I-7000 and M-7000 DIO User Manual

Warranty

All products manufactured by ICP DAS are under warranty regarding defective materials for a period of one year from the date of delivery to the original purchaser.

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Date: 2025/3/17

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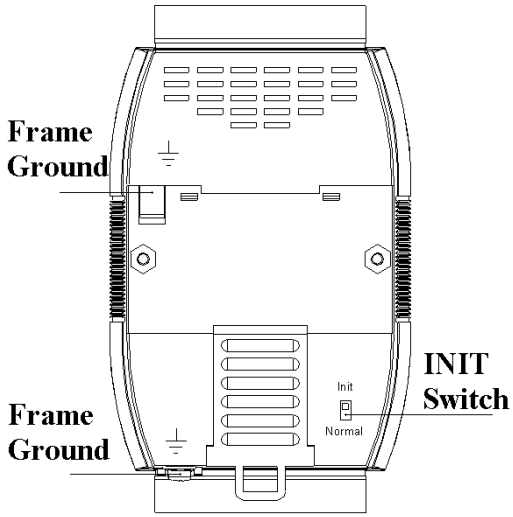
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1. Introduction

The I-7000 series is a family of network data acquisition and control modules, providing analog-to-digital, digital-to-analog, digital input/output, timer/counter and other functions. The modules can be remotely controlled using a set of commands, which we call the DCON protocol. Communication between the module and the host is in ASCII format via an RS-485 bi-directional serial bus standard. Baud Rates are software programmable and transmission speeds of up to 115.2 Kbps can be selected.

The functionality of the M-7000 series is the same as the I-7000 series, with the exception that the M-7000 series offers extended support for the Modbus RTU protocol.

Some I-7000 modules feature a new design for the frame ground and INIT switch as shown in the figure (rear view). The frame ground provides enhanced static protection (ESD) abilities and ensures the module is more reliable. The INIT switch allows easier access to INIT mode. Please refer to Sections A.1 and A.3 for more details.



The I-7000 and M-7000 DIO modules support TTL signal, photo-isolated digital input, AC voltage digital input, relay contact output, solid-state relay output, photoMOS output and open-collector output.

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1.1 More Information

For more information regarding the I-7000 series, please refer to chapter 1 of the “I-7000 Bus Converter User’s Manual” as shown below or visit the ICP DAS website http://www.icpdas.com.

1.1 The 7000 Series Overview

1.2 Related Documentation for the 7000 Series

1.3 Common Features of the 7000 Series

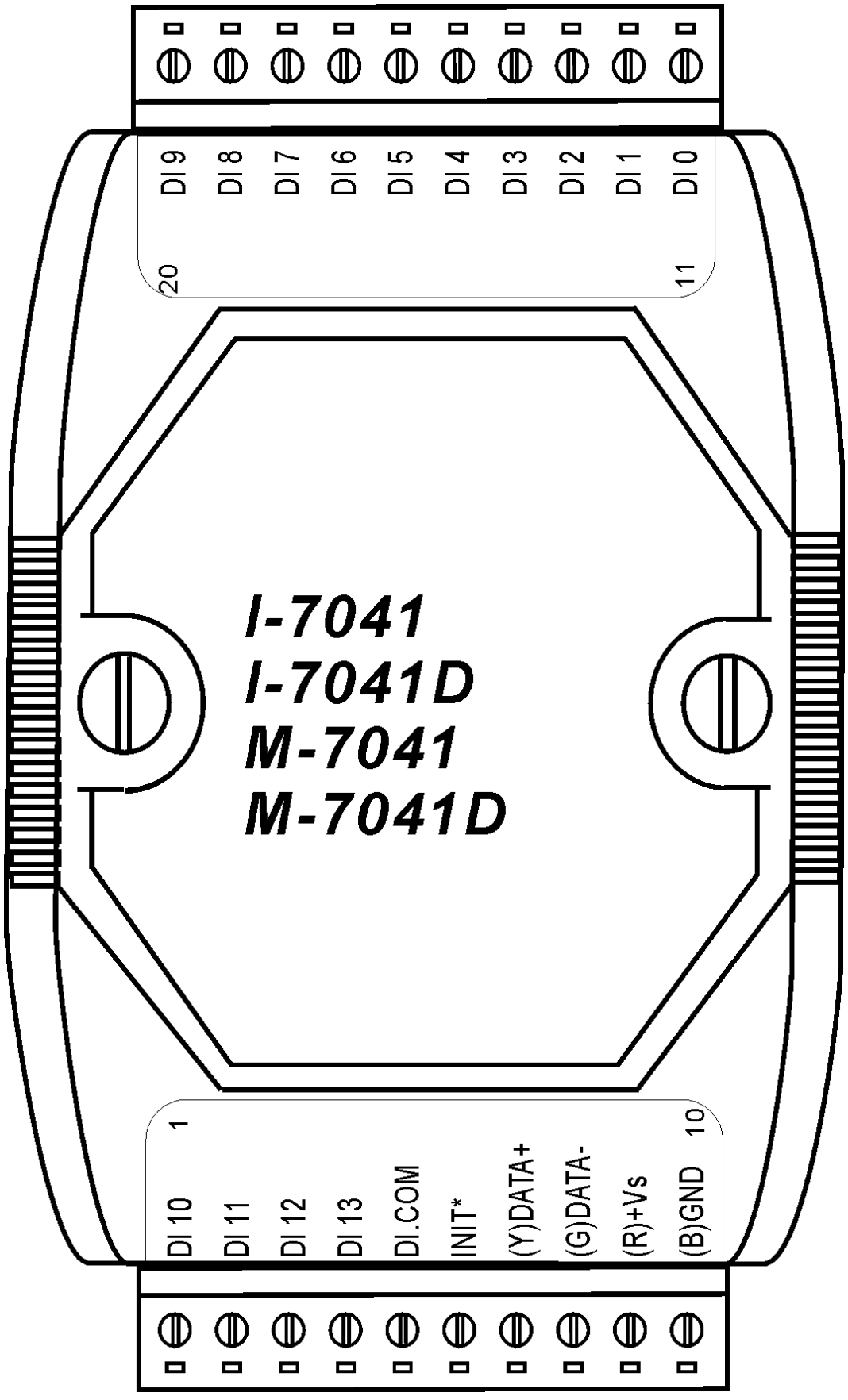
1.4 The 7000 Series System Network Configuration

1.5 7000 Dimensions

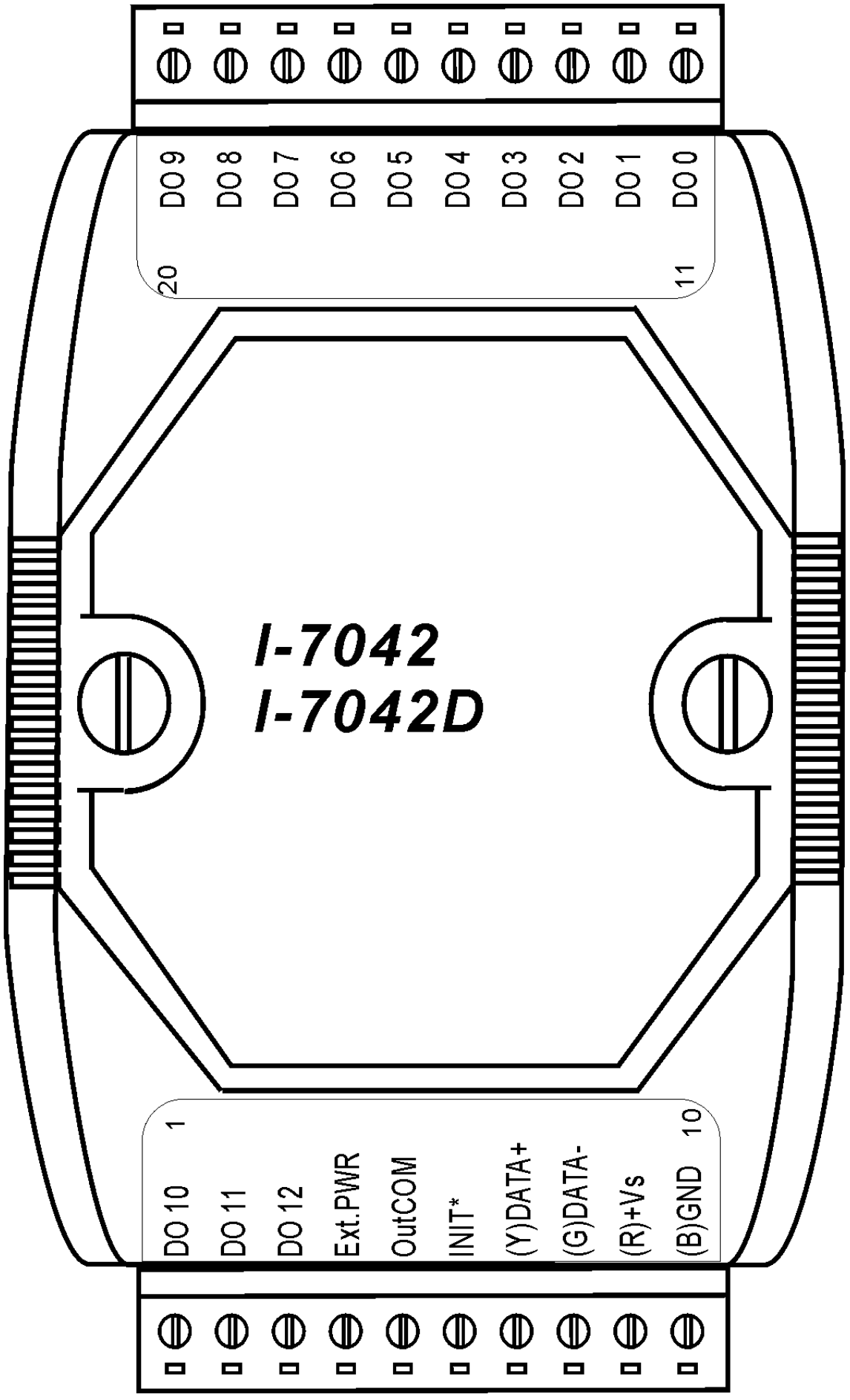
- For details of **INIT mode** operation, please refer to Section A.1 INIT Mode.
- For details of **module watchdog** and **host watchdog**, please refer to Section A.2 Dual Watchdog Operation.
- For details of **ESD protection** and **grounding**, please refer to Section A.3 Frame Ground.
- There is a way to check whether the module is reset, please refer to Section A.4 **Reset Status** for details.
- For details of the **safe value** and **power-on value** of the digital output, please refer to Section A.5 Safe Value and Power-on Value of Digital Output.
- The module with digital inputs provides the **latched digital inputs**, please refer to Section A.6 Latched Digital Input for details.
- For details of the **I/O extension modules**, please refer to Section A.7 DN Module.

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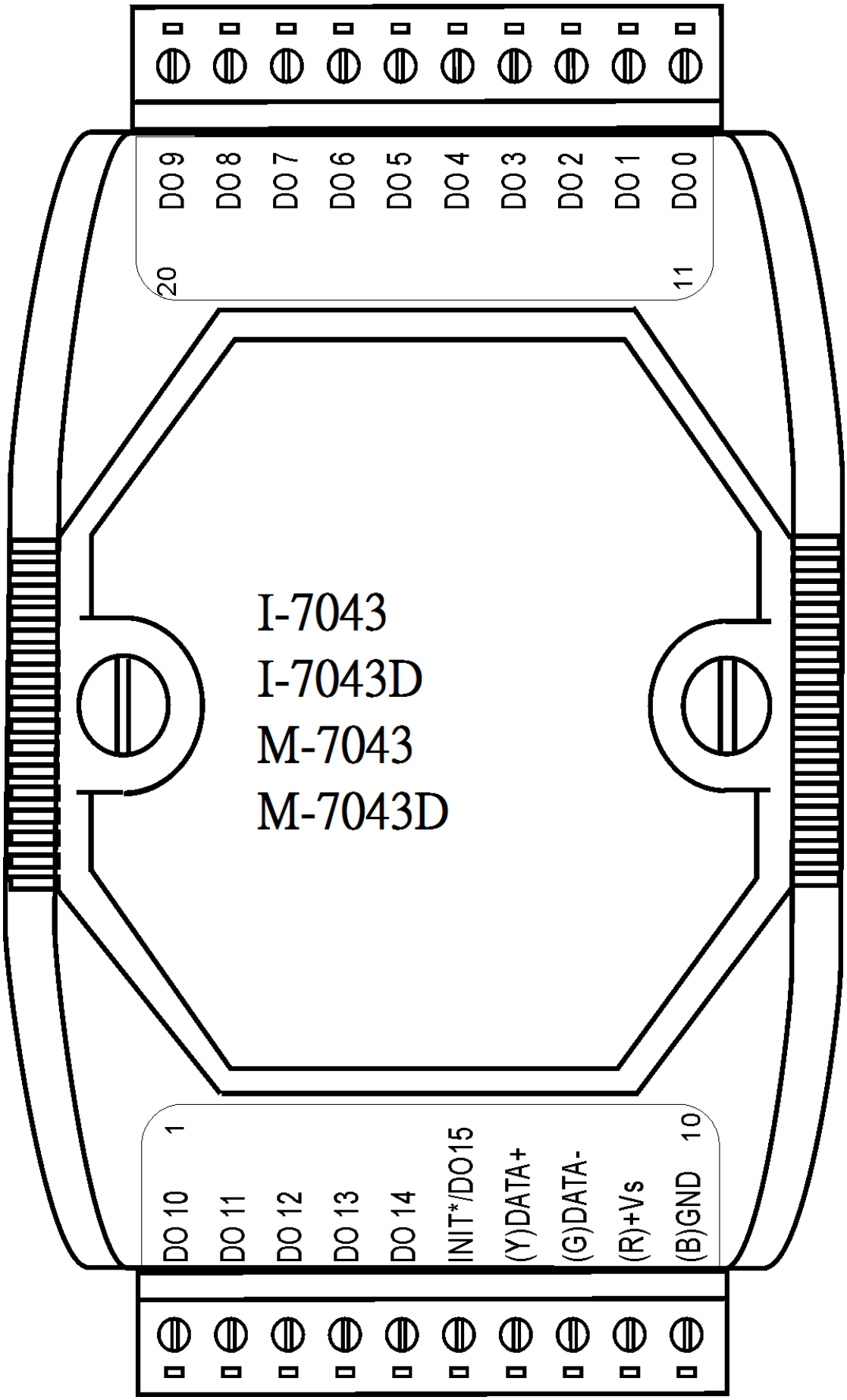
1.2 Terminal Assignment



