

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:

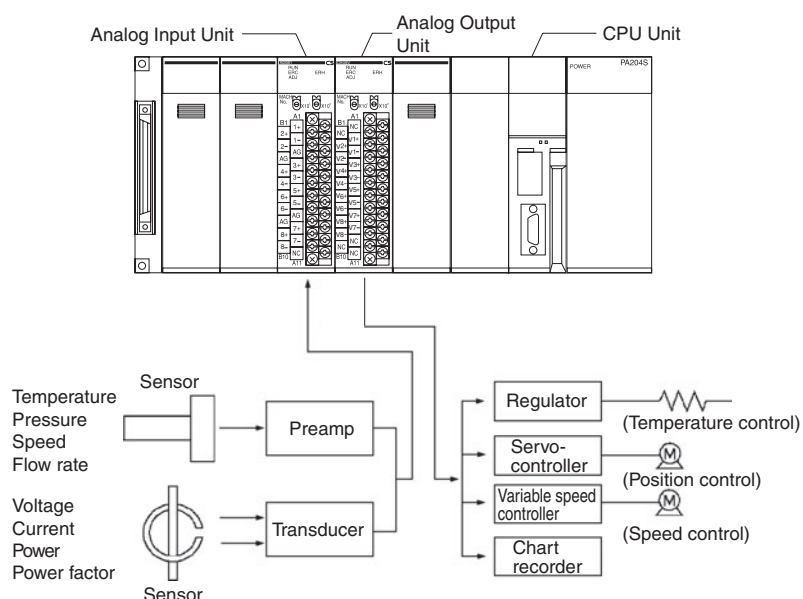
- Has both analog input and output signals
- Ratio conversion function stores the results of positive and negative gradient analog inputs calculated for ratio and bias as analog output values
- Hold a maximum of 4 analog input signals and outputs 4 analog output signals in 1 unit

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 × 40 × 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 | 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 | | | | | | |

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 | 16 |
| | 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 | 23±2°C | 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 |
| | | 0°C to 55°C | 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 | 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

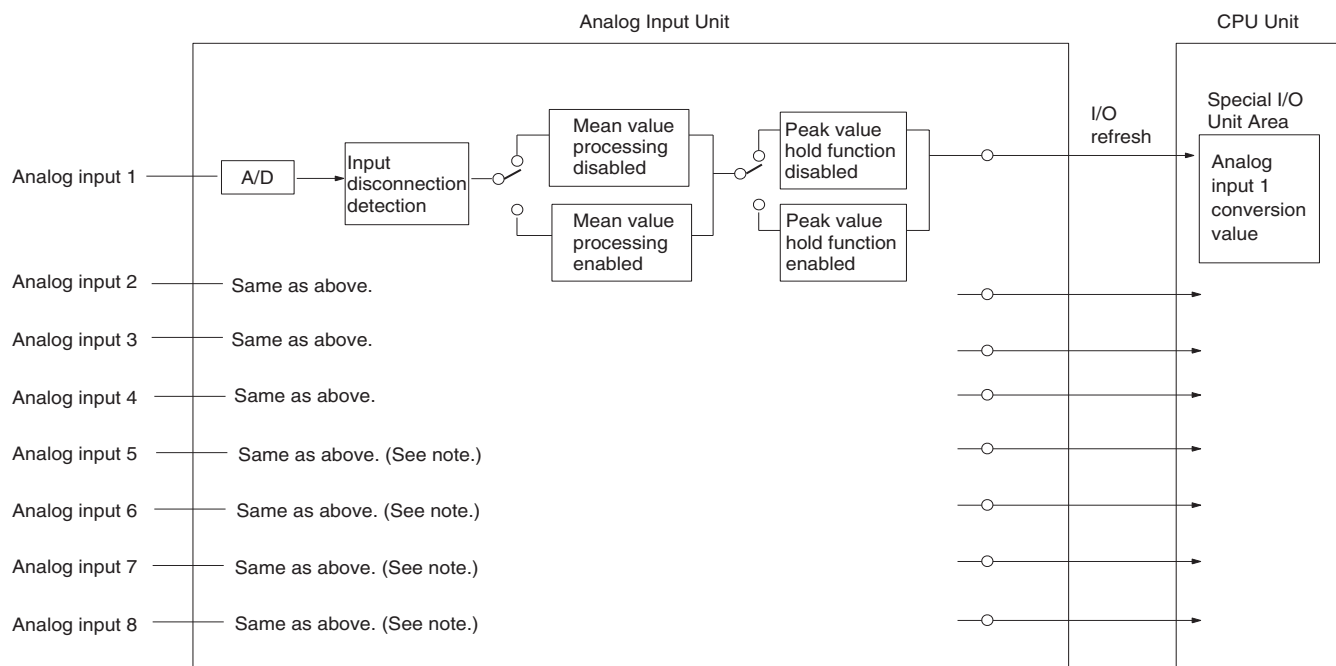
Calibration conditions: Recommended Terminal Block-Connector Conversion Unit used. (The factory calibration for a current input can be made effective by setting DM word m+52.)

