT-D	CPM2A-30CDT1-D
CPU Units with 40 I/O points   AC model      DC models	24	16	AC	CPM2A-40CDR-A	—	—
			DC	CPM2A-40CDR-D	CPM2A-40CDT-D	CPM2A-40CDT1-D
CPU Units with 60 I/O points   AC model      DC models	36	24	AC	CPM2A-60CDR-A	—	—
			DC	CPM2A-60CDR-D	CPM2A-60CDT-D	CPM2A-60CDT1-D

## ■ EXPANSION I/O AND SPECIAL I/O MODULES

Description	Max. number of Units	Inputs	Outputs	Output type	Part number
Expansion I/O 	3 max. (See Note.)	12	8	Relay	CPM1A-20EDR
				Transistor (NPN)	CPM1A-20EDT
				Transistor (PNP)	CPM1A-20EDT1
		8	—	—	CPM1A-8ED
		—	8	Relay	CPM1A-8ER
		—	8	Transistor (NPN)	CPM1A-8ET
Transistor (PNP)	CPM1A-8ET1				
Analog I/O 	3 max. (See Note.)	2	1	Analog	CPM1A-MAD01
Temperature Sensor Inputs 	3 max. 1 (See Note.)	2	—	Thermocouple	CPM1A-TS001
					CPM1A-TS002
	3 max.	2	—	Platinum resistance thermometer	CPM1A-TS101
					2
	1 (See Note.)	4	—	—	CPM1A-TS102
CompoBus/S I/O Link 	3 max. (See Note.)	I/O Link of 8 input bits and 8 output bits		—	CPM1A-SRT21

Note: If a CPM1A-TS002/102 is connected, only one other module (and not a CPM1A-TS002/102) can be connected.

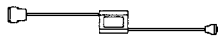



## ■ PROGRAMMING CONSOLES AND CABLES

Product	Part number	
Programming console (2 m cable attached), connects directly to peripheral port	CQM1H-PRO01-E	
Programming console (2 m cable attached); order CS1W-CN114 adapter for peripheral port	CQM1-PRO01-E	
Programming console (Requires separate cable. See below.)	C200H-PRO27-E	
Connecting cable for C200H-PRO27-E	2 m cable	C200H-CN222
	4 m cable	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

## ■ SERIAL COMMUNICATIONS ADAPTERS AND CABLES

CPM2A port	Name	Appearance	Comments	Cable length	Part number
Peripheral	RS-232C Adapter		Cable-mounted communication adapter converts peripheral port to DB9-pin serial port.	3.3 m (10.8 ft)	CQM1-CIF02
			DIN mount communication adapter converts peripheral port to DB9-pin serial port.	3.3 m (10.8 ft)	CPM1-CIF01
RS-232C	RS-232C Cable		Program download cable from computer to Omron DB9 serial port.	2 m (6.6 ft)	C200HS-CN220-EU
			Communication cable to other Omron devices with DB9 serial port	3 m (9.8 ft)	C200H-CN320-EU
				5 m (16.4 ft)	C200H-CN520-EU
Peripheral	RS-422/RS-485 Adapter		Converts CPM2A peripheral port to RS-422/RS-485 communications.	3.3 m (10.8 ft)	CPM1-CIF11

## ■ BATTERY

Product	Function	Part number
Backup Battery Replacement	Backs up memory in the CPM2A CPU Unit. (One battery is already installed in the unit.)	CPM2A-BAT01

## ■ 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	EEPROM-CPM1-EMU01

## ■ MANUALS

Product	Description	Part number
Operation manual	CPM2A operation manual	W352
Programming manual	For controller series SRM1, CPM1, CPM1A, CPM2A, CPM2B, and CPM2C	W353

# Specifications

## ■ GENERAL SPECIFICATIONS

Item		CPU Units with 20 I/O points	CPU Units with 30 I/O points	CPU Units with 40 I/O points	CPU Units with 60 I/O points
Supply voltage	AC power	100 to 240 VAC, 50/60 Hz			
	DC power	24 VDC			
Operating voltage range	AC power	85 to 264 VAC			
	DC power	20.4 to 26.4 VDC			
Power consumption	AC power	60 VA max.			
	DC power	20 W max.			
Inrush current	AC power	60 A max.			
	DC power	20 A max.			
External power supply (AC power supplies only)	Supply voltage	24 VDC			
	Output capacity	300 mA (See Notes 1, 2)			
Insulation resistance		20 M $\Omega$ min. at 500 VDC between the external AC terminals and protective ground terminals.			
Dielectric strength		2,300 VAC 50/60 Hz for 1 minute between the external AC and protective ground terminals, leakage current: 10 mA max.			
Noise immunity		1,500 Vp-p, pulse width: 0.1 to 1 $\mu$ s, rise time: 1 ns (via noise simulation)			
Vibration resistance		10 to 57 Hz, 0.075-mm amplitude, 57 to 150 Hz, acceleration: 9.8 m/s <sup>2</sup> in X, Y, and Z directions for 80 minutes each. (Time coefficient; 8 minutes $\times$ coefficient factor 10 = total time 80 minutes)			
Shock resistance		147 m/s <sup>2</sup> three times each in X, Y, and Z directions.			
Ambient temperature	Operating	0°C to 55°C (32°F to 131°F)			
	Storage	-20°C to 75°C (-4°F to 167°F)			
Humidity		10% to 90% RH with no condensation			
Atmosphere		Must be free from corrosive gas			
Terminal screw size		M3			
Power interrupt time		AC power supply: 10 ms min. DC power supply: 2 ms min.			
CPU Unit weight	AC power	650 g max.	700 g max.	800 g max.	1,000 g max.
	DC power	550 g max.	600 g max.	700 g max.	900 g max.
Expansion I/O Module weight		Modules with 20 I/O points: 300 g max. Modules with 8 output points: 250 g max. Modules with 8 input points: 200 g max.			
Expansion Module weight		Analog I/O Modules: 150 g max. Temperature Sensor Modules: 250 g max. CompoBus/S I/O Link Modules: 200 g max.			

- Note: 1. Use the external power supply as the power supply for input devices only. (It cannot be used as to drive output devices.)  
 2. If the external power supply current exceeds the rated current, or there is a short-circuit, the external power supply voltage will drop and PLC operation will stop.

