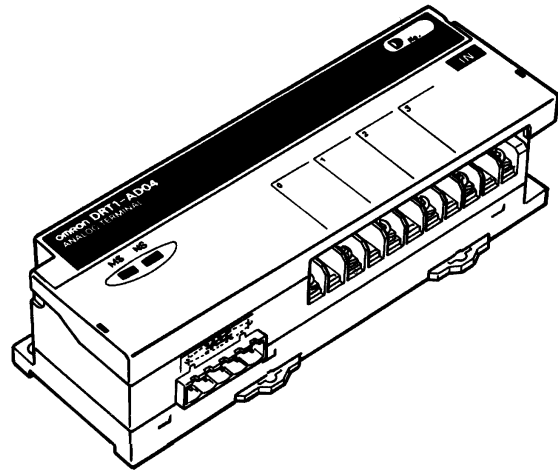


## Analog Input Terminal

DRT1-AD04

### I/O Interface Converts Analog Input Data into Binary Data

- Four inputs available.
- High resolution of 1/6000.
- Conversion is possible within a range of -5% to 105% FS.
- High conversion speed of 2 ms/point.
- Handles a wide range of inputs including 1 to 5 V, 0 to 5 V, 0 to 10 V, -10 to 10 V, 4 to 20 mA, and 0 to 20 mA.



### Ordering Information

Classification	I/O points	Model
Analog input terminal	Either 4 points or 2 points (Set with the DIP switch) (Occupies 4 or 2 input words of the Master Unit.)	DRT1-AD04

### Specifications

#### ■ Ratings

##### Input

Item	Type	
	Voltage input	Current input
Input points	4 points	
Input type	0 to 5 V 1 to 5 V 0 to 10 V -10 to 10 V	0 to 20 mA 4 to 20 mA
Max. signal input	±15 V	±30 mA
Input impedance	1 MΩ min.	Approx. 250 Ω
Resolution	1/6000 (full scale)	
Overall accuracy	25°C : ±0.3% FS 0°C to 55°C: ±0.6% FS	25°C : ±0.4% FS 0°C to 55°C: ±0.8% FS
Conversion time	2 ms/point (8 ms/4 points, 4 ms/2 points)	
Converted output data	Binary data -10- to 10-V range: 8BB8 to 0BB8 full scale Other signal ranges: 0000 to 1770 full scale	
Insulation resistance	20 MΩ min. at 250 VDC (between insulated circuits)	
Insulation method	Photocoupler insulation between inputs and communications lines (There is no insulation between input signals.)	

■ Characteristics

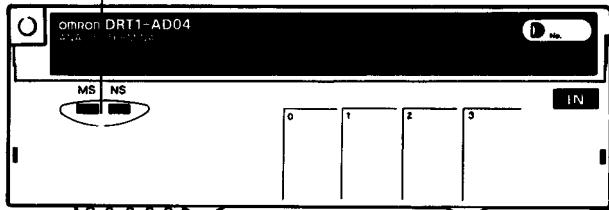
<b>Communications power supply voltage</b>	11 to 25 VDC (supplied from the communications connector)
<b>Internal power supply voltage</b>	20.4 to 26.4 VDC (24 VDC +10%/−15% )
<b>Current consumption</b>	Communications: 60 mA max. at 24 VDC Internal circuit: 100 mA max. at 24 VDC
<b>Dielectric strength</b>	500 VAC for 1 min (1-mA sensing current between insulated circuits)
<b>Noise immunity</b>	Power supply normal: ±600 V for 10 minutes with a pulse width of 100 ns to 1 μs Power supply common: ±1,500 V for 10 minutes with a pulse width of 100 ns to 1 μs
<b>Vibration resistance</b>	10 to 55 Hz, 1.5-mm double amplitude
<b>Shock resistance</b>	Malfunction: 200 m/s <sup>2</sup> (approx. 20G) Destruction: 300 m/s <sup>2</sup> (approx. 30G)
<b>Mounting method</b>	M4 screw mounting or 35-mm DIN track mounting
<b>Mounting strength</b>	No damage when 50 N (approx. 5 kgf) pull load was applied for 10 s in all directions (10 N min. (approx. 1 kgf) in the DIN Track direction)
<b>Terminal strength</b>	No damage when 50 N (approx. 5 kgf) pull load was applied for 10 s in all directions
<b>Ambient temperature</b>	Operating: 0°C to 55°C (with no icing or condensation) Storage: −25°C to 65°C (with no icing or condensation)
<b>Ambient humidity</b>	Operating: 35% to 85%
<b>Weight</b>	200 g max.