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

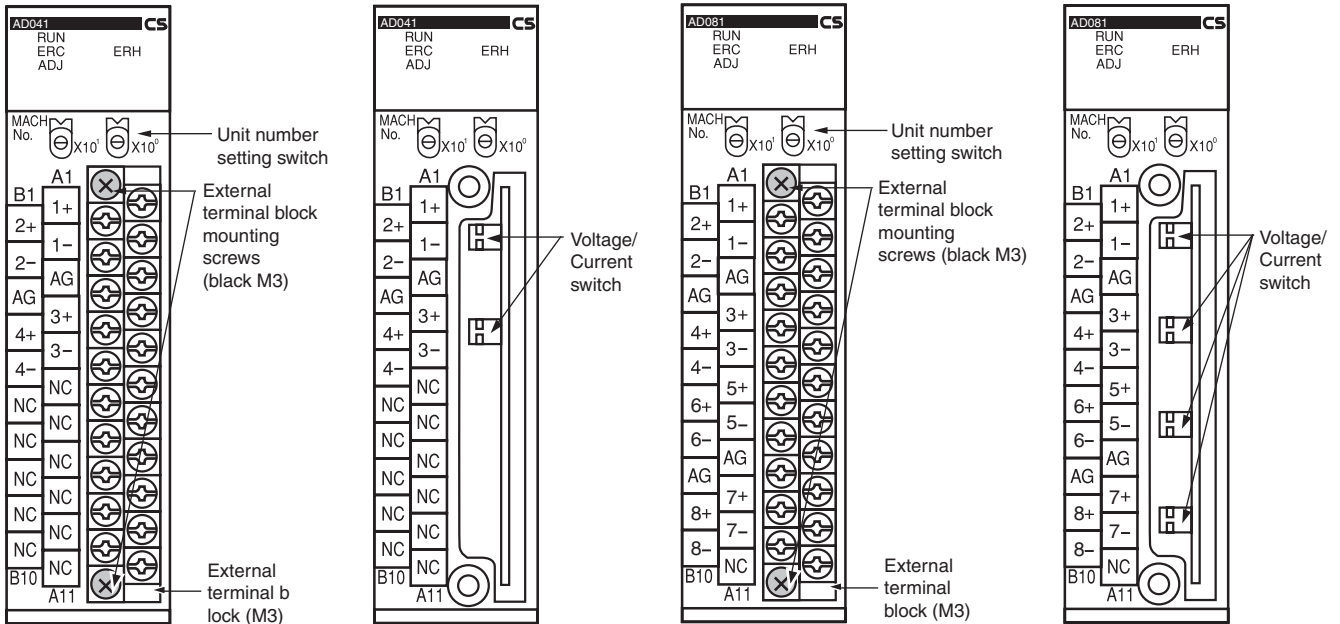
Front

With Terminal Block

With Terminal Block Removed

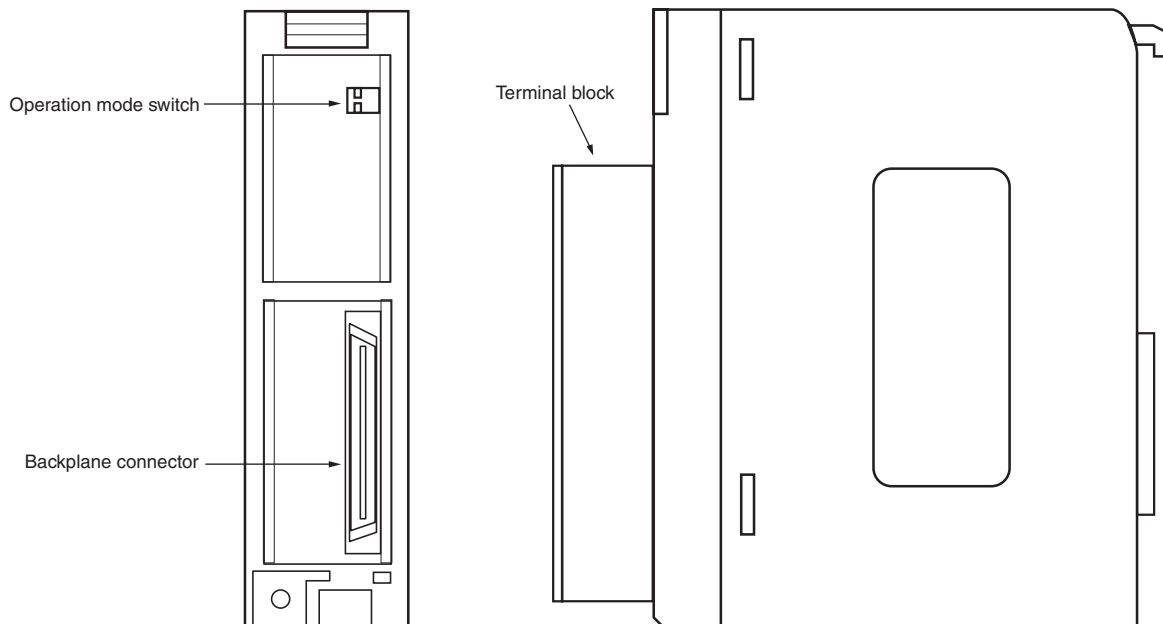
With Terminal Block

With Terminal Block Removed



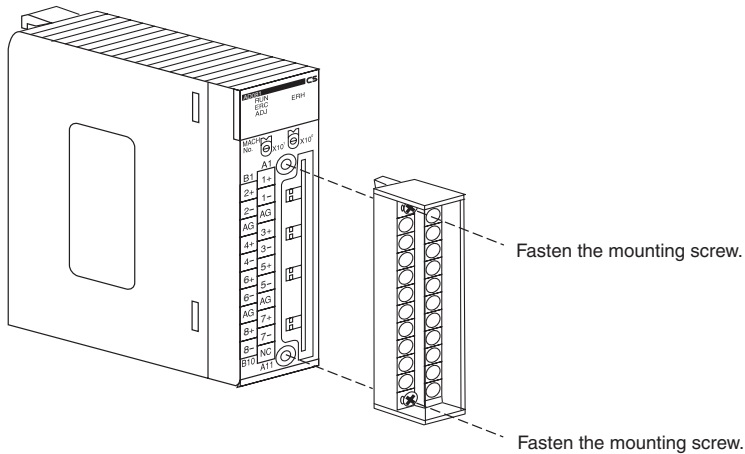
Back

Side

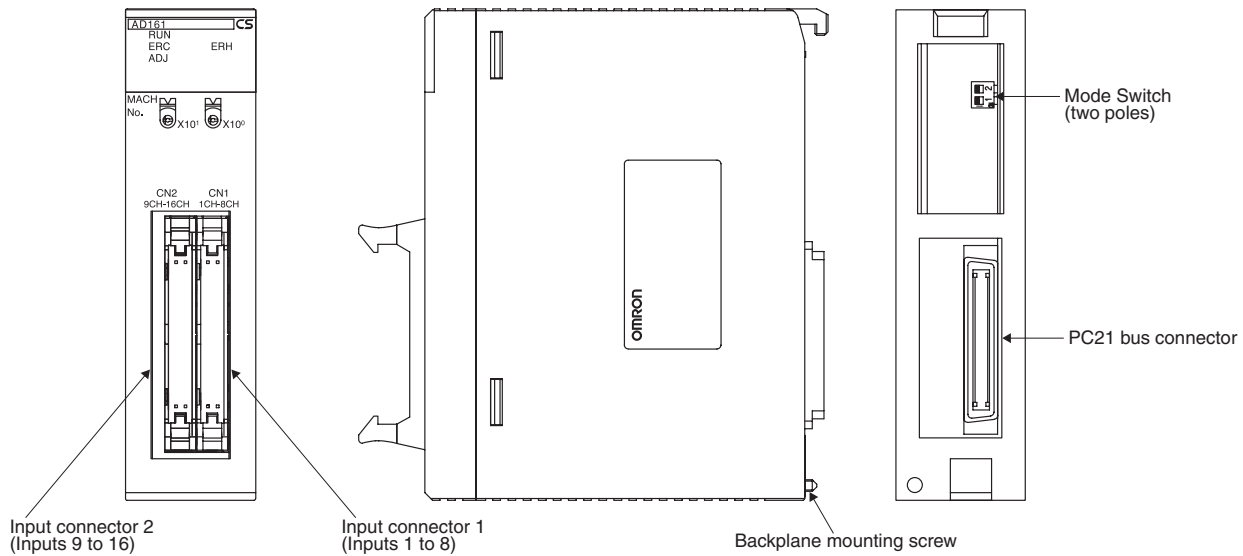


The terminal block is attached by a connector. It can be removed by loosening the two black mounting screws located at the top and bottom of the terminal block.

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.

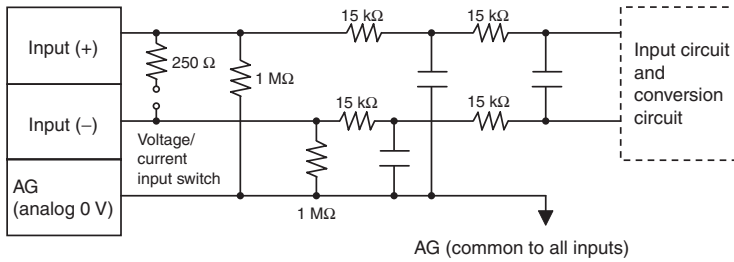
| LED | Meaning | Indicator | Operating status |
|--------------|------------------------|-----------|---|
| RUN (green) | Operating | Lit | Operating in normal mode. |
| | | Not lit | Unit has stopped exchanging data with the CPU Unit. |
