

For Various Analog I/Os

- Analog Input Units for converting analog input signals into binary data
- Analog Output Units for converting binary data into analog output signals



CS1W-MAD44



CS1W-DA08V



CS1W-AD081-V1

Features

Analog Input Unit:

- Holds a maximum of 16 analog input signals in 1 unit.
- Reduces wiring using MIL connector (CS1W-AD161)
- Connector-Terminal Block Conversion Unit and Connecting Cable available for CS1W-AD161
- With functions including line disconnection detection, peak value holding, as well as mean value processing
- Scaling function (CS1W-AD161 only)

Analog Output Unit:

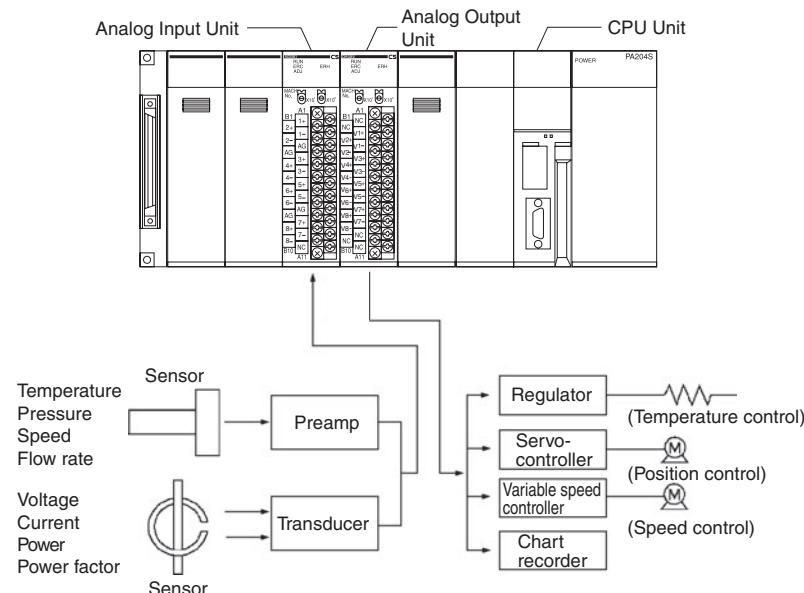
- Outputs a maximum of 8 analog output signals in 1 unit.
- Output hold function

Analog I/O Unit:

- Has both analog input and output signals
- Ratio conversion function stores the results of positive and negative gradient analog inputs calculated for ratio and bias as analog output values
- Hold a maximum of 4 analog input signals and outputs 4 analog output signals in 1 unit
 - **Analog Input functions** - Peak value holding, mean value processing and line disconnection detection
 - **Analog Output functions** - Output hold function

System Configuration

CS-series PLCs



Note: The above diagram is an installation example for the CS1W-AD081-V1 Analog Input Unit and CS1W-DA08V Analog Output Unit.

Ordering Information

Analog Input Units

Unit type	Product name	Specifications						Model	No. of Unit numbers allocated	Current consumption (A)		Standards	
		I/O points	Signal range selection	Signal range	Resolution	Conversion speed	External connection			5V	26V		
CS-series Special I/O Units	Analog Input Units	4 inputs	Set separately for each input	1 to 5 V, 0 to 5 V, 0 to 10 V, -10 V to 10 V, 4 to 20 mA	1/8,000 (Settable to 1/4,000)	250 s/point max. (Settable to 1 ms/point)	Removable terminal block	CS1W-AD041-V1	1	0.12	0.09	UC1, N, CE	
		8 inputs		1 to 5 V, 0 to 5 V, 0 to 10 V, -10 V to 10 V, 4 to 20 mA	1/8,000 (Settable to 1/4,000)	250 s/point max. (Settable to 1 ms/point)	Removable terminal block	CS1W-AD081-V1	2	0.12	0.09		
		16 inputs		1 to 5 V, 0 to 5 V, 0 to 10 V, -10 V to 10 V, 4 to 20 mA	1/8,000 (Settable to 1/4,000)	250 s/point max. (Settable to 1 ms/point)	MIL connector	CS1W-AD161		0.15	0.06	UC1, CE	
	CS1W-AD161 Connector-Terminal block conversion Units	Slim-type terminal block 34 terminal, dimensions: 128 x 40 x 39 mm						XW2D-34G6	-			-	
Connecting cable Length: 2 m								XW2Z-200C	-			-	

Analog Output Units

Unit type	Product name	Specifications						Model	No. of Unit numbers allocated	Current consumption (A)		Standards
		I/O points	Signal range selection	Signal range	Resolution	Conversion speed	External connection			5V	26V	
CS1 Special analog I/O Units	Analog Output Units	4 outputs	Set separately for each input	1 to 5 V, 0 to 5 V, 0 to 10 V, -10 V to 10 V, 4 to 20 mA	1/4,000	1 ms/point	Removable terminal block	CS1W-DA041	1	0.13	0.18	UC1, N, CE
		8 outputs		1 to 5 V, 0 to 5 V, 0 to 10 V, -10 V to 10 V	1/4,000	1 ms/point		CS1W-DA08V		0.13	0.18	
		8 outputs		4 to 20 mA	1/4,000	1 ms/point		CS1W-DA08C		0.13	0.25	

Analog I/O Units

Unit type	Product name	Specifications						Model	No. of Unit numbers allocated	Current consumption (A)		Standards
		I/O points	Signal range selection	Signal range	Resolution	Conversion speed	External connection			5V	26V	
CS1 Special analog I/O Units	Analog I/O Units	4 inputs	Set separately for each input	1 to 5 V, 0 to 5 V, 0 to 10 V, -10 V to 10 V, 4 to 20 mA	1/4,000	1 ms/point	Removable terminal block	CS1W-MAD44	1	0.20		UC1, N, L, CE
		4 outputs		1 to 5 V, 0 to 5 V, 0 to 10 V, -10 V to 10 V	1/4,000	1 ms/point				0.20	0.20	

International Standards

- The standards indicated in the "Standards" column are those current for UL, CSA, cULus, cUL, NK, and Lloyd standards and EC Directives as of the end of September 2008. The standards are abbreviated as follows: U: UL, U1: UL Class I Division 2 Products for Hazardous Locations, C: CSA, UC: cULus, UC1: cULus Class I Division 2 Products for Hazardous Locations, CU: cUL, N: NK, L: Lloyd, and CE: EC Directives.
- Ask your OMRON representatives for the conditions under which the standards were met.

Individual Specifications

Analog Input Units CS1W-AD041-V1/AD081-V1/AD161

Specifications

Item	CS1W-AD041-V1	CS1W-AD081-V1	CS1W-AD161
Applicable PLC model	CS series		
Unit type	CS1 Special I/O Unit		
Isolation ^{*1}	Between I/O and PLC signals: Photocoupler (No isolation between individual I/O signals.)		
External terminals	21-point detachable terminal block (M3 screws)		Two 34-pin MIL connectors
Affect on CPU Unit cycle time	0.2 ms		
Power consumption	120 mA max. at 5 VDC, 90 mA max. at 26 VDC		150 mA max. at 5 VDC, 55 mA max. at 26 VDC
Dimensions (mm) ^{*2}	35 × 130 × 126 (W × H × D)		35 × 130 × 119 (W × H × D)
Weight	450 g max.		
General specifications	Conforms to general specifications for SYSMAC CS Series.		
Mounting position	CS-series CPU Rack or CS-series Expansion Rack (Cannot be mounted to a C200H Expansion I/O Rack or a SYSMAC BUS Slave Rack.)		
Maximum number of Units	Depends on the power supply Unit. ^{*3}		
Data exchange with CPU Units ^{*4}	Special I/O Unit Area in CIO Area (CIO 2000 to CIO 2959): 10 words per Unit Special I/O Unit Area in DM Area (D20000 to D29599): 100 words per Unit		Special I/O Unit Area in CIO Area (CIO 2000 to CIO 2959): 20 words per Unit Special I/O Unit Area in DM Area (D20000 to D29599): 200 words per Unit
Input specifications	Number of analog inputs	4	8
	Input signal range ^{*5}	1 to 5 V 0 to 5 V 0 to 10 V -10 to 10 V 4 to 20 mA *6	
	Maximum rated input (for 1 point) ^{*7}	Voltage Input: ±15 V Current Input: ±30 mA	
	Input impedance	Voltage Input: 1 MΩ min. Current Input: 250 Ω (rated value)	
	Resolution	4,000/8,000 ^{*8}	
	Converted output data	16-bit binary data	
	Accuracy ^{*9}	Voltage Input: ±0.2% of full scale Current Input: ±0.4% of full scale	Voltage Input: ±0.2% of full scale Current Input: ±0.2% of full scale
		Voltage Input: ±0.4% of full scale Current Input: ±0.6% of full scale	Voltage Input: ±0.4% of full scale Current Input: ±0.4% of full scale
	A/D conversion time ^{*10}	1.0 ms or 250 μs per point max. ^{*8}	
	Mean value processing	Stores the last "n" data conversions in the buffer, and stores the mean value of the conversion values. Buffer number: n = 2, 4, 8, 16, 32, 64	
	Peak value holding	Stores the maximum conversion value while the Peak Value Hold Bit is ON.	
	Input disconnection detection	Detects the disconnection and turns ON the Disconnection Detection Flag. ^{*11}	
	Scaling function	None	Enabled only for conversion time of 1 ms and resolution of 4,000. Setting any values within a range of ±32,000 as the upper and lower limits allows the A/D conversion result to be output with these values as full scale.