Nomenclature

DRT1-AD04

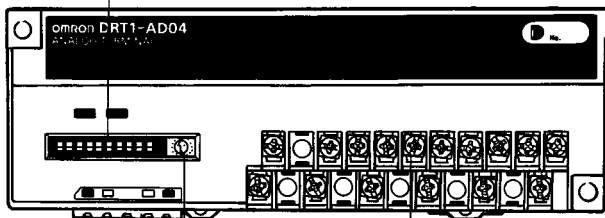
Indicators

Indicates the status of the Slave and the network.



The DIP switch pins have the following functions:

- Pins 1 to 6: Node number
- Pins 7 and 8: Baud rate
- Pin 9: Number of inputs setting (4 points or 2 points)
- Pin 10: Averaging function setting



Rotary Switch

Sets the input ranges.

Terminal Block

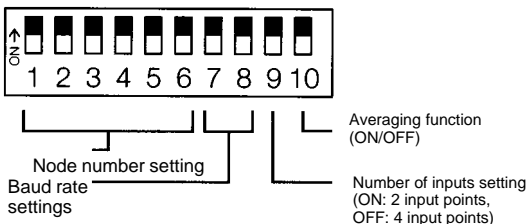
Connects the input power supply and analog inputs.

Communications Connector

Connects the network communications cable. The communications power is also supplied through this connector.

### DIP Switch Settings

The following diagram shows the functions of the DIP switch.



### Baud Rate Settings

	Pin 7	Pin 8
125,000 bps	OFF	OFF
250,000 bps	ON	OFF
500,000 bps	OFF	ON

- Note:**
1. Setting both pins 7 and 8 to ON is not allowed.
  2. Pins 7 and 8 are factory-set to OFF.