| ERC (red) | Error detected by Unit | Lit | Alarm has occurred (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

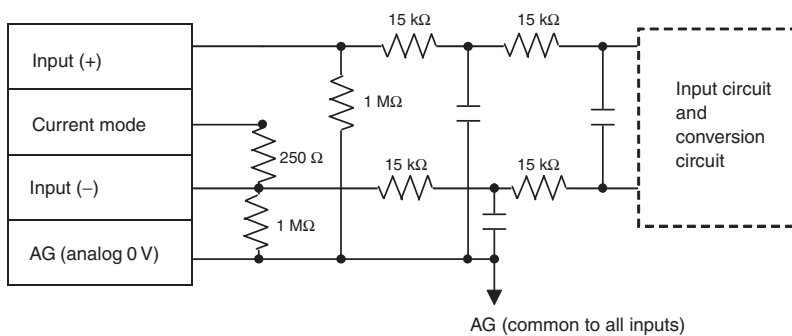
The following diagrams show the internal circuitry of the analog input section.

Input Circuitry

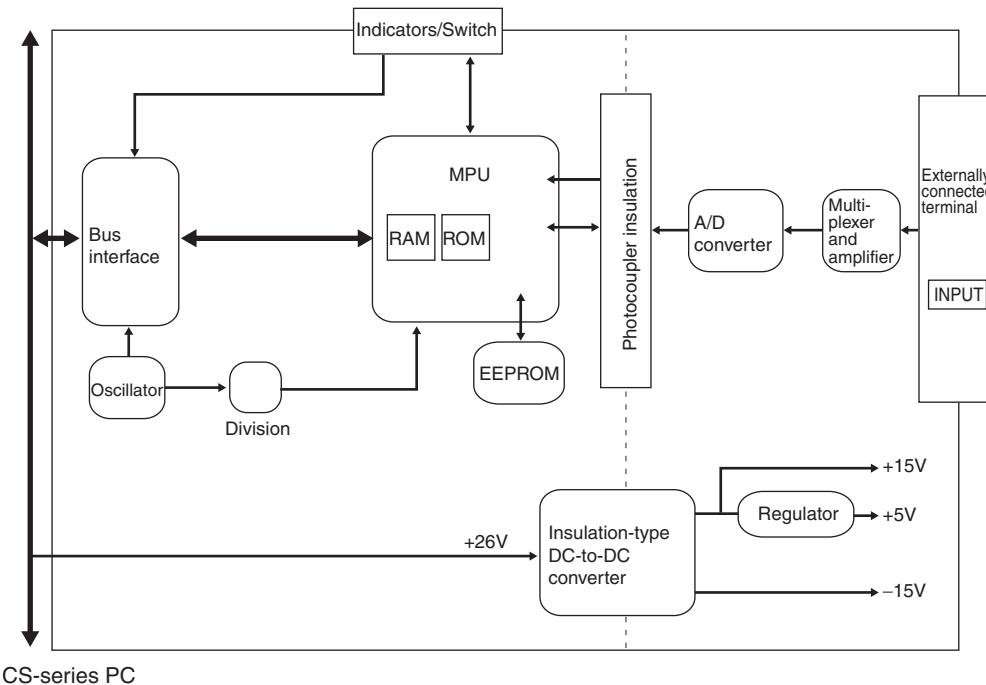
CS1W-AD041-V1/AD081-V1



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 to 16

| | | | |
|-----------------|----|----|-----------------|
| 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 | 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 | 4 to 20 mA |
| | 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 | — | 600 Ω (current output) *8 |
| | 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 | | |
| 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 C200HW-PA204R C200HW-PD024 | 3 Units max. | 2 Units max. |
| 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.