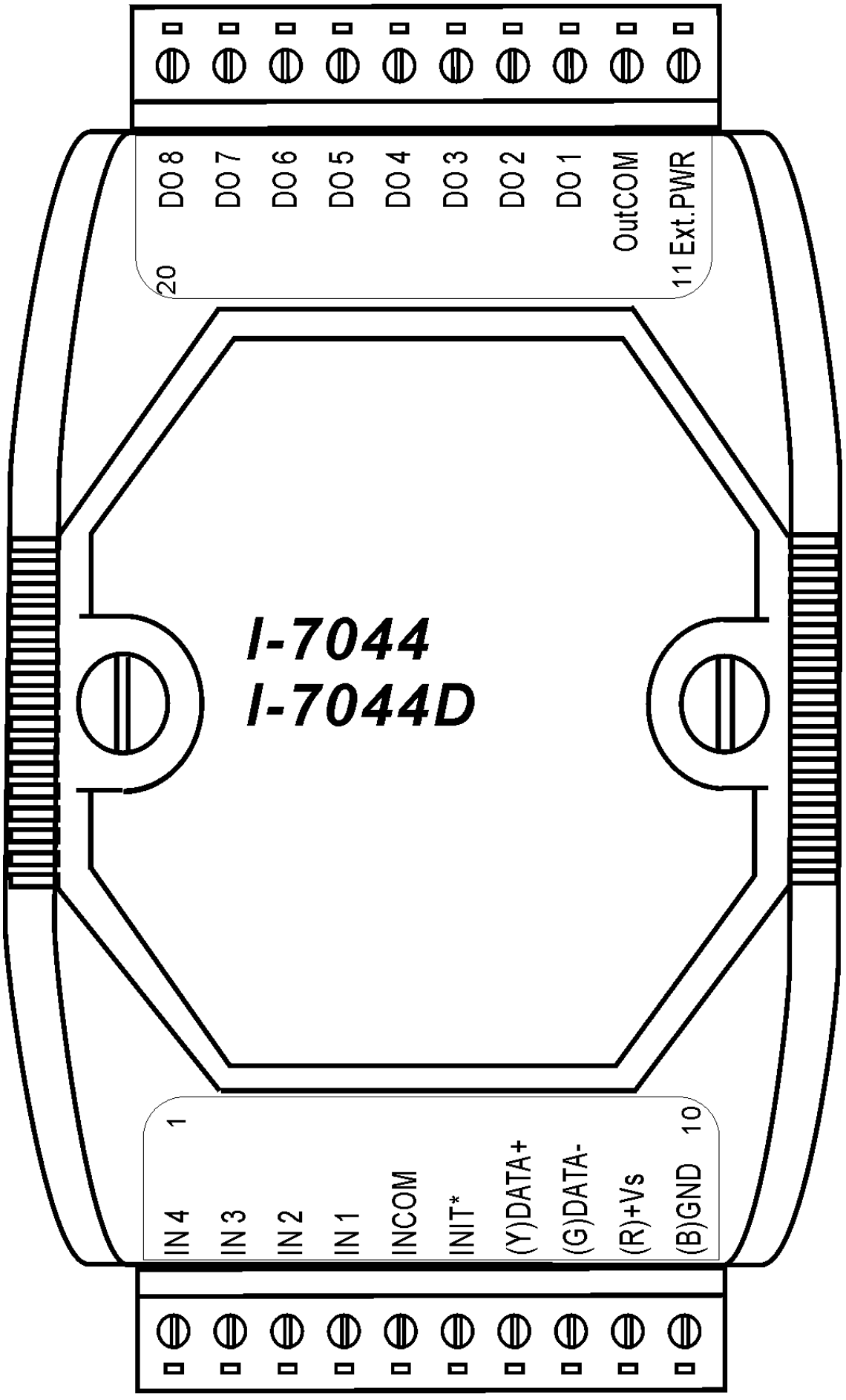
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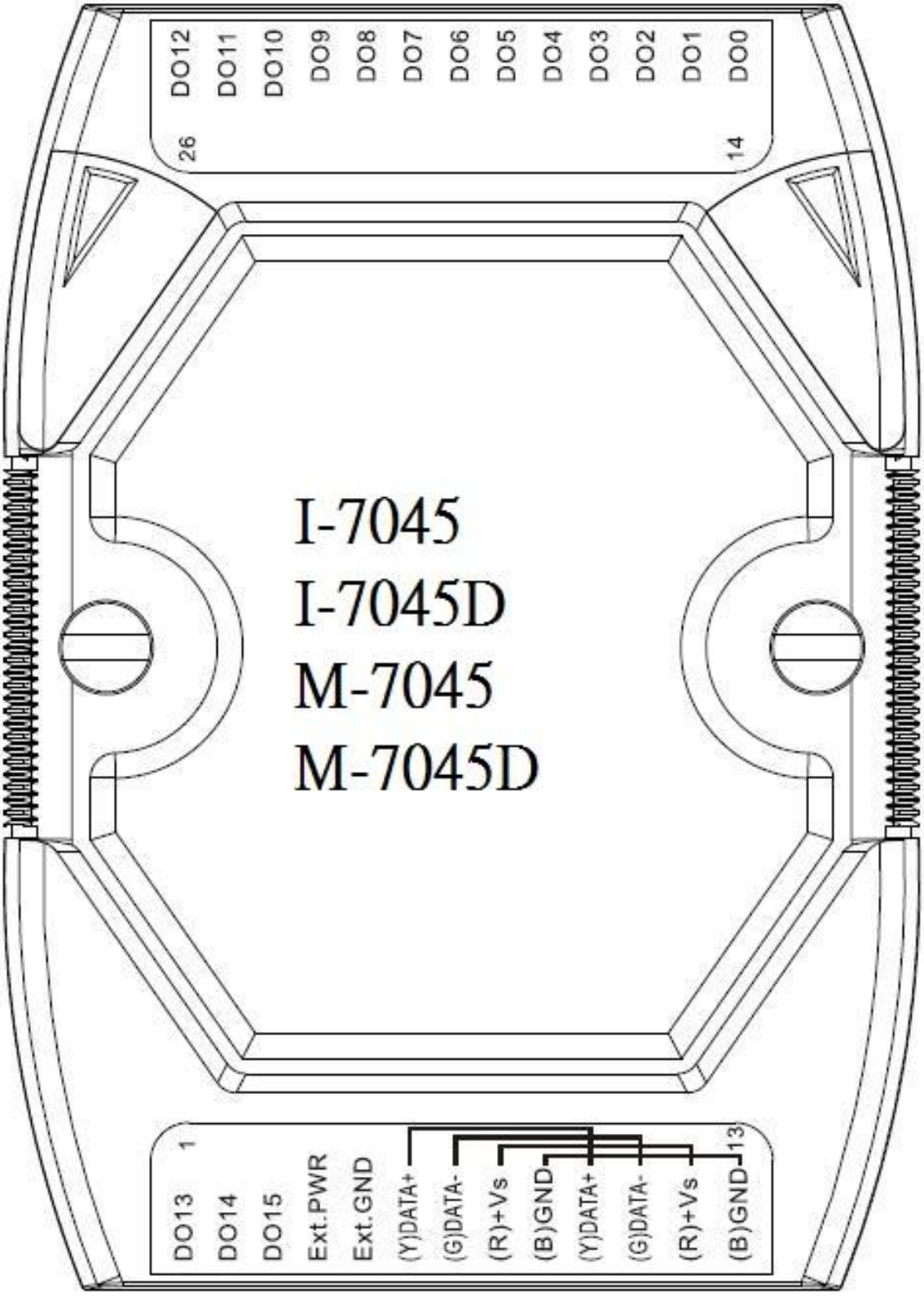
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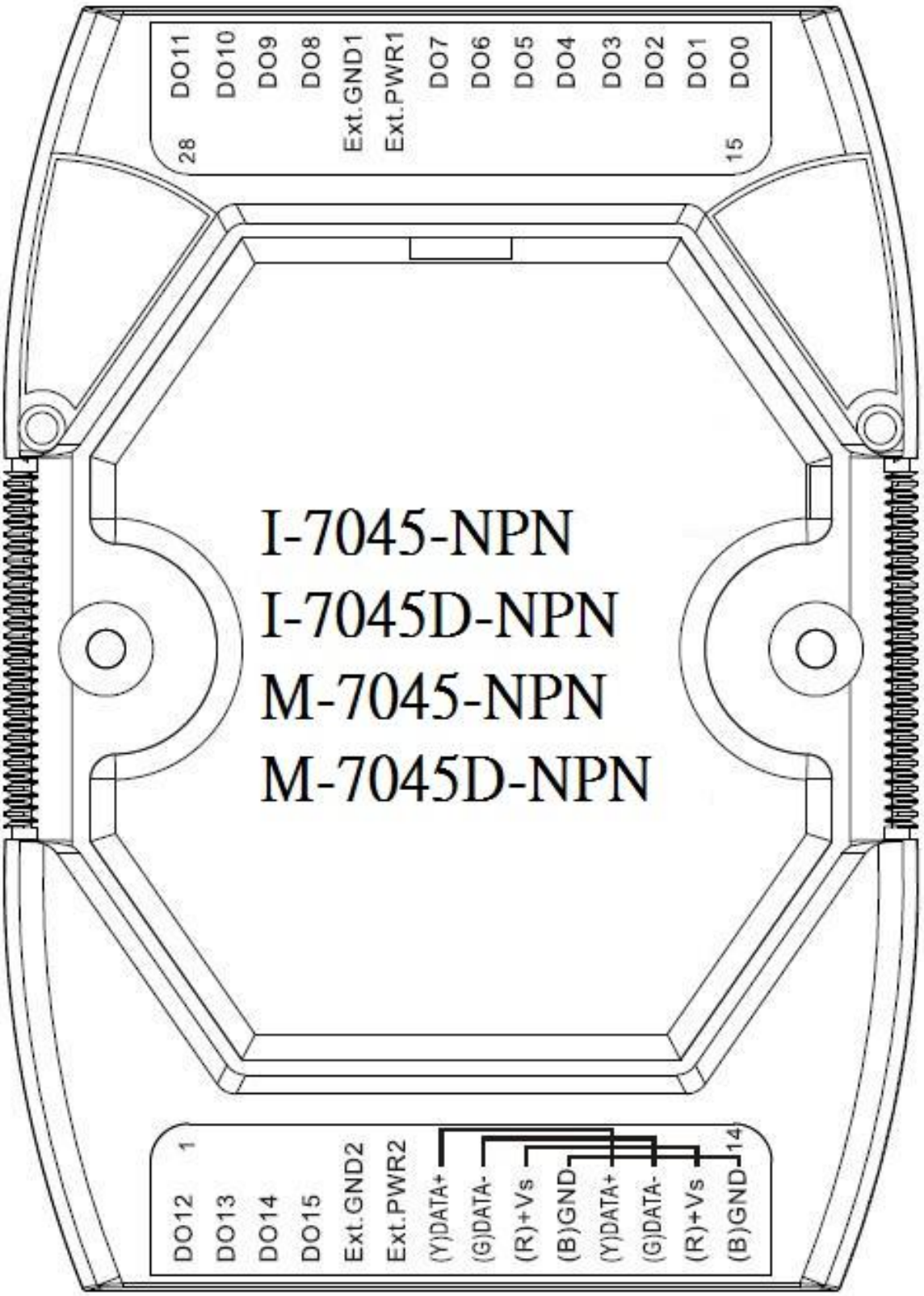
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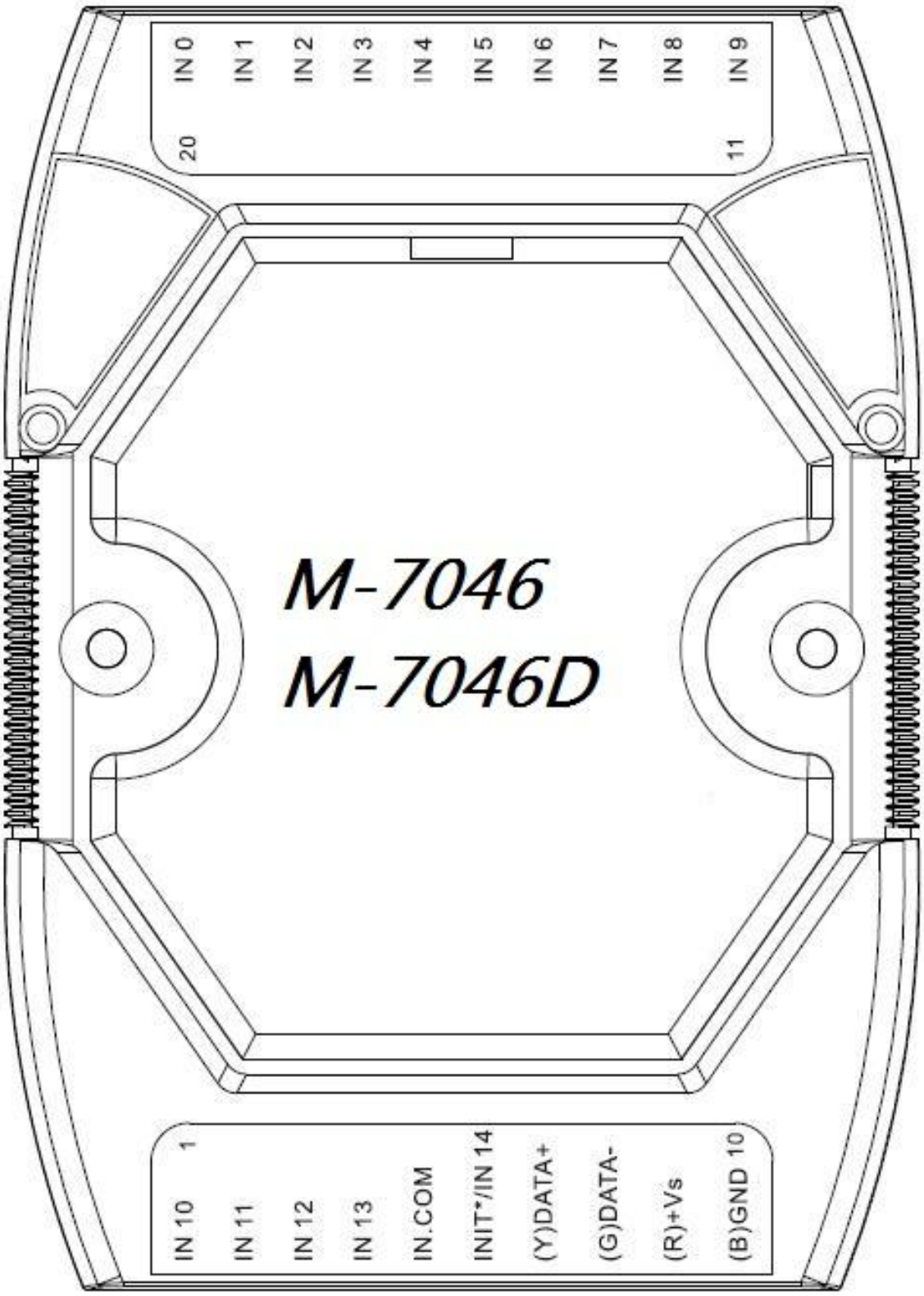
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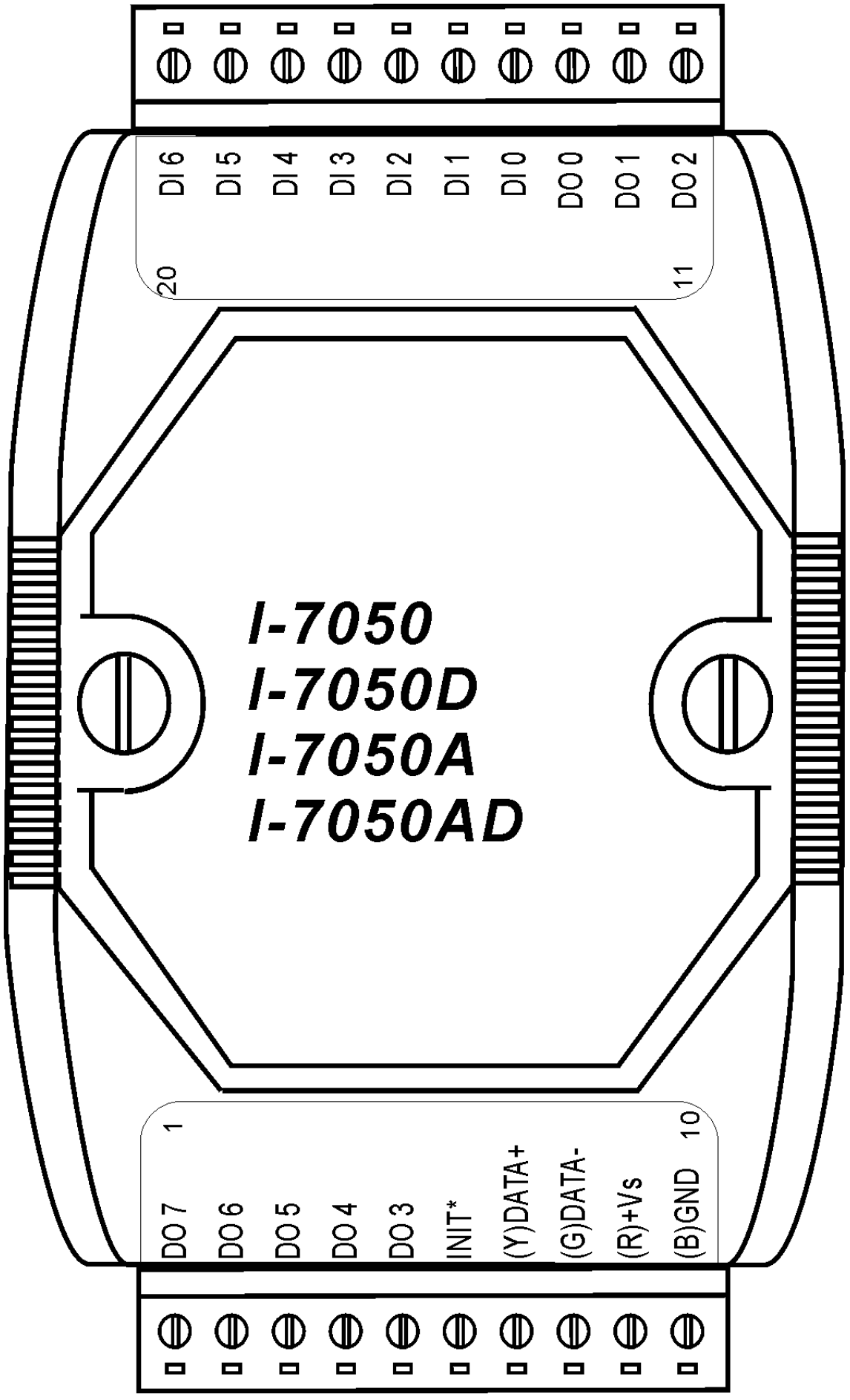
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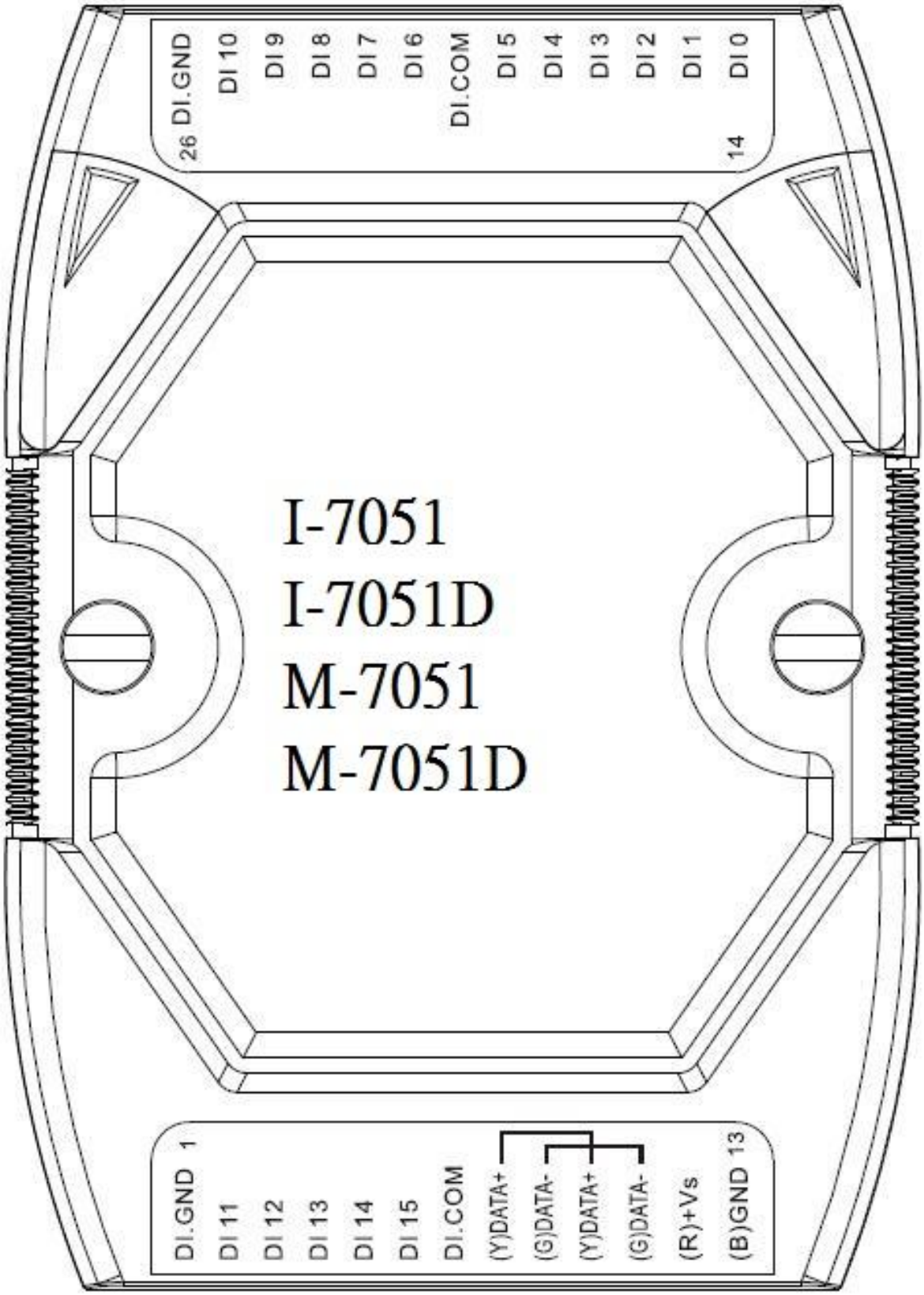
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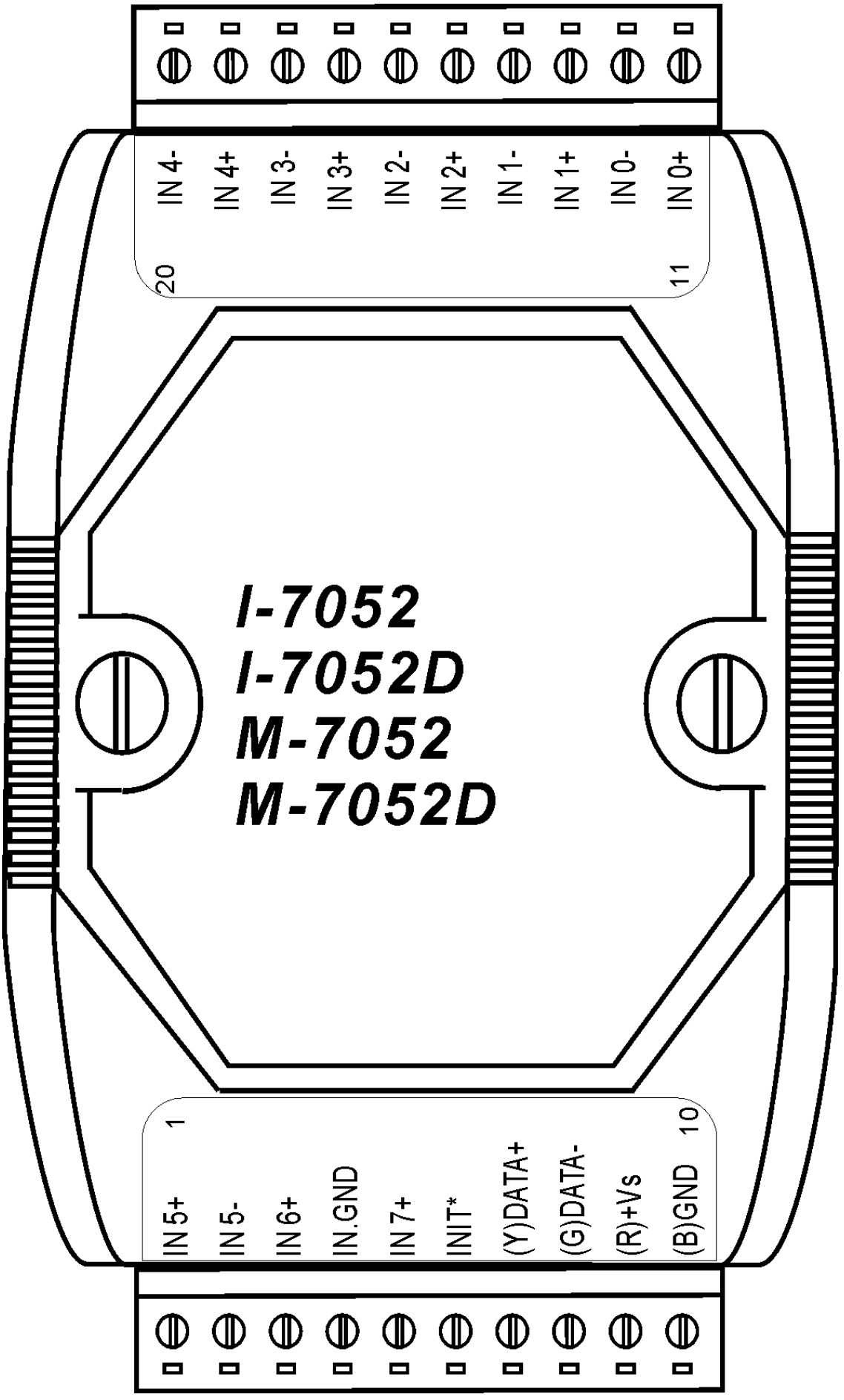
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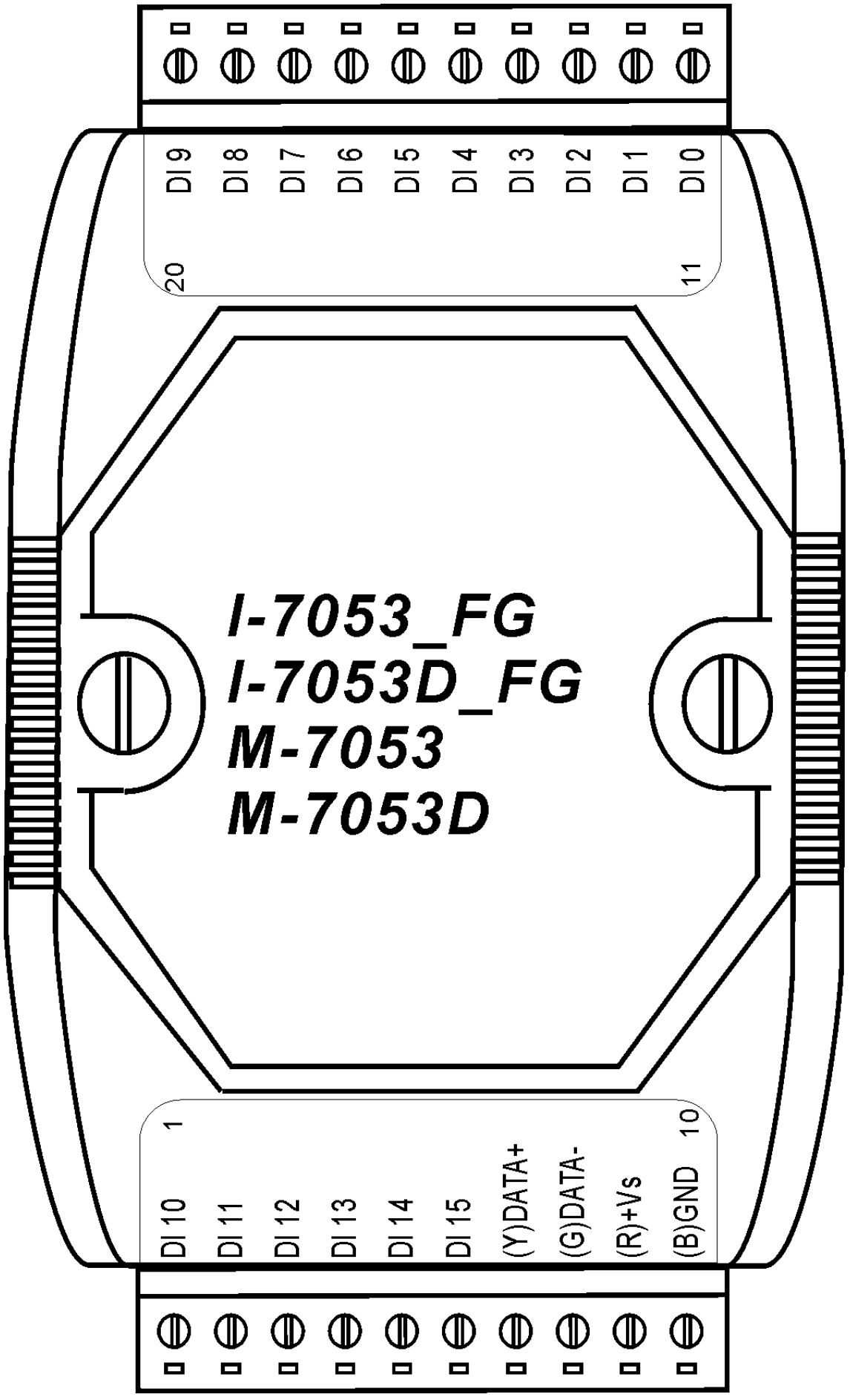
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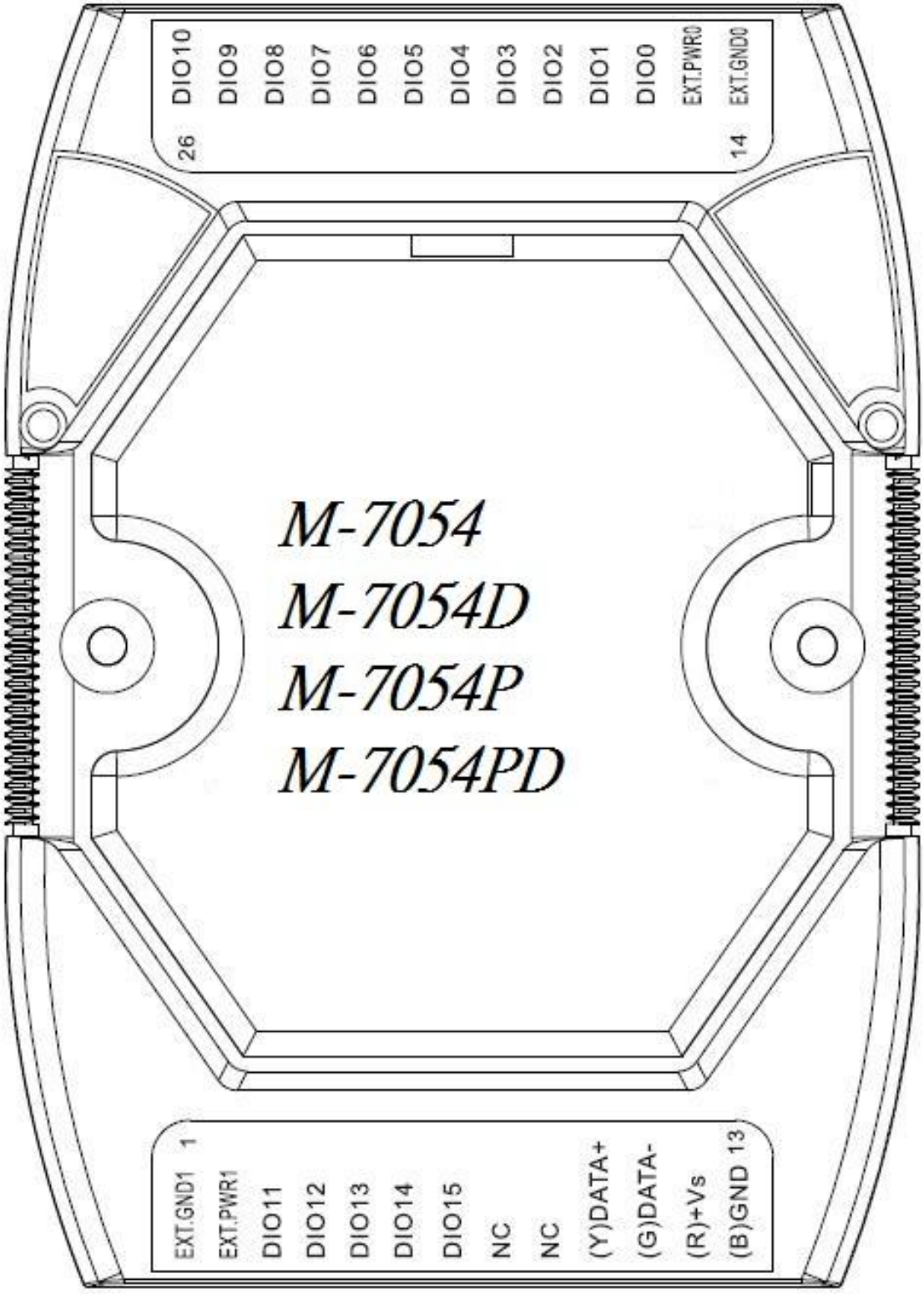
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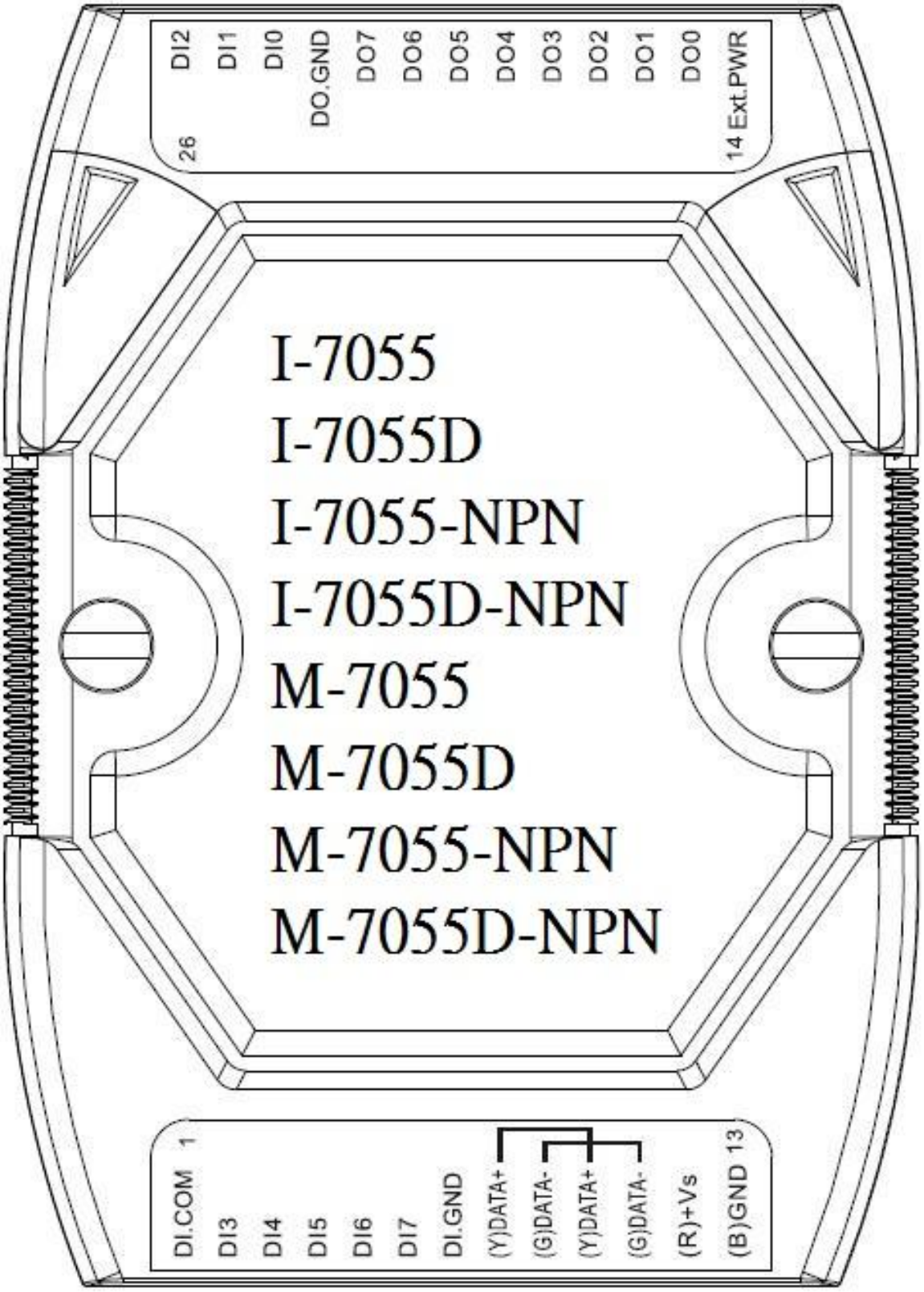
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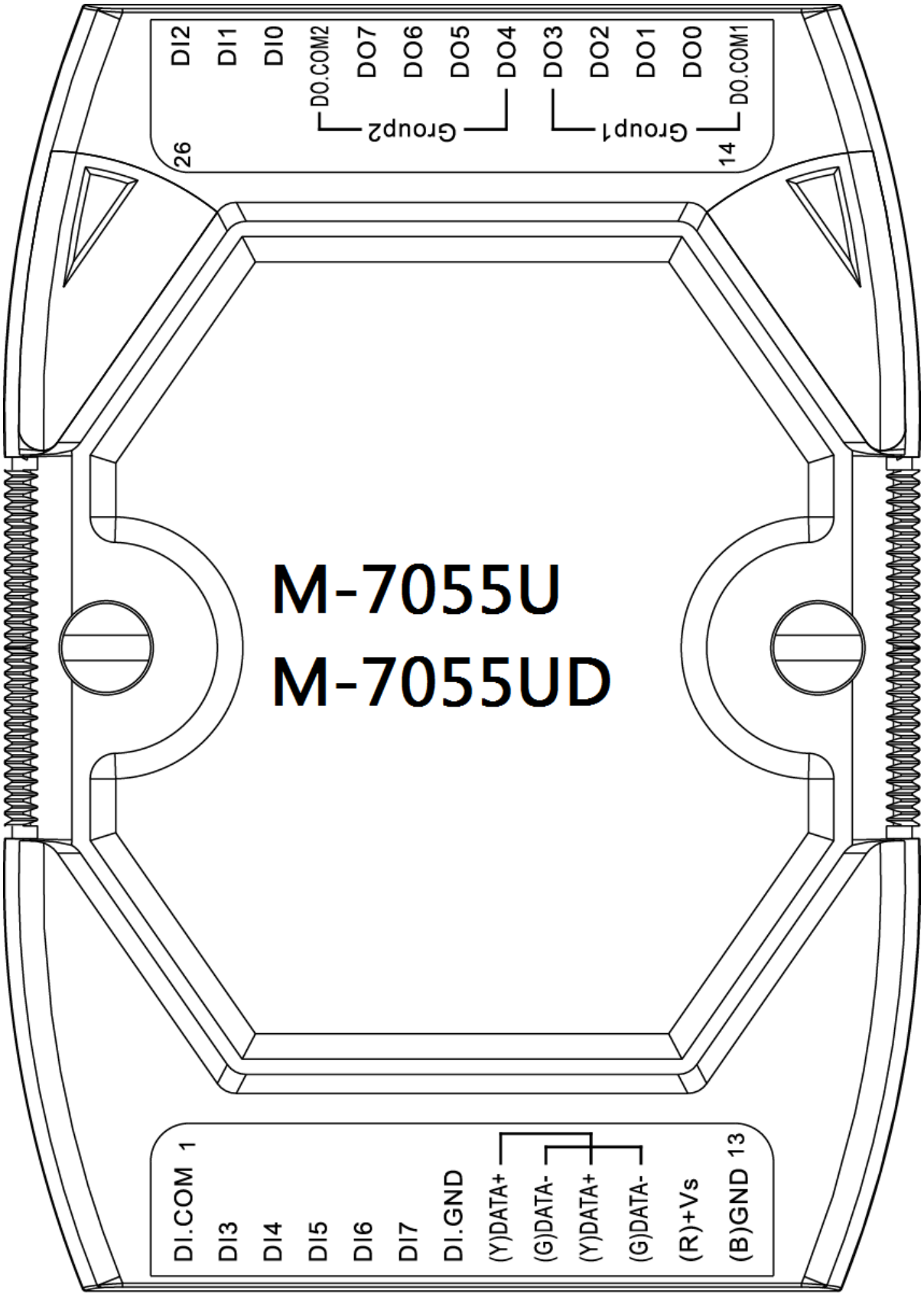
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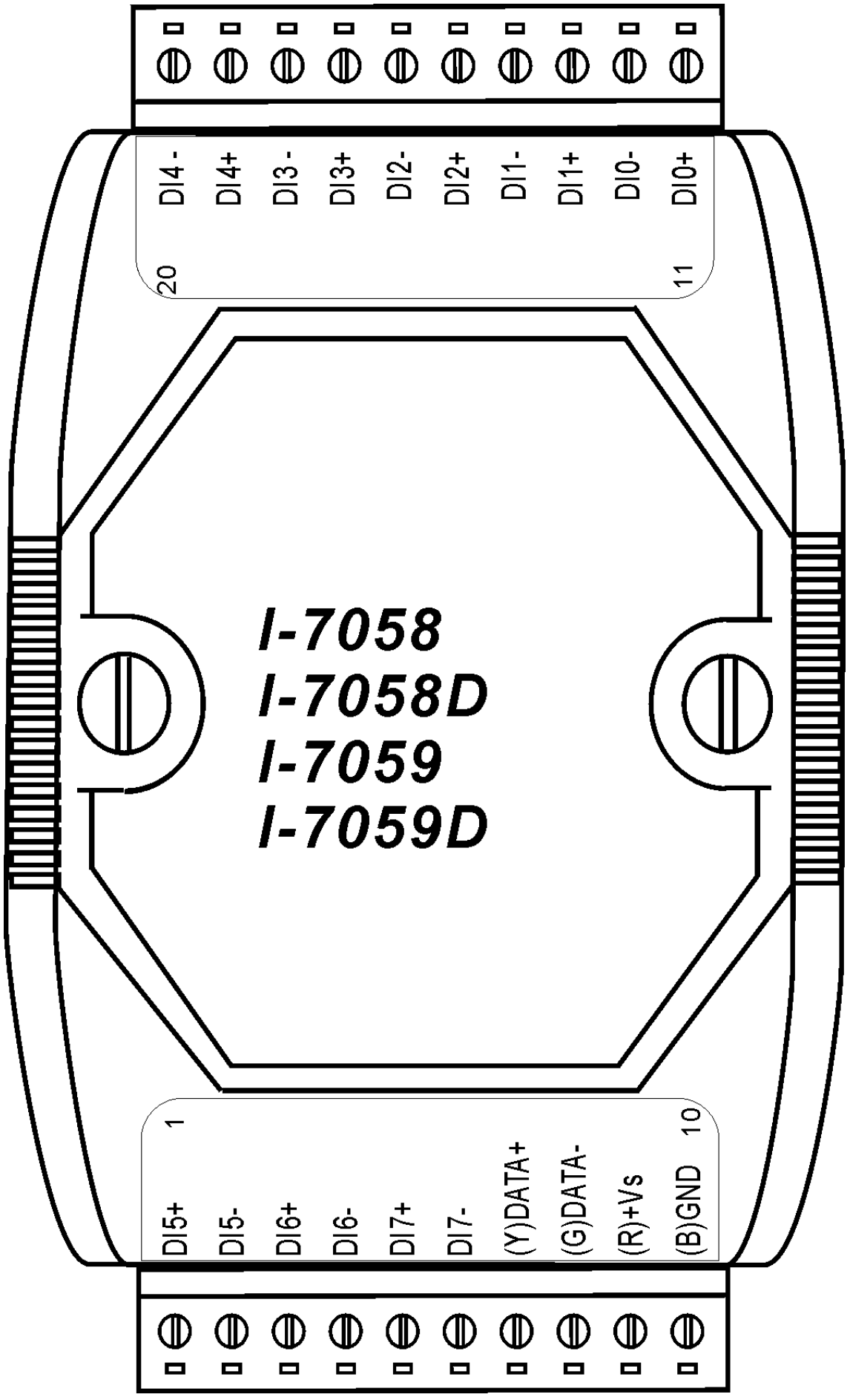
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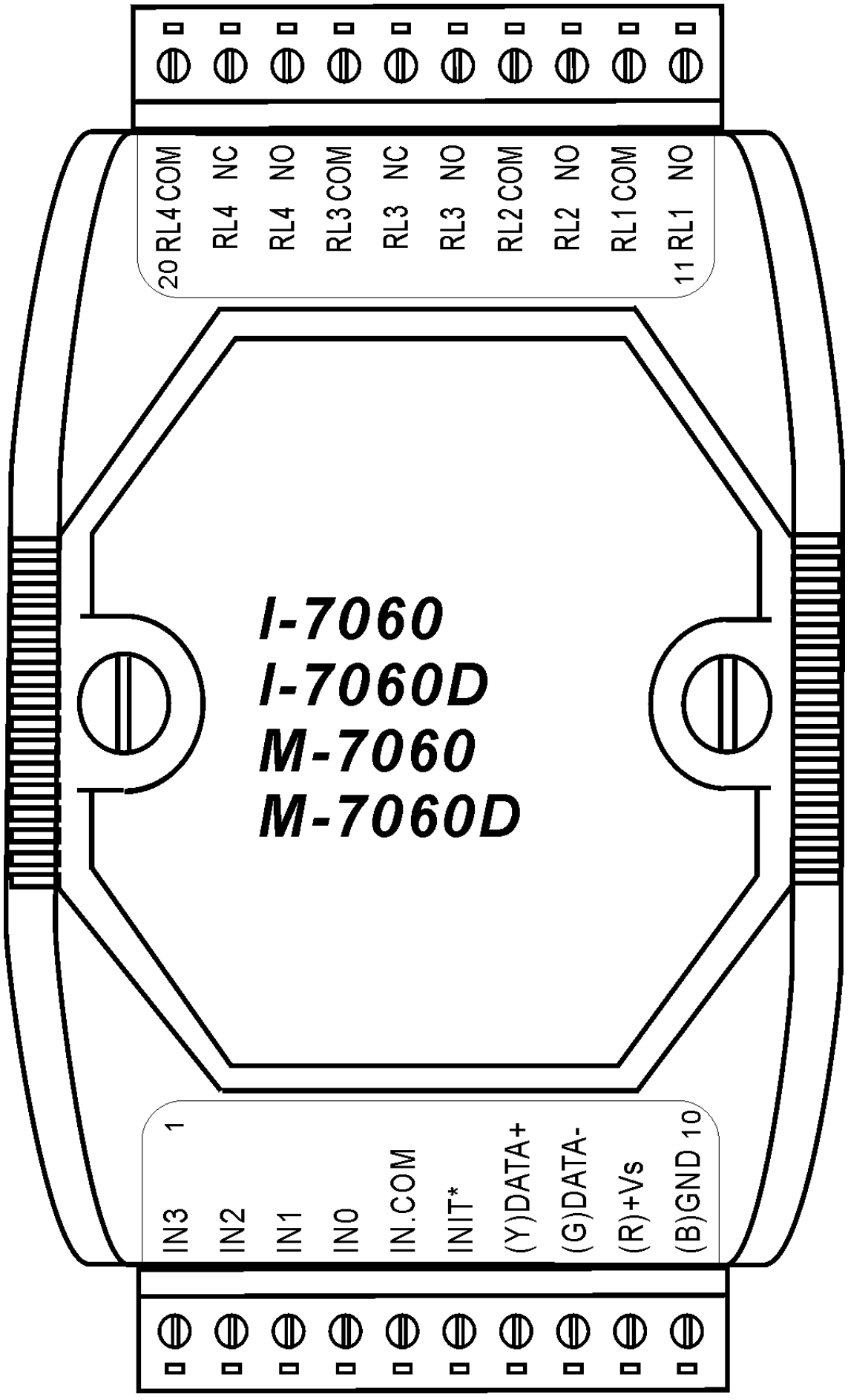