### Node Number Settings

Node number	Pin 6	Pin 5	Pin 4	Pin 3	Pin 2	Pin 1	Node number	Pin 6	Pin 5	Pin 4	Pin 3	Pin 2	Pin 1
	32	16	8	4	2	1		32	16	8	4	2	1
0	OFF	OFF	OFF	OFF	OFF	OFF	32	ON	OFF	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	OFF	OFF	ON	33	ON	OFF	OFF	OFF	OFF	ON
2	OFF	OFF	OFF	OFF	ON	OFF	34	ON	OFF	OFF	OFF	ON	OFF
3	OFF	OFF	OFF	OFF	ON	ON	35	ON	OFF	OFF	OFF	ON	ON
4	OFF	OFF	OFF	ON	OFF	OFF	36	ON	OFF	OFF	ON	OFF	OFF
5	OFF	OFF	OFF	ON	OFF	ON	37	ON	OFF	OFF	ON	OFF	ON
6	OFF	OFF	OFF	ON	ON	OFF	38	ON	OFF	OFF	ON	ON	OFF
7	OFF	OFF	OFF	ON	ON	ON	39	ON	OFF	OFF	ON	ON	ON
8	OFF	OFF	ON	OFF	OFF	OFF	40	ON	OFF	ON	OFF	OFF	OFF
9	OFF	OFF	ON	OFF	OFF	ON	41	ON	OFF	ON	OFF	OFF	ON
10	OFF	OFF	ON	OFF	ON	OFF	42	ON	OFF	ON	OFF	ON	OFF
11	OFF	OFF	ON	OFF	ON	ON	43	ON	OFF	ON	OFF	ON	ON
12	OFF	OFF	ON	ON	OFF	OFF	44	ON	OFF	ON	ON	OFF	OFF
13	OFF	OFF	ON	ON	OFF	ON	45	ON	OFF	ON	ON	OFF	ON
14	OFF	OFF	ON	ON	ON	OFF	46	ON	OFF	ON	ON	ON	OFF
15	OFF	OFF	ON	ON	ON	ON	47	ON	OFF	ON	ON	ON	ON
16	OFF	ON	OFF	OFF	OFF	OFF	48	ON	ON	OFF	OFF	OFF	OFF
17	OFF	ON	OFF	OFF	OFF	ON	49	ON	ON	OFF	OFF	OFF	ON
18	OFF	ON	OFF	OFF	ON	OFF	50	ON	ON	OFF	OFF	ON	OFF
19	OFF	ON	OFF	OFF	ON	ON	51	ON	ON	OFF	OFF	ON	ON
20	OFF	ON	OFF	ON	OFF	OFF	52	ON	ON	OFF	ON	OFF	OFF
21	OFF	ON	OFF	ON	OFF	ON	53	ON	ON	OFF	ON	OFF	ON
22	OFF	ON	OFF	ON	ON	OFF	54	ON	ON	OFF	ON	ON	OFF
23	OFF	ON	OFF	ON	ON	ON	55	ON	ON	OFF	ON	ON	ON
24	OFF	ON	ON	OFF	OFF	OFF	56	ON	ON	ON	OFF	OFF	OFF
25	OFF	ON	ON	OFF	OFF	ON	57	ON	ON	ON	OFF	OFF	ON
26	OFF	ON	ON	OFF	ON	OFF	58	ON	ON	ON	OFF	ON	OFF
27	OFF	ON	ON	OFF	ON	ON	59	ON	ON	ON	OFF	ON	ON
28	OFF	ON	ON	ON	OFF	OFF	60	ON	ON	ON	ON	OFF	OFF
29	OFF	ON	ON	ON	OFF	ON	61	ON	ON	ON	ON	OFF	ON
30	OFF	ON	ON	ON	ON	OFF	62	ON	ON	ON	ON	ON	OFF
31	OFF	ON	ON	ON	ON	ON	63	ON	ON	ON	ON	ON	ON

### Rotary Switch Settings

Used for setting the input signal ranges.



Inputs 0 and 2 share the same signal range, as do inputs 1 and 3.

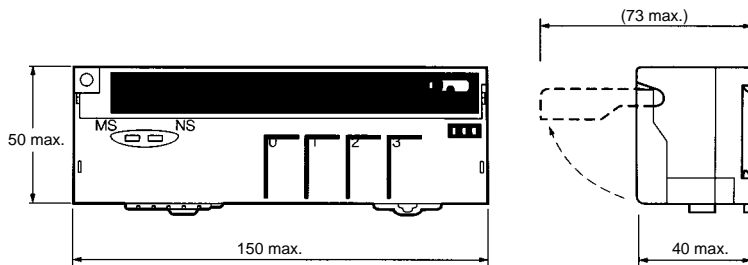
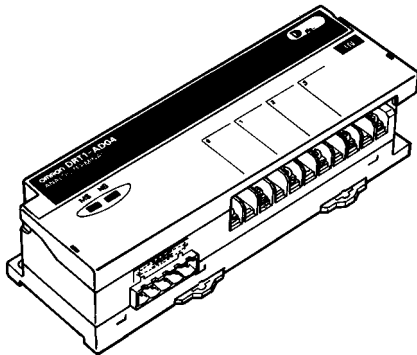
No.	Signal range for inputs 0 and 2	Signal range for inputs 1 and 3
0	0 to 5 V or 0 to 20 mA	0 to 5 V or 0 to 20 mA
1	0 to 5 V or 0 to 20 mA	1 to 5 V or 4 to 20 mA
2	0 to 5 V or 0 to 20 mA	0 to 10 V
3	0 to 5 V or 0 to 20 mA	-10 to 10 V
4	1 to 5 V or 4 to 20 mA	1 to 5 V or 4 to 20 mA
5	1 to 5 V or 4 to 20 mA	0 to 10 V
6	1 to 5 V or 4 to 20 mA	-10 to 10 V
7	0 to 10 V	0 to 10 V
8	0 to 10 V	-10 to 10 V
9	-10 to 10 V	-10 to 10 V

The voltage input/current input selection is carried out by connecting the V+ terminal to the I+ terminal.