## ■ CHARACTERISTICS

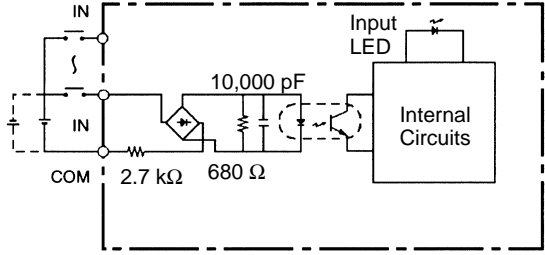
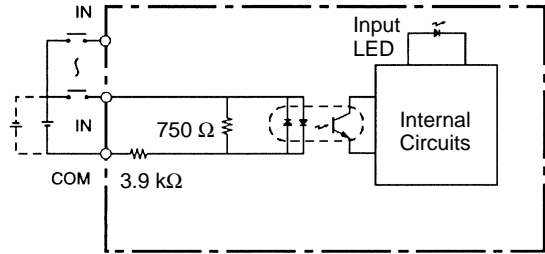
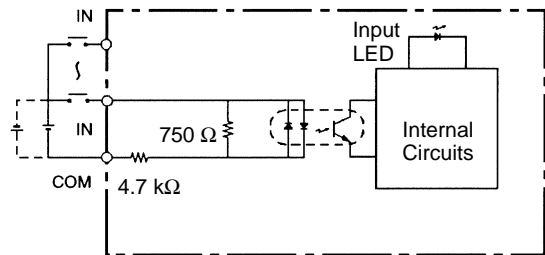
Control method		Stored program method			
I/O control method		Cyclic scan with direct output (Immediate refreshing can be performed with IORF(97).)			
Programming language		Ladder diagram			
Instruction length		1 step per instruction, 1 to 5 words per instruction			
Instructions		Basic instructions: 14 Special instructions: 105 instructions, 185 variations			
Execution time		Basic instructions: 0.64 $\mu$ s (LD instruction) Special instructions: 7.8 $\mu$ s (MOV instruction)			
Program capacity		4,096 words			
User data memory		2,048 words			
I/O capacity	CPU Unit only	20 points	30 points	40 points	60 points
	With Expansion I/O Modules	80 points max.	90 points max.	100 points max.	120 points max.
Memory protection		HR area, AR area, program contents, read/write DM area contents, and counter values maintained during power interruptions.			
Memory backup		Flash memory: Program, read-only DM area, and PC Setup  Battery backup: The read/write DM area, HR area, AR area, and counter values are backed up by a battery. (Battery life is approximately 5 years.)			
Self-diagnostic functions		CPU Unit failure (watchdog timer), I/O bus error, and memory failure, battery error			
Program checks		No END instruction and programming errors are checked at the start of operation.			
Communications functions		Built-in peripheral port: Supports host link, peripheral bus, no-protocol, or Programming Console connections.  Built-in RS-232C port: Supports Host Link, No-protocol, 1:1 Slave Unit link, 1:1 Master Unit link, or 1:1 NT Link connections.			
Functions provided by Expansion Modules		Analog I/O Module: Provides 2 analog inputs and 1 analog output. CompoBus/S I/O Link Module: Provides 8 inputs and 8 outputs as a CompoBus/S Slave. Temperature Sensor Modules: Provide 2 or 4 thermocouple inputs, or 2 or 4 temperature-resistance thermometer inputs.			

## ■ I/O ALLOCATION

Input bits	IR 00000 to IR 00915 (Words not used for input bits can be used for work bits.)	
Output bits	IR 01000 to IR 01915 (Words not used for output bits can be used for work bits.)	
Work bits	928 bits: IR 02000 to IR 04915 (Words IR 020 to IR 049) and IR 20000 to IR 22715 (Words IR 200 to IR 227)	
Special bits (SR area)	448 bits: SR 22800 to SR 25515 (Words IR 228 to IR 255)	
Temporary bits (TR area)	8 bits (TR0 to TR7)	
Holding bits (HR area)	320 bits: HR 0000 to HR 1915 (Words HR 00 to HR 19)	
Auxiliary bits (AR area)	384 bits: AR 0000 to AR 2315 (Words AR 00 to AR 23)	
Link bits (LR area)	256 bits: LR 0000 to LR 1515 (Words LR 00 to LR 15)	
Timers/Counters	256 timers/counters (TIM/CNT 000 to TIM/CNT 255)  1-ms timers: TMHH(—) 10-ms timers: TIMH(15) 100-ms timers: TIM 1-s/10-s timers: TIML(—) Decrementing counters: CNT Reversible counters: CNTR(12)	
Data memory	Read/Write: 2,048 words (DM 0000 to DM 2047) Error Log is contained in DM 2000 to DM 2021 Read-only: 456 words (DM 6144 to DM 6599) PC Setup: 56 words (DM 6600 to DM 6655)	
Basic in- terrupts	Interrupt processing	External interrupts: 4 (Shared by the external interrupt inputs (counter mode) and the quick-response inputs.)
	Interval timer interrupts	1 (Scheduled Interrupt Mode or Single Interrupt Mode)
High-speed counter	High-speed counter	One high-speed counter: 20 kHz single-phase or 5 kHz two-phase (linear count method) Counter interrupt: 1 (set value comparison or set-value range comparison)
	Interrupt Inputs (counter mode)	Four inputs (Shared with external interrupt inputs (counter mode) and quick-response inputs.) Counter interrupts: 4 (Shared by the external interrupt inputs and quick-response inputs.)
Pulse output	Two points with no acceleration/deceleration, 10 to 10 kHz each, and no direction control. One point with waveform acceleration/deceleration, 10 to 10 kHz, and direction control. Two points with variable duty-ratio outputs using PWM(—). (Pulse outputs can be used with transistor outputs only, they cannot be used with relay outputs.)	
Synchronized pulse control	One point: A pulse output can be created by combining the high-speed counter with the pulse output and multiplying the frequency of the input pulses from the high-speed counter by a fixed factor. (This output is possible with transistor outputs only, it cannot be used with relay outputs.)	
Quick-response inputs	Four points (Min. input pulse width: 50 μs min.)	
Analog controls	2 controls, setting range: 0 to 200	
Input time constant	Can be set for all input points. (1 ms, 2 ms, 3 ms, 5 ms, 10 ms, 20 ms, 40 ms, or 80 ms; default setting: 10 ms)	
Clock function	Shows the year, month, day of the week, day, hour, minute, and second. (Battery backup)	

## ■ I/O SPECIFICATIONS

### CPU Unit Input

Item	Inputs	Specification
Input voltage	All	24 VDC $+10\%/ -15\%$
Input impedance	IN00000 to IN00001	2.7 k $\Omega$
	IN00002 to IN00006	3.9 k $\Omega$
	IN00007 and up	4.7 k $\Omega$
Input current	IN00000 to IN00001	8 mA typical
	IN00002 to IN00006	6 mA typical
	IN00007 and up	5 mA typical
ON voltage/current	IN00000 to IN00001	17 VDC min., 5 mA
	IN00002 and up	14.4 VDC min., 3 mA
OFF voltage/current	All	5.0 VDC max., 1 mA
ON delay	All	1 to 80 ms max. Default: 10 ms (See Note.)
OFF delay	All	1 to 80 ms max. Default: 10 ms (See Note.)
Circuit configuration	IN00000 to IN00001	
	IN00002 to IN00006	
	IN00007 and up	

Note: The input time constant can be set to 1, 2, 3, 5, 10, 20, 40, or 80 ms in the PLC Setup.

### High-speed Counter Inputs

Inputs IN00000 through IN00002 can be used as high-speed counter inputs, as shown in the following table. The maximum count frequency is 5 kHz in differential phase mode and 20 kHz in the other modes.

Input	Function			
	Differential phase mode	Pulse + direction input mode	Up/down input mode	Increment mode
IN00000	A-phase pulse input	Pulse input	Increment pulse input	Increment pulse input
IN00001	B-phase pulse input	Direction input	Decrement pulse input	Normal input
IN00002	Z-phase pulse input/Hardware reset input (IN00002 can be used as a normal input when it is not used as a high-speed counter input.)			

### Interrupt Inputs

Inputs IN00003 through IN00006 can be used as interrupt inputs (interrupt input mode or counter mode) and quick-response inputs. The minimum pulse width for these inputs is 0.05 ms.

Expansion I/O Module Input

Item	Specification
Input voltage	24 VDC +10%/−15%
Input impedance	4.7 kΩ
Input current	5 mA typical
ON voltage	14.4 VDC min.
OFF voltage	5.0 VDC max.
ON delay	1 to 80 ms max. Default: 10 ms (See note.)
OFF delay	1 to 80 ms max. Default: 10 ms (See note.)
Circuit configuration	

Note: The input time constant can be set to 1, 2, 3, 5, 10, 20, 40, or 80 ms in the PLC Setup.