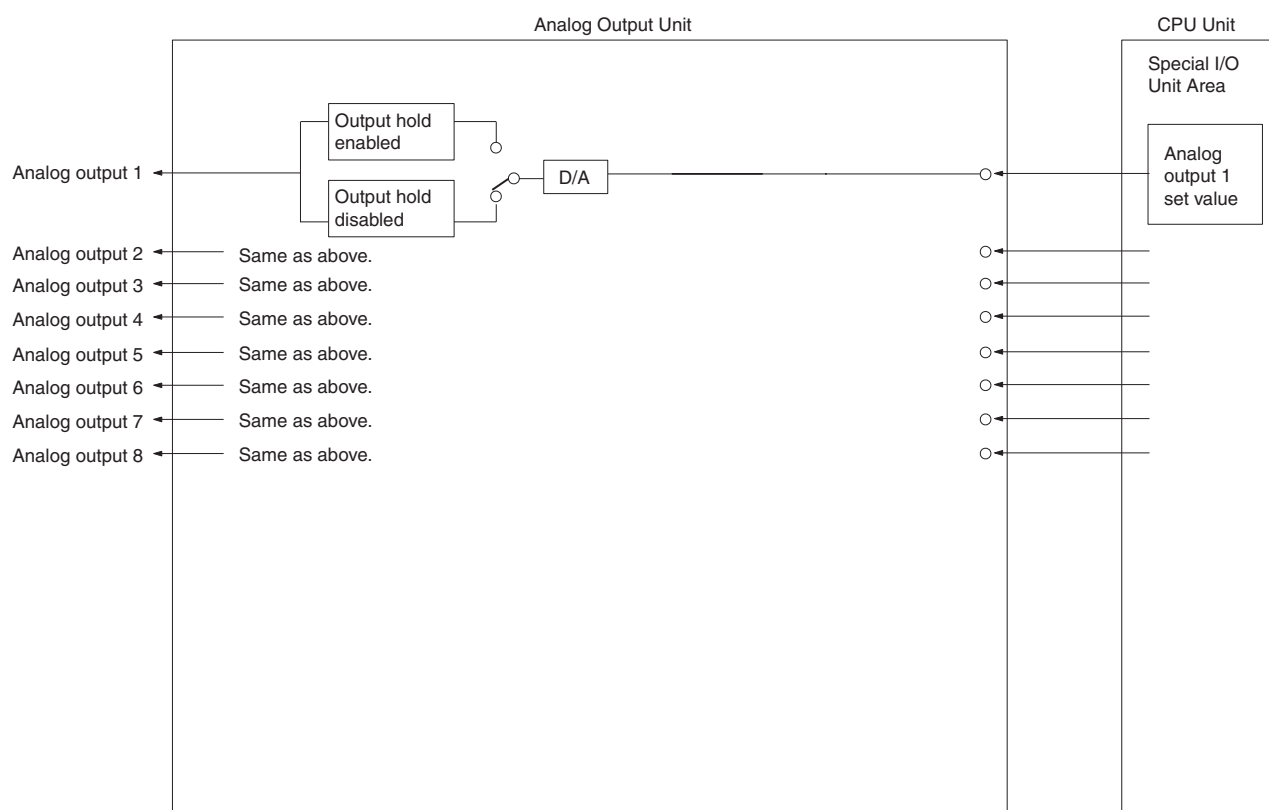
*6. The accuracy is given for full scale. For example, an accuracy of ±0.3% means a maximum error of ±12 (BCD).

*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.

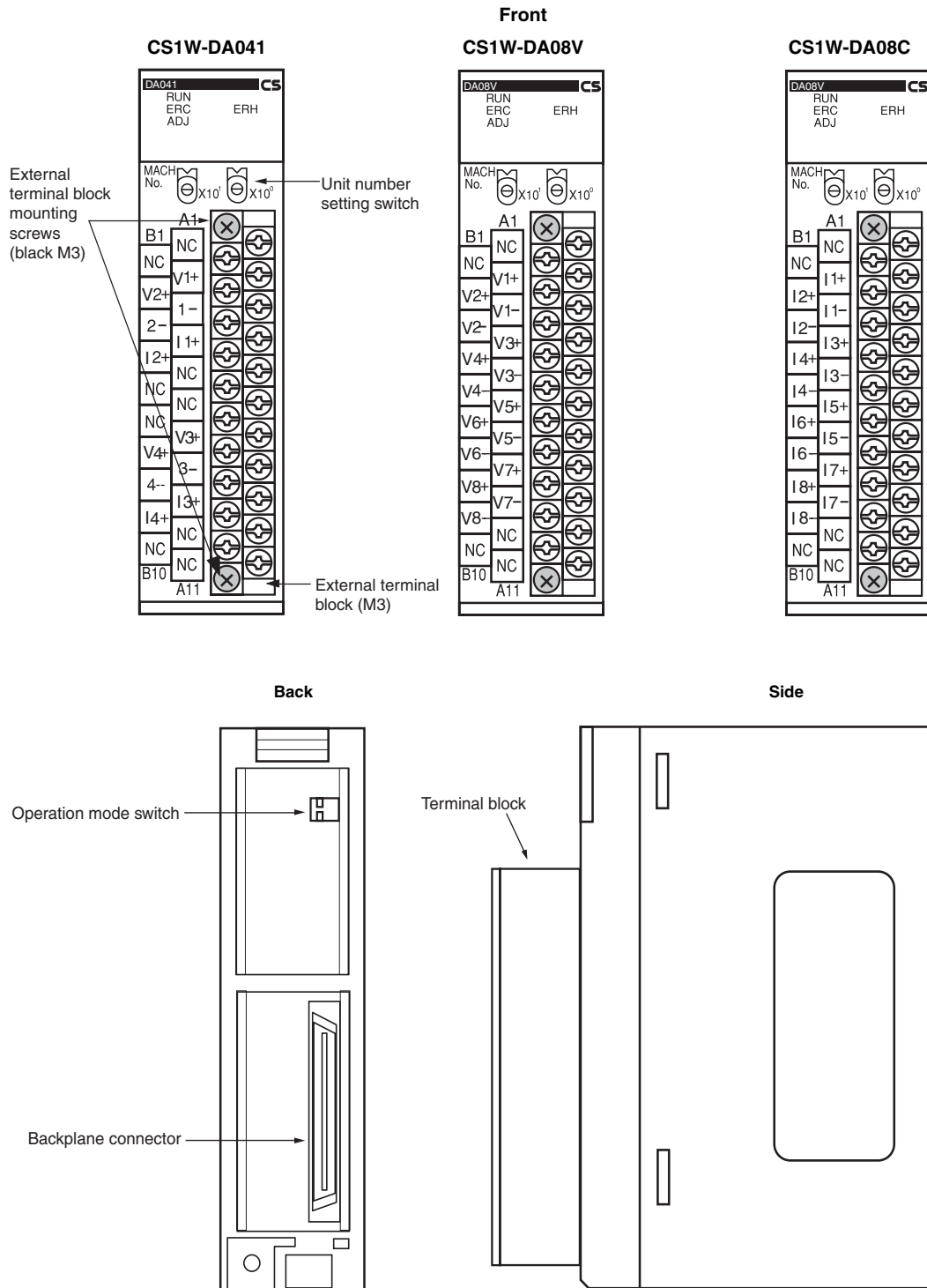
*9. The load resistance is adjusted to 250 Ω at the factory. Always adjust the offset gain before application when the load resistance is not 250 Ω. The CS1W-DA041 is adjusted for current outputs (load resistance: 250 Ω) at the factory. Adjust the offset gain before application when using voltage outputs.

