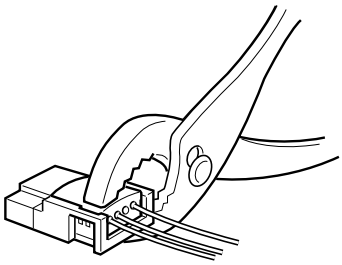
so that you do not distort it. Press the cover in until there is no gap between the cover and connector plug.



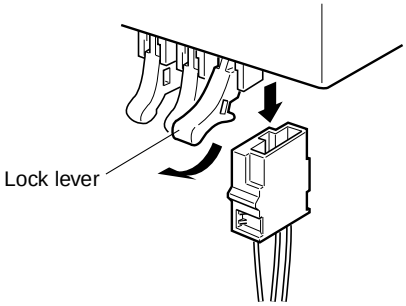
Connecting and Disconnecting the Cable Connector

Connecting

With terminal number 1 toward the front, insert the Cable Connector into the I/O connector on the Slave until it clicks into place.

Disconnecting

Lift up on the lock lever as shown in the following diagram and remove the Cable Connector to disconnect it.



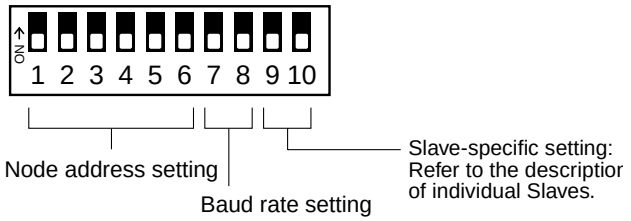
Note Cable Connectors (XS8A-0441/0442) are not provided with the Sensor Terminals and must be purchased separately.

4-8 Analog I/O Terminals

4-8-1 Node Address and Baud Rate Setting

This section describes the Slaves' node address setting, baud rate settings, and hold/clear outputs for communications error setting. These settings are made using the following pins on the DIP switch.

Node address setting: Pins 1 through 6
Baud rate setting: Pins 7 and 8
Slave-specific setting: Pins 9 and 10
(Refer to the descriptions of individual Slaves.)



Node Address Settings

Each Slave's node address is set with pins 1 through 6 of the Slave's DIP switch. Any node address within the setting range can be used as long as it isn't already set on another node.

DIP switch setting						Node address
Pin 6	Pin 5	Pin 4	Pin 3	Pin 2	Pin 1	
0	0	0	0	0	0	0 (default)
0	0	0	0	0	1	1
0	0	0	0	1	0	2
			⋮			⋮
1	1	1	1	0	1	61
1	1	1	1	1	0	62
1	1	1	1	1	1	63

0: OFF, 1: ON

Note

1. Refer to *Appendix A Node Address Settings Table* for a complete table of DIP switch settings.
2. The Slave won't be able to participate in communications if the same node address is used for the Master or another Slave node (node address duplication error).

Baud Rate Setting

Pins 7 and 8 are used to set the baud rate as shown in the following table. (These pins are factory-set to OFF.)

Pin 7	Pin 8	
OFF	OFF	125 kbps (default)
ON	OFF	250 kbps
OFF	ON	500 kbps
ON	ON	Not allowed.

Note

1. Always turn OFF the Slave's power supply (including the communications power supply) before changing the baud rate setting.
2. Set the same baud rate on all of the nodes (Master and Slaves) in the Network. Any Slaves with baud rates different from the Master's rate won't be able to participate in communications. Furthermore, a node with an incorrect baud rate may cause communications errors between nodes with correct baud rate settings.