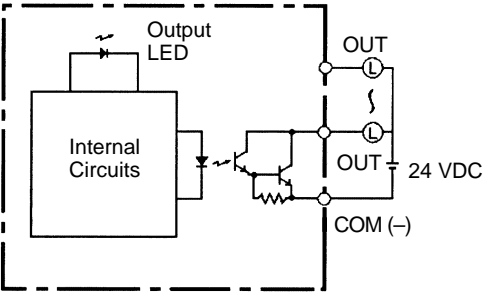
■ OUTPUT SPECIFICATIONS (CPU UNIT AND EXPANSION I/O MODULE)

Relay Output

Item	Specification
Max. switching capacity	2 A, 250 VAC (cosφ = 1) 2 A, 24 VDC (4 A/common)
Min. switching capacity	10 mA, 5 VDC
Service life of relay	Electrical: 150,000 operations (30 VDC resistive load) 100,000 operations (240 VAC inductive load, cosφ = 4) Mechanical: 20,000,000 operations
ON delay	15 ms max.
OFF delay	15 ms max.
Circuit configuration	

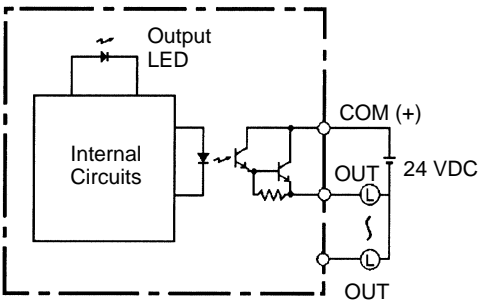


## Transistor Output (Sinking)

Item	Specification					
	20CDT-D	30CDT-D	40CDT-D	60CDT-D	8ET	20EDT
Max. switching capacity	OUT01000, 01001: 4.5 to 30 VDC, 0.2 A/output					24 VDC <sup>+10%/−5%</sup> , 0.3 A/output
	OUT01002 and up: 4.5 to 30 VDC, 0.3 A/output					
	0.8 A/common 1.6 A/Unit	0.8 A/common 2.4 A/Unit	0.8 A/common 3.2 A/Unit	0.8 A/common 4.8 A/Unit	0.9 A/common 1.8 A/Unit	0.9 A/common 1.8 A/Unit
Leakage current	0.1 mA max.					
Residual voltage	1.5 V max.					
ON delay	OUT01000 and OUT01001: 20 μs max. OUT01002 and up: 0.1 ms max.					0.1 ms max.
OFF delay	OUT01000 and OUT01001: 40 μs max. (4.5 to 26.5 V, 10 to 100 mA) 0.1 ms max. (4.5 to 30 V, 10 to 300 mA) OUT01002 and up: 1 ms max. (4.5 to 30 V, 10 to 300 mA)					1 ms max. 24 VDC <sup>+10%/−5%</sup> , 5 to 300 mA)
Fuse (See Note)	1 fuse/output					1 fuse/common
Circuit configuration						

Note: Cannot be replaced by the user.

## Transistor Output (Sourcing)

Item	Specification					
	20CDT1-D	30CDT1-D	40CDT1-D	60CDT1-D	8ET1	20DET1
Max. switching capacity	OUT01000, 01001: 4.5 to 30 VDC, 0.2 A/output					24 VDC <sup>+10%/−5%</sup> , 0.3 A/output
	OUT01002 and up: 4.5 to 30 VDC, 0.3 A/output					
	0.8 A/common 1.6 A/Unit	0.8 A/common 2.4 A/Unit	0.8 A/common 3.2 A/Unit	0.8 A/common 4.8 A/Unit	0.9 A/common 1.8 A/Unit	0.9 A/common 1.8 A/Unit
Leakage current	0.1 mA max.					
Residual voltage	1.5 V max.					
ON delay	OUT01000 and OUT01001: 20 μs max. OUT01002 and up: 0.1 ms max.					0.1 ms max.
OFF delay	OUT01000 and OUT01001: 40 μs max. (4.5 to 26.5 V, 10 to 100 mA) 0.1 ms max. (4.5 to 30 V, 10 to 300 mA) OUT01002 and up: 1 ms max. (4.5 to 30 V, 10 to 300 mA)					1 ms max. 24 VDC <sup>+10%/−5%</sup> , 5 to 300 mA)
Fuse (See Note)	1 fuse/output					1 fuse/common
Circuit configuration						

Note: Cannot be replaced by the user.

## ■ ANALOG I/O MODULE

Up to 3 Expansion I/O Modules or Expansion Modules (including the CPM1A-MAD01 Analog I/O Module) can be connected to a CPM2A CPU Unit.

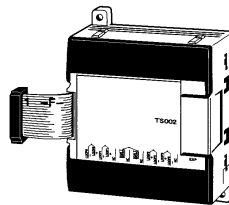
Item		Voltage I/O	Current I/O
Analog inputs	Number of inputs	2	
	Input signal range	0 to 10 V or 1 to 5 V	4 to 20 mA
	Maximum rated input	±15 V	±30 mA
	External input impedance	1 MΩ min.	250 Ω rated
	Resolution	1/256	
	Overall precision	1.0% of full scale	
	Converted A/D data	8-bit binary	
Analog output (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 PLC (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 CPM2A, 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 JPt100, selectable	
Input resolution	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.

### Input Temperature Ranges

The input type is selected with a rotary switch. The ranges for each of the input types are shown in the following table.

Model	CPM1A-TS001/TS002		CPM1A-TS101/TS101-DA/TS102	
Input type	Thermocouple type K	Thermocouple type J	Platinum RTD Pt100	Platinum RTD JPt100
Range in °C	-200 to 1,300, 0.0 to 500.0	-100 to 850, 0.0 to 400.0	-200.0 to 650.0	-200.0 to 650.0
Range in °F	-300 to 2300, 0.0 to 900.0	-100 to 1500, 0.0 to 750.0	-300.0 to 1200.0	-300.0 to 1200.0

## ■ COMMUNICATIONS ADAPTER

### RS-232C Adapter and RS-422 Adapter

Part number		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.	

# Dimensions

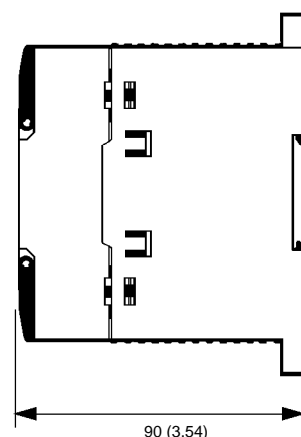
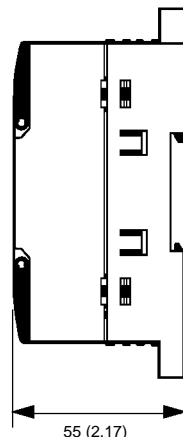
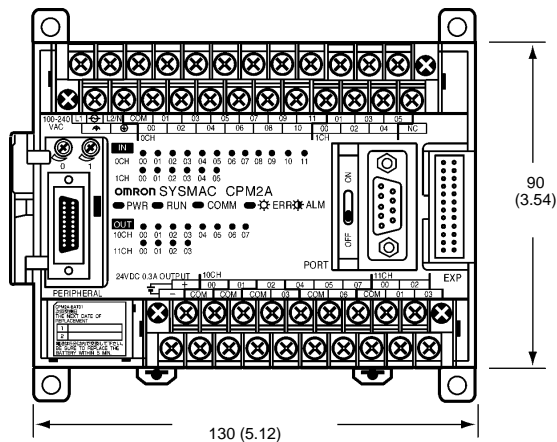
Unit: mm (inch)