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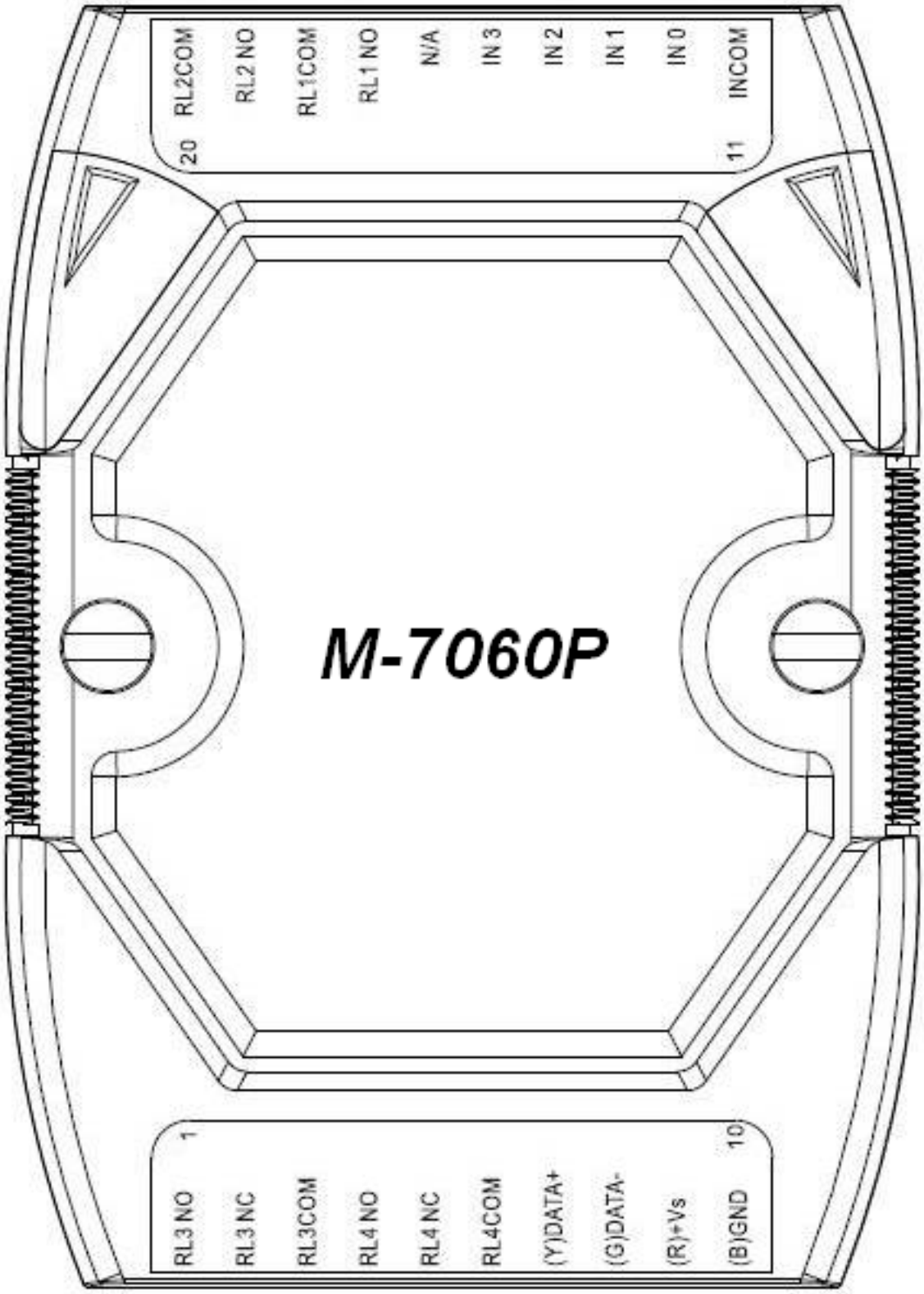
M-7058-16/ M-7058D-16/M-7059-16/M-7059D-16