***1.** Do not apply a voltage higher than 600 V to the terminal block when performing withstand voltage test on this Unit. Otherwise, internal elements may deteriorate.

***2.** Refer to *Dimensions* on page 20 for details on the Unit's dimensions.

***3.** The maximum number of Analog Input Units that can be mounted to one Rack depends on the Power Supply Unit mounted to the Rack.

Power Supply Unit	Rack	CS1W-AD041-V1 CS1W-AD081-V1 (5 VDC 120 mA)	CS1W-DA041 CS1W-DA08V (5 VDC 130 mA)	CS1W-MAD44 (5 VDC 200 mA)	CS1W-DA08C (5 VDC 130 mA)	CS1W-AD161 (5 VDC 150 mA)
C200HW-PA204 C200HW-PA204S C200HW-PA204R C200HW-PA204C C200HW-PD024 (4.6 A at 5 VDC)	CPU Rack	6	3	3	2	8
	Expansion Rack	6	3	3	2	9
C200HW-PA209R (9 A at 5 VDC)	CPU Rack	10	7	6	5	10
	Expansion Rack	10	7	6	5	10
CS1D-PA207R (7 A at 5 VDC)	CPU Rack	8	5	4	4	8
	Expansion Rack	9	6	5	4	9
CS1D-PD024 (4.3 A at 5 VDC)	CPU Rack	6	3	2	2	7
	Expansion Rack	6	3	2	2	8

The above limits may be reduced depending on the power consumed by other Units on the same Rack.

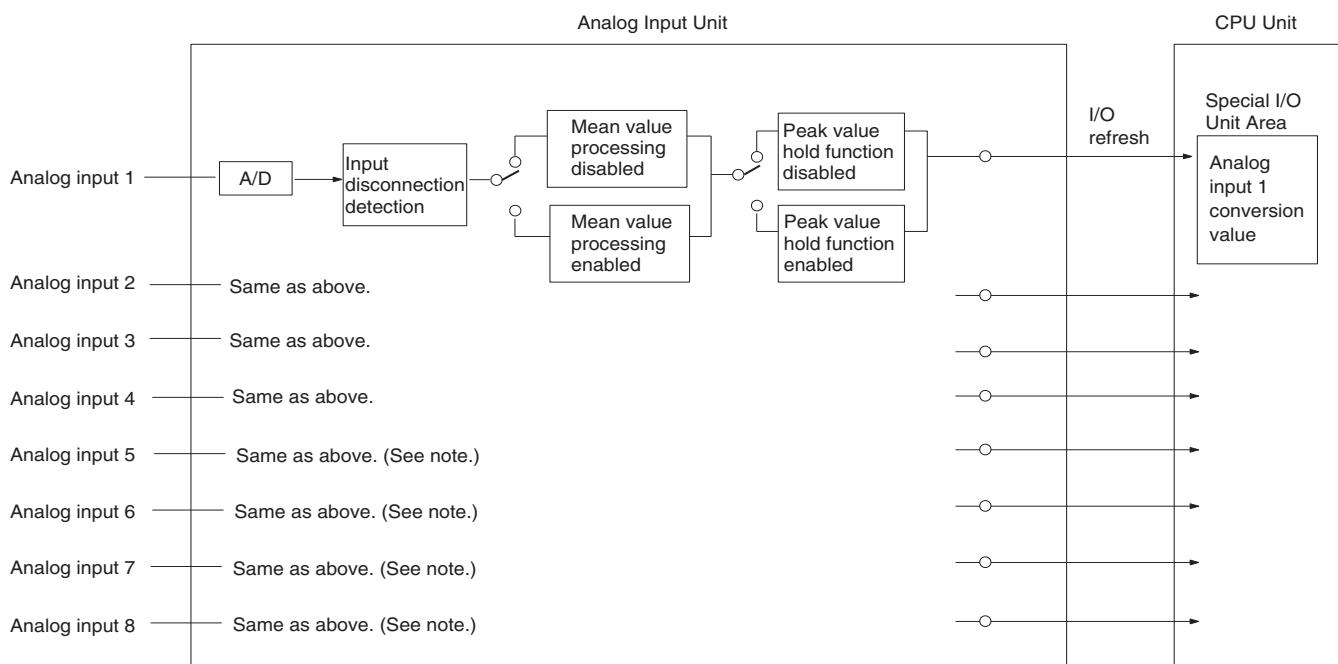
*4. Data Exchange with the CPU Unit

Area	Number of words	Data transfer timing	Transfer direction	Data contents
Special I/O Unit Area in CIO Area (CIO 2000 to CIO 2959, CIO 2000.00 to CIO 2959.15)	<ul style="list-style-type: none"> • CS1W-AD041-V1/081-V1: 10 words per Unit • CS1W-AD161: 20 words per Unit 	Constantly	CPU Unit to Analog Input Unit	Peak hold indicators
			Analog Input Unit to CPU Unit	Analog input values Line disconnection detection Alarm flags Etc.
Special I/O Unit Area in DM Area (D20000 to D26959)	<ul style="list-style-type: none"> • CS1W-AD041-V1/081-V1: 100 words per Unit • CS1W-AD161: 200 words per Unit 	When power is turned ON or Unit is restarted	CPU Unit to Analog Input Unit	Input signal conversion ON/OFF Signal range specifications Averaging specifications Resolution/conversion time setting Operation mode setting Scaling setting (CS1W-AD161 only)

The resolution/conversion time setting and operation mode setting are supported only by version-1 Analog Input Units.

- *5. Input signal ranges can be set for each input.
- *6. Voltage input or current input is selected for the CS1W-AD041-V1 and CS1W-AD081-V1 by using the voltage/current switch at the back of the terminal block. Voltage input or current input is selected for the CS1W-AD161 by wiring the connector terminals. Voltage/current selection for input ranges 1 to 5 V or 4 to 20 mA can be set in DM word m+52.
- *7. Use the analog input voltage/current value within the specified input signal range. Exceeding the specified range may result in malfunction.
- *8. With Analog Input Units, the resolution can be changed from 4,000 to 8,000 and the conversion time changed from 1 ms to 250 μ s in DM word m+18 for CS1W-AD041-V1 and CS1W-AD081-V1 or in DM word m+19 for CS1W-AD161.
- *9. The following are adjusted at the factory.
 - CS1W-AD041-V1/081-V1: Voltage inputs
 - CS1W-AD161: Voltage inputs and current inputs
 - Calibration conditions: Recommended Terminal Block-Connector Conversion Unit used. (The factory calibration for a current input can be made effective by setting DM word m+52.)
- To use current inputs with the CS1W-AD041-V1/081-V1 or to use the CS1W-AD161 with products other than the recommended ones, adjust the offset and gain as required.
- *10. A/D conversion time is the time it takes for an analog signal to be stored in memory as converted data after it has been input. It takes at least one cycle before the converted data is read by the CPU Unit.
- *11. Input disconnection detection is valid only when the 1 to 5-V or 4 to 20-mA range is set. If there is no input signal for when the 1 to 5-V or 4 to 20-mA range is set, the Disconnection Detection Flag will turn ON.

Input Function Block Diagram



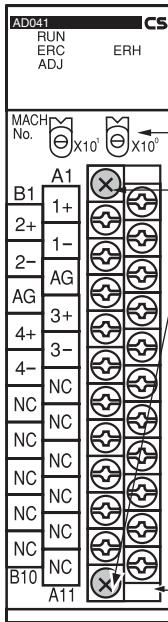
Note: There are only four analog inputs for the CS1W-AD041-V1, and 16 analog inputs for the CS1W-AD161.