4-8-2 Analog Input Terminals: DRT1-AD04 and DRT1-AD04H

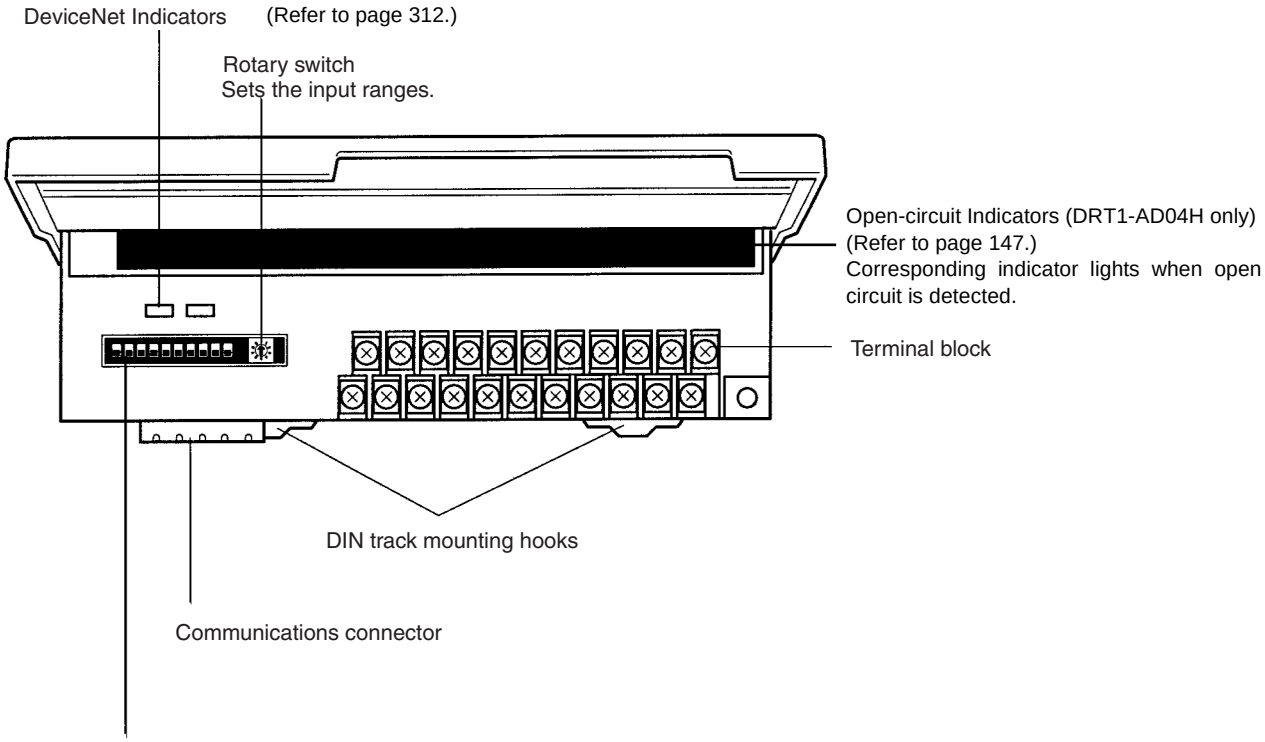
Specifications

General Specifications

Item	Specification			
	DRT1-AD04		DRT1-AD04H	
	Voltage inputs	Current inputs	Voltage inputs	Current inputs
Input points	Either 4 points or 2 points (Set with the DIP switch.) (Master Unit uses 4 input words or 2 input words respectively)		4 points (Four input words occupied at Master Unit.)	
Communications power supply voltage	11 to 25 V DC (supplied from the communications connector)			
Internal power supply voltage	20.4 to 26.4 V DC (24 V DC –15% to 10%)			

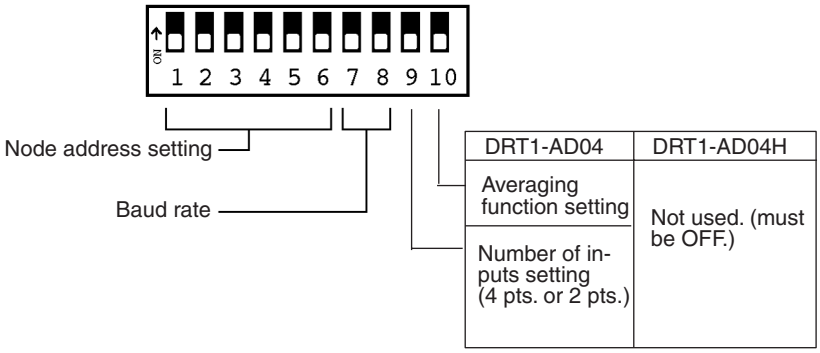
Item		Specification			
		DRT1-AD04		DRT1-AD04H	
		Voltage inputs	Current inputs	Voltage inputs	Current inputs
Current consumption		Communications: 30 mA max. Internal circuit: 80 mA max.		Communications: 30 mA max. Internal circuit: 130 mA max.	
Noise immunity		±1.5 $kV_{p-p,}$ pulse width: 0.1 to 1 µs, pulse rise time: 1 ns (via noise simulator)			
Vibration resistance		10 to 55 Hz, 1.0-mm double amplitude			
Shock resistance		200 m/s^2			
Dielectric strength		500 V AC for 1 min (between insulated circuits)		500 V AC (between insulated circuits)	
Insulation resistance		20 MΩ min. at 250 V DC (between insulated circuits)			
Ambient operating temperature		0 to 55°C			
Ambient operating humidity		35% to 85% (with no condensation)			
Ambient operating environment		No corrosive gases.			
Ambient storage temperature		–25 to 65°C			
Mounting method		M4 screw mounting or 35-mm DIN track mounting			
Mounting strength		50 N 10 N min. in the DIN Track direction			
Terminal strength		Pull: 50 N			
Weight		160 g max.			
Input signal range		0 to 5 V, 1 to 5 V, 0 to 10 V, or –10 to 10 V	0 to 20 mA or 4 to 20 mA	0 to 5 V, 1 to 5 V or 0 to 10 V,	0 to 20 mA or 4 to 20 mA
Max. signal input		±15 V	±30 mA	±15 V	±30 mA
Input impedance		1 MΩ min.	Approx. 250 Ω	1 MΩ min.	Approx. 250 Ω
Resolution		1/6000 (full scale)		1/30000 (full scale)	
Accuracy	25°C	±0.3% FS	±0.4% FS	±0.3% FS	±0.4% FS
	0 to 55°C	±0.6% FS	±0.8% FS	±0.6% FS	±0.8% FS
Conversion time		2 ms/input (8 ms/4 points, 4 ms/2 points)		250 ms/4 points	
Converted output data (Binary)		Binary (4-digit hexadecimal) –10- to 10-V range: 8BB8 to 0 to 0BB8 full scale Other signal ranges: 0000 to 1770 full scale		Binary (4-digit hexadecimal) 0000 to 7530 (hexadecimal) full scale	
Averaging function		Settable (via DIP switch)		Not provided.	
Open circuit detection		Provided.		Provided.	
Isolation method		Photocoupler isolation between analog inputs and communications lines (There is no isolation between analog input signals.)		Photocoupler isolation between analog inputs and communications lines Photocoupler isolation between analog input signals.	