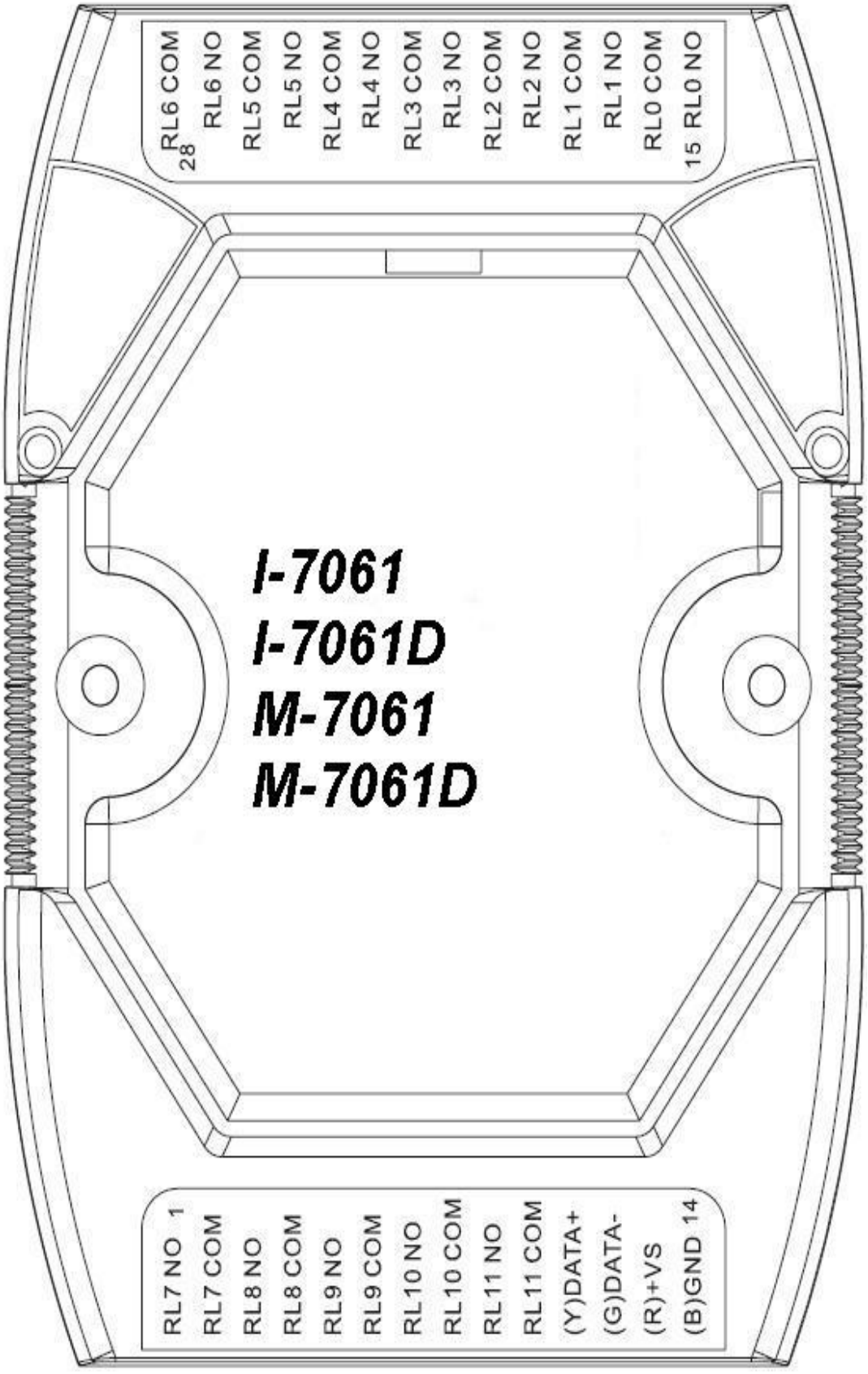
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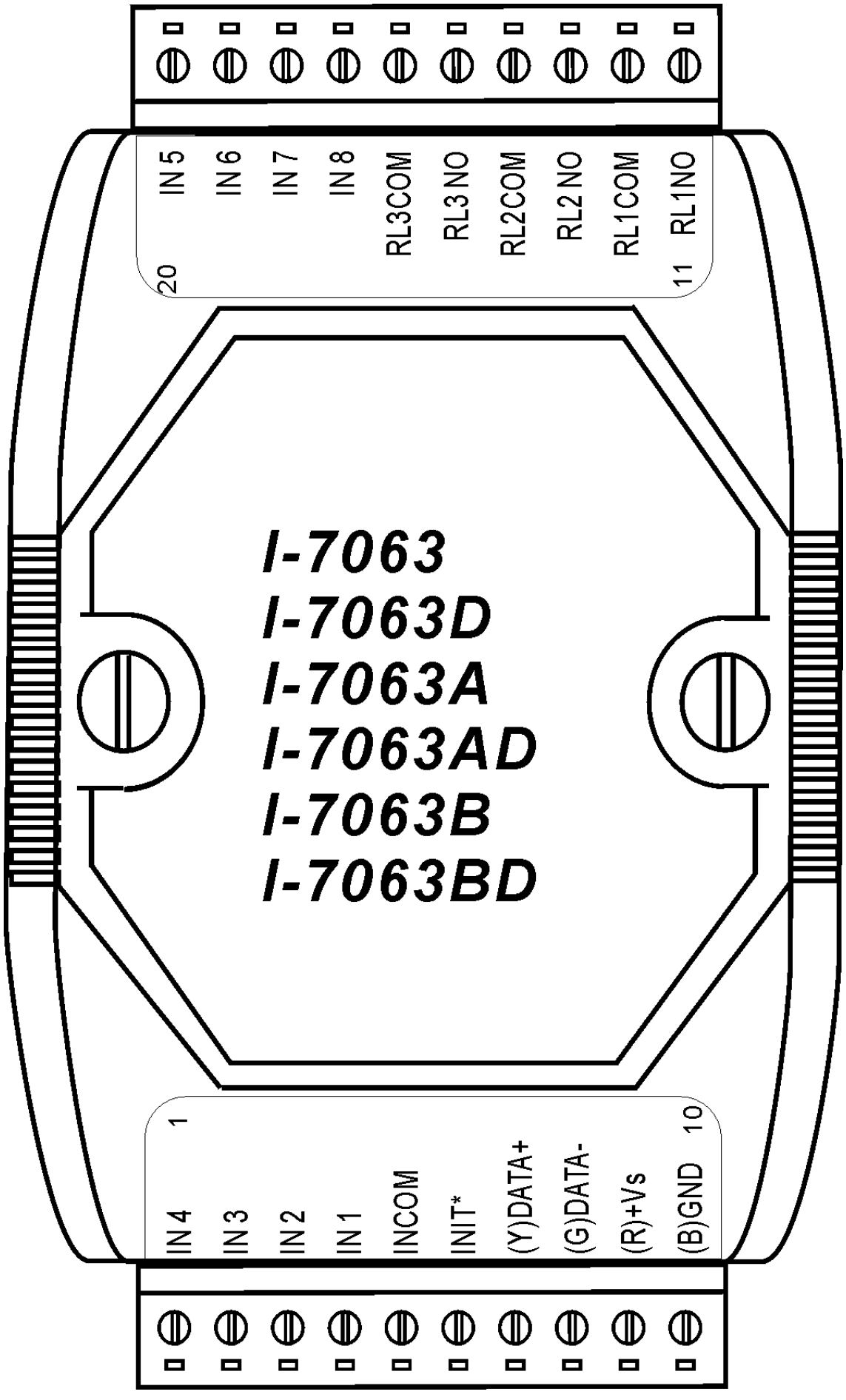
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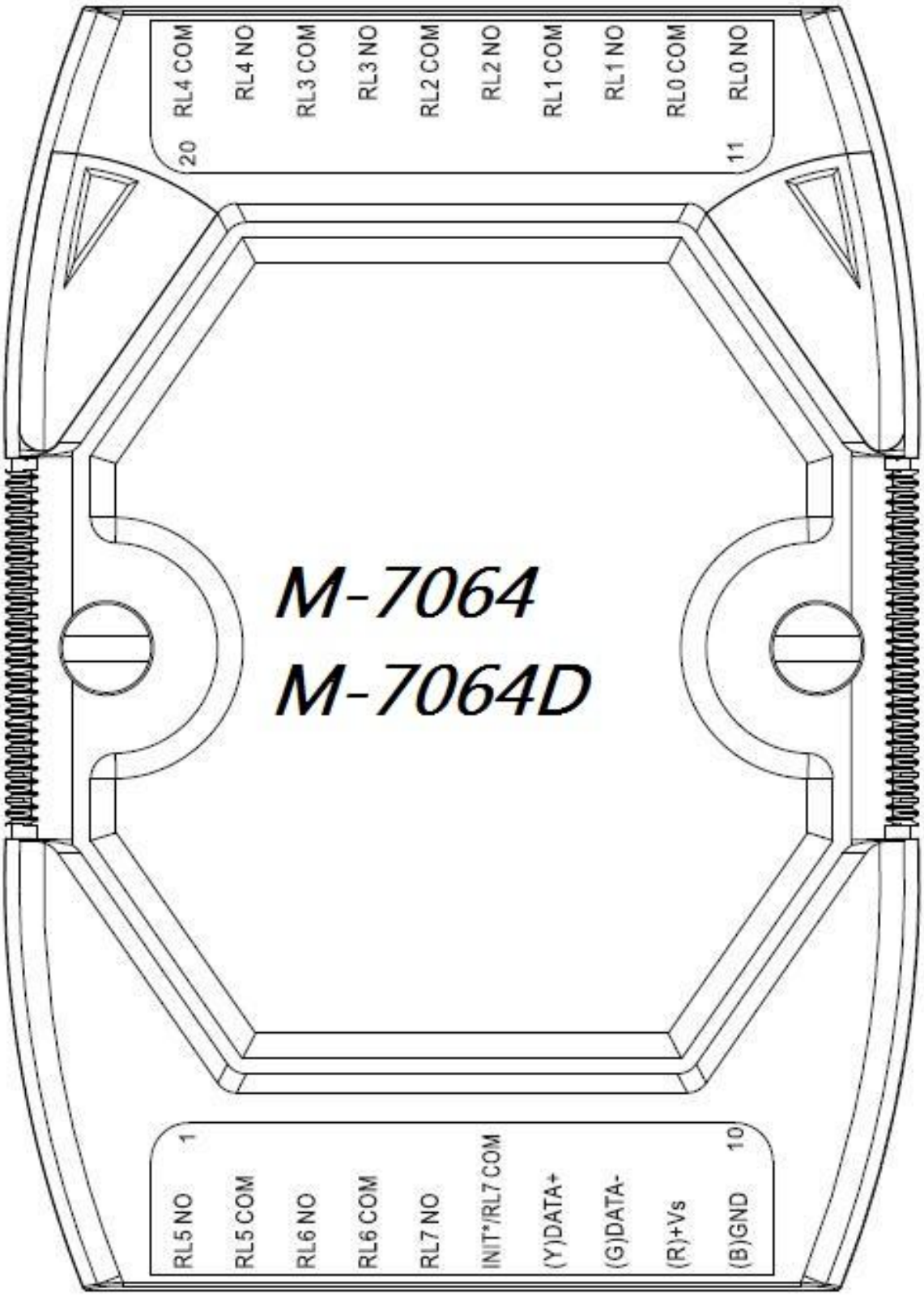
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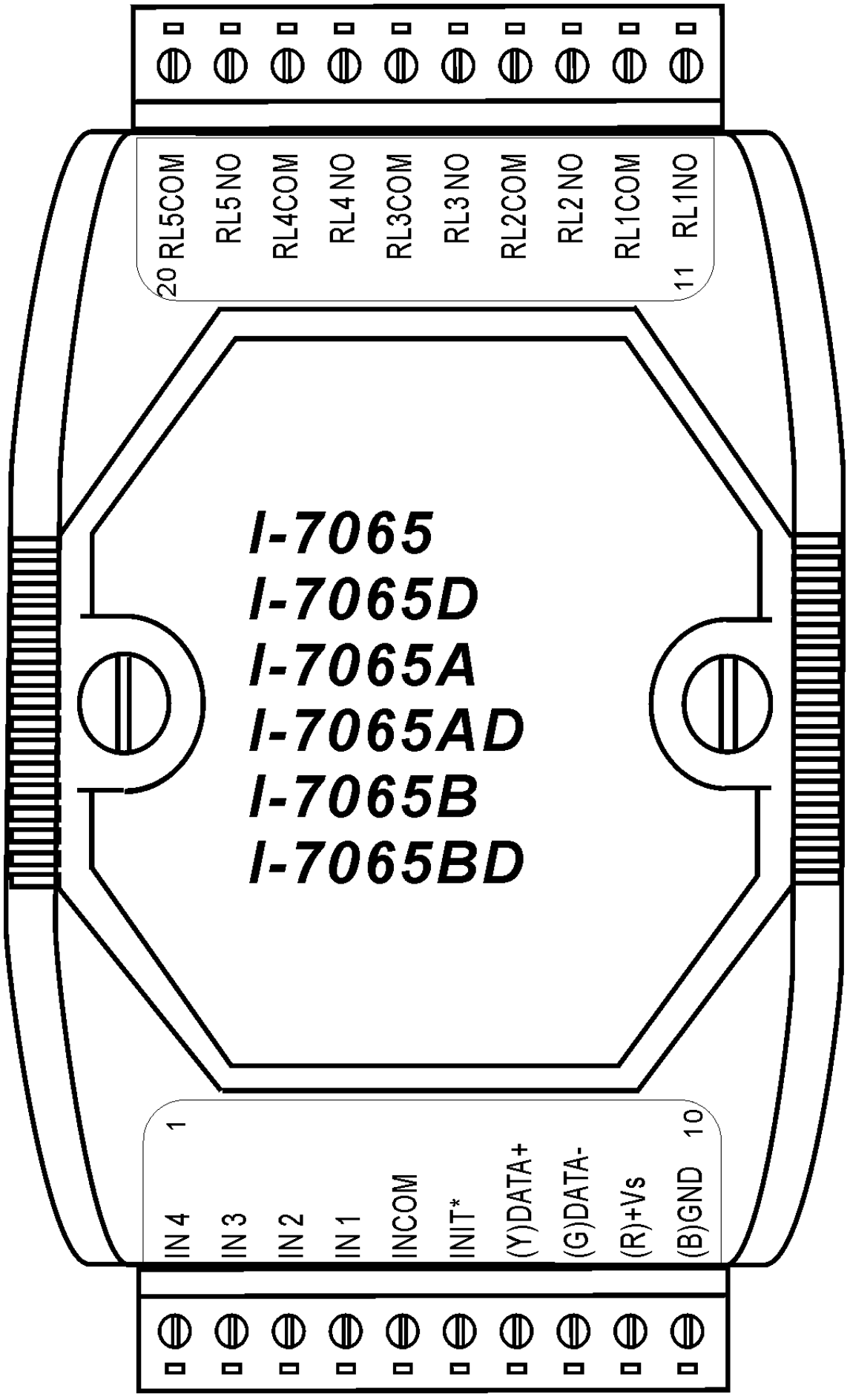
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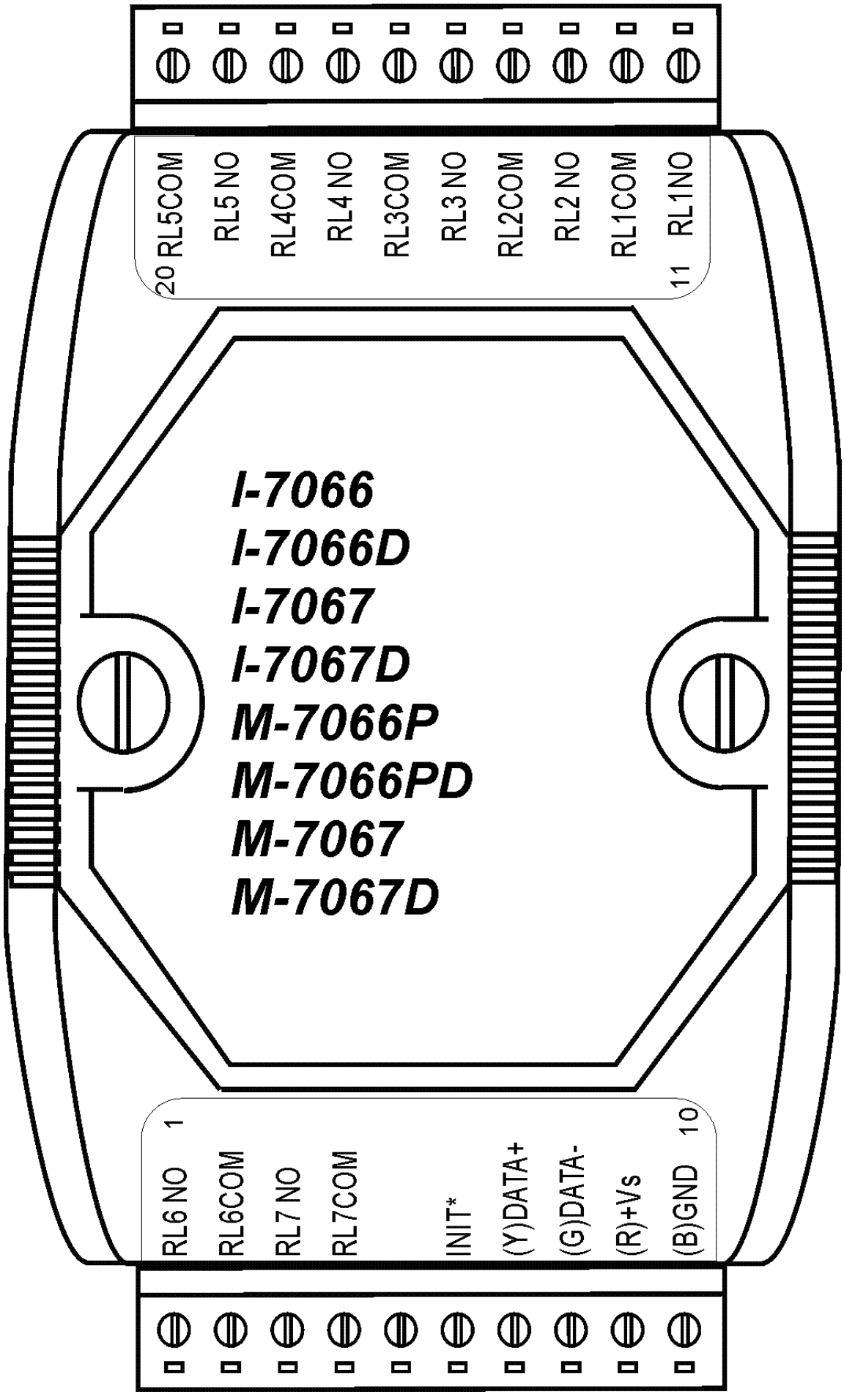
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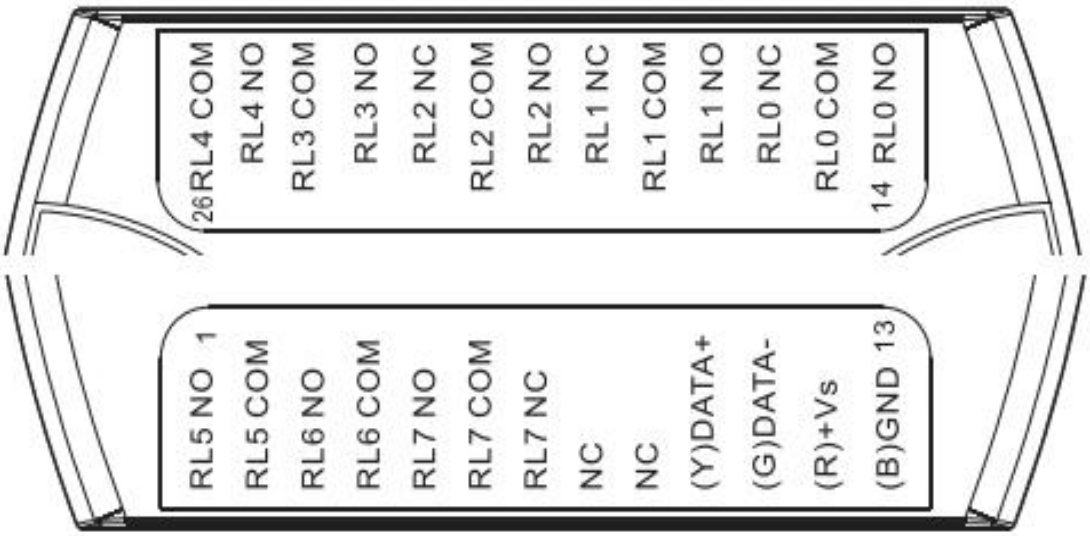