Output Function Block Diagram



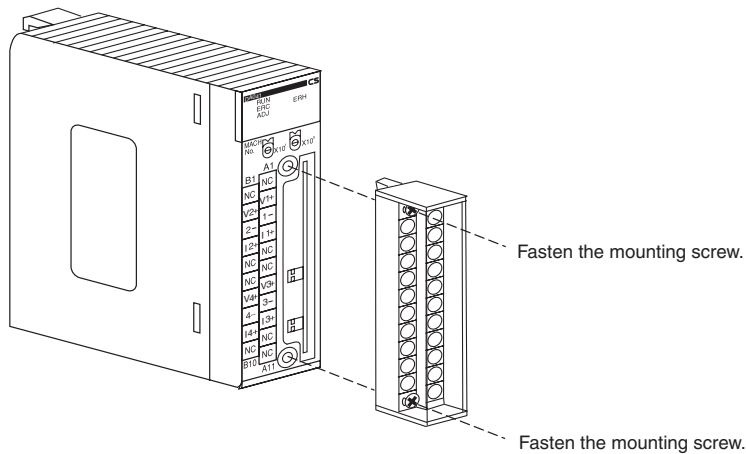
Note: There are only four analog outputs for the CS1W-DA041.

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.

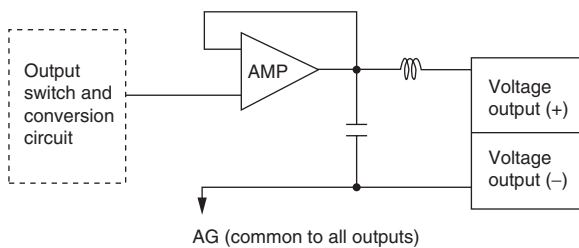
| LED | Meaning | Indicator | Operating status |
|--------------|------------------------|-----------|---|
| RUN (green) | Operating | Lit | Operating in normal mode. |
| | | Not lit | Unit has stopped exchanging data with the CPU Unit. |
| ERC (red) | Error detected by Unit | Lit | Alarm has occurred (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.