Components of the DRT1-AD04 and DRT1-AD04H



DIP Switch Settings

The following diagram shows the functions of the DIP switch on the DRT1-AD04 and DRT1-AD04H Analog Input Terminals.



DRT1-AD04	DRT1-AD04H
Averaging function setting	Not used. (must be OFF.)
Number of inputs setting (4 pts. or 2 pts.)	

The following table summarizes the DIP switch settings. (All pins are factory-set to OFF.)

Pin(s)	Function	Settings	Setting contents	
			DRT1-AD04	DRT1-AD04H
1 through 6	Node address setting	Refer to *4-8-1 Node Address and Baud Rate Setting* for details. (Factory-set to OFF.)		
7 and 8	Baud rate			
9	Number of inputs setting (2 or 4) (See page 146 for details.)	OFF*	4 points	Not used. (Must be OFF.)
		ON	2 points	
10	Averaging function (See page 147 for details.)	OFF*	Averaging is not performed. (Factory setting)	Not used. (Must be OFF.)
		ON	Averaging is performed.	

* Factory settings.

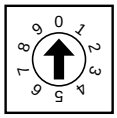
Note Always turn OFF the Slave's power supply (including the communications power supply) before changing any settings.

Rotary Switch Setting

Set the input signal range for each input with the rotary switch. Inputs 0 and 2 share the same signal range, as do inputs 1 and 3.
The voltage input/current input selection is carried out by connecting the V+ terminal to the I+ terminal. Short-circuit the V+ terminal and I+ terminal when inputting current.

Note Always turn OFF the Slave's power supply (including the communications power supply) before changing any settings.

DRT1-AD04



The following table shows the rotary switch settings and corresponding input signal range settings.

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

DRT1-AD04H

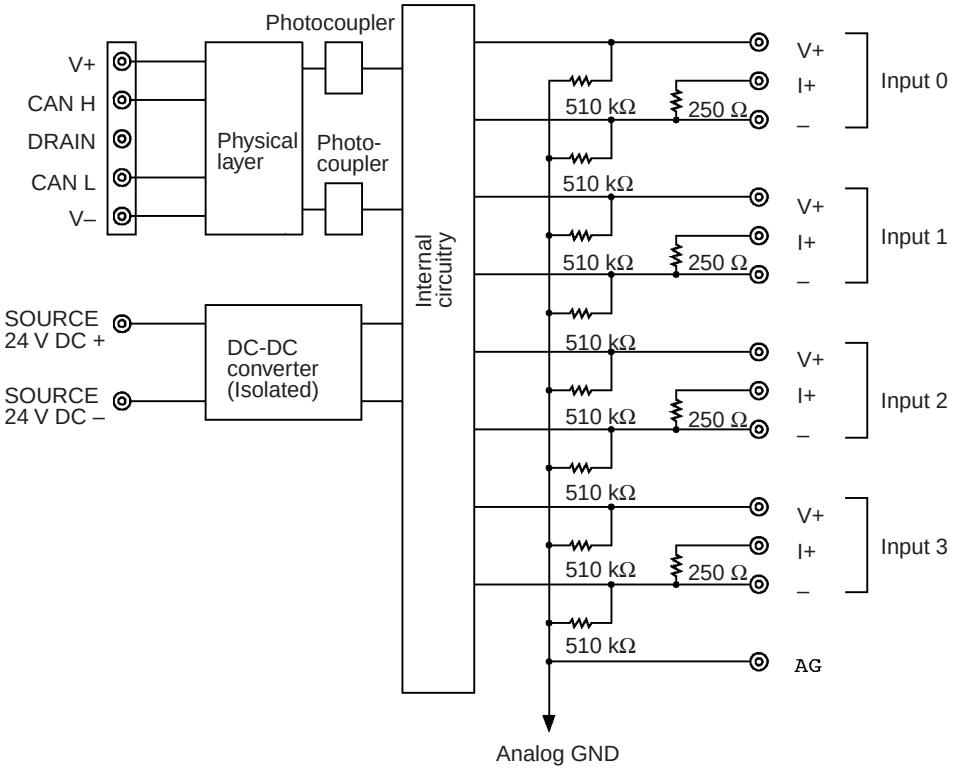
The following table shows the rotary switch settings and corresponding input signal range settings.