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M-7068/M-7068D/M-7069/M-7069D



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1.3 Specifications

DC Input Modules					
Module	I-7041/41D M-7041/41D	I-7041P/41PD M-7041P/41PD	I-7051/51D M-7051/51D	I-7052/52D M-7052/52D	I-7053_FG/53D_FG M-7053/53D
Input Channels	14 (Sink/Source)	14 (Sink/Source)	16 (Sink/Source)	8 (Sink)	16 (Source)
Input Type	Isolated with Common Power or Ground	Isolated with Common Power or Ground	Dry Contact and Wet Contact	6 Differential and 2 Common Ground	Non-Isolated with Dry Contact
ON Voltage Level	M-7041/41D +4 to +30 V	M-7041P/41PD +19 to +30 V	+10 to +50 V	+4 to +30 V	Close to GND
	I-7041/41D +1 V Max.	I-7041P/41PD +11 V Max.			
OFF Voltage Level	M-7041/41D +1 V Max.	M-7041P/41PD +11 V Max.	+4 V Max.	+1 V Max.	open
	I-7041/41D +4 to +30 V	I-7041P/41PD +19 to +30 V			
Input Impedance	3K Ohms	3K Ohms	10K Ohms	3K Ohms	820 Ohms
Isolation Voltage	3750 Vrms	3750 Vrms	3750 Vrms	5000 Vrms	Non-Isolated
Modbus RTU	M-7041/41D	M-7041P/41PD	M-7051/51D	M-7052/52D	M-7053/53D
Power Requirement	+10 to +30 VDC				
Power Consumption	0.2 W for I-7041/ M-7041 0.9 W for I-7041D/ M-7041D	0.2 W for I-7041P/ M-7041P 0.9 W for I-7041PD/ M-7041PD	0.3 W for I-7051/ M-7051 1.1 W for I-7051D/ M-7051D	0.2 W for I-7052/ M-7052D 0.6 W for I-7052D/ M-7052D	0.6 W for I-7053/ M-7053 1.4 W for I-7053D/ M-7053D
Operating Temperature	-25 °C to +75 °C	-25 °C to +75 °C	-25 °C to +75 °C	-25 °C to +75 °C	-25 °C to +75 °C
Storage Temperature	-30 °C to +75 °C	-30 °C to +75 °C	-30 °C to +75 °C	-30 °C to +75 °C	-30 °C to +75 °C

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DC Input Modules					
Module	M-7046/46D				
Input Channels	15 (Sink/Source)				
Input Type	Isolated with Common Power or Ground				
ON Voltage Level	+3.5 to +50 V				
OFF Voltage Level	+1 V Max.				
Input Impedance	10K Ohms				
Isolation Voltage	5000 VDC				
Modbus RTU	M-7046/46D				
Power Requirement	+10 to +30 VDC				
Power Consumption	0.2 W for M-7046 1.0 W for M-7046D				
Operating Temperature	-25 °C to +75 °C				
Storage Temperature	-30 °C to +75 °C				

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AC Input Module		
Module	I-7058/58D M-7058/58D	I-7059/59D M-7059/59D
Input Channels	8	8
Input Type	Differential	Differential
ON Voltage Level	> 80 VAC Min.	> 10 VAC Min.
OFF Voltage Level	< 30 VAC Max.	< 3 VAC Max.
Max. Input Voltage	250 VAC	80 VAC
Operating AC Frequency	47~400 Hz	47 ~ 400 Hz
Input Impedance	68k Ohms	10k Ohms
Isolation Voltage	5000 Vrms	5000 Vrms
Modbus RTU	M-7058/58D	M-7059/59D
Power Requirement	+10 to +30 VDC	+10 to +30 VDC
Power Consumption	0.3 W for I-7058/M-7058 0.7 W for I-7058D/M-7058D	0.3 W for I-7059/M-7059 0.7 W for I-7059D/M-7059D
Operating Temperature	-25 °C to +75 °C	-25 °C to +75 °C
Storage Temperature	-30 °C to +75 °C	-30 °C to +75 °C

AC Input and Output Module		
Module	M-7058-16/58D-16	M-7059-16/59D-16
Input Channels	16	16
ON Voltage Level	80 - 250 VAC/VDC	10 - 80 VAC 15 - 80 VDC
OFF Voltage Level	< 30 VAC/VDC Max.	< 3 VAC/VDC Max.
Input Impedance	150k Ohms	30k Ohms
Overvoltage Protection	300 VAC/VDC Max.	120 VAC/VDC Max.
Output Channels	2 (Sink)	2 (Sink)
Output type	Isolated Open Collector	Isolated Open Collector
Load Voltage	+5 to +50 VDC	+5 to +50 VDC
Max Load Current	600 mA/channel	600 mA/channel
Short-Circuit Protection	Yes	Yes
Overvoltage Protection	60 VDC	60 VDC
Modbus RTU	M-7058-16/58D-16	M-7059-16/59D-16
Power Requirement	+10 to +30 VDC	+10 to +30 VDC
Power Consumption	0.4 W	0.4 W
Operating Temperature	-25 °C to +75 °C	-25 °C to +75 °C
Storage Temperature	-40 °C to +85 °C	-40 °C to +85 °C

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DC Output Modules				
Module	I-7042/42D	I-7043/43D M-7043/43D	I-7045/45D M-7045/45D	I-7045-NPN/45D-NPN M-7045-NPN/45D-NPN
Output Channels	13 (Sink)	16 (Sink)	16 (Source)	16 (Sink)
Output type	Open Collector (NPN)	Open Collector (NPN)	Open Source (N-MOSFET)	Open Collector (NPN)
Load Voltage	+3.5 to +30 V	+10 to +30 V	+10 to +40 V	+3.5 to +50 V
Max Load Current	100 mA	100 mA	650 mA	700 mA
Short-Circuit Protection	No	No	Yes	Yes
Isolation Voltage	3750 Vrms	Non-Isolated	3750 Vrms	3750 Vrms
Modbus RTU		M-7043/43D	M-7045/45D	M-7045-NPN/45D-NPN
Power Requirement	+10 to +30 VDC			
Power Consumption	0.9 W for I-7042 1.5 W for I-7042D	0.4 W for I-7043 1.2 W for I-7043D	0.6 W for I/M-7045 1.5 W for I/M-7045D	0.4 W for I/M-7045 1.2 W for I/M-7045D
Operating Temperature	-25 °C to +75 °C	-25 °C to +75 °C	-25 °C to +75 °C	-25 °C to +75 °C
Storage Temperature	-30 °C to +75 °C	-30 °C to +75 °C	-30 °C to +75 °C	-30 °C to +75 °C

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DC Input and Output Modules					
Module	I-7044/44D	I-7050/50D	I-7050A/50AD	I-7055/55D M-7055/55D	I-7055-NPN I-7055D-NPN M-7055-NPN M-7055D-NPN
Output Channels	8 (Sink)	8 (Sink)	8 (Source)	8 (Source)	8 (Sink)
Output Type	Open Collector (NPN)	Open Collector (NPN)	Open Collector (PNP)	Open Source (N-MOSFET)	Open Collector (NPN)
Load Voltage	+3.5 to +30 V	+3.5 to +30 V	+3.5 to +30 V	+10 to +40 V	+3.5 to +50 V
Max Load Current	375 mA	30 mA	50 mA	650 mA	700 mA
Short-Circuit Protection	No	No	No	Yes	Yes
Isolation Voltage	3750 Vrms	Non-Isolated	Non-Isolated	3750 Vrms	3750 Vrms
Input Channels	4 (Sink/Source)	7 (Source)	7 (Sink)	8 (Sink/Source)	8 (Sink/Source)
Input Type	Isolated with Common Source	Non-Isolated	Non-Isolated	Dry Contact and Wet Contact	Dry Contact and Wet Contact
ON Voltage Level	+1 V Max.	Open	+4 to +30 V	+10 to +50 V	+10 to +50 V
OFF Voltage Level	+4 to +30 V	Close to GND	+1 V Max.	+4 V Max.	+4 V Max.
Input Impedance	3K Ohms	-	-	10K Ohms	10K Ohms
Isolation Voltage	3750 Vrms	Non-Isolated	Non-Isolated	3750 Vrms	3750 Vrms
Modbus RTU				M-7055/55D	M-7055-NPN M-7055D-NPN
Power Requirement	+10 to +30 V				
Power Consumption	0.6 W for I-7044 1.2 W for I-7044D	0.4 W for I-7050 1.2 W for I-7050D	1.0 W for I-7050A 1.8 W for I-7050AD	0.8 W for I-7055/ M-7055 1.6 W for I-7055D/ M-7055D	1.2 W for I-7055-NPN/ M-7055-NPN 2.2 W for I-7055D-NPN/ M-7055D-NPN
Operating Temperature	-25 °C to +75 °C	-25 °C to +75 °C	-25 °C to +75 °C	-25 °C to +75 °C	-25 °C to +75 °C
Storage Temperature	-30 °C to +75 °C	-30 °C to +75 °C	-30 °C to +75 °C	-30 °C to +75 °C	-30 °C to +75 °C

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DC Input and Output Modules					
Module	M-7055U/55UD				
Output Channels	8 (Sink/Source)				
Output Type	Push-Pull				
Load Voltage	+3.5 to +80 VDC				
Max Load Current	500 mA / channel				
Short-Circuit Protection	No				
Isolation Voltage	2000 VDC				
Input Channels	8 (Sink/Source)				
Input Type	Dry Contact and Wet Contact				
ON Voltage Level	+10 to +50 V				
OFF Voltage Level	+4 V Max.				
Input Impedance	10K Ohms				
Isolation Voltage	2000 VDC				
Modbus RTU	M-7055U/55UD				
Power Requirement	+10 to +48 V				
Power Consumption	0.9 W for M-7055U 1.0 W for M-7055UD				
Operating Temperature	-25 °C to +75 °C				
Storage Temperature	-30 °C to +75 °C				

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Universal DC Input and Output Modules			
Model		M-7054/54D	M-7054P/54PD
Channels		16-channel Isolated Universal Digital Input / Output (Configurable via Wire Connection)	
Digital Output	Output Type	Sink	Sink
	Load Voltage	+5 ~ 30 VDC	+5 ~ 50 VDC
	Max Load Current	100 mA	500 mA
	Overvoltage Protection	35V DC	60V DC
	Overload Protection		Yes
	Short Circuit Protection		Yes
	Power-on Value	Yes, Programmable	Yes, Programmable
	Safe Value	Yes, Programmable	Yes, Programmable
Digital Input	ON Voltage Level	Close to GND	Close to GND
	OFF Voltage Level	Open	Open
	Overvoltage Protection		60 VDC
Isolation Voltage		3750 Vrms	3750 Vrms
Modbus RTU		M-7054/54D	M-7054P/54PD
Power Requirement		+10 to +30 V	
Power Consumption		1.2 W for M-7054 1.3 W for M-7054D	1.2 W for M-7054P 1.3 W for M-7054PD
Operating Temperature		-25 °C to +75 °C	
Storage Temperature		-30 °C to +75 °C	

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Relay Output and DC Input Modules				
Module	I-7060/60D M-7060/60D	I-7063/63D	I-7065/65D	M-7060P
Output Channels	4	3	5	4
Relay Type	RL1, RL2: Form A RL3, RL4: Form C	Form A	Form A	RL1, RL2: Form A RL3, RL4: Form C
Contact Rating	0.6A@125 VAC 2A@30 VDC	5A@250 VAC 5A@30 VDC		Form A: 16 A@250 VAC 10A @ 30 VDC Form C: 10A(NO)/6A(NC) @250 VAC 10A(NO)/6A(NC) @30 VDC
Surge Strength	500 V	4000 V		2500 V
Operate Time	3 ms	6 ms Max.		6 ms
Release Time	2 ms	3 ms Max.		3 ms
Min. Life	$5*10^5$ ops.	10^5 ops.		$5*10^4$ ops
Input Channels	4	8	4	4
Isolation	Isolated with Common Source			
Isolation Voltage	3750 Vrms			
Digital Level 0	+1 V max			+4 V max
Digital Level 1	+4 to 30 V			+10 to 50 V
Input Impedance	3K ohm			10K ohm
Modbus RTU	M-7060/60D			M-7060P
Power Requirement	+10 to 30 VDC			
Power Consumption	1.3 W for I-7060/ M-7060 1.9 W for I-7060D/ M-7060D	1.0 W for I-7063 1.5 W for I-7063D	1.3 W for I-7065 2.2 W for I-7065D	1.4W for M-7060P
Operating Temperature	-25 °C to +75 °C	-25 °C to +75 °C	-25 °C to +75 °C	-25 °C to +75 °C
Storage Temperature	-30 °C to +75 °C	-30 °C to +75 °C	-30 °C to +75 °C	-30 °C to +75 °C