## ■ CPU UNITS

### CPM2A-20CD□-□/30CD□-□

CPU Units with DC Power

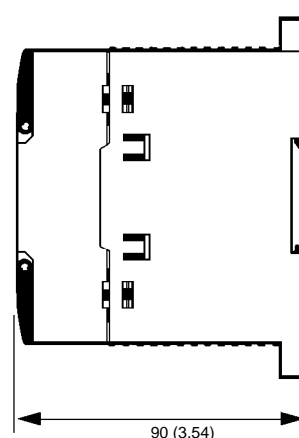
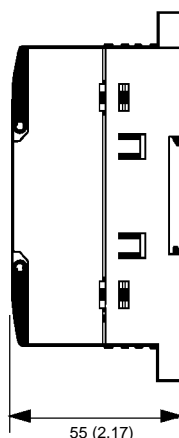
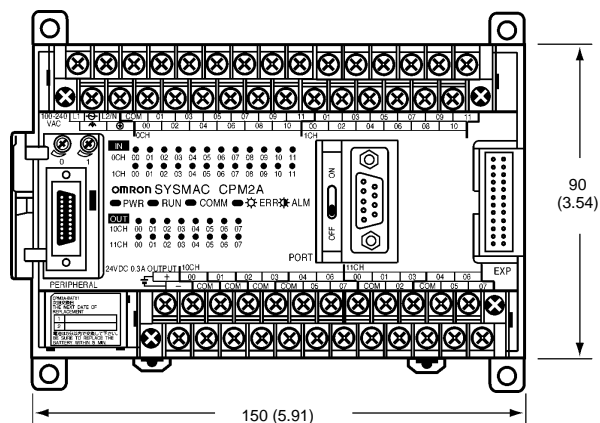
CPU Units with AC Power



### CPM2A-40CD□-□

CPU Units with DC Power

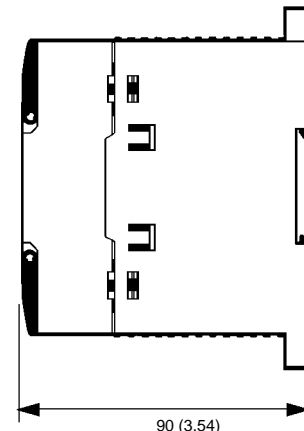
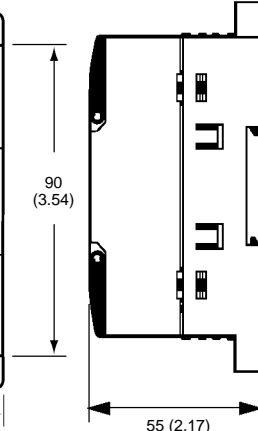
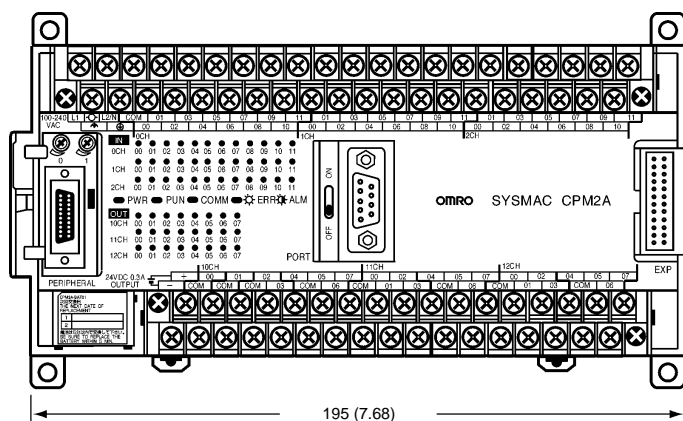
CPU Units with AC Power