External Interface

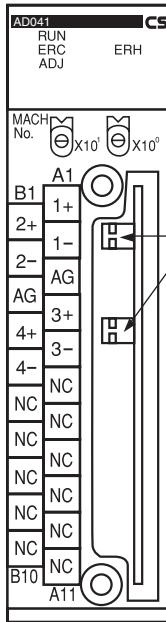
CS1W-AD041-V1

CS1W-AD081-V1

With Terminal Block

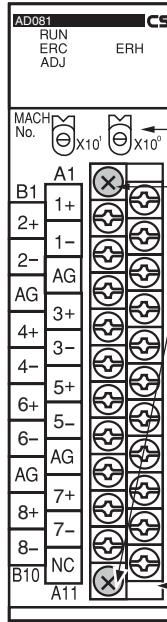


With Terminal Block Removed

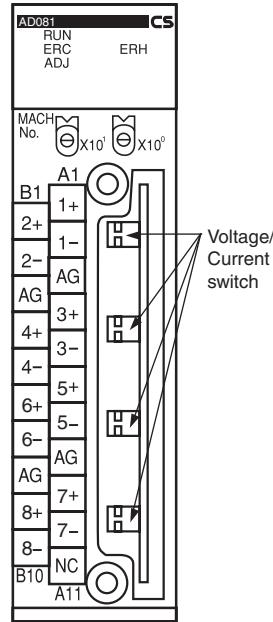


Front

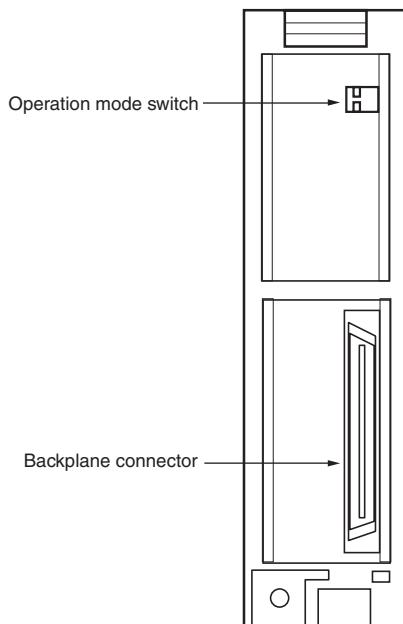
With Terminal Block



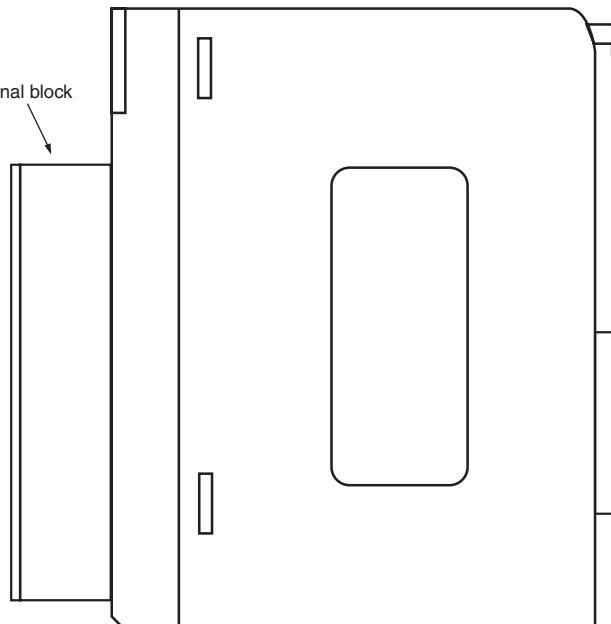
With Terminal Block Removed



Back

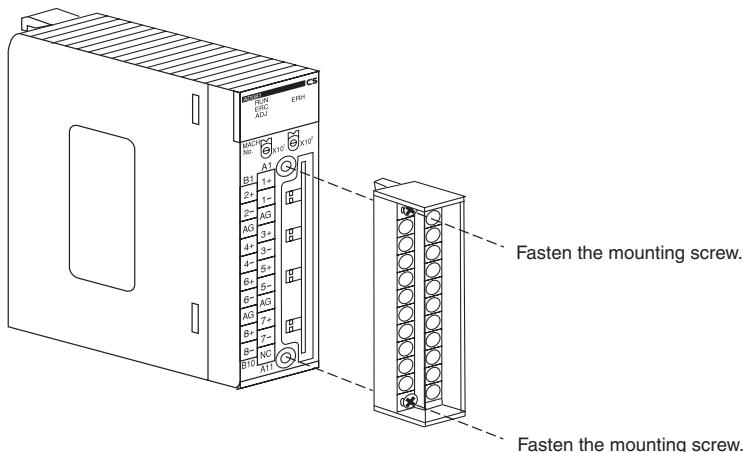


Side

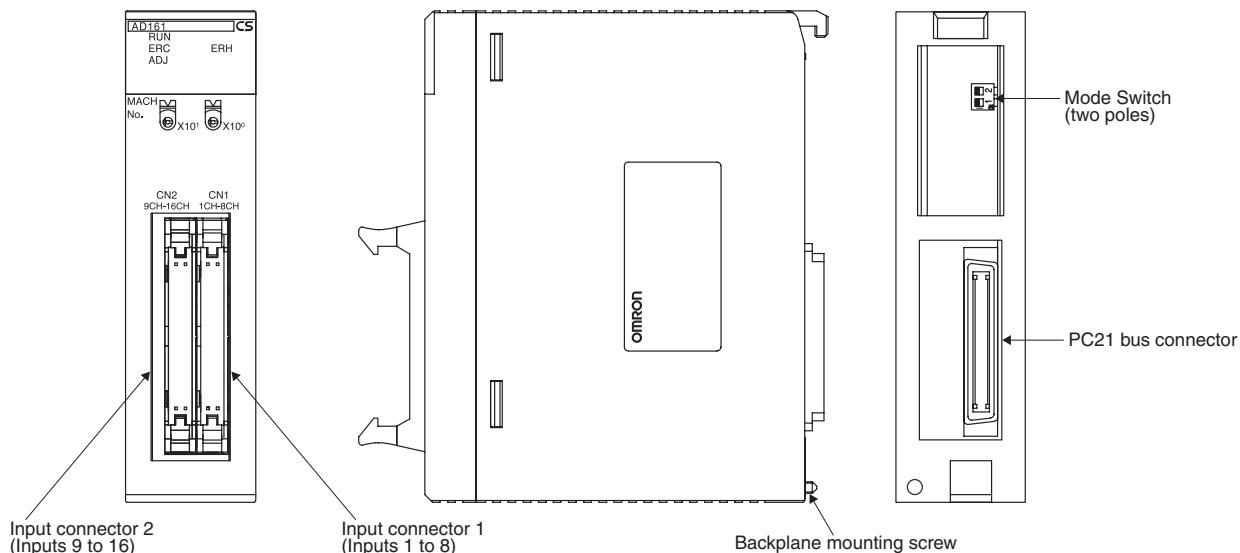


The terminal block is attached by a connector. It can be removed by loosening the two black mounting screws located at the top and bottom of the terminal block.

Check to be sure that the black terminal block mounting screw is securely tightened to a torque of 0.5 N·m.



CS1W-AD161



Indicators

The indicators show the operating status of the Unit. The following table shows the meanings of the indicators.

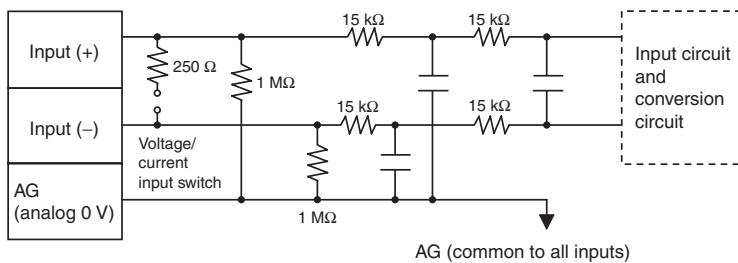
LED	Meaning	Indicator	Operating status
RUN (green)	Operating	Lit	Operating in normal mode.
		Not lit	Unit has stopped exchanging data with the CPU Unit.
ERC (red)	Error detected by Unit	Lit	Alarm has occurred (such as disconnection detection) or initial settings are incorrect.
		Not lit	Operating normally.
ADJ (yellow)	Adjusting	Flashing	Operating in offset/gain adjustment mode.
		Not lit	Other than the above.
ERH (red)	Error in the CPU Unit	Lit	Error has occurred during data exchange with the CPU Unit.
		Not lit	Operating normally.

Internal Circuitry

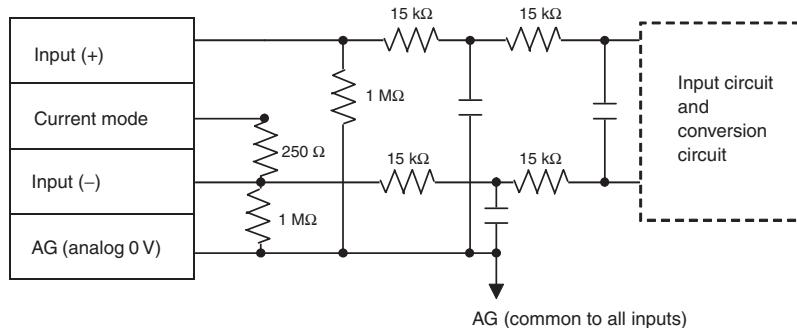
The following diagrams show the internal circuitry of the analog input section.

Input Circuitry

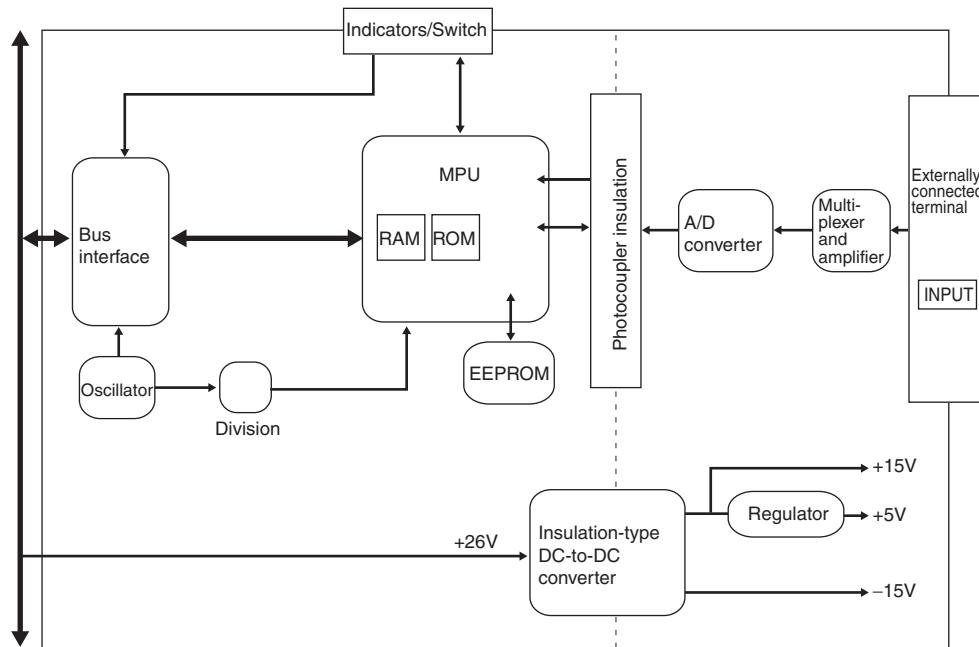
CS1W-AD041-V1/AD081-V1



CS1W-AD161



Internal Configuration



CS-series PC

Terminal Arrangement

The signal names corresponding to the connecting terminals are as shown in the following diagram.