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Relay Output Modules				
Module	I-7067/67D M-7067/67D	I-7061/61D M-7061/61D	M-7068/68D	M-7069/69D
Output Channels	7 Form A	12 Form A	4 Form A, 4 Form C	4 Form A, 4 Form C
Relay Type	Signal Relay	Power Relay	Signal Relay	Power Relay
Contact Rating	0.5A@120 VAC 1.0A@24 VDC	5A@250 VAC 5A@30 VDC	2 A @ 30 VDC 0.24 A @ 220 VDC 0.25 A @ 250 VAC	Form A: 6 A @ 35 VDC 6 A @ 240 VAC Form C: 5 A @ 30 VDC 5 A @ 250 VAC
Surge Strength	1500 VDC	3000 VDC	2000 VDC	4000 VDC
Operate Time	5 ms Max.	6 ms	3 ms (typical)	5 ms (typical)
Release Time	2 ms Max.	3 ms	4 ms (typical)	Form A: 1 ms (typical) Form C: 2 ms (typical)
Min. Life	10^5 ops.	$20x10^5$ ops	10^8 ops. Mechanical $2x10^5$ ops Electrical	Form A: $30x10^6$ ops. Mechanical 10^5 ops Electrical Form C: $15x10^6$ ops. Mechanical 10^5 ops Electrical
Modbus RTU	M-7067/67D	M-7061/61D	M-7068/68D	M-7069/69D
Power Requirement	+10 to 30 VDC			
Power Consumption	1.5W for I-7067/ M-7067 2.2 W for I-7067D/ M-7067D	1.7W for I-7061/ M-7061 2.3 W for I-7061D/ M-7061D	1.6 W for M-7068 2.0 W for M-7068D	2.1 W for M-7069 2.5 W for M-7069D
Operating Temperature	-25 °C to +75 °C			
Storage Temperature	-30 °C to +75 °C			

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Relay Output Modules				
Module	M-7064/64D			
Output Channels	8 Form A			
Relay Type	Signal Relay			
Contact Rating	0.25A@250 VAC 2.0A@30 VDC			
Surge Strength	2000 VDC			
Operate Time	3 ms (typical)			
Release Time	4 ms (typical)			
Min. Life	10^8 ops.			
Modbus RTU	M-7064/64D			
Power Requirement	+10 to 30 VDC			
Power Consumption	1.5W for M-7064 1.9 W for M-7064D			
Operating Temperature	-25 °C to +75 °C			
Storage Temperature	-30 °C to +75 °C			

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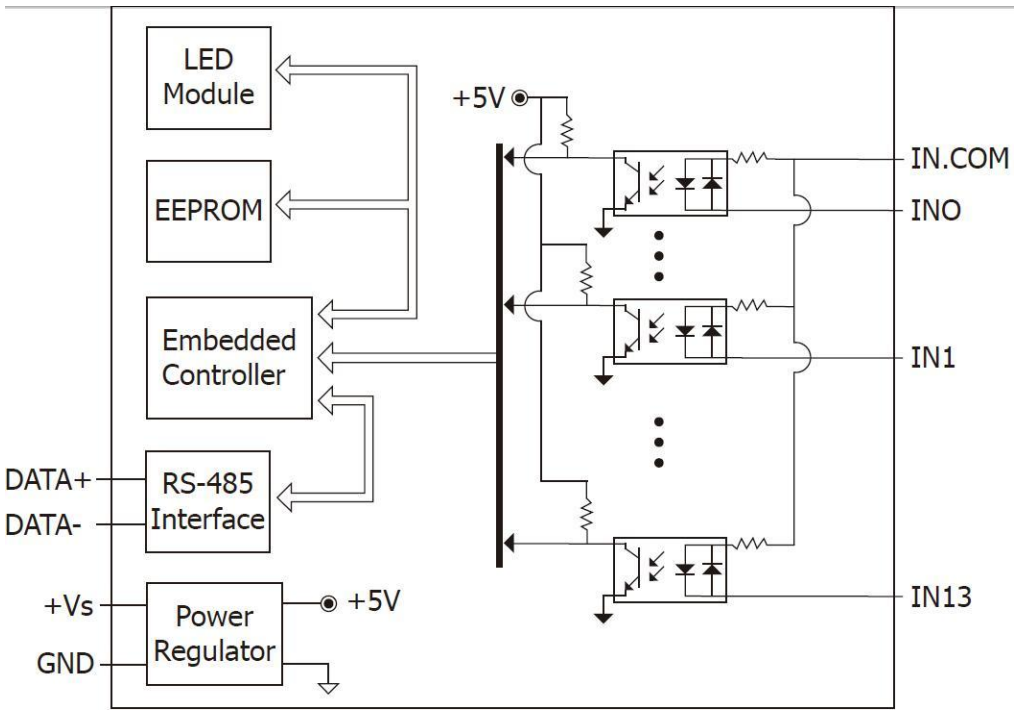
Solid-State Relay Output Modules				
Module	I-7063A/63AD	I-7065A/65AD	I-7063B/63BD	I-7065B/65BD
Output Channels	3	5	3	5
SSR Type	AC-SSR, Normal Open		DC-SSR, Normal Open	
Load Voltage Range	24 to 265 Vrms		3 to 30 VDC	
Leakage Current	1.5 mArms		0.1 mA	
Max Load Current	1.0 Arms		1.0 A	
Min. Operate Time	1mS			
Min. Release Time	1/2 cycle +1mS		1 mS	
Dielectric Strength	2500 Vrms			
Input Channels	8	4	8	4
Isolation	Isolated with Common Source			
Isolation Voltage	3750 Vrms			
Digital Level 0	+1 V max			
Digital Level 1	+4 to +30 V			
Input Impedance	3K ohms			
Power Requirement	+10 to +30 VDC			
Power Consumption	0.7 W for I-7063A 1.5 W for I-7063AD	0.8 W for I-7065A 1.6 W for I-7065AD	0.6 W forI-7063B 1.4 W for I-7063BD	0.7 W for I-7065B 1.5 W for I-7065BD
Operating Temperature	-25 °C to +75 °C	-25 °C to +75 °C	-25 °C to +75 °C	-25 °C to +75 °C
Storage Temperature	-30 °C to +75 °C	-30 °C to +75 °C	-30 °C to +75 °C	-30 °C to +75 °C

PhotoMos Output Modules		
Module	I-7066/66D	M-7066P/66PD
Output Channels	7	7
Load Current	0.13 A	1 A
Load Voltage	350 V max	80 V max
Isolation Voltage	5000 VDC	2000 VDC
Turn On Time	2 ms max	0.5 ms max
Turn Off Time	1 ms max	0.2 ms max
Power Requirement	+10 to +30 VDC	+10 to +30 VDC
Power Consumption	0.4 W for I-7066 0.8 W for I-7066D	0.5 W for M-7066P 0.9 W for M-7066PD
Operating Temperature	-25 °C to +75 °C	-25 °C to +75 °C
Storage Temperature	-30 °C to +75 °C	-30 °C to +75 °C

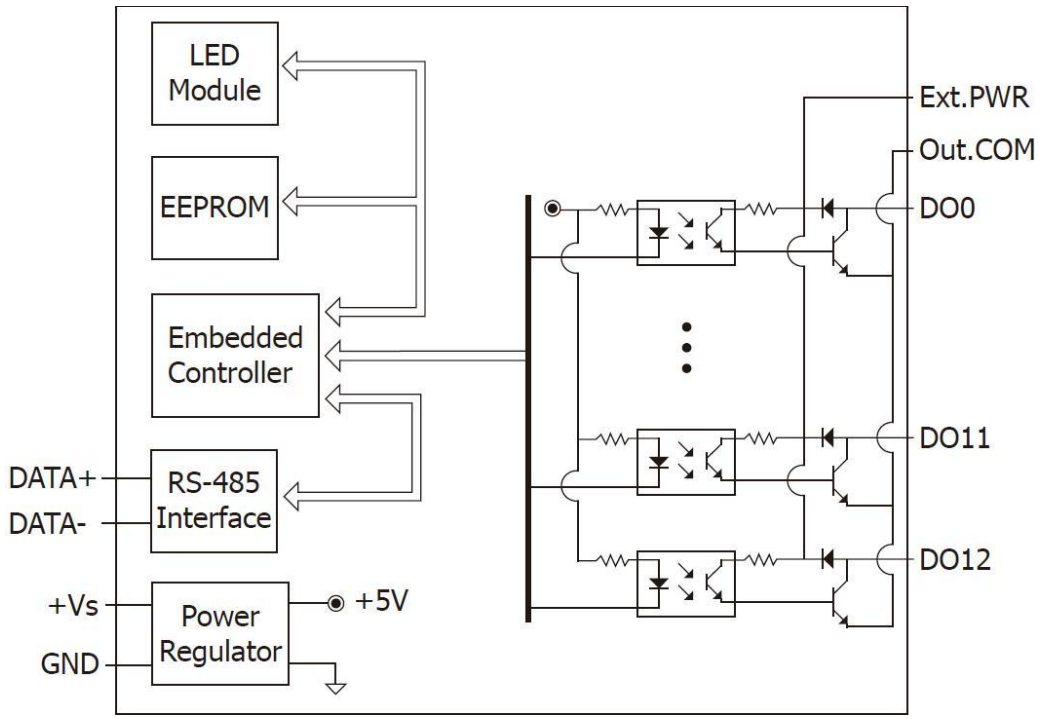
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1.4 Block Diagrams

1.4.1 Block Diagram for the I-7041/41D, I-7041P/41PD, M-7041/41D and M-7041P/41PD

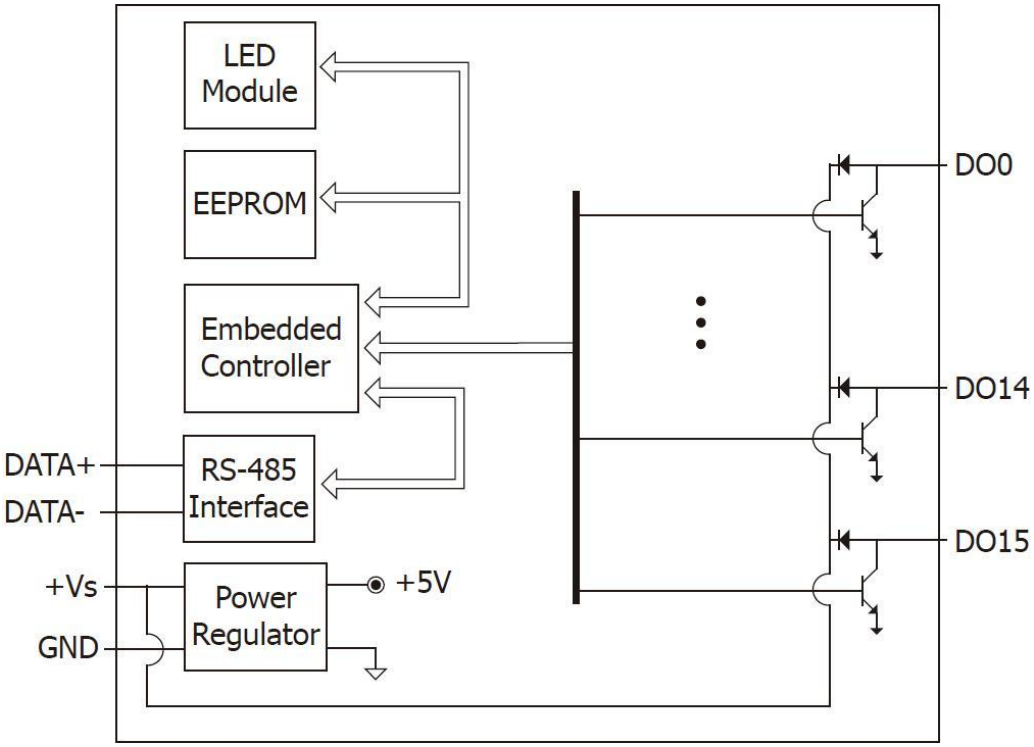


1.4.2 Block Diagram for the I-7042/42D

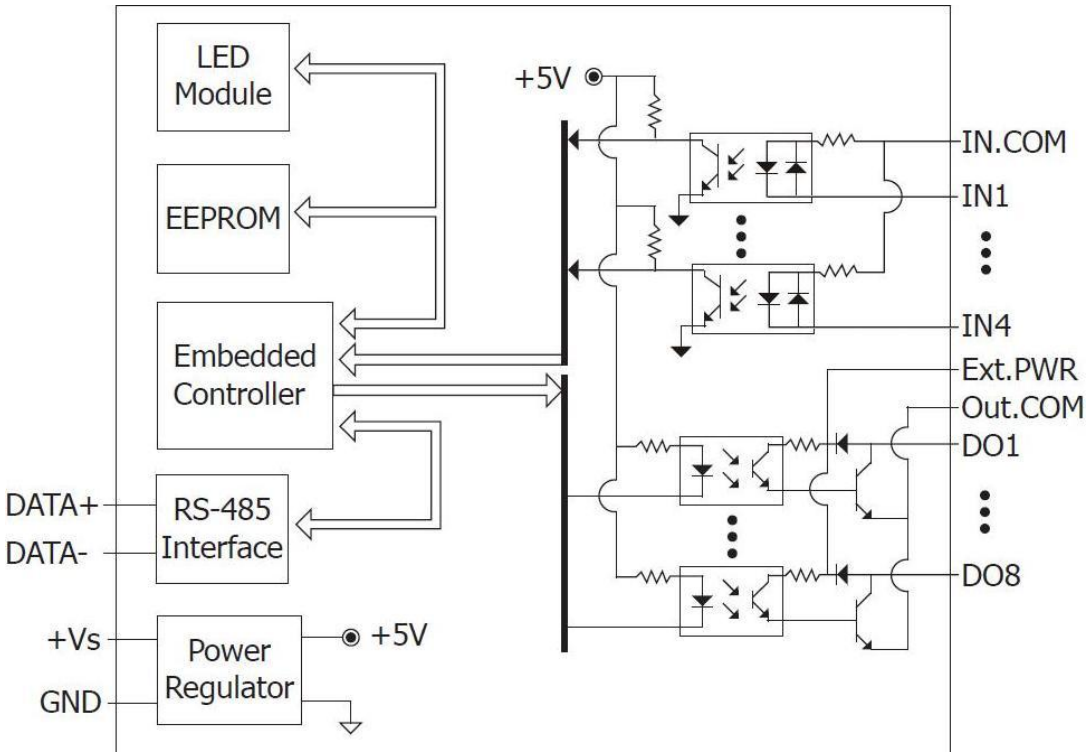


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1.4.3 Block Diagram for the I-7043/43D and M-7043/43D

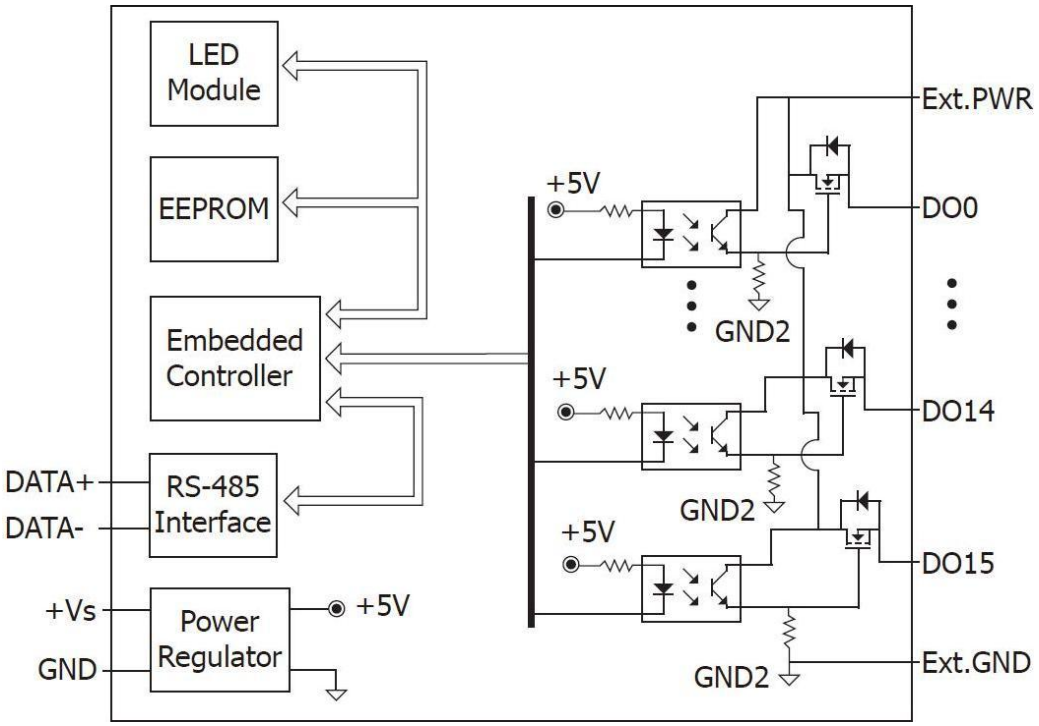


1.4.4 Block Diagram for the I-7044/44D

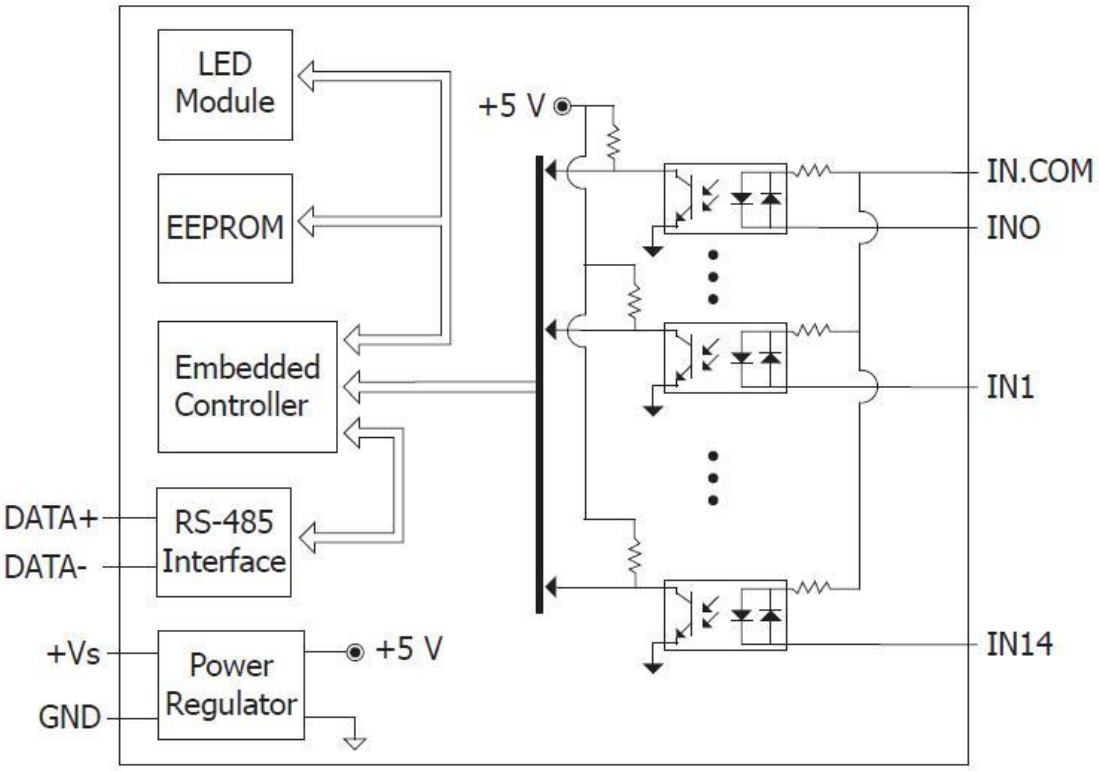


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1.4.5 Block Diagram for the I-7045/45D and M-7045/45D