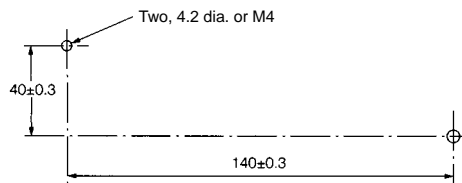
## Dimensions

**Note:** All units are in millimeters unless otherwise indicated.

### DRT1-AD04



#### Mounting Holes



## Data and Functions

### ■ Converted Data

	Bit															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
First word	Sign bit	0	0	Input 0 converted data												
First word + 1	Sign bit	0	0	Input 1 converted data												
First word + 2	Sign bit	0	0	Input 2 converted data												
First word + 3	Sign bit	0	0	Input 3 converted data												

The last two words are not used when the number of inputs is set to 2, in which case only two words are allocated in the Master Unit.

#### Sign Bit

The sign bit is turned ON to indicate that the converted value is negative, at which time the converted value will be an absolute value.

**Input Ranges and Converted Data**

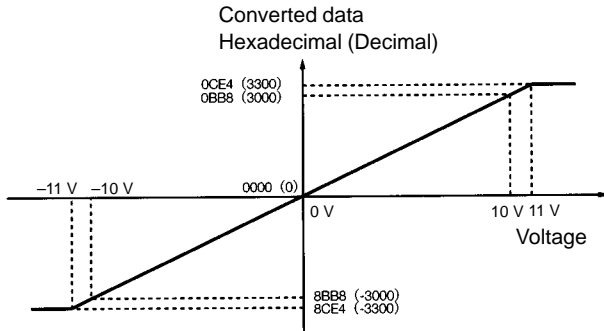
The Unit converts analog input data to digital values. The digital values depend on the input signal ranges, as shown in the following diagrams.

**-10- to 10-V Inputs**

The -10- to 10-V range corresponds to the hexadecimal values 8BB8 to 0BB8 (-3000 to 3000).

The most significant bit (bit 15) is set to 1 (ON) for negative values; the rest of the word indicates the absolute value.

The entire data range is 8CE4 to 0CE4 (-3300 to 3300).

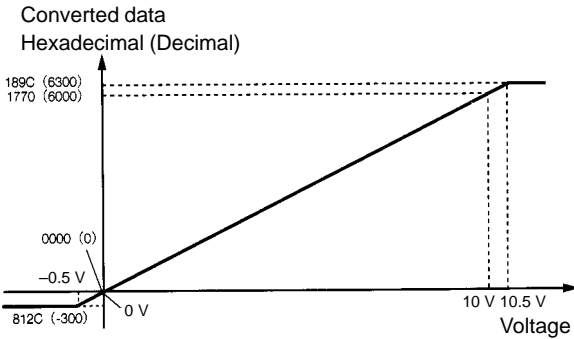


**0- to 10-V Inputs**

The 0- to 10-V range corresponds to the hexadecimal values 0000 to 1770 (0 to 6000).

The most significant bit (bit 15) is set to 1 (ON) for negative values; the rest of the word indicates the absolute value.

The entire data range is 812C to 189C (-300 to 6300).



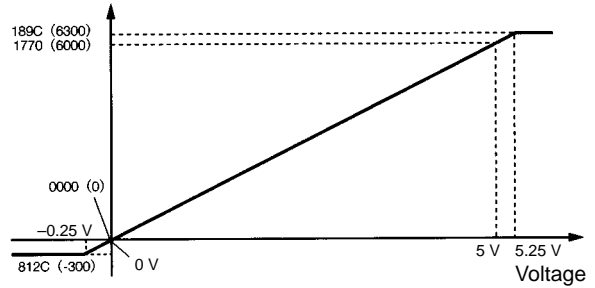
**0- to 5-V Inputs**

The 0- to 5-V range corresponds to the hexadecimal values 0000 to 1770 (0 to 6000).