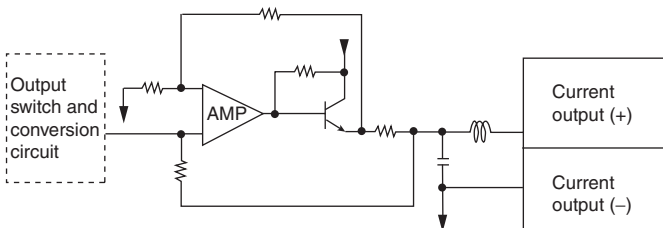
Voltage Output Circuitry

Voltage output section for CS1W-DA08V/DA041

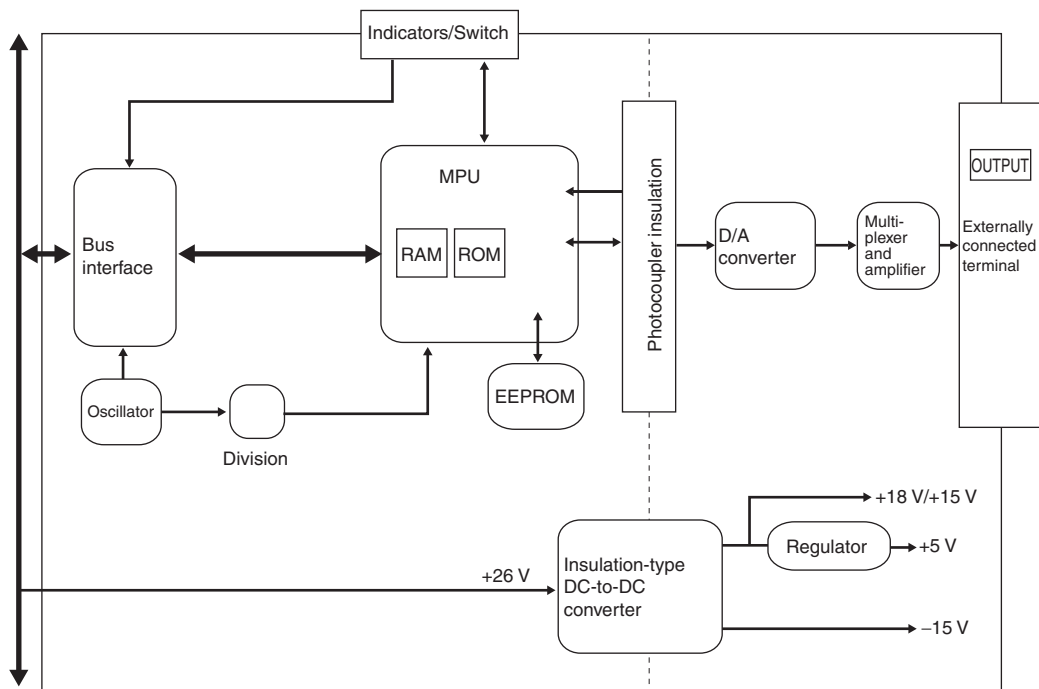


Current Output Circuitry

Current output section for CS1W-DA08C/DA041



Internal Configuration



CS-series PLC

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

CS1W-DA041

| | | | |
|-------------------|-----|-----|-------------------|
| N.C. | B1 | A1 | N.C. |
| Output voltage 2+ | B2 | A2 | Output voltage 1+ |
| Output 2- | B3 | A3 | Output 1- |
| Output current 2+ | B4 | A4 | Output current 1+ |
| N.C. | B5 | A5 | N.C. |
| N.C. | B6 | A6 | N.C. |
| Output voltage 4- | B7 | A7 | Output voltage 3+ |
| Output 4- | B8 | A8 | Output 3- |
| Output current 4+ | B9 | A9 | Output current 3+ |
| N.C. | B10 | A10 | N.C. |
| | | 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. | | |
| | | Units per basic system | | When C200HW-PA209R Power Supply Units only are used: 6 Units max. × 8 Racks = 48 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 output Peak value hold Conversion Enable Bit | | |
| | | | | Analog I/O Unit to CPU Unit | Analog input Input disconnection detection 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 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 | | Current 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 | | 4 to 20 mA | |
| | | Maximum rated input (for 1 point) *5 | | ±15 V | | ±30 mA | |
| | | Input impedance | | 1 MΩ min. | | 250 Ω (rated value) | |
| | | Resolution | | 4,000 (full scale) | | | |
| | | Converted output data | | 16-bit binary data | | | |
| | | Accuracy *6 | 23±2°C | ±0.2% of full scale | | ±0.4% of full scale | |
| | | | 0°C to 55°C | ±0.4% of full scale | | ±0.6% of full scale | |
| | | A/D conversion time *7 | | 1.0 ms/point max. | | | |
| | Functions | Mean value processing | | Stores the last "n" data conversions in the buffer, and stores the 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°C to 55°C |
| | | D/A conversion time *7 | ±0.3% of full scale ±0.5% of full scale 1.0 ms/point max. |
| | 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. |
| 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 vary 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.

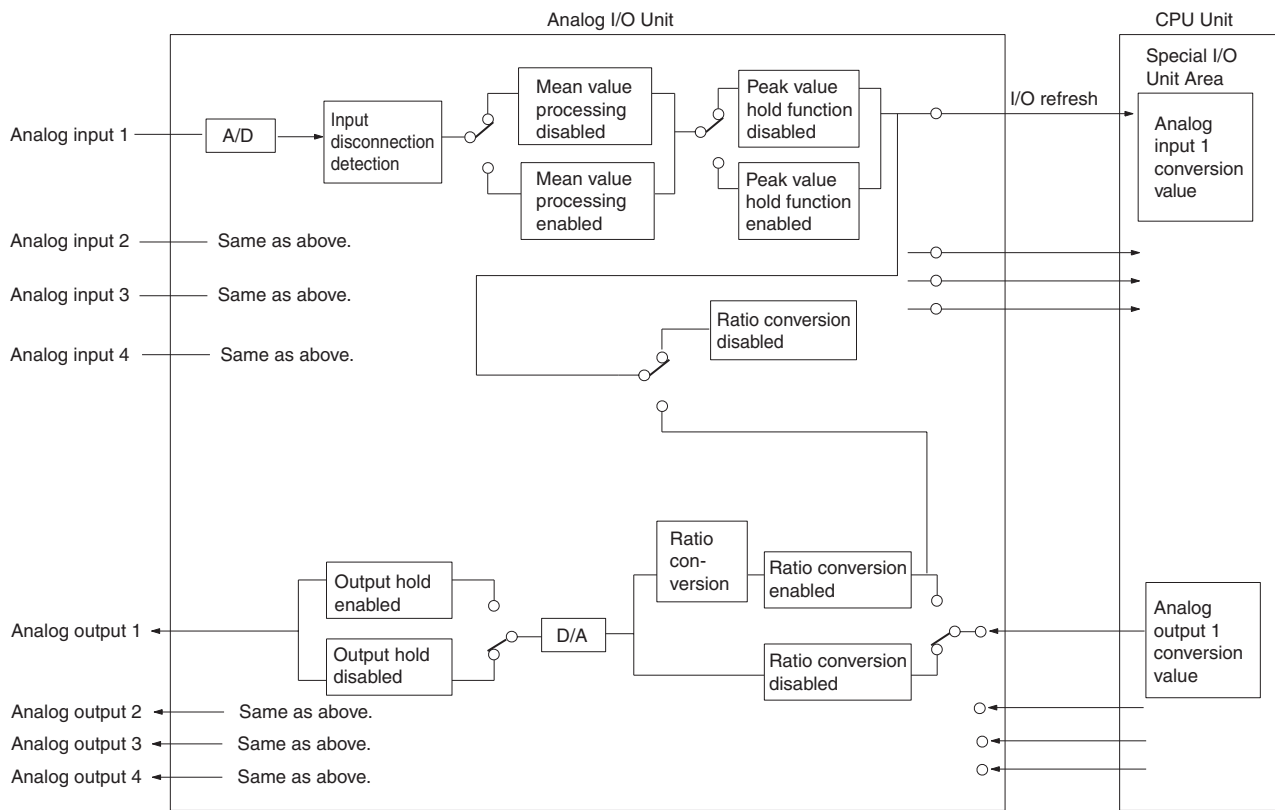
*6. The accuracy is given for full scale. For example, an accuracy of ±0.2% means a maximum error of ±8 (BCD).
The default setting is adjusted for voltage input. To use current input, perform the offset and gain adjustments as required.

*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.