No.	Signal range for inputs 0 and 2	Signal range for inputs 1 and 3
0	0 to 5 V	0 to 5 V
1	0 to 5 V	1 to 5 V
2	0 to 5 V	0 to 10 V
3	0 to 5 V	0 to 20 mA
4	0 to 5 V	4 to 20 mA
5	1 to 5 V	1 to 5 V
6	1 to 5 V	0 to 10 V
7	1 to 5 V	0 to 20 mA
8	1 to 5 V	4 to 20 mA
9	0 to 10 V	0 to 10 V
A	0 to 10 V	0 to 20 mA
B	0 to 10 V	4 to 20 mA
C	0 to 20 mA	0 to 20 mA
D	0 to 20 mA	4 to 20 mA
E	4 to 20 mA	4 to 20 mA
F	(Cannot be set.)	

Internal Circuits

The following diagram shows the internal circuits for the DRT1-AD04 Analog Input Terminal.

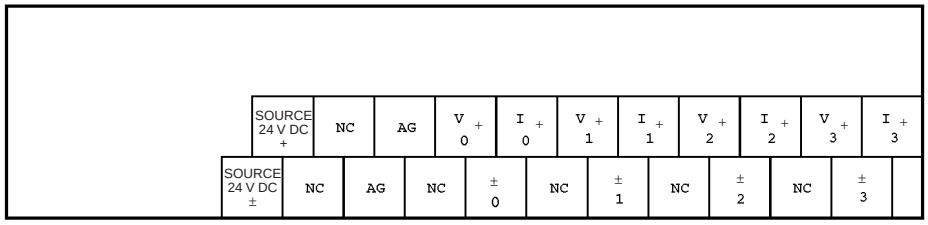
DRT1-AD04



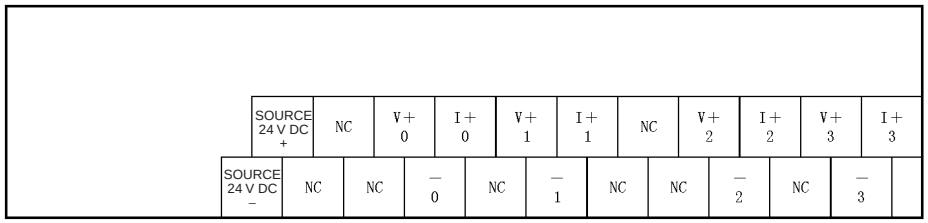
Note The DRT1-AD04H has insulation between the inputs, so there is no need for the user to be concerned with the internal circuitry.

Terminal Arrangement

DRT1-AD04

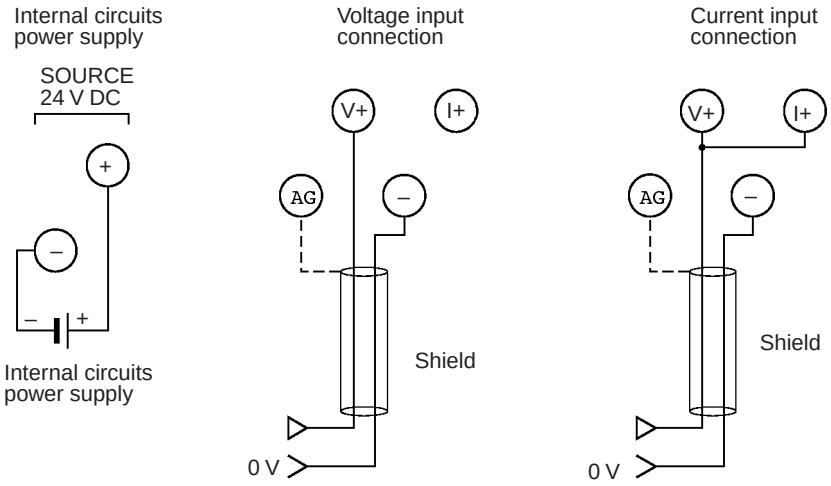


DRT1-AD04H



Wiring: DRT1-AD04 and DRT1-AD04 H (Common)

Connect the power supply and inputs (voltage input or current input) to the Analog Input Terminal's terminal block as shown in the following diagram.