### CPM2A-60CD□-□

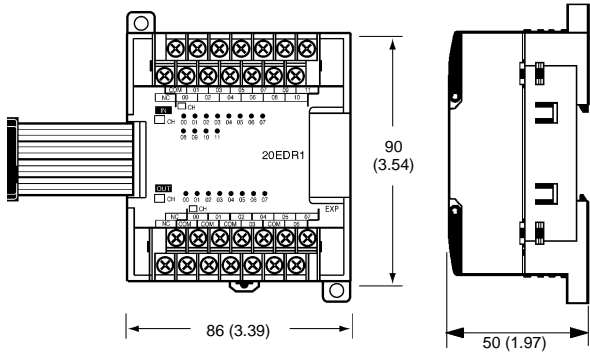
CPU Units with DC Power

CPU Units with AC Power

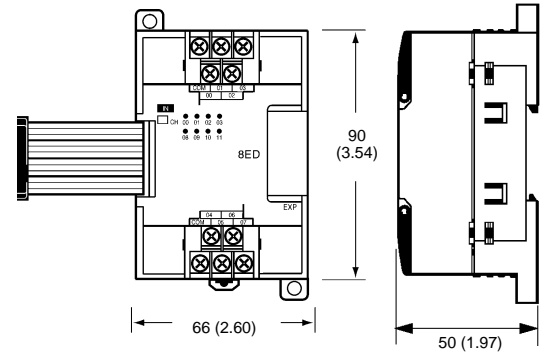


■ EXPANSION I/O AND SPECIAL I/O MODULES

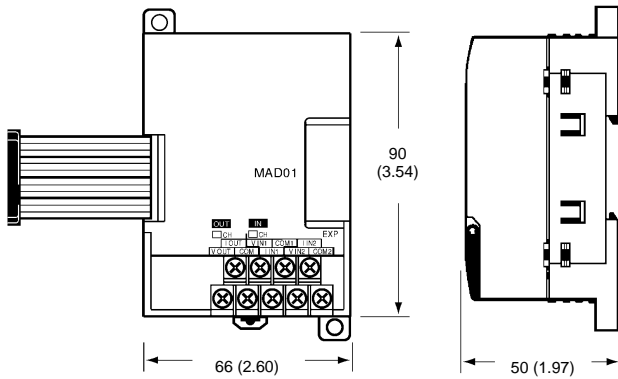
CPM1A-20ED Expansion I/O Modules



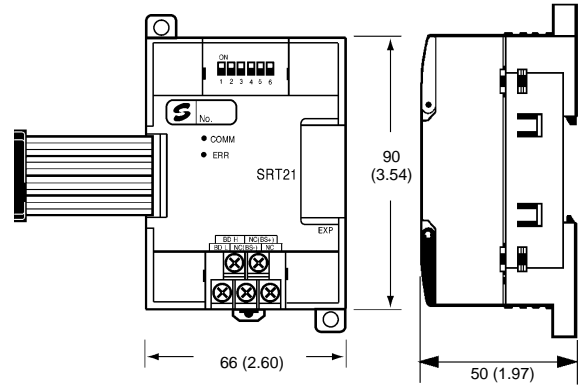
CPM1A-8 Expansion I/O Modules



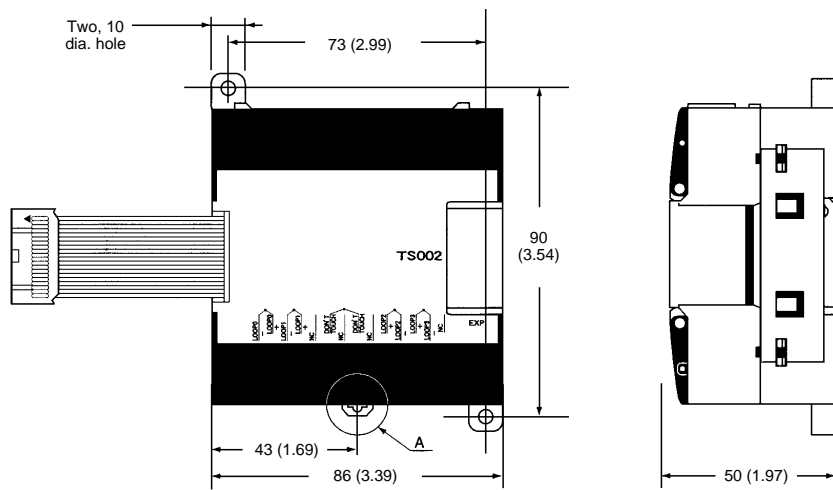
CPM1A-MAD01 Analog I/O Module



CPM1A-SRT21 CompoBus/S I/O Link Module



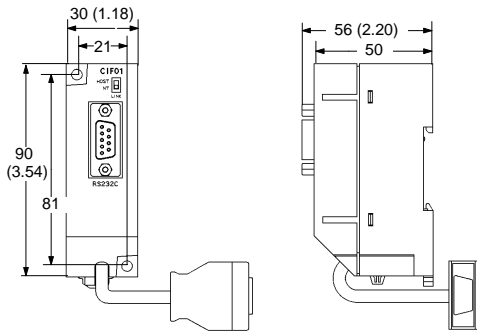
CPM1A-TS Temperature Sensor Input Modules



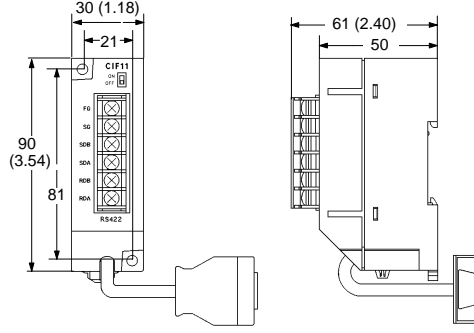
Unit: mm (inch)

**COMMUNICATION ADAPTER MODULES**

**CPM1-CIF01**



**CPM1-CIF11**

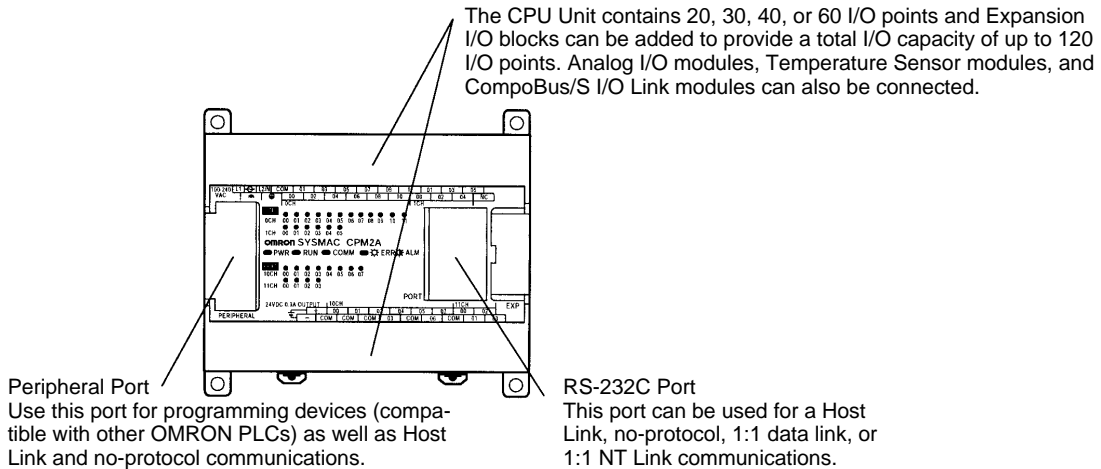


**Functions**

**CONFIGURATION**

The CPM2A PLCs incorporate a variety of features, including synchronized pulse control, interrupt inputs, pulse outputs, analog settings, and a clock function. Use the CPM2A CPU Unit as a stand-alone controller for a broad range of machine control applications.

The CPM2A easily communicates with personal computers, other OMRON PLCs, and OMRON Programmable Terminals. These communications capabilities allow the user to design a low-cost distributed production system.



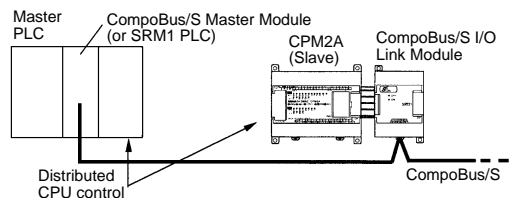
**TIME-PROPORTIONAL CONTROL**

The CPM2A performs simple-to-program, time-proportional control using up to three Analog I/O modules (maximum 6 analog inputs and 3 analog outputs) and the PID and PWM expansion instructions. These instructions set the parameters for PID control and a pulse output with variable duty ratio. For increased reliability, an open-circuit detection function can be used with the 1 to 5 VDC and 4 to 20 mA analog input settings.

For temperature monitoring applications, CPM2A accepts up to 6 inputs (two per module) from Temperature Sensor Input modules. The PID instruction can manipulate the input from either thermocouple or platinum resistance thermometer sensors.

**DISTRIBUTED I/O CONTROL**

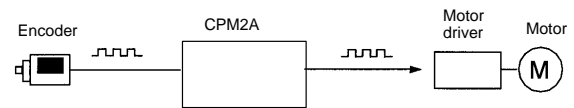
Omron's CompoBus/S Network provides distributed CPU control based on a "PLC + compact PLC" configuration which provides improvements over distributed control based on "PLC + remote I/O" configurations. The distributed CPU control makes equipment module, so designs can be standardized, special needs can be addressed and modules can be replaced easily in the event of breakdown without affecting the main CPU.



## ■ BUILT-IN MOTOR CONTROL CAPABILITY

### Synchronized Pulse Control (transistor output models only)

Synchronized output pulse control provides an easy way to coordinate the operation of a peripheral piece of equipment with the main equipment. The output pulse frequency can be controlled as a multiple of the input pulse frequency, allowing the speed of a peripheral piece of equipment (such as a supply conveyor) to be synchronized with the speed of the main piece of equipment.



Pulses are output as a fixed multiple of the input frequency.

## ■ HIGH-SPEED COUNTERS AND INTERRUPTS

The CPM2A has a total of five high-speed counter inputs. The one high-speed counter input has a response frequency of 20 kHz/5 kHz, and the four interrupt inputs (in counter mode) have a response frequency of 2 kHz.

### Four Input Modes

The high-speed counter can be used in any one of the four input modes: differential phase mode (5 kHz), pulse plus direction input mode (20 kHz), up/down pulse mode (20 kHz), or increment mode (20 kHz). Interrupts can be triggered when the count matches a set value or falls within a specified range.

### Interrupt Inputs

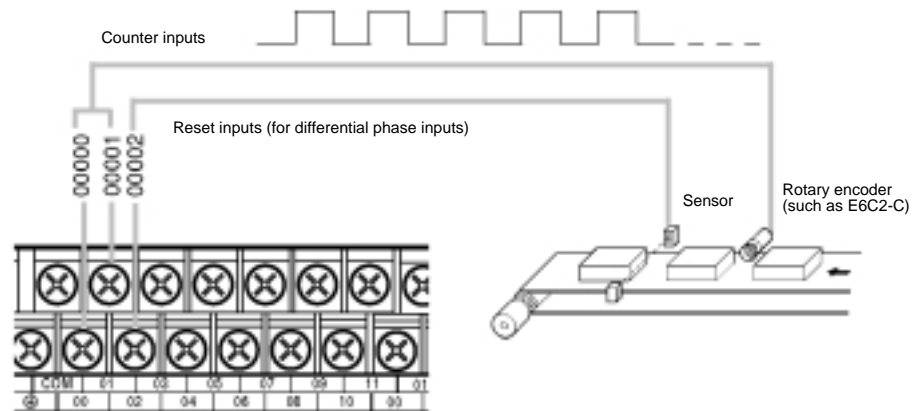
The interrupt inputs (counter mode) can be used for incrementing counters or decrementing counters (2 kHz) and trigger an interrupt (executing the interrupt program) when the count matches the target value. Use this for target-value comparison or range comparison control that is unaffected by the cycle time.