The most significant bit (bit 15) is set to 1 (ON) for negative values; the rest of the word indicates the absolute value.

The entire data range is 812C to 189C (-300 to 6300).

Converted data  
Hexadecimal (Decimal)



**1- to 5-V Inputs**

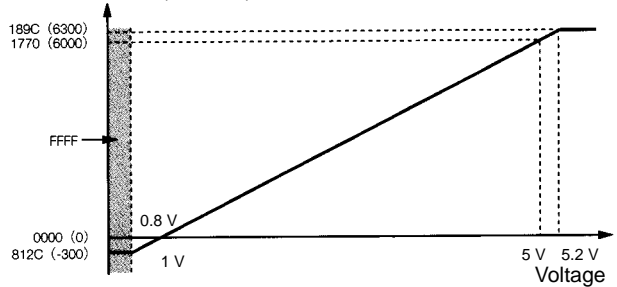
The 1- to 5-V range corresponds to the hexadecimal values 0000 to 1770 (0 to 6000).

The most significant bit (bit 15) is set to 1 (ON) for voltages from 0.8 to 1 V. The rest of the word indicates the absolute value.

The entire data range is 812C to 189C (-300 to 6300).

If the input voltage falls below 0.8 V, the open circuit detection function is activated and the converted data is set to FFFF.

Converted data  
Hexadecimal (Decimal)



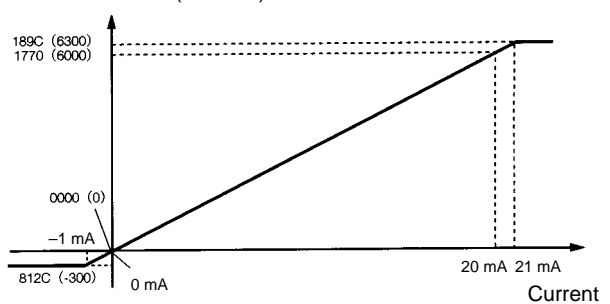
**0- to 20-mA Inputs**

The 0- to 20-mA range corresponds to the hexadecimal values 0000 to 1770 (0 to 6000).

The most significant bit (bit 15) is set to 1 (ON) for the negative values; the rest of the word indicates the absolute value.

The entire data range is 812C to 189C (-300 to 6300).

Converted data  
Hexadecimal (Decimal)



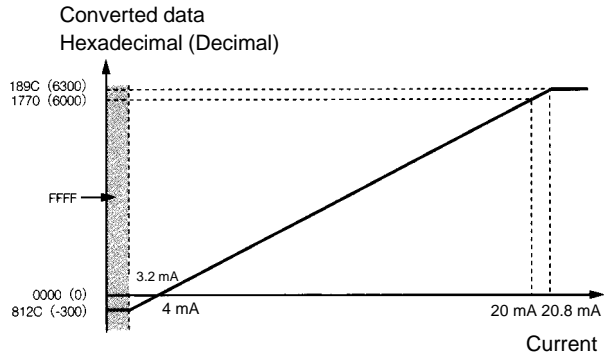
## 4- to 20-mA Inputs

The 4- to 20-mA range corresponds to the hexadecimal values 0000 to 1770 (0 to 6000).

The most significant bit (bit 15) is set to 1 (ON) for currents from 3.2 to 4 mA. The rest of the word indicates the absolute value.

The entire data range is 812C to 189C (–300 to 6300).

If the input current falls below 3.2 mA, the open-circuit detection function is activated and the converted data is set to FFFF.



## ■ Number of Input Settings

The number of inputs can be limited to two by setting pin 9 of the DIP switch to ON. Changing the number of inputs from four to two reduces the sampling time from 8 ms/4 inputs to 4 ms/2 inputs, which provides faster conversion.