Do not connect the shield when using shielded cables for the inputs.

Input Ranges and Converted Data

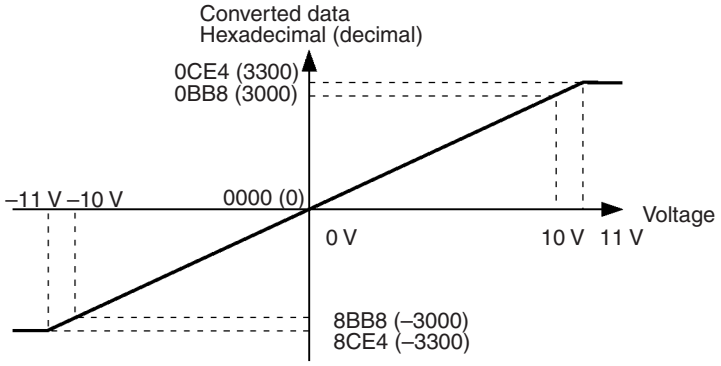
The Analog Input Terminal converts analog input data to digital values. The digital values depend on the input signal ranges, as shown in the following diagrams.

Note When the input exceeds the specified range, the AD conversion data will be fixed at either the lower limit or upper limit.

DRT1-AD04

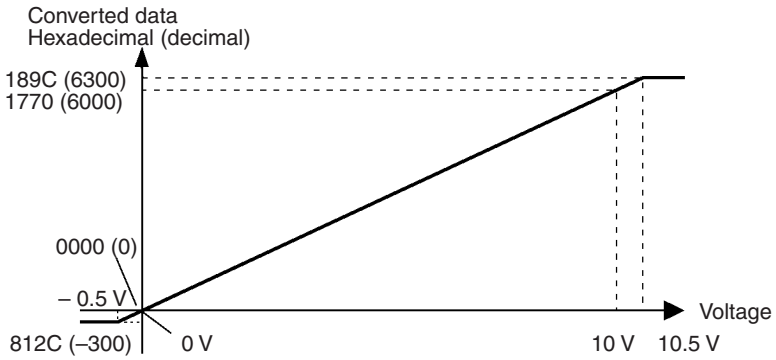
–10- to 10-V Inputs

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 and the AD conversion data is set to the absolute values; the rest of the word indicates the absolute value. The entire data range is 8CE4 to 0CE4 (–3300 to 3300).



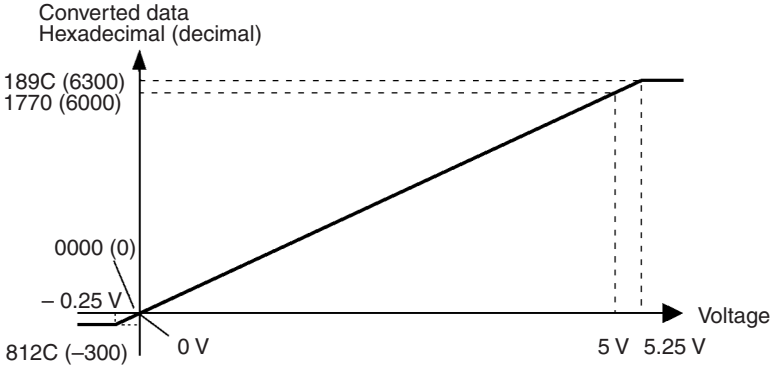
0- to 10-V Inputs

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 and the AD conversion data is set to the absolute values; the rest of the word indicates the absolute value. The entire data range is 812C to 189C (–300 to 6300).



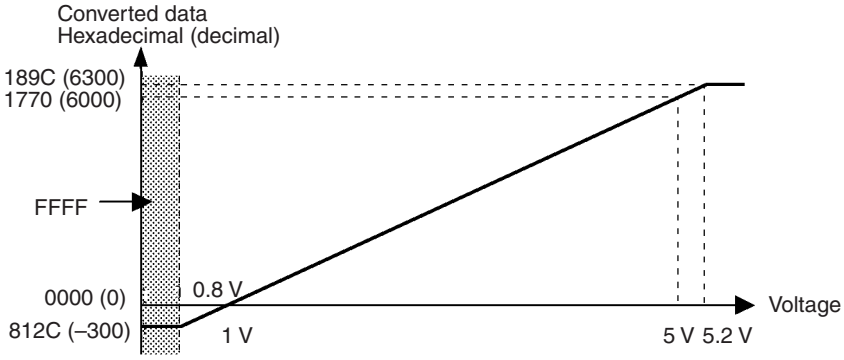
0- to 5-V Inputs

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 and the AD conversion data is set to the absolute values; the rest of the word indicates the absolute value. The entire data range is 812C to 189C (–300 to 6300).