### Easy Position Control with Pulse Outputs (transistor output models only)

The CPM2A PLCs with transistor outputs have two outputs that can produce 10 Hz to 10 kHz pulses (single-phase outputs).

When used as single-phase pulse outputs, there can be two outputs with a frequency range of 10 Hz to 10 kHz with a fixed duty ratio or 0.1 to 999.9 Hz with a variable duty ratio (0 to 100% duty ratio).

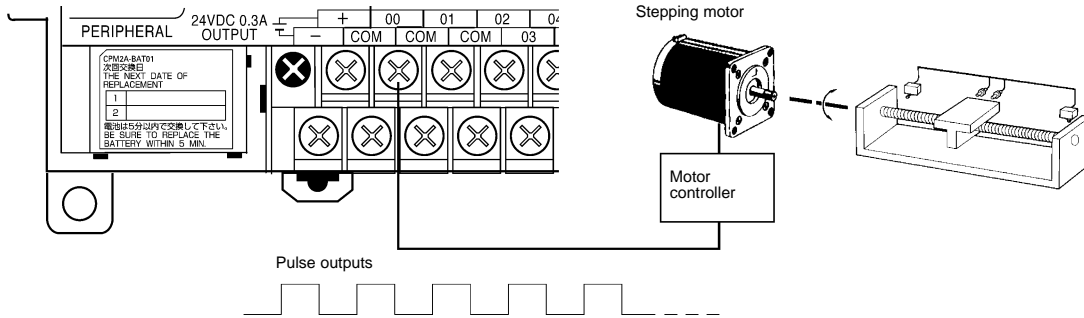
When used as pulse plus direction or up/down pulse outputs, there can be just one output with a frequency range of 10 Hz to 10 kHz.



Input	Response frequency	Input mode (count value)	Control method
00000	5 kHz	Differential phase input mode (-8,388,608 to 8,388,607)	Target value comparison interrupts
00001	20 kHz	Pulse + direction input mode (-8,388,608 to 8,388,607)	Range comparison interrupts
00002		Up/down pulse input mode (-8,388,608 to 8,388,607)	
		Increment mode (0 to 16,777,215)	

### ■ PULSE OUTPUTS

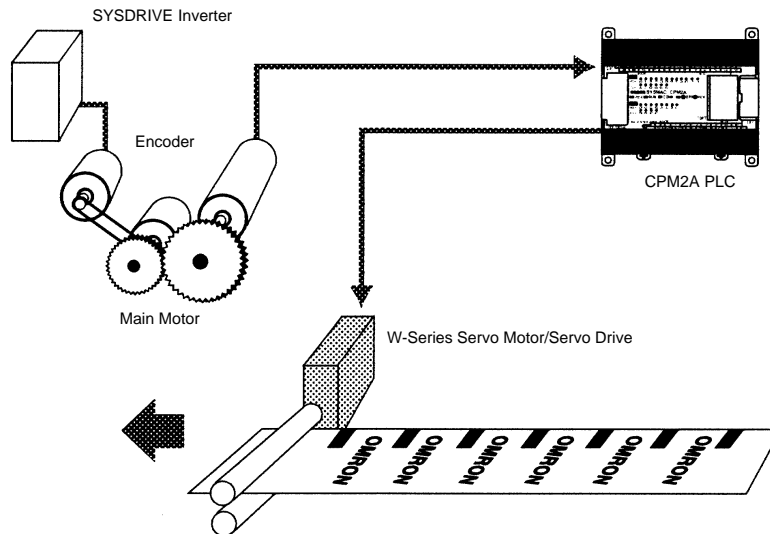
The CPM2A has two pulse outputs. You can configure these outputs as two single-phase outputs without acceleration and deceleration, two variable duty-ratio pulse outputs, or pulse outputs with trapezoidal acceleration/deceleration (one pulse + direction output and one up/down pulse output). The pulse output's PV coordinate system can also be specified in the PLC Setup as either relative or absolute.



Item		Single-phase pulse output without acceleration/deceleration	Variable duty-ratio pulse output	Single-phase pulse output with trapezoidal acceleration/deceleration			
				Pulse + direction output	Up/down pulse output		
Controlling instruction(s)		PULS(65) and SPED(64)	PWM(—)	PULS(65) and ACC(—)			
Output number	01000	Pulse output 0 (See Note.)	Pulse output 0 (See Note.)	Pulse output 0	Pulse output	Pulse output 0	CW pulse output
	01001	Pulse output 1 (See Note.)	Pulse output 1 (See Note.)		Direction output		CCW pulse output
Output frequency range		10 Hz to 10 kHz	0.1 Hz to 999.9 Hz	10 Hz to 10 kHz		10 Hz to 10 kHz	
	Pitch	10 Hz	0.1 Hz	10 Hz		10 Hz	
Duty ratio		50%	0 to 100%	50%		50%	

Note: With single-phase pulse outputs, pulse outputs 0 and 1 can each be output independently.

#### Application Example: Adjusting Film/Paper Web Speed in Packaging and Printing





## ■ HIGH-SPEED INPUT CAPABILITIES FOR MACHINE CONTROL

### High-speed Interrupt Input Function

There are four inputs used for interrupt inputs (shared with quick-response inputs and interrupt inputs in counter mode) with a minimum input signal width of 50  $\mu$ s and a response time of 0.3 ms. When an interrupt input goes ON, the main program is stopped and the interrupt program is executed.

### Quick-response Input Function

There are four inputs used for quick-response inputs (shared with interrupt inputs and interrupt inputs in counter mode) that can reliably read input signals with a signal width as short as 50  $\mu$ s. Quick-response inputs are received into an internal buffer, so signals that change status within a cycle can be processed.

### Stabilizing Input Filter Function

The input time constant for all inputs can be set to 1 ms, 2 ms, 3 ms, 5 ms, 10 ms, 20 ms, 40 ms, or 80 ms. The effects of chattering and external noise can be reduced by increasing the input time constant.

### Interval Timer Interrupts

The interval timer offers a 0.5 and 319,968 ms range and can be set to generate just one interrupt (one-shot mode) or periodic interrupts (scheduled interrupt mode) to match the application.

## ■ OTHER FUNCTIONS

### Analog Settings

There are two controls on the CPU Unit that can be turned to change the analog settings (0 to 200 BCD) of timers and counters. These controls can be used to easily change or fine-tune machine settings such as a conveyor belt's pause time or feed rate.

### Calendar/Clock

The built-in clock (accuracy within 1 minute/month) can be read from the program to show the current year, month, day, day of the week, and time. The clock can be set from a programming device (such as a Programming Console) or the time can be adjusted by rounding up or down to the nearest minute.