CS1W-AD041-V1

Input 2+	B1	A1	Input 1+
Input 2-	B2	A2	Input 1-
AG	B3	A3	AG
Input 4+	B4	A4	Input 3+
Input 4-	B5	A5	Input 3-
N.C.	B6	A6	N.C.
N.C.	B7	A7	N.C.
N.C.	B8	A8	N.C.
N.C.	B9	A9	N.C.
N.C.	B10	A10	N.C.
		A11	N.C.

CS1W-AD081-V1

Input 2+	B1	A1	Input 1+
Input 2-	B2	A2	Input 1-
AG	B3	A3	AG
Input 4+	B4	A4	Input 3+
Input 4-	B5	A5	Input 3-
Input 6+	B6	A6	Input 5+
Input 6-	B7	A7	Input 5-
AG	B8	A8	AG
Input 8+	B9	A9	Input 7+
Input 8-	B10	A10	Input 7-
		A11	N.C.

CS1W-AD161

CN2 Inputs 9 to16

Input 9+	1	2	Input 10+
Current mode 9	3	4	Current mode 10
Input 9-	5	6	Input 10-
AG	7	8	AG
Input 11+	9	10	Input 12+
Current mode 11	11	12	Current mode 12
Input 11-	13	14	Input 12-
AG	15	16	AG
Input 13+	17	18	Input 14+
Current mode 13	19	20	Current mode 14
Input 13-	21	22	Input 14-
AG	23	24	AG
Input 15+	25	26	Input 16+
Current mode 15	27	28	Current mode 16
Input 15-	29	30	Input 16-
AG	31	32	AG
NC	33	34	NC

CN1 Inputs 1 to 8

Input 1+	1	2	Input 2+
Current mode 1	3	4	Current mode 2
Input 1-	5	6	Input 2-
AG	7	8	AG
Input 3+	9	10	Input 4+
Current mode 3	11	12	Current mode 4
Input 3-	13	14	Input 4-
AG	15	16	AG
Input 15+	17	18	Input 6+
Current mode 5	19	20	Current mode 6
Input 5-	21	22	Input 6-
AG	23	24	AG
Input 7+	25	26	Input 8+
Current mode 7	27	28	Current mode 8
Input 7-	29	30	Input 8-
AG	31	32	AG
NC	33	34	NC

Note:

1. The analog input numbers that can be used are set in the Data Memory (DM).
2. The input signal ranges for each input are set in the Data Memory (DM). They can be set in units of input numbers.
3. The AG terminals (A8, B8) are connected to the 0-V analog circuit in the Unit. Connecting shielded input lines can improve noise resistance.
4. Do not make any connections to the N.C. terminals.

Analog Outputs Units CS1W-DA041/DA081/DA08C

Specifications

Item	CS1W-DA041	CS1W-DA08V	CS1W-DA08C
Applicable PLC model	CS series		
Unit type	CS1 Special I/O Unit		
Isolation ^{*1}	Between I/O and PLC signals: Photocoupler (No isolation between individual I/O signals.)		
External terminals	21-point detachable terminal block (M3 screws)		
Power consumption	130 mA max. at 5 VDC, 180 mA max. at 26 VDC	130 mA max. at 5 VDC, 180 mA max. at 26 VDC	130 mA max. at 5 VDC, 250 mA max. at 26 VDC
Dimensions (mm) ^{*2}	35 × 130 × 126 (W × H × D)		
Weight	450 g max.		
General specifications	Conforms to general specifications for SYSMAC CS-series Series.		
Mounting position	CS-series CPU Rack or CS-series Expansion Rack (Cannot be mounted to a C200H Expansion I/O Rack or a SYSMAC BUS Slave Rack.)		
Maximum number of Units	Depends on the Power Supply Unit. ^{*3}		
Data exchange with CPU Units ^{*4}	Special I/O Unit Area CIO 200000 to CIO 295915 (Words CIO 2000 to CIO 2959)		
	Internal Special I/O Unit DM Area (D20000 to D29599)		
Output specifications	Number of analog outputs	4	8
	Output signal ranges ^{*5}	1 to 5 V/4 to 20 mA 0 to 5 V 0 to 10 V -10 to 10V	1 to 5 V 0 to 5 V 0 to 10 V -10 to 10 V
	Output impedance	0.5 Ω max. (for voltage output)	
	Max. output current (for 1 point)	12 mA (for voltage output)	
	Maximum permissible load resistance	600 Ω (current output) ^{*9}	–
	Resolution	4,000 (full scale)	
	Set data	16-bit binary data	
	Accuracy ^{*6}	23±2°C: Voltage output: ±0.3% of full scale Current output: ±0.5% of full scale	
		0°C to 55°C: Voltage output: ±0.5% of full scale Current output: ±0.8% of full scale	
	D/A conversion time ^{*7}	1.0 ms/point max.	
Output functions	Output hold function	Outputs the specified output status (CLR, HOLD, or MAX) under any of the following circumstances. When the Conversion Enable Bit is OFF. ^{*8} In adjustment mode, when a value other than the output number is output during adjustment. When there is an output setting error or a fatal error occurs at the PLC. When the CPU Unit is on standby. When the Load is OFF.	

***1.** Do not apply a voltage higher than 600 V to the terminal block when performing withstand voltage test on this Unit.

***2.** Refer to *Dimensions* on page 20 for details on the Unit's dimensions.

***3.** Maximum Number of Units

Power Supply Unit	CS1W-DA041/08V	CS1W-DA08C
C200HW-PA204		
C200HW-PA204S	3 Units max.	2 Units max.
C200HW-PA204R		
C200HW-PD024		
C200HW-PA209R	7 Units max.	5 Units max.

The maximum number of Units that can be mounted to one Rack varies depending on the current consumption of the other Units mounted to the Rack and may be less than the number shown in the above table.

***4.** Data Exchange with CPU Units

Special I/O Unit Area CIO 200000 to CIO 295915 (Words CIO 2000 to CIO 2959)	Exchanges 10 words of data per Unit.	CPU Unit to Analog Output Unit	Analog output setting data Conversion Enable Bit
		Analog Output Unit to CPU Unit	Alarm flags
Internal Special I/O Unit DM Area (D20000 to D29599)	Transmits 100 words of data per Unit at power-up or when the Unit is restarted.	CPU Unit to Analog Output Unit	Output signal conversion enable/disable, output signal range setting Output status for output hold

***5.** Output signal ranges can be set for each output.

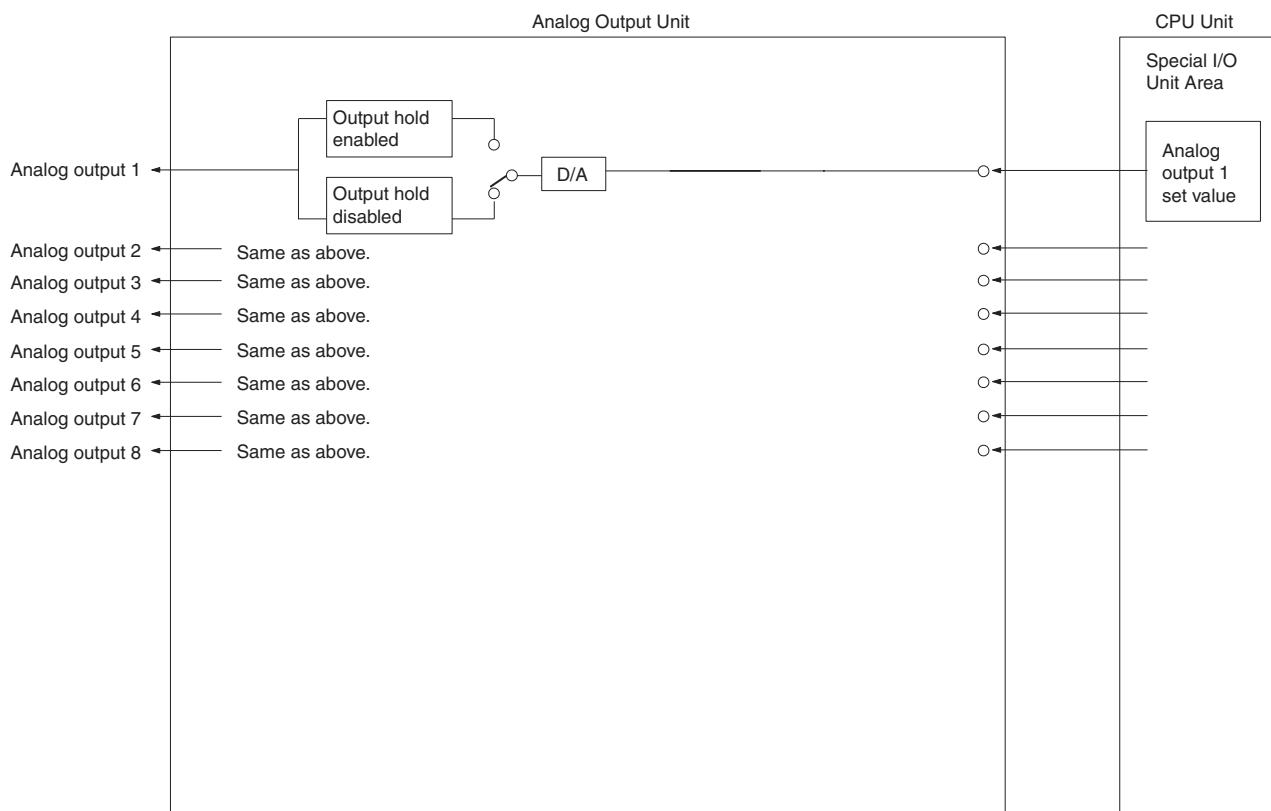
***6.** The accuracy is given for full scale. For example, an accuracy of ±0.3% means a maximum error of ±12 (BCD).