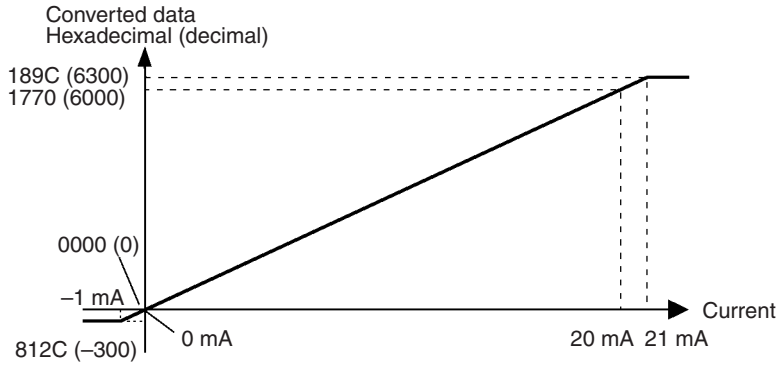
1- to 5-V Inputs

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 V to 1 V and the AD conversion data is set to the absolute values; 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.



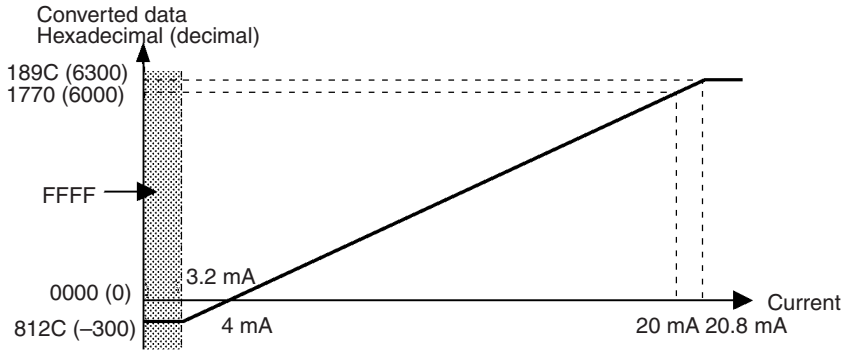
0- to 20-mA Inputs

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 negative values and the AD conversion data is set to the absolute values; the rest of the word indicates the absolute value. The entire data range is 812C to 189C (–300 to 6300).



4- to 20-mA Inputs

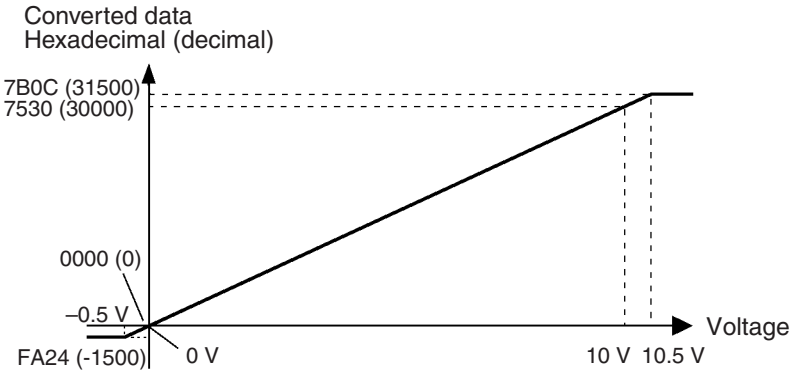
The 4- to 20-mA range corresponds to the hexadecimal values 0000 to 1770 (0 to 6000). The most significant bit (bit 15) is set to 1 (ON) for currents from 3.2 to 4 mA and the AD conversion data is set to the absolute values; the rest of the word indicates the absolute value. The entire data range is 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.



DRT1-AD04H

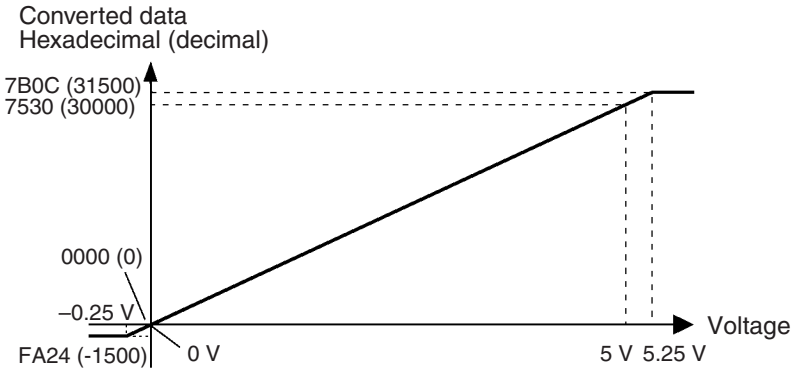
0 to 10 V

The 0- to 10-V range corresponds to the hexadecimal values 0000 to 7530 (0 to 30,000). The convertible data range is FA24 to 7B0C (–1,500 to 31,500). When the voltage is negative, the negative number is expressed as a two's complement.