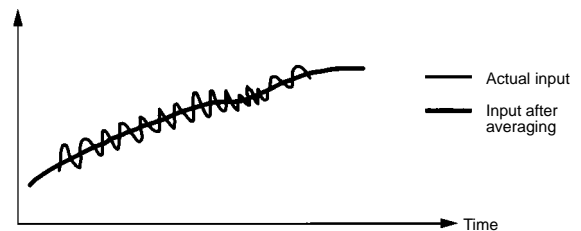
If the number of inputs is two, the occupied word number on the AD Unit of the PC Master becomes two as well. For the input number of two, inputs 0 and 1 are used (Inputs 2 and 3 cannot be used.)

## ■ Averaging Function Setting

The averaging function can be enabled for all inputs (0 through 3) by setting pin 10 of the DIP switch to ON.

The averaging function outputs the average of the last eight input values as the converted value.

Use this function to smooth inputs that vary like the one in the following diagram.



## ■ Open-circuit Detection Function

The open-circuit detection function is activated when the input range is set to 1 to 5 V and the voltage drops below 0.8 V or the input range is set to 4 to 20 mA and the current drops below 3.2 mA.

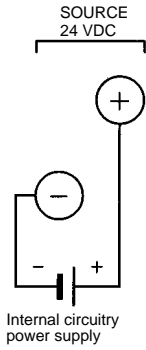
The converted data will be FFFF when the open-circuit detection function is activated.

If the input returns to the convertible range, the open-circuit detection will be cleared automatically and the output will return to the normal range.

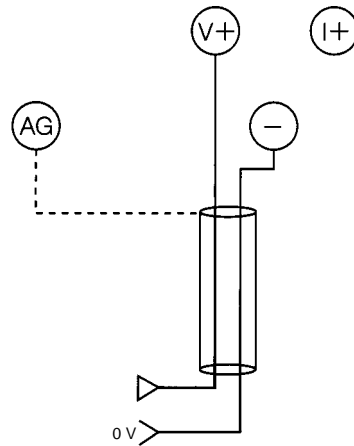
■ Wiring

DRT1-AD04

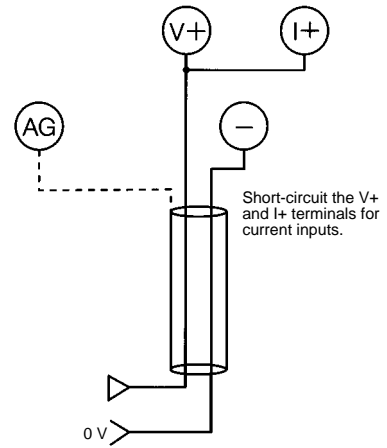
Internal circuitry power supply



Voltage input connection



Current input connection



Do not connect the shield wire when using shielded cables for the inputs. In some cases, however, connecting the shielded wire to the AG terminal may reduce noise.

■ Terminal Arrangement

DRT1-AD04

SOURCE 24 VDC +	NC	AG	V+ 0	I+ 0	V+ 1	I+ 1	V+ 2	I+ 2	V+ 3	I+ 4	
SOURCE 24 VDC -	NC	AG	NC	- 0	NC	- 1	NC	- 2	NC	- 3	



## Precautions

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Refer to the *CompoBus/D Operation Manual (W267)* before using the Unit.

- To prevent inductive noise, do not wire power lines or high-tension lines along with or near the cables. Other noise-prevention techniques, such as using shielding or separate conduit/ducting, are also effective.
- Install the Unit as far as possible from equipment that generates strong high-frequency signals (such as high-frequency welders) and equipment that generates surges. Such equipment can cause the Unit to malfunction.
- Install surge absorbers or noise filters on nearby equipment that generates noise, particularly equipment that has inductive components such as motors, transformers, solenoids, or magnetic coils.
- When using a noise filter in the power supply, check the voltage and current and install the noise filter as close as possible to the Unit.

**NOTE: ALL DIMENSIONS SHOWN ARE IN MILLIMETERS. TO CONVERT MILLIMETERS TO INCHES DIVIDE BY 25.4.**

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