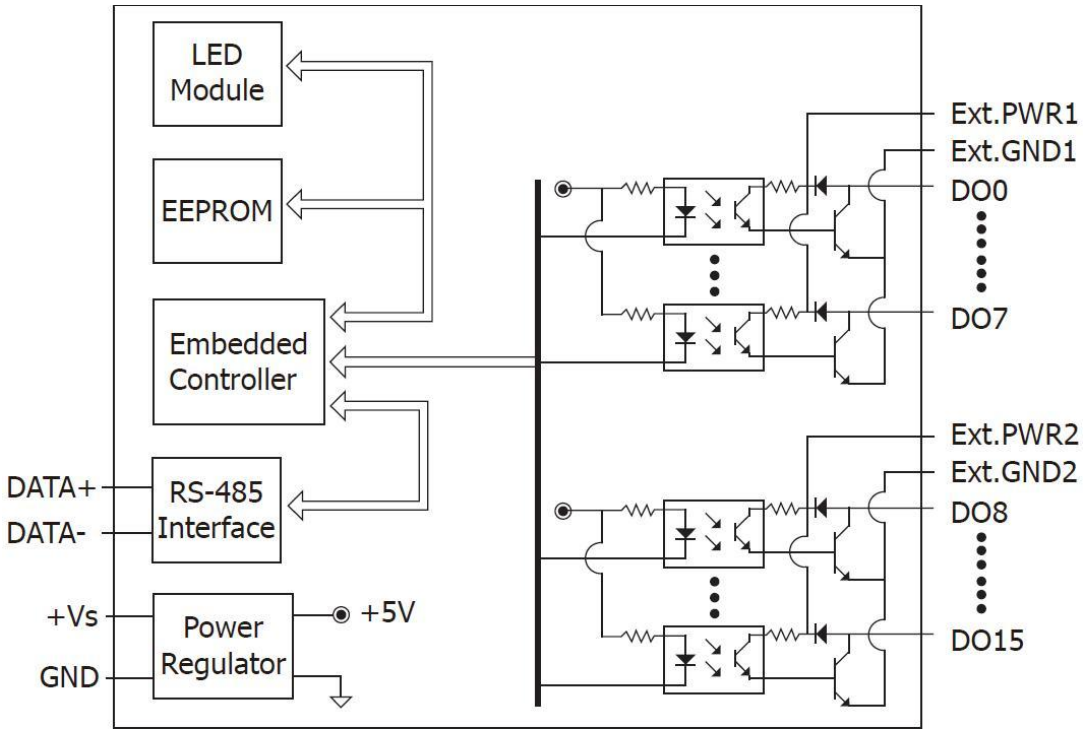


1.4.6 Block Diagram for the M-7046 and M-7046D

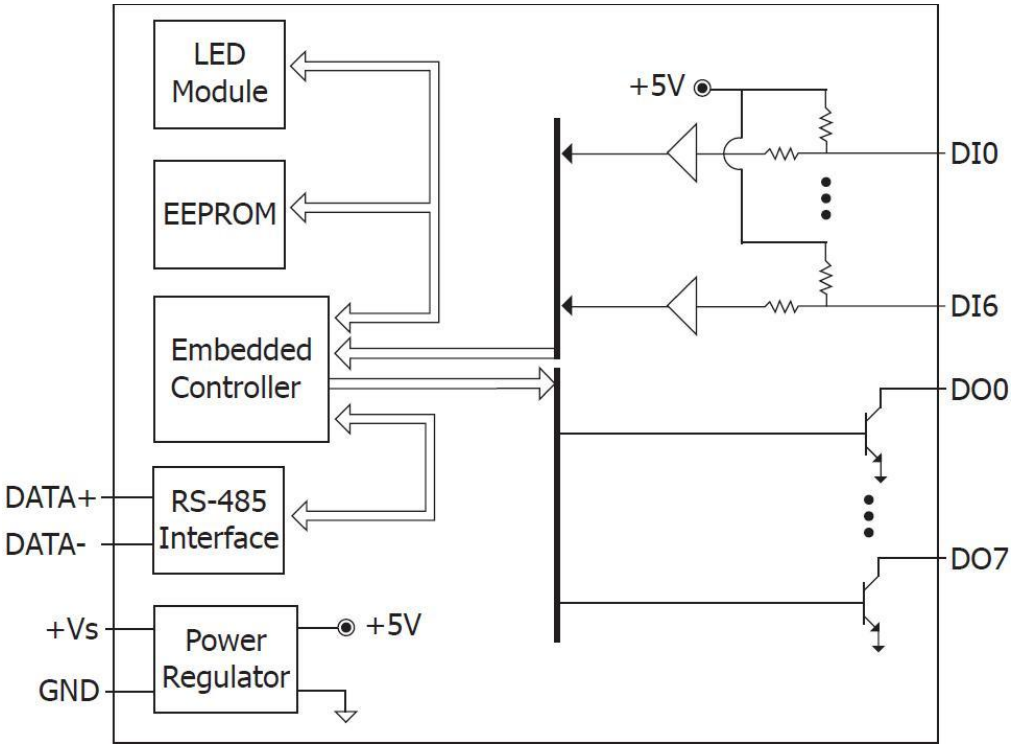


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1.4.7 Block Diagram for the I-7045-NPN/45D-NPN and M-7045-NPN/45D-NPN

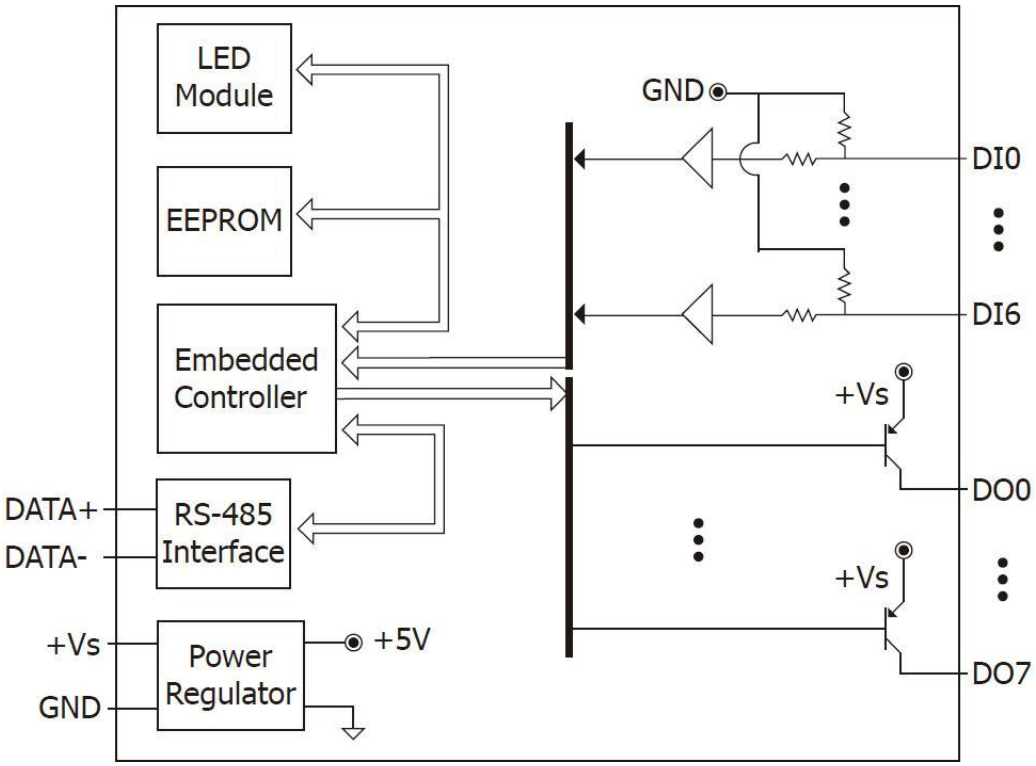


1.4.8 Block Diagram for the I-7050/50D and M-7050/50D

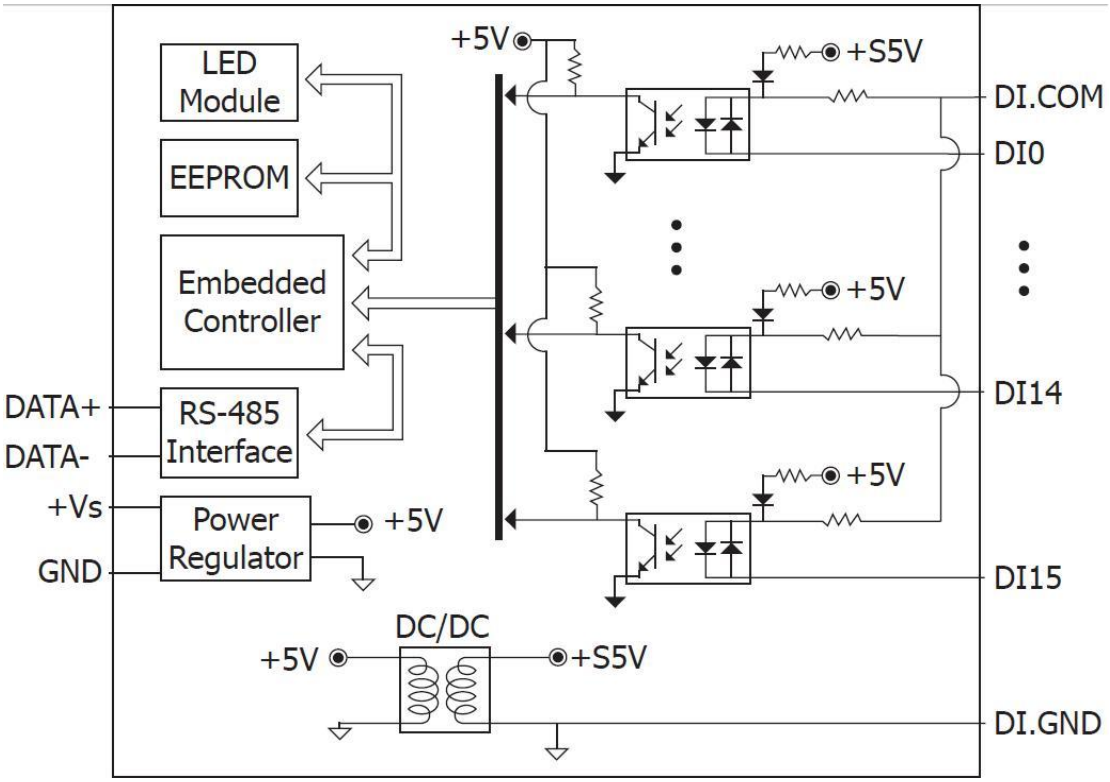


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1.4.9 Block Diagram for the I-7050A/50AD

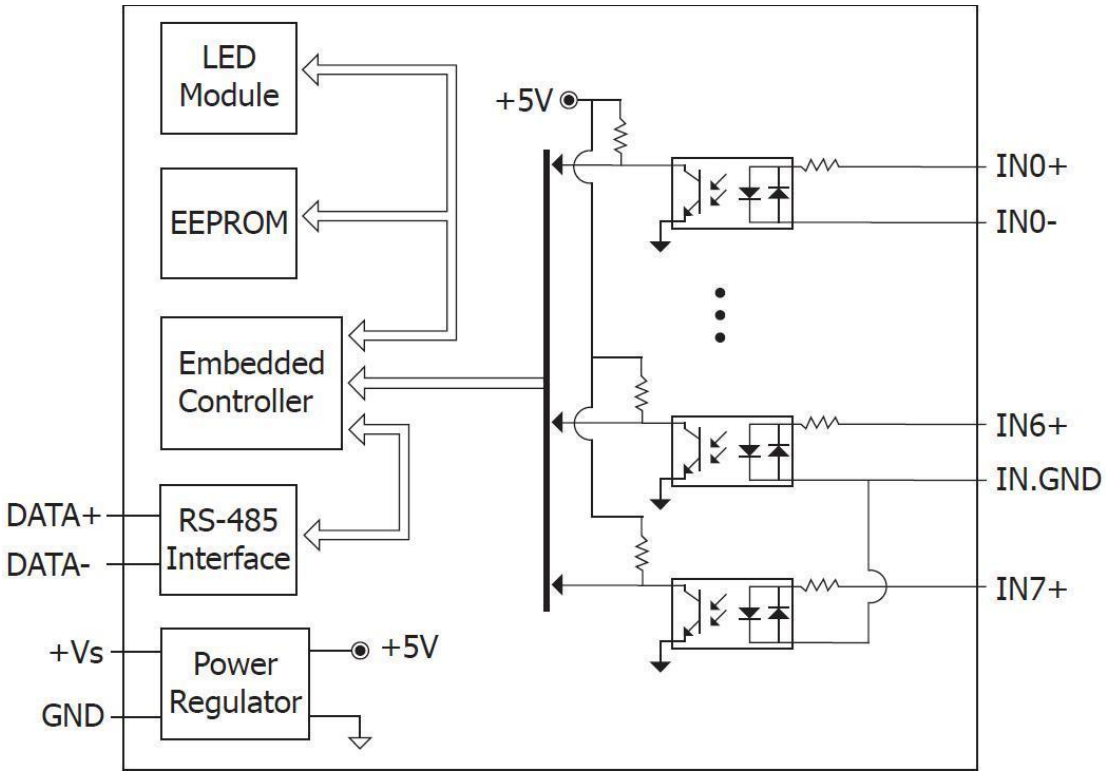


1.4.10 Block Diagram for the I-7051/51D and M-7051/51D

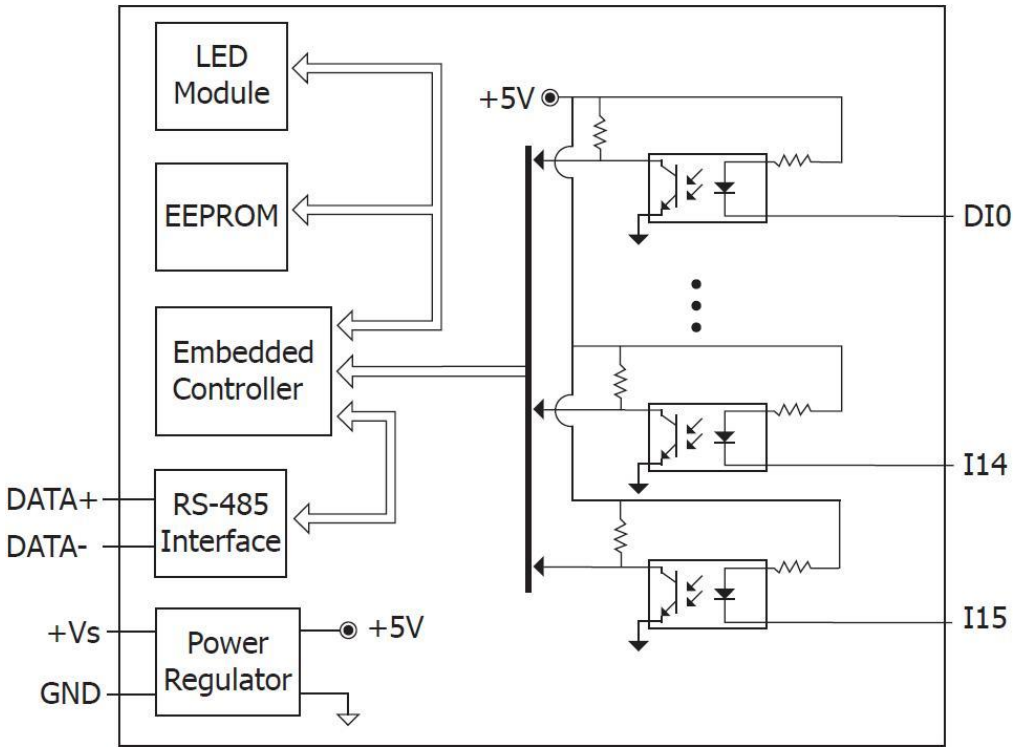


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1.4.11 Block Diagram for the I-7052/52D and M-7052/52D

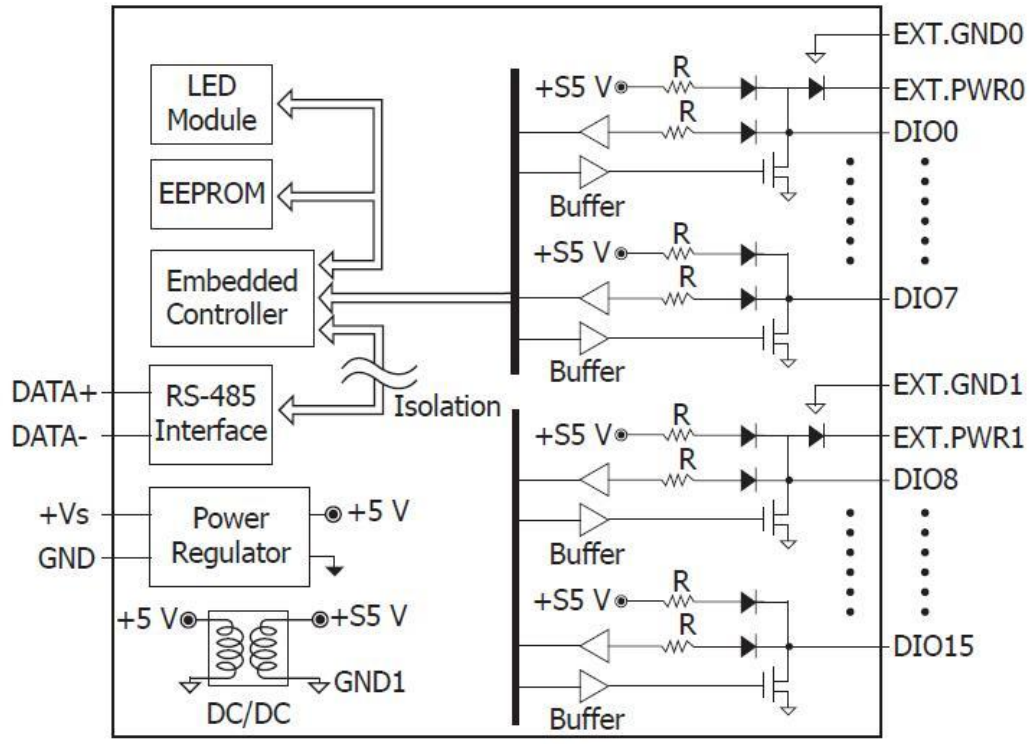


1.4.12 Block Diagram for the I-7053_FG/53D_FG and M-7053/53D

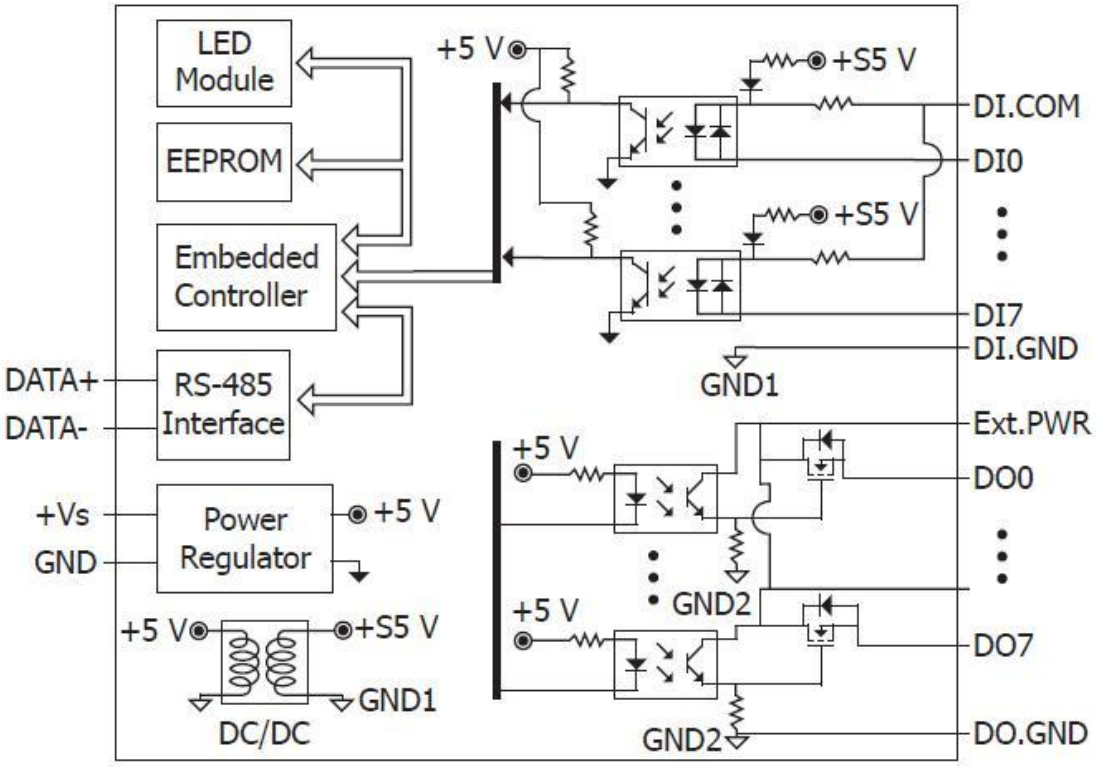


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1.4.13 Block Diagram for the M-7054/54D and M-7054P/54PD