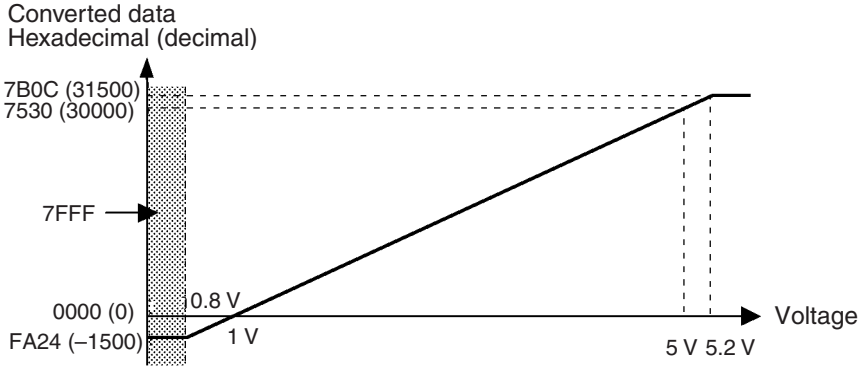
0 to 5 V

The 0- to 5-V range corresponds to the hexadecimal values 0000 to 7530 (0 to 30,000). The convertible data range is FA24 to 7B0C (–1,500 to 31,500). When the voltage is negative, the negative number is expressed as a two's complement.



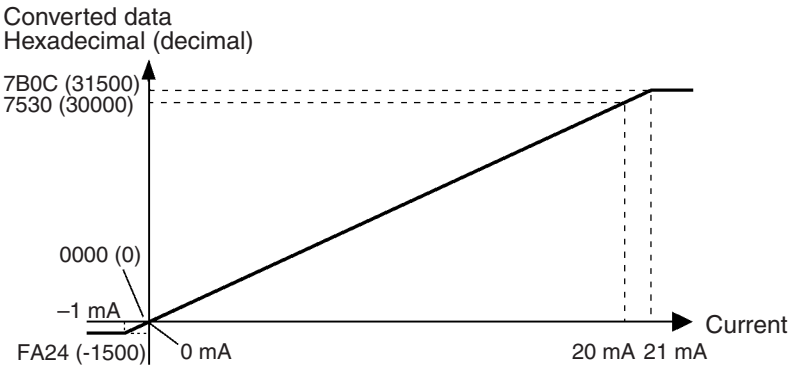
1 to 5 V

The 1- to 5-V range corresponds to the hexadecimal values 0000 to 7530 (0 to 30,000). The convertible data range is FA24 to 7B0C (–1,500 to 31,500). The 0.8- to 1-V range corresponds to the hexadecimal values FA24 to 7B0C (–1,500 to 0). If the voltage drops below the input range (i.e., if the input voltage drops below 0.8 V), the open-circuit detection function is activated and the data is set to 7FFF.



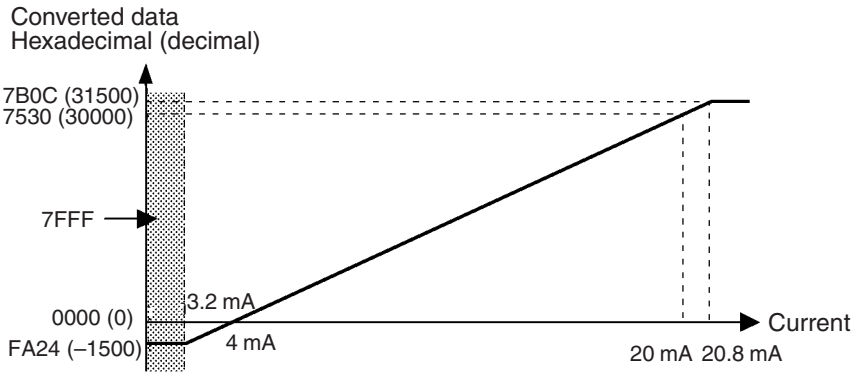
0 to 20 mA

The 0- to 20-mA range corresponds to the hexadecimal values 0000 to 7530 (0 to 30,000). The convertible data range is FA24 to 7B0C (–1,500 to 31,500). When the current is negative, the negative number is expressed as a two's complement.