***7.** D/A conversion time is the time required for converting and outputting the PLC data. It takes at least one cycle for the data stored in the PLC to be read by the Analog Output Unit.

***8.** When the operation mode for the CPU Unit is changed from RUN mode or MONITOR mode to PROGRAM mode, or when the power is turned ON, the Output Conversion Enable Bit will turn OFF. The output status specified according to the output hold function will be output.

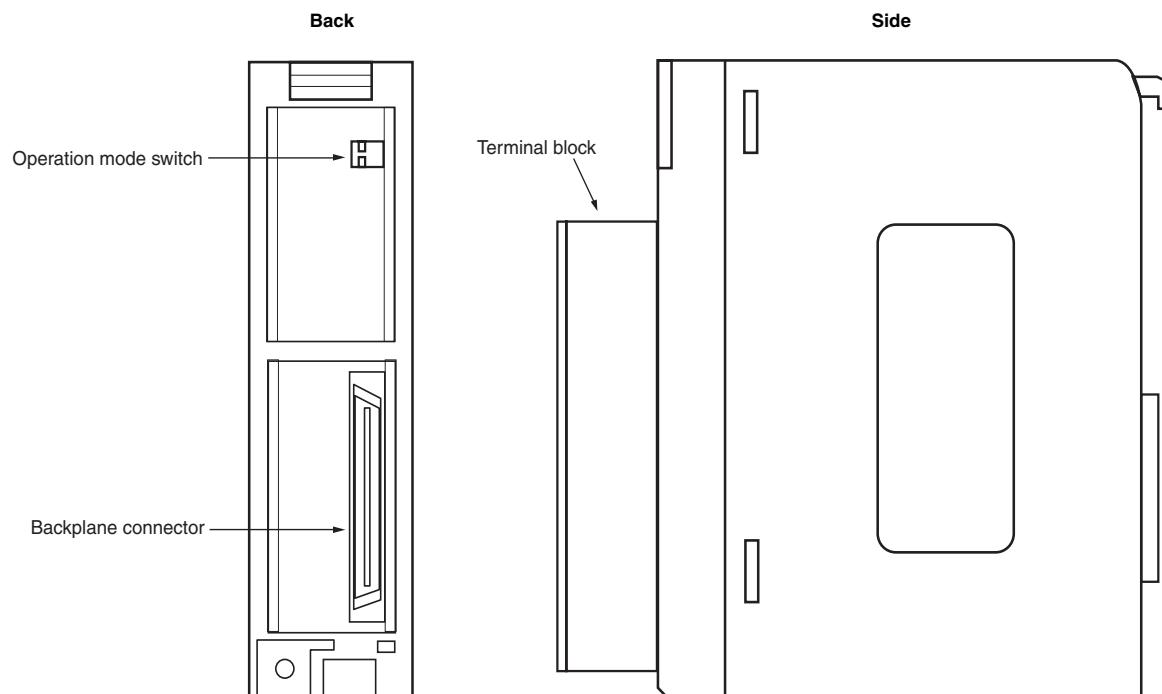
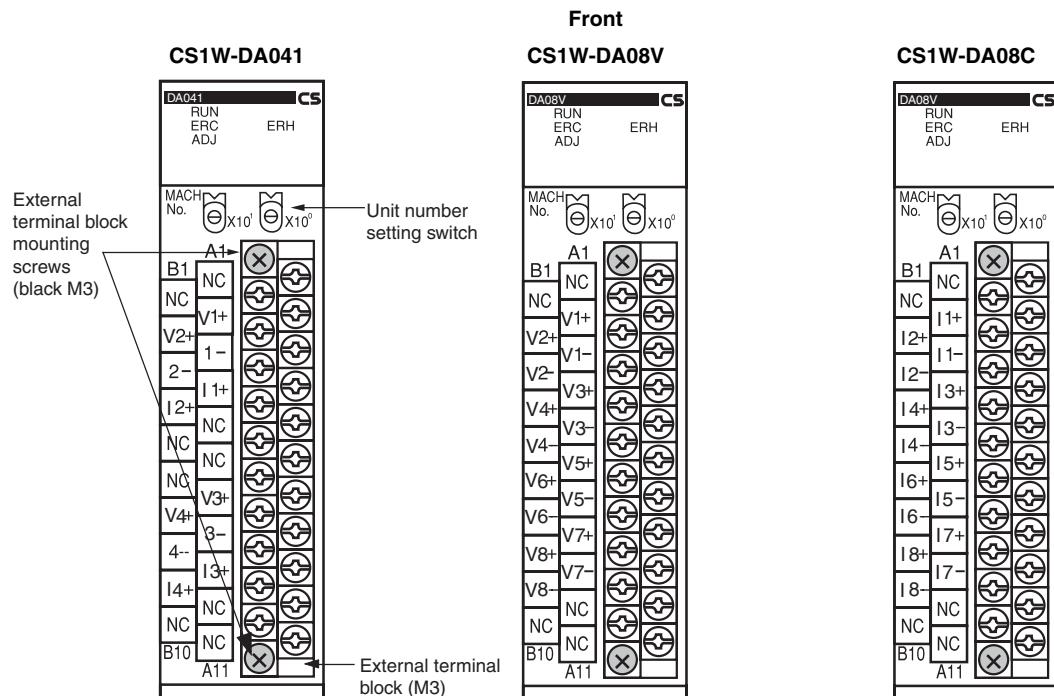
***9.** The load resistance is adjusted to 250 Ω at the factory. Always adjust the offset gain before application when the load resistance is not 250 Ω. The CS1W-DA041 is adjusted for current outputs (load resistance: 250 Ω) at the factory. Adjust the offset gain before application when using voltage outputs.

Output Function Block Diagram



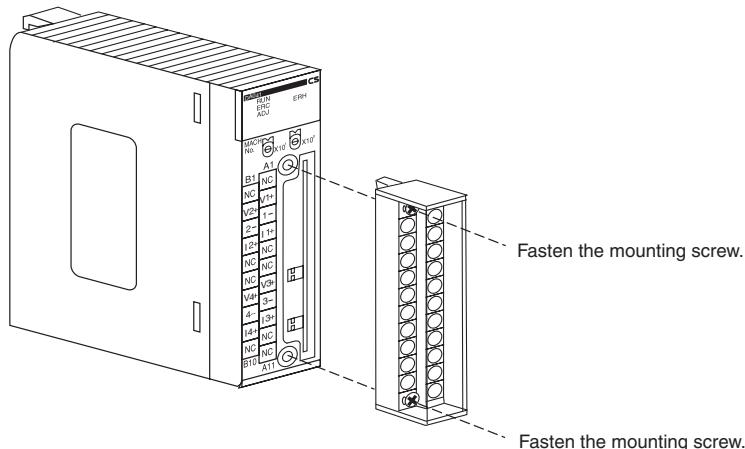
Note: There are only four analog outputs for the CS1W-DA041.

External Interface



The terminal block is attached by a connector. It can be removed by loosening the two black mounting screws located at the top and bottom of the terminal block.

Check to be sure that the black terminal block mounting screw is securely tightened to a torque of 0.5 N·m.



Indicators

The indicators show the operating status of the Unit. The following table shows the meanings of the indicators.

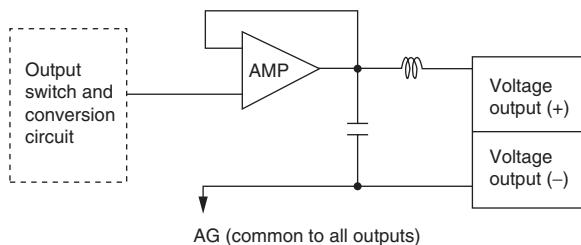
LED	Meaning	Indicator	Operating status
RUN (green)	Operating	Lit	Operating in normal mode.
		Not lit	Unit has stopped exchanging data with the CPU Unit.
ERC (red)	Error detected by Unit	Lit	Alarm has occurred (such as disconnection detection) or initial settings are incorrect.
		Not lit	Operating normally.
ADJ (yellow)	Adjusting	Flashing	Operating in offset/gain adjustment mode.
		Not lit	Other than the above.
ERH (red)	Error in the CPU Unit	Lit	Error has occurred during data exchange with the CPU Unit.
		Not lit	Operating normally.

Internal Circuitry

The following diagrams show the internal circuitry of the analog output section.