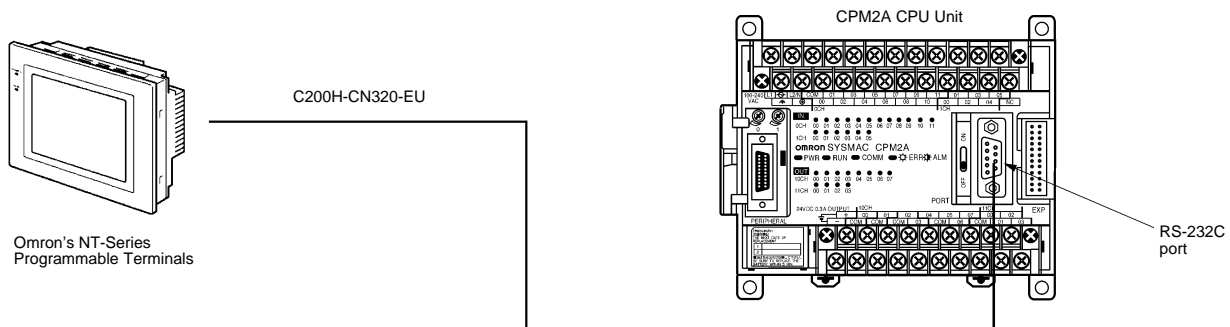
### Long-term Timer

The long-term timer provides an easy way to control equipment scheduling. Use two instructions to set this up. The long-term timer instruction (TIML) lets you set values up to 99,990 seconds (27 hours, 46 minutes, 30 seconds) and the Seconds-to-Hours conversion instruction (HMS) lets you schedule this with other clock functions.

## Communications

### ■ NT LINK FOR PROGRAMMABLE TERMINALS

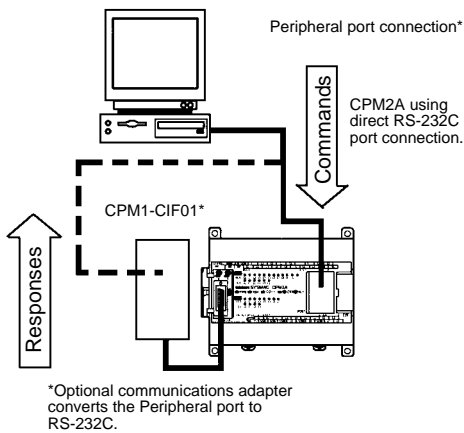
The CPM2A can be connected directly to an OMRON NT-Series Programmable Terminal in NT Link mode (1:1) for high-speed transmission of data. No separate drivers are required. Use the RS-232C port for the NT Link connection.



**HOST LINK**

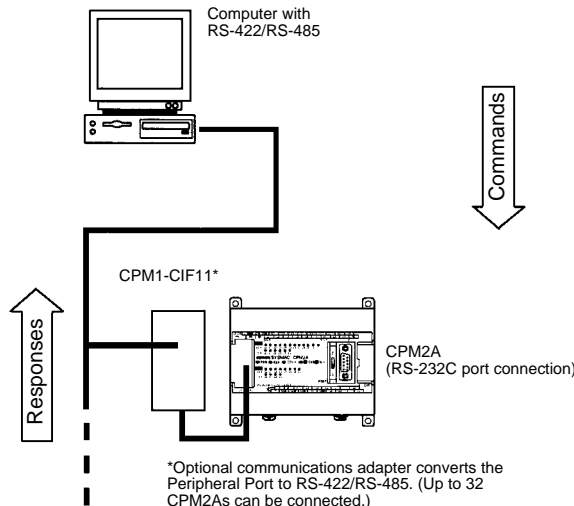
A Host Link connection can be made through the CPM2A's RS-232C port or Peripheral port. A personal computer or Programmable Terminal connected in Host Link mode can be used for operations such as reading/writing data in the CPM2A's I/O memory or reading/changing the controller's operating mode.

1:1 Host Link Communications



\*Optional communications adapter converts the Peripheral port to RS-232C.

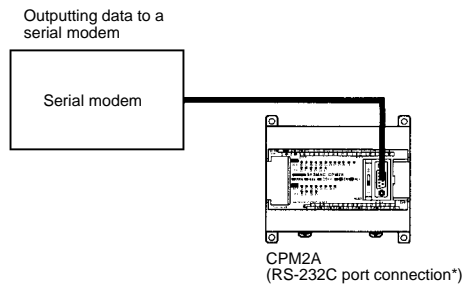
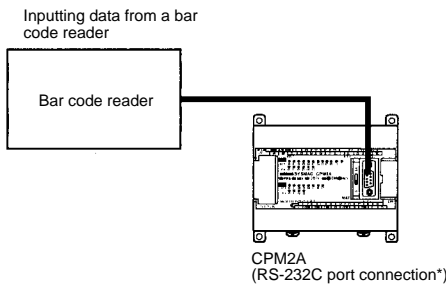
1:N Host Link Communications



\*Optional communications adapter converts the Peripheral Port to RS-422/RS-485. (Up to 32 CPM2As can be connected.)

**No-Protocol Communications**

The transmit TXD (48) and receive RXD (47) instructions can be used in No-Protocol mode to exchange data with standard serial devices. For example, data can be received from a bar code reader or transmitted to a serial modem. The serial devices can be connected directly to the RS-232C port or the Peripheral port using the CPM1-CIF01 serial communications adapter.

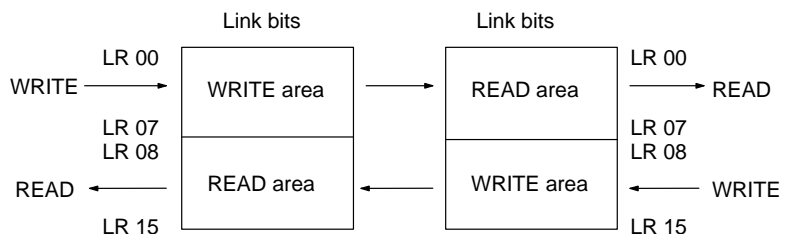
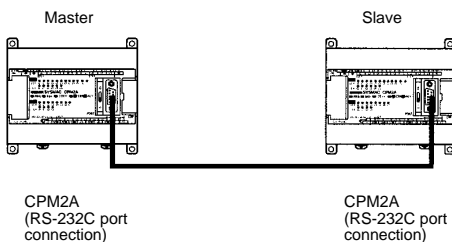


\*An RS-232C Adapter is needed to connect to the Peripheral port.

**1:1 DATA LINKS**

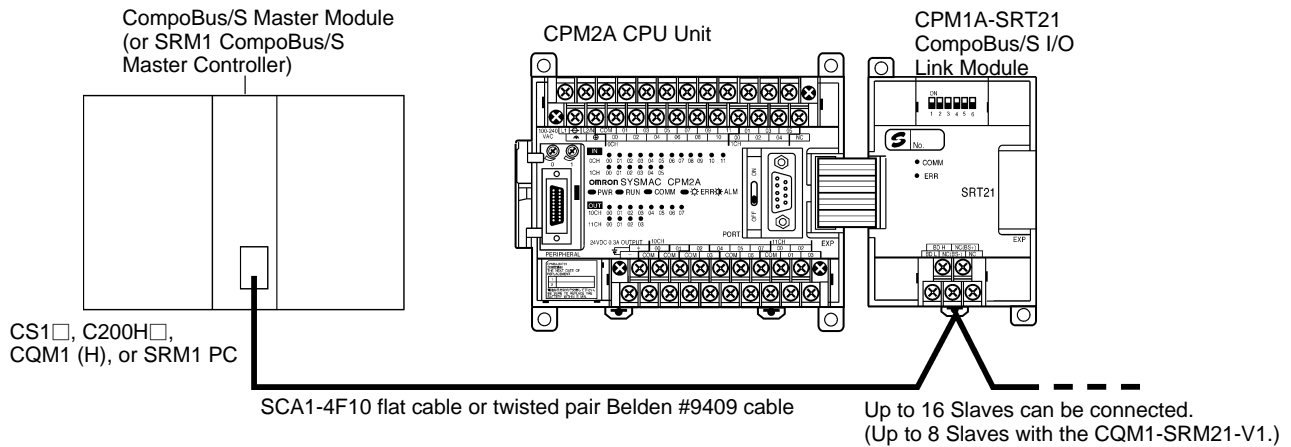
A CPM2A can be linked directly to another CPM2A, CQM1, CPM1, CPM1A, CPM2C, SRM1(-V2), or a C200HS or C200HX/HG/HE programmable controller. The 1:1 PLC Link allows automatic data link connections or sharing of memory between two Omron CPUs.. The controller must be connected through the RS-232C port; it cannot be connected through the Peripheral port.