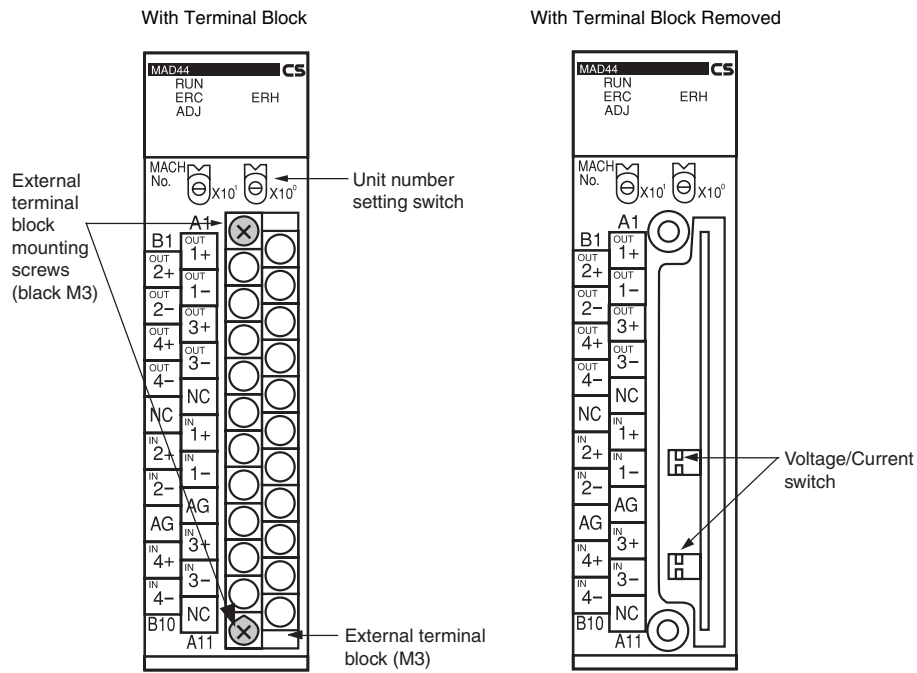
I/O Function Block Diagram



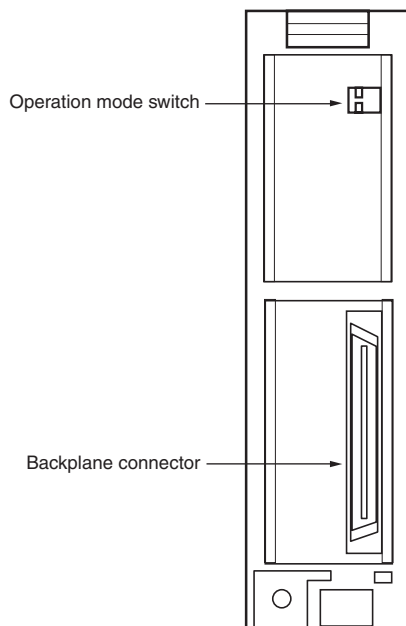
External Interface

CS1W-MAD44

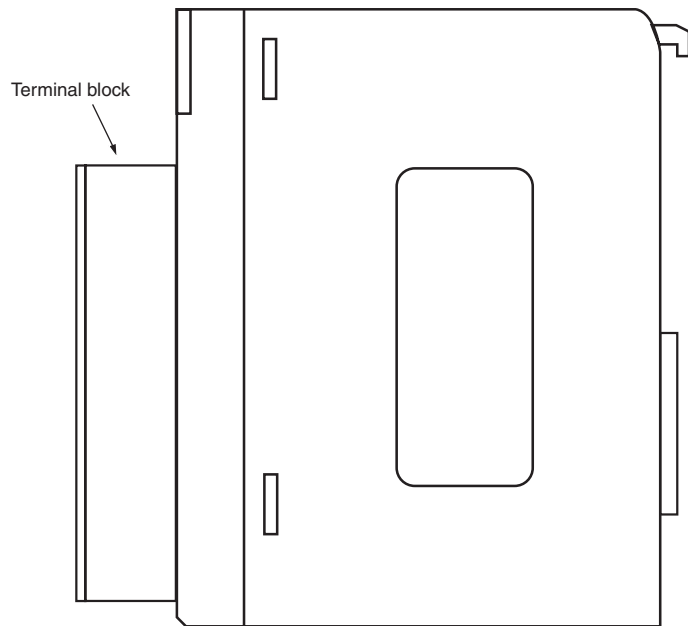
Front



Back

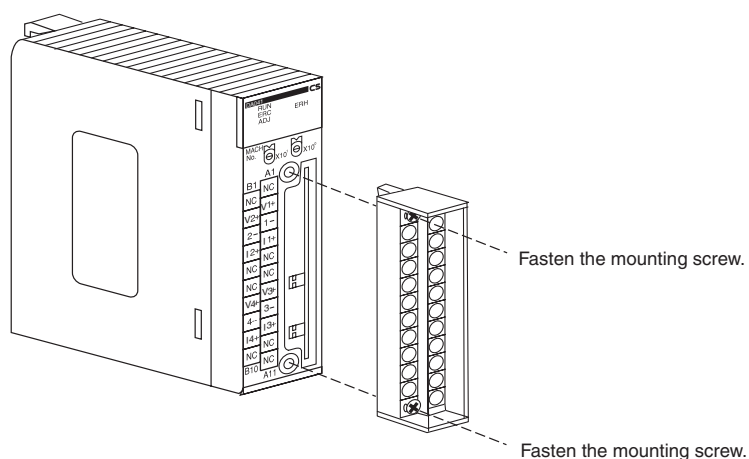


Side



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.



Indicators

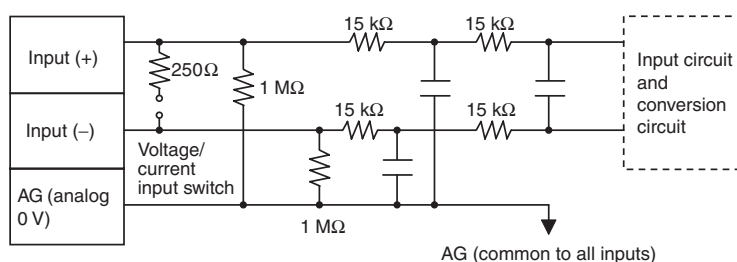
The indicators show the operating status of the Unit. The following table shows the meanings of the indicators.