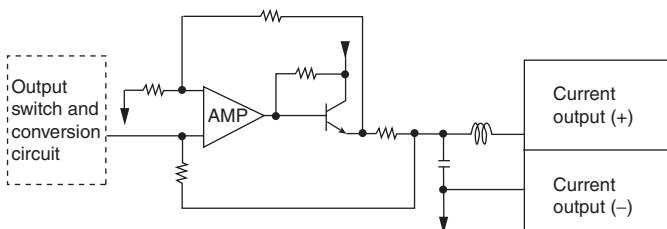
Voltage Output Circuitry

Voltage output section for CS1W-DA08V/DA041

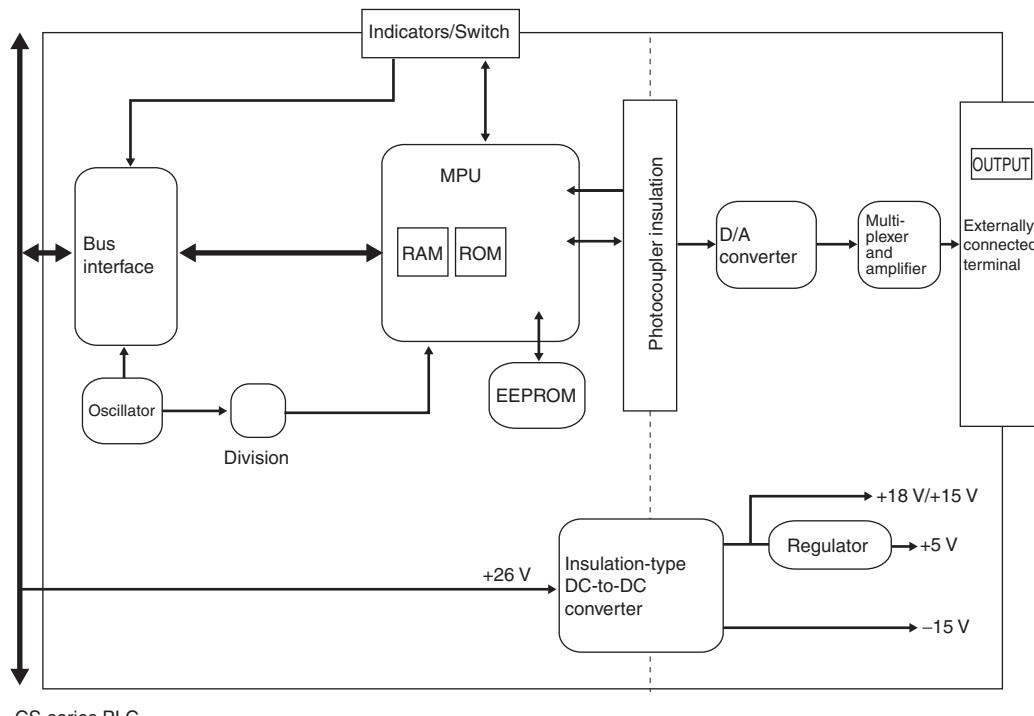


Current Output Circuitry

Current output section for CS1W-DA08C/DA041



Internal Configuration



Terminal Arrangement

The signal names corresponding to the connecting terminals are as shown in the following diagram.

CS1W-DA08V/08C

N.C.	B1	A1	N.C.
		A2	Output 1+
Output 2+	B2	A3	Output 1-
Output 2-	B3	A4	Output 3+
Output 4+	B4	A5	Output 3-
Output 4-	B5	A6	Output 5+
Output 6+	B6	A7	Output 5-
Output 6-	B7	A8	Output 7+
Output 8+	B8	A9	Output 7-
Output 8-	B9	A10	N.C.
N.C.	B10	A11	N.C.

CS1W-DA041

N.C.	B1	A1	N.C.
		A2	Output voltage 1+
Output voltage 2+	B2	A3	Output 1-
Output 2-	B3	A4	Output current 1+
Output current 2+	B4	A5	N.C.
N.C.	B5	A6	N.C.
N.C.	B6	A7	Output voltage 3+
Output voltage 4-	B7	A8	Output 3-
Output 4-	B8	A9	Output current 3+
Output current 4+	B9	A10	N.C.
N.C.	B10	A11	N.C.

Note:

1. The analog output numbers that can be used are set in the Data Memory (DM).
2. The output signal ranges for individual outputs are set in the Data Memory (DM). They can be set in units of output numbers.
3. The N.C. terminals are not connected to internal circuitry.

Analog I/O Units CS1W-MAD44**Specifications**

Item	CS1W-MAD44		
Applicable PLC model	CS series		
Unit type	CS1 Special I/O Unit		
Isolation	Between I/O and PLC signals: Photocoupler (No isolation between individual I/O signals.)		
External terminals	21-point detachable terminal block (M3 screws)		
Power consumption	200 mA max. at 5 VDC, 200 mA max. at 26 VDC		
Dimensions (mm) *1	35 × 130 × 126 (W × H × D)		
Weight	450 g max.		
General specifications	Conforms to general specifications for SYSMAC CS-series Series.		
Mounting position	CS-series CPU Rack or CS-series Expansion Rack (Cannot be mounted to a C200H Expansion I/O Rack or a SYSMAC BUS Slave Rack.)		
Maximum number of Units	Units per Rack (CPU Rack or Expansion Rack) *2	Power Supply Unit	Maximum number of Units per Rack
		C200HW-PA204 C200HW-PA204S C200HW-PA204R C200HW-PD024	3 Units max.
		C200HW-PA209R	6 Units max.
Data exchange with CPU Units	Special I/O Unit Area CIO 200000 to CIO 295915 (Words CIO 2000 to CIO 2959)	Exchanges 10 words of data per Unit.	CPU Unit to Analog I/O Unit Analog I/O Unit to CPU Unit
			Analog input Input disconnection detection Alarm flags
		Transmits 100 words of data per Unit at power-up or when the Unit is restarted.	CPU Unit to Analog I/O Unit Input signal conversion enable/disable, input signal range setting Output signal conversion enable/disable, output signal range setting Ratio conversion function setting, constants Output status for output hold Mean value function setting
Input	Specifications	Input signal *4	Voltage input
		Number of analog inputs	4
		Input signal range *3	1 to 5 V 0 to 5 V 0 to 10 V -10 to 10 V
		Maximum rated input (for 1 point) *5	±15 V
		Input impedance	1 MΩ min.
		Resolution	4,000 (full scale)
		Converted output data	16-bit binary data
		Accuracy *6	23±2°C 0°C to 55°C
	Functions	A/D conversion time *7	±0.2% of full scale ±0.4% of full scale ±0.6% of full scale
		Mean value processing	Stores the last "n" data conversions in the buffer, and stores the mean value of the conversion values. Buffer number: n = 2, 4, 8, 16, 32, 64
		Peak value holding	Stores the maximum conversion value while the Peak Value Hold Bit is ON.
		Input disconnection detection *9	Detects the disconnection and turns ON the Disconnection Detection Flag.

Item		CS1W-MAD44	
Output	Specifications	Output signal	Voltage output
		Number of analog outputs	4
		Output signal range *3	1 to 5 V 0 to 5 V 0 to 10 V -10 to 10 V
		Output impedance (for 1 point)	0.5 Ω max.
		Max. output current	12 mA
		Resolution	4,000 (full scale)
		Set data	16-bit binary data
		Accuracy *6	23±2°C: ±0.3% of full scale 0°C to 55°C: ±0.5% of full scale
		D/A conversion time *7	1.0 ms/point max.
		Functions	Outputs the specified output status (CLR, HOLD, or MAX) under any of the following circumstances. When the Conversion Enable Bit is OFF. *8 In adjustment mode, when a value other than the output number is output during adjustment. When there is an output setting error or a fatal error occurs at the PLC. When the CPU Unit is on standby. When the Load is OFF.
Other	Functions	Ratio conversion function	Stores the results of positive and negative gradient analog inputs calculated for ratio and bias as analog output values. Positive gradient: Analog output = A × Analog input + B (A = 0 to 99.99, B = 8,000 to 7FFF Hex) Negative gradient: Analog output = F - A × Analog input + B (A = 0 to 99.99, B = 8,000 to 7FFF Hex, F = output range max. value)

***1.** Refer to *Dimensions* on page 20 for details on the Unit's dimensions.

***2.** The maximum number of Analog I/O Units that can be mounted to one Rack will varies depending on the current consumption of the other Units mounted to the Rack.

***3.** Input and output signal ranges can be set for each input and output.

***4.** Voltage input or current input are chosen by using the voltage/current switch at the back of the terminal block.

***5.** The Analog I/O Unit must be operated according to the input specifications provided here. Operating the Unit outside these specifications will cause the Unit to malfunction.