4 to 20 mA

The 4- to 20-mA range corresponds to the hexadecimal values 0000 to 7530 (0 to 30,000). The convertible data range is FA24 to 7B0C (–1,500 to 31,500). The 3.2- to 4-mA range corresponds to the hexadecimal values FA24 to 0000 (–1,500 to 0). If the current drops below the input range (i.e., if the current voltage drops below 3.2 mA), the open-circuit detection function is activated and the data is set to 7FFF.



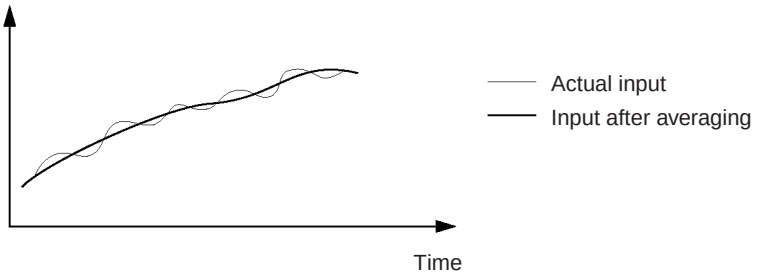
Number of Inputs Setting (DRT1-AD04 Only)

The number of inputs can be limited to two by turning ON pin 9 of the DIP switch. 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 number of words allocated to the Input Terminal in the PLC is also reduced to 2 words. When only two inputs are used, inputs 0 and 1 are used (inputs 2 and 3 cannot be used.)

Averaging Function Setting (DRT1-AD04 Only)

With the DRT1-AD04, the averaging function can be enabled for all inputs (0 through 3) by turning ON pin 10 of the DIP switch. The averaging function outputs the average (a moving 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.



Note The time required for converted data refreshing remains 2 ms/point when the averaging function is enabled. The first communications data after the power is turned ON will be output after averaging eight samples.

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 when the input range is set to 4 to 20 mA and the current drops below 3.2 mA. When the open-circuit detection function is activated, the converted data is set to FFFF for the DRT1-AD04 and 7FFF for the DRT1-AD04H. In addition, with the DRT1-AD04H, the broken wire indicator lights when the open-circuit detection function is activated.

The open-circuit detection function is enabled or cleared at the same time as the conversion time. If the input returns to the convertible range, the open-circuit detection is cleared automatically and the output returns to the normal range.

Converted Data

The converted data is transferred to the Master as shown in the following diagram.

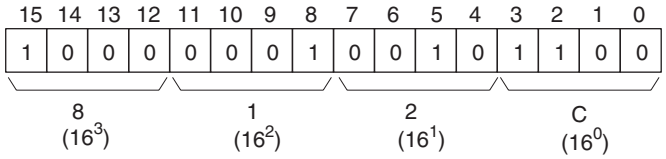
DRT1-AD04

	15	14	13	12 11 10 9 8 7 6 5 4 3 2 1 0 Bit
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*

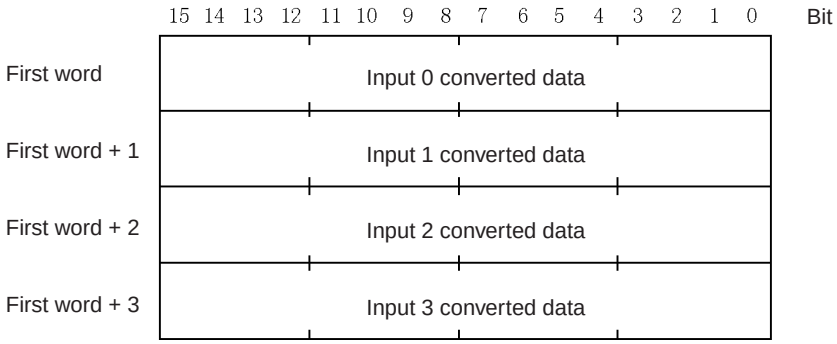
Note *Not used when there are two input points. At that time only two words are occupied.

The sign bit is turned ON to indicate that the converted value is negative; the converted value will be the absolute value (not the two's complement).

Example: When –300 is converted, the sign bit (bit 15) is set to 1 and 300 is output as the binary value as 12C hexadecimal. The contents of the word is thus 812C, as shown in the following illustration.



DRT1-AD04H



If the converted data is a negative number, it is expressed as a two's complement. The NEG command can be useful to obtain the absolute value from the two's complement.

Conversion Time

DRT1-AD04

AD conversion values are refreshed every 2 ms for each input point.

DRT1-AD04H

AD conversion values are refreshed every 250 ms. It may take up to 650 ms, however, from when the step response is input until AD conversion data of 90% of that value can be transmitted.