Example of a 1:1 Link between CPM2As



■ COMPOBUS/S I/O LINK MODULE

The CPM2A PLC can function as a Slave to a CompoBus/S Master Module (or SRM1 CompoBus/S Master Controller) 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 CPM2A. Up to 3 Expansion I/O Modules or Expansion Modules can be connected to a CPM2A CPU Unit.



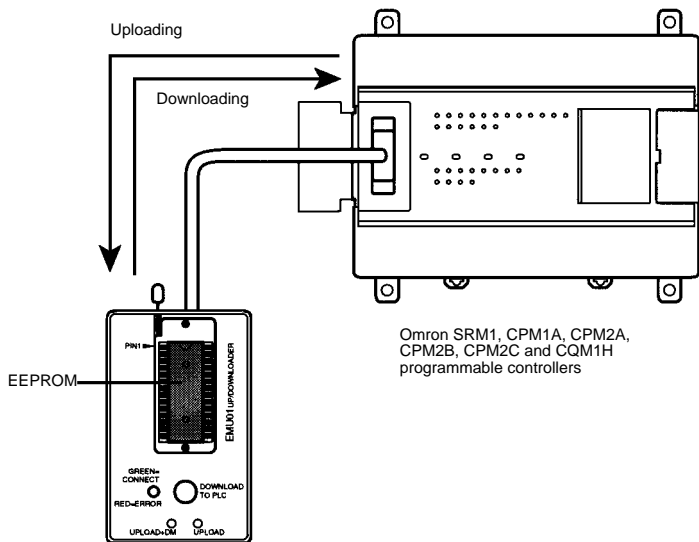
Specifications

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 CPM2A I/O memory	1 input word, 1 output word (Allocated in the same way as other Expansion I/O Units or Expansion Units)
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.

■ 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.



# 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

## ■ COMPARISON INSTRUCTIONS

Instruction	Mnemonic	Code
COMPARE	CMP	20
TABLE COMPARE	TCMP(@)	85
DOUBLE COMPARE	CMPL(@)†	60
BLOCK COMPARE	BCMP(@)†	68
AREA RANGE COMPARE	ZCP	—
DOUBLE AREA RANGE COMPARE	ZCPL	—

## ■ 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

## ■ 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

## ■ INCREMENT/DECREMENT

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

## ■ CALCULATION INSTRUCTIONS

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
BIT COUNTER	BCNT(@)†	67

Note: ○: Instruction keys allocated to the Programming Console.  
 (@): Instruction can be differentiated using input rise time to execute the instruction in just one cycle.  
 —: Identifies an expansion instruction.  
 †: Identifies an expansion instruction assigned a default code.

## ■ DATA CONVERSION INSTRUCTIONS

Instruction	Mnemonic	Code
BCD TO BINARY	BIN(@)	23
BINARY TO BCD	BCD(@)	24
DOUBLE CBD-TO-DOUBLE BINARY	BINL(@)	58
DOUBLE BINARY-TO-DOUBLE BCD	BCDL(@)	59
4 TO 16 DECODER	MLPX(@)	76
16 TO 4 DECODER	DMPX(@)	77
ASCII CODE CONVERT	ASC(@)	86
ASCII-TO-HEXADECIMAL	HEX(@)	—
2'S COMPLEMENT	NEG(@)	—
HOURS-TO-SECONDS	SEC(@)	—
SECONDS-TO-HOURS	HMS(@)	—

## ■ TABLE DATA MANIPULATION INSTRUCTIONS

Instruction	Mnemonic	Code
FRAME CHECKSUM	FCS(@)	—
SUM	SUM(@)	—
DATA SEARCH	SRCH(@)	—
FIND MAXIMUM	MAX(@)	—
FIND MINIMUM	MIN(@)	—

## ■ DATA CONTROL INSTRUCTIONS

Instruction	Mnemonic	Code
SCALING	SCL(@)†	66
SIGNED BINARY TO BCD SCALING	SCL2(@)	—
BCD TO SIGNED BINARY SCALING	SCL3(@)	—
PID CONTROL	PID	—
AVERAGE VALUE	AVG	—

## ■ LOGIC INSTRUCTIONS

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

## ■ 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

## ■ PULSE CONTROL INSTRUCTIONS

### High-speed Counter Control Instructions

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

## ■ POSITION CONTROL INSTRUCTIONS

### Pulse Output Control Instructions

Instruction	Mnemonic	Code
SPEED OUTPUT	SPED(@)†	64
SET PULSES	PULS(@)†	65
PULSE W/VARIABLE DUTY RATIO	PWM(@)	—
ACCELERATION CONTROL	ACC(@)	—
SYNCHRONIZED PULSE CONTROL	SYNC(@)	—

## ■ PERIPHERAL DEVICE CONTROL

### I/O Unit Instructions

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

## ■ COMMUNICATIONS INSTRUCTIONS

Instruction	Mnemonic	Code
MESSAGE	MSG(@)	46
RECEIVE	RXD(@)†	47
TRANSMIT	TXD(@)†	48
CHANGE RS-232C SETUP	STUP(@)†	—

## ■ STEP INSTRUCTIONS

Instruction	Mnemonic	Code
STEP DEFINE	STEP	08
STEP START	SNXT	09

## ■ DAMAGE DIAGNOSIS INSTRUCTIONS

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

## ■ CARRY FLAG INSTRUCTIONS

Instruction	Mnemonic	Code
SET CARRY	PST(@)	40
CLEAR CARRY	CLD(@)	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.

—: Identifies an expansion instruction.

†: Identifies an expansion instruction assigned a default code.

## FUNCTION CODE SUMMARY

The following table lists the CPM2A 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.

The shaded areas are function codes to which expansion instructions are allocated by default or to which the user can allocate expansion instructions. The expansion instructions in the bottom table are available in addition to the ones listed with default function codes.

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

### Expansion Instructions Without Default Codes

Mnemonic	Name	Mnemonic	Name
(@)ACC	ACCELERATION CONTROL	(@)SCL3	BCD TO SIGNED BINARY SCALING
AVG	AVERAGE VALUE	(@)SEC	HOURS TO SECONDS
(@)FCS	FCS CALCULATE	(@)SRCH	DATA SEARCH
(@)HEX	ASCII-TO-HEXADECIMAL	(@)STUP	CHANGE RS-232C SETUP
(@)HMS	SECONDS TO HOURS	(@)SUM	SUM CALCULATE
(@)MAX	FIND MAXIMUM	SYNC	SYNCHRONIZED PULSE CONTROL
(@)MIN	FIND MINIMUM	TIML	LONG TIMER
(@)NEG	2'S COMPLEMENT	TMHH	VERY HIGH-SPEED TIMER
PID	PID CONTROL	ZCP	AREA RANGE COMPARE
(@)PWM	PULSE WITH VARIABLE DUTY RATIO	ZCPL	DOUBLE AREA RANGE COMPARE
(@)SCL2	SIGNED BINARY TO BCD SCALING		

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

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