***6.** The accuracy is given for full scale. For example, an accuracy of ±0.2% means a maximum error of ±8 (BCD).

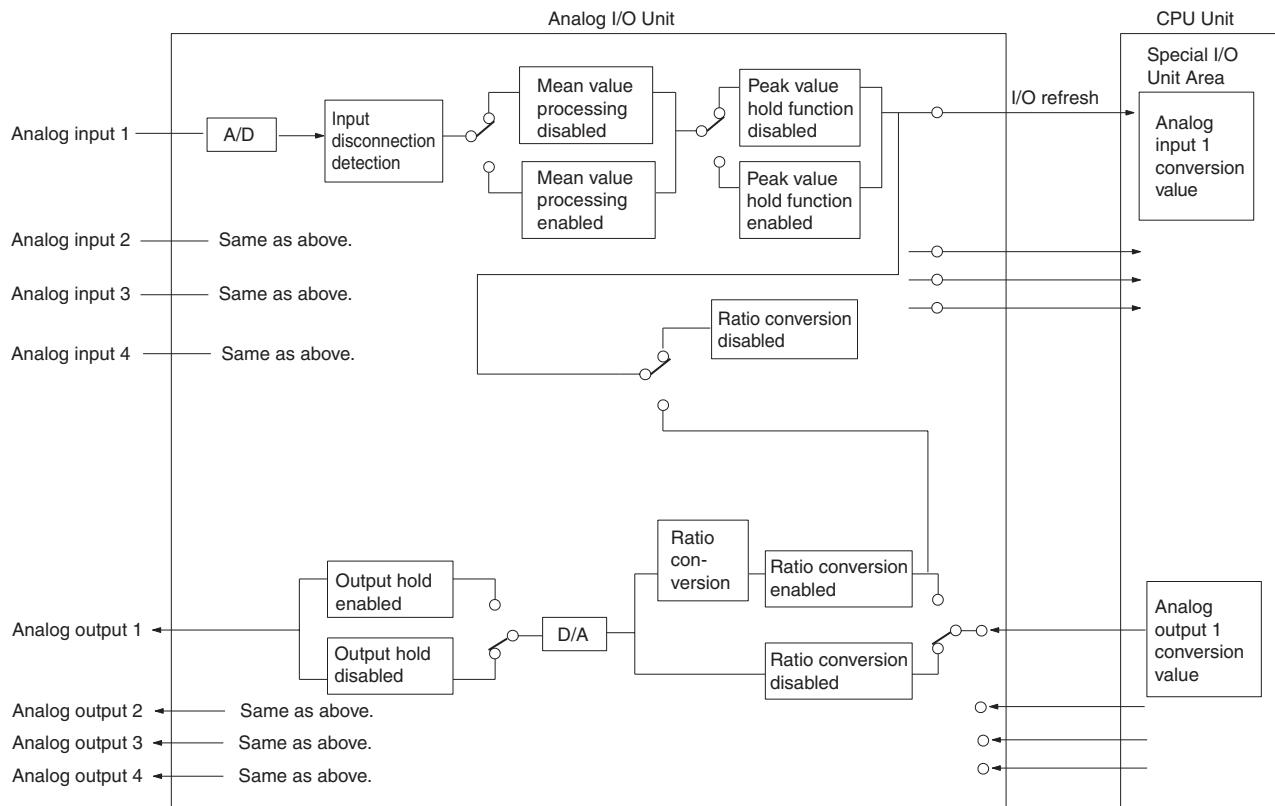
The default setting is adjusted for voltage input. To use current input, perform the offset and gain adjustments as required.

***7.** A/D conversion time is the time it takes for an analog signal to be stored in memory as converted data after it has been input. It takes at least one cycle before the converted data is read by the CPU Unit. D/A conversion time is the time required for converting and outputting the PLC data. It takes at least one cycle for the data stored in the PLC to be read by the Analog I/O Unit.

***8.** When the operation mode for the CPU Unit is changed from RUN mode or MONITOR mode to PROGRAM mode, or when the power is turned ON, the Output Conversion Enable Bit will turn OFF. The output status specified according to the output hold function will be output.

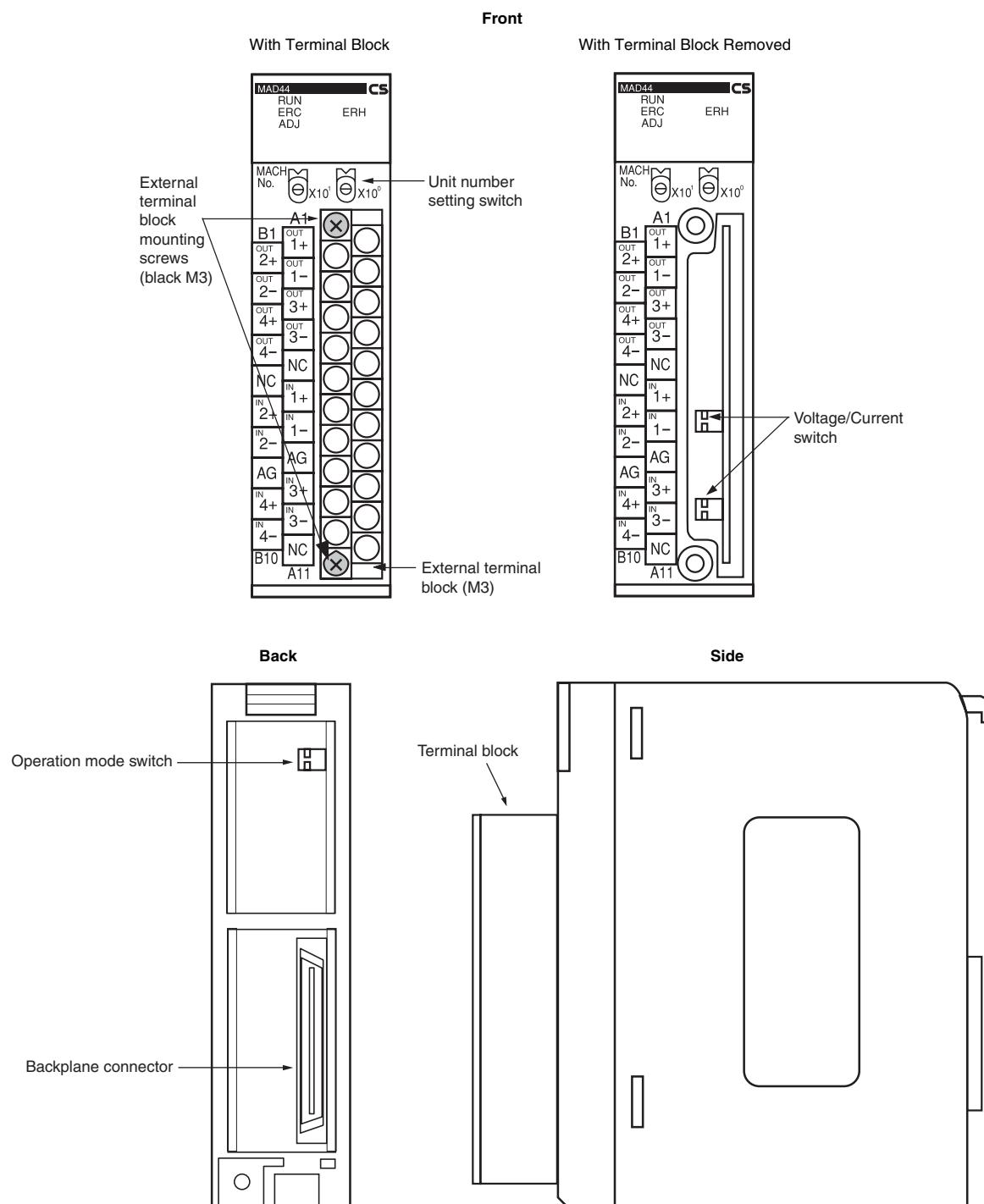
***9.** Input disconnection detection is valid only when the 1 to 5-V or 4 to 20-mA range is set. If there is no input signal for when the 1 to 5-V or 4 to 20-mA range is set, the Disconnection Detection Flag will turn ON.

I/O Function Block Diagram



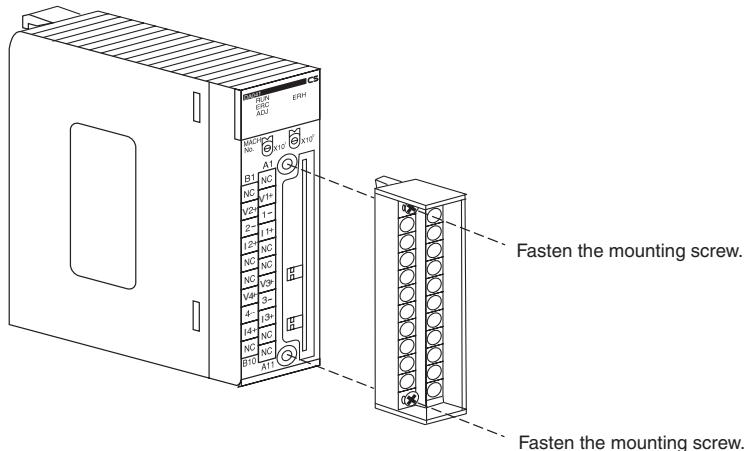
External Interface

CS1W-MAD44



The terminal block is attached by a connector. It can be removed by loosening the two black mounting screws located at the top and bottom of the terminal block.

Check to be sure that the black terminal block mounting screw is securely tightened to a torque of 0.5 N·m.



Indicators

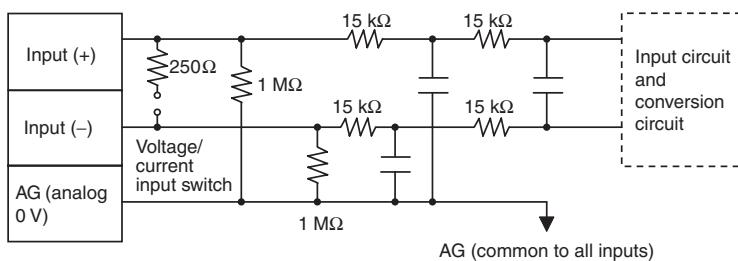
The indicators show the operating status of the Unit. The following table shows the meanings of the indicators.

LED	Meaning	Indicator	Operating status
RUN (green)	Operating	Lit	Operating in normal mode.
		Not lit	Unit has stopped exchanging data with the CPU Unit.
ERC (red)	Error detected by Unit	Lit	Alarm has occurred (such as disconnection detection) or initial settings are incorrect.
		Not lit	Operating normally.
ADJ (yellow)	Adjusting	Flashing	Operating in offset/gain adjustment mode.
		Not lit	Other than the above.
ERH (red)	Error in the CPU Unit	Lit	Error has occurred during data exchange with the CPU Unit.
		Not lit	Operating normally.

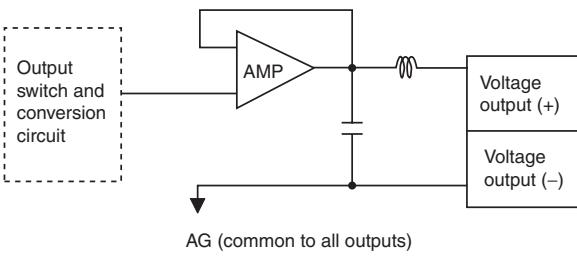
Internal Circuitry

The following diagrams show the internal circuitry of the analog I/O section.