| 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. |

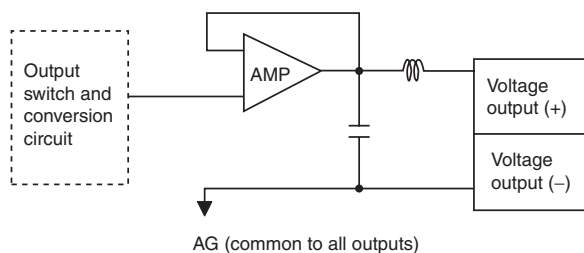
Internal Circuitry

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

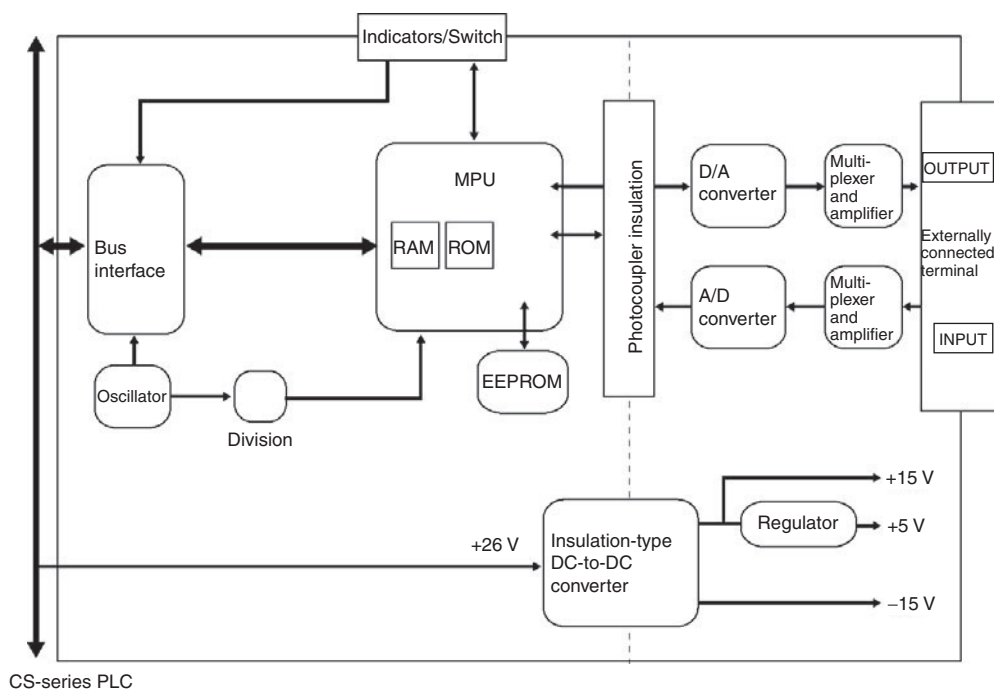
Input Circuitry



Output Circuitry



Internal Configuration



Terminal Arrangement

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

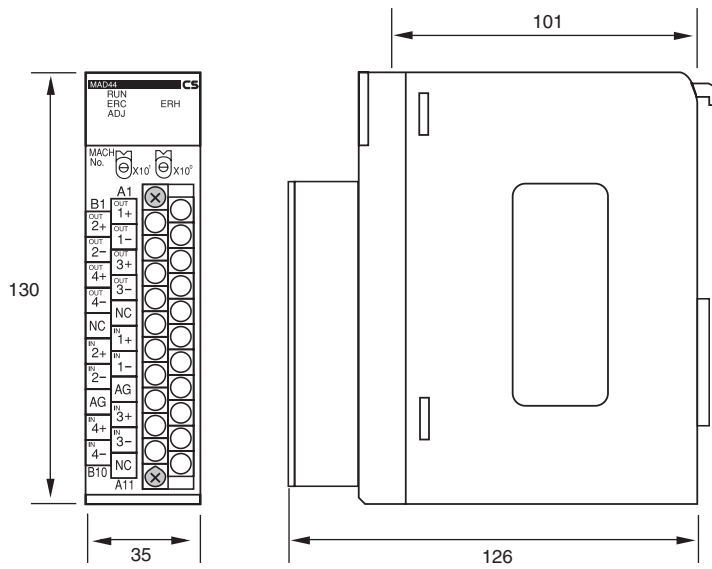
| | | | |
|-----------|-----|-----|-----------|
| Output 2+ | B1 | A1 | Output 1+ |
| Output 2- | B2 | A2 | Output 1- |
| Output 4+ | B3 | A3 | Output 3+ |
| Output 4- | B4 | A4 | Output 3- |
| N.C. | B5 | A5 | N.C. |
| Input 2+ | B6 | A6 | Input 1+ |
| Input 2- | B7 | A7 | Input 1- |
| AG | B8 | A8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

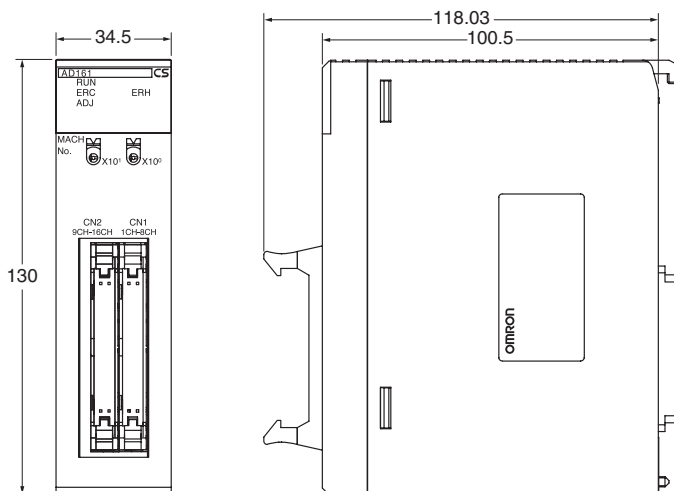
Dimensions

(Unit: mm)

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

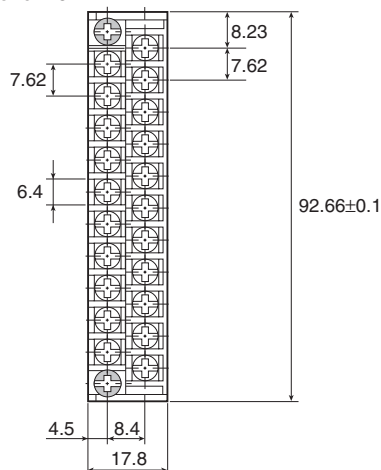


CS1W-AD161



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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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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