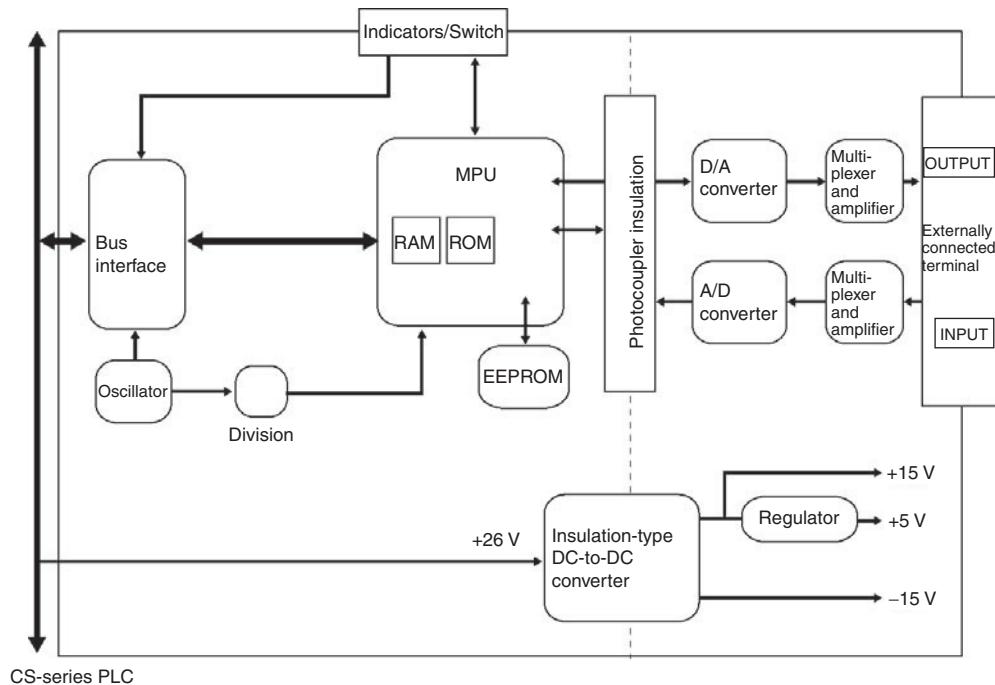
Input Circuitry



Output Circuitry



Internal Configuration



Terminal Arrangement

The signal names corresponding to the connecting terminals are as shown in the following diagram.

Output 2+	B1	A1	Output 1+
Output 2-	B2	A2	Output 1-
Output 4+	B3	A3	Output 3+
Output 4-	B4	A4	Output 3-
N.C.	B5	A5	N.C.
Input 2+	B6	A6	Input 1+
Input 2-	B7	A7	Input 1-
AG	B8	A8	AG
Input 4+	B9	A9	Input 3+
Input 4-	B10	A10	Input 3-
		A11	N.C.

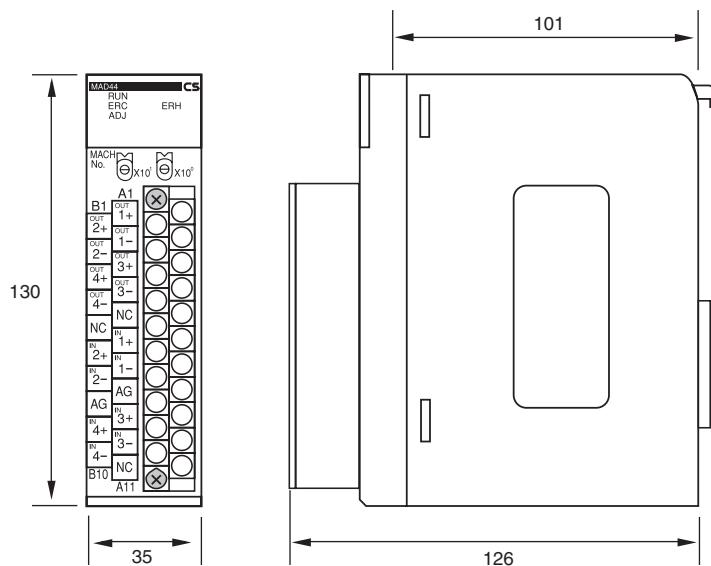
Note:

1. The analog I/O numbers that can be used are set in the Data Memory (DM).
2. The I/O signal ranges for individual inputs and outputs are set in the Data Memory (DM). They can be set in units of I/O numbers.
3. The AG terminal (A8, B8) is connected to the 0-V analog circuit in the Unit. Connecting shielded input lines can improve noise resistance.
4. The N.C. terminals (A5, A11, B5) are not connected to internal circuitry.

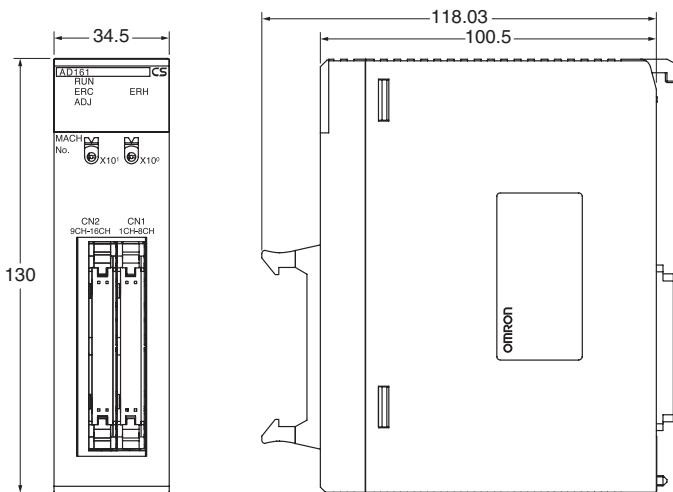
Dimensions

(Unit: mm)

CS-series Units: CS1W-AD041-V1/081-V1, CS1W-DA08V/08C/041, CS1W-MAD44

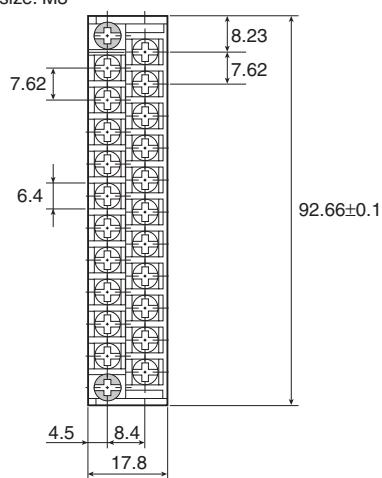


CS1W-AD161



CS-series Unit Terminal Block Dimensions

Terminal size: M3



About this Manual

Name	Cat. No.	Contents
SYSMAC CS/CJ-series Analog I/O Units Operation Manual CS1W-AD041-V1/AD081-V1/AD161, CS1W-DA041/DA08V/DA08C, CS1W-MAD44, CJ1W-AD041-V1/AD081-V1, CJ1W-DA021/DA041/DA08V/DA08C, CJ1W-MAD42	W345	Describes the application methods of the CS/CJ-series Analog Input, Analog Output, and Analog I/O Units.
SYSMAC CS-series Programmable Controllers Operation Manual CS1G/H-CPU□□-EV1, CS1G/H-CPU□□H	W339	Describes the installation and operation of the CS-series PLCs.
SYSMAC CS Series CS1D Duplex System Operation Manual CS1D-CPU□□H CPU Units, CS1D-CPU□□S CPU Units, CS1D-DPL01 Duplex Unit, CS1D-PA/PD□□□ Power Supply Unit	W405	Provides an outline of and describes the design, installation, maintenance, and other basic operations for a Duplex System based on CS1D CPU Units.
CJ-series PLCs Operation Manual CJ1H-CPU□□H-R, CJ1G/H-CPU□□H, CJ1G-CPU□□P, CJ1G-CPU□□, CJ1H-CPU□□	W393	Provides the following information on CJ-series PLCs: • Overview and features • System configuration design • Installation and wiring • I/O memory allocations • Troubleshooting
CS/CJ/NSJ-series PLCs Programming Manual CS1G/H-CPU□□H, CS1G/H-CPU□□-V1, CS1D-CPU□□H, CS1D-CPU□□S, CJ1H-CPU□□H-R, CJ1G/H-CPU□□H, CJ1G-CPU□□P, CJ1M-CPU□□, CJ1G-CPU□□, NSJ□-□□□□(B)-G5D, NSJ□-□□□□(B)-M3D	W394	Provides the following information on CS/CJ/NSJ-series PLCs: • Programming • Task functions • File memory • Various operations
CS/CJ/NSJ-series PLCs Instructions Reference Manual CS1G/H-CPU□□H, CS1G/H-CPU□□-V1, CS1D-CPU□□H, CS1D-CPU□□S, CJ1H-CPU□□H-R, CJ1G/H-CPU□□H, CJ1G-CPU□□P, CJ1M-CPU□□, CJ1G-CPU□□, NSJ□-□□□□(B)-G5D, NSJ□-□□□□(B)-M3D	W340	Describes all the ladder programming instructions in detail.
CX-Programmer Operation Manual (Version 8.□) WS02-CXPC□-V8	W446	Describes how to use the CX-Programmer.
SYSMAC CS/CJ-series Programming Consoles Operation Manual CQM1H-PRO01, CQM1-PRO01, C200H-PRO27 + CS1W-KS001	W341	Describes how to use the Programming Console.

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