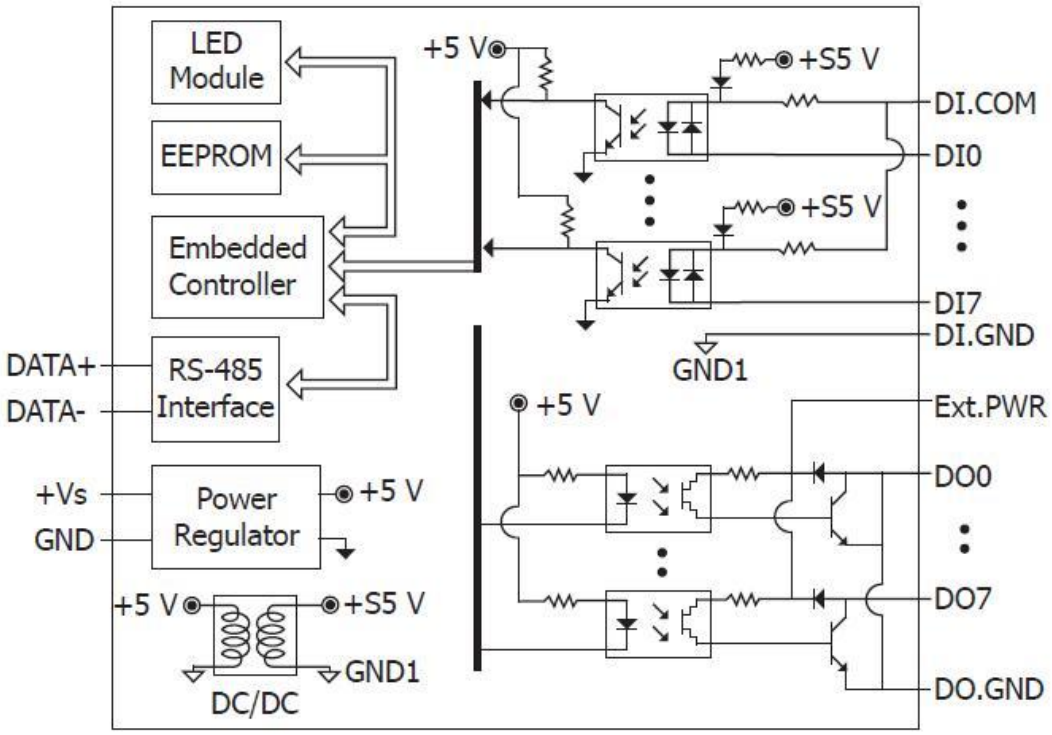


1.4.14 Block Diagram for the I-7055/55D and M-7055/55D

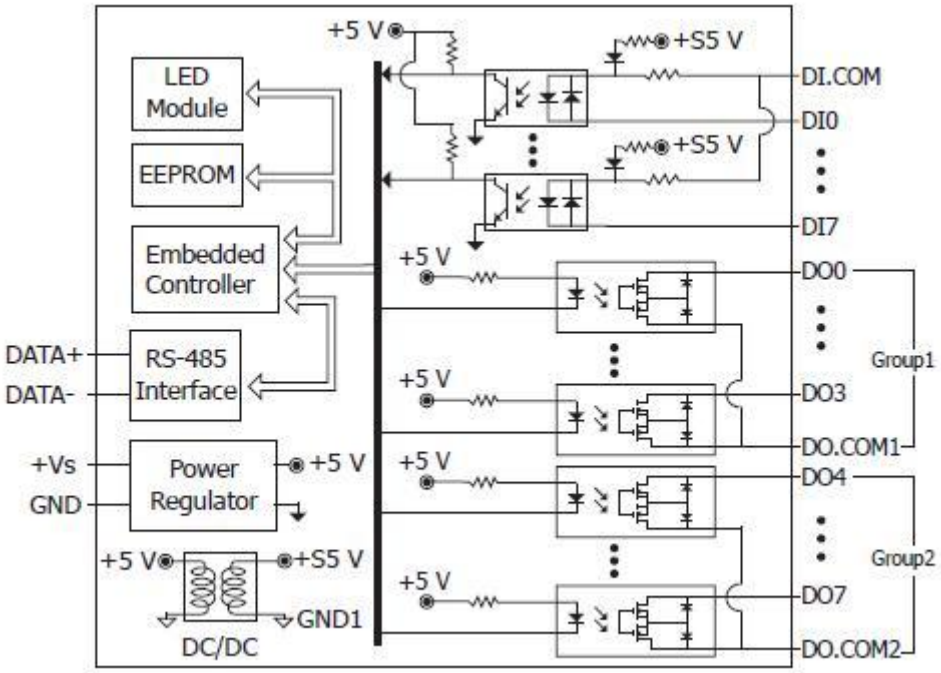


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1.4.15 Block Diagram for the I-7055-NPN/55D-NPN and M-7055-NPN/55D-NPN

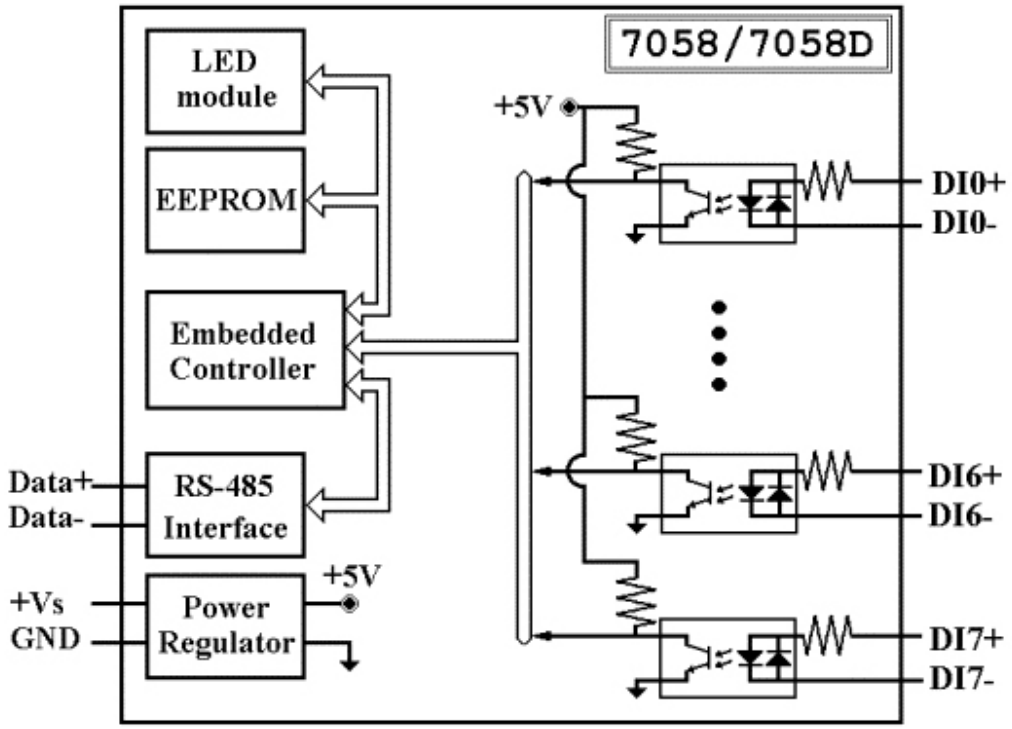


1.4.16 Block Diagram for the M-7055U/55UD

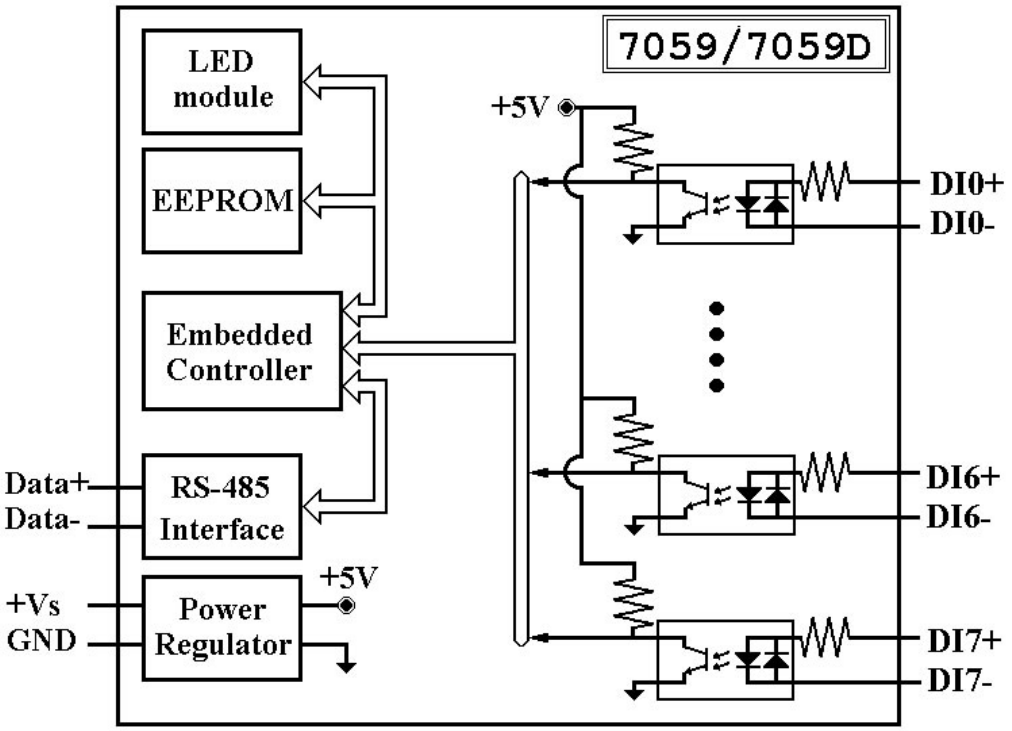


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1.4.17 Block Diagram for the I-7058/58D and M-7058/58D

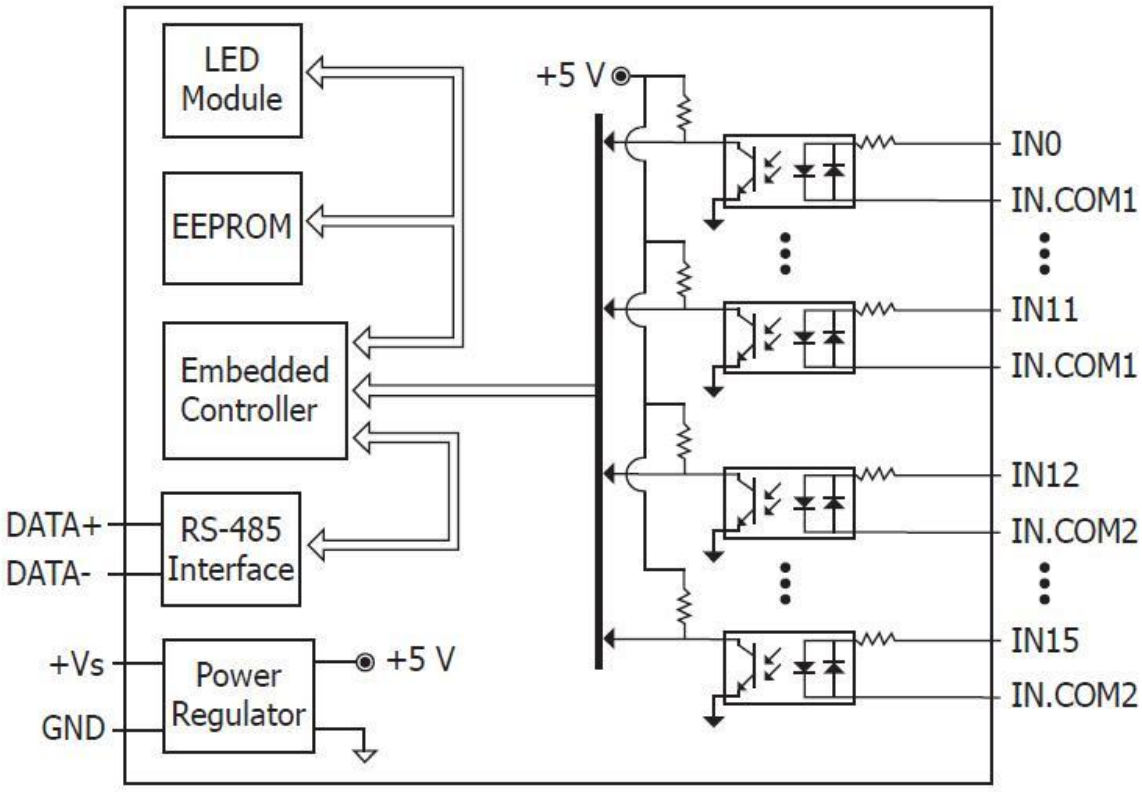


1.4.18 Block Diagram for the I-7059/59D and M-7059/59D

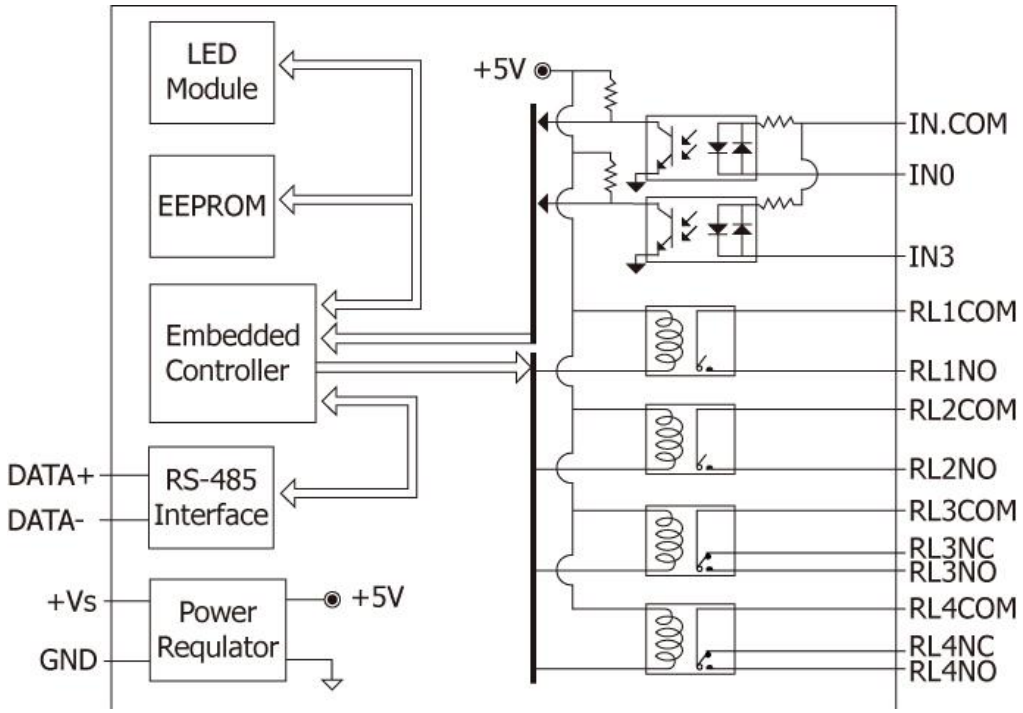


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1.4.19 Block Diagram for the M-7058-16/58D-16 and M-7059-16/59D-16

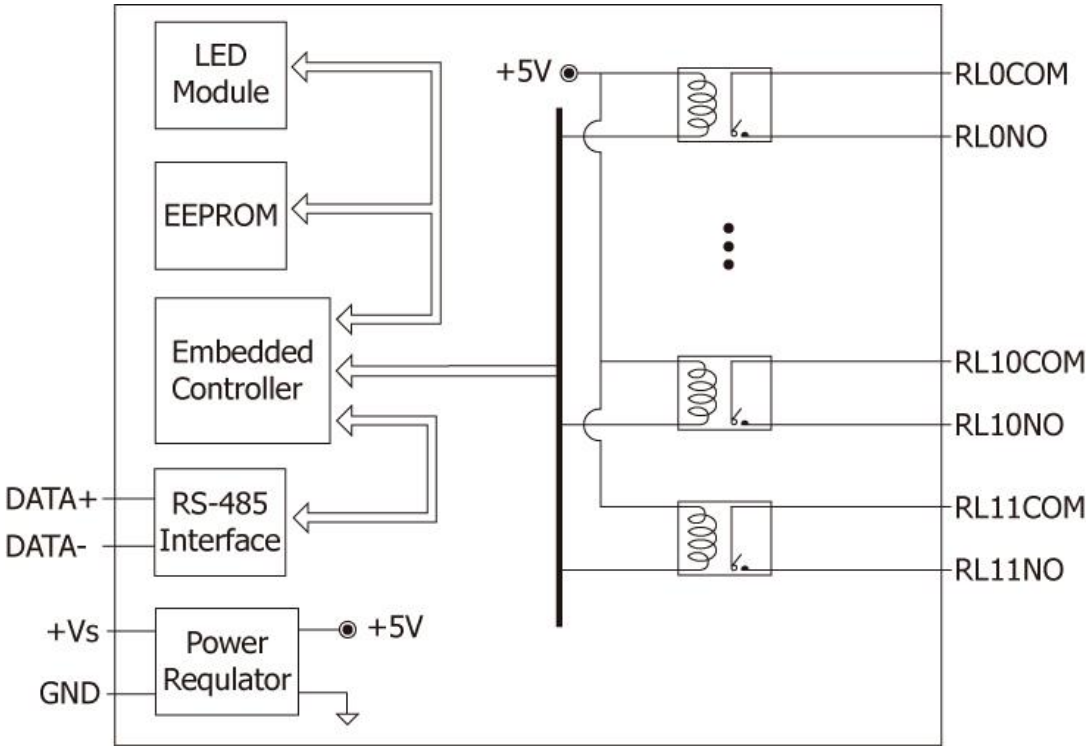


1.4.20 Block Diagram for the I-7060/60D, M-7060/60D, and M-7060P

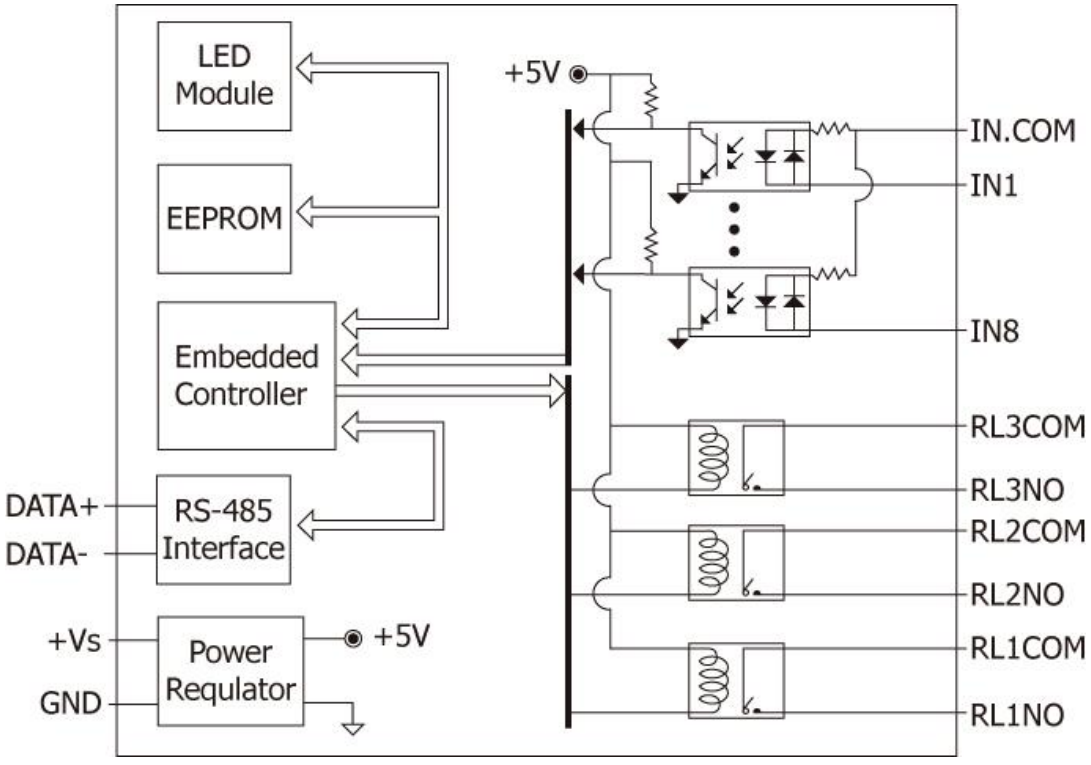


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1.4.21 Block Diagram for the I-7061/61D and M-7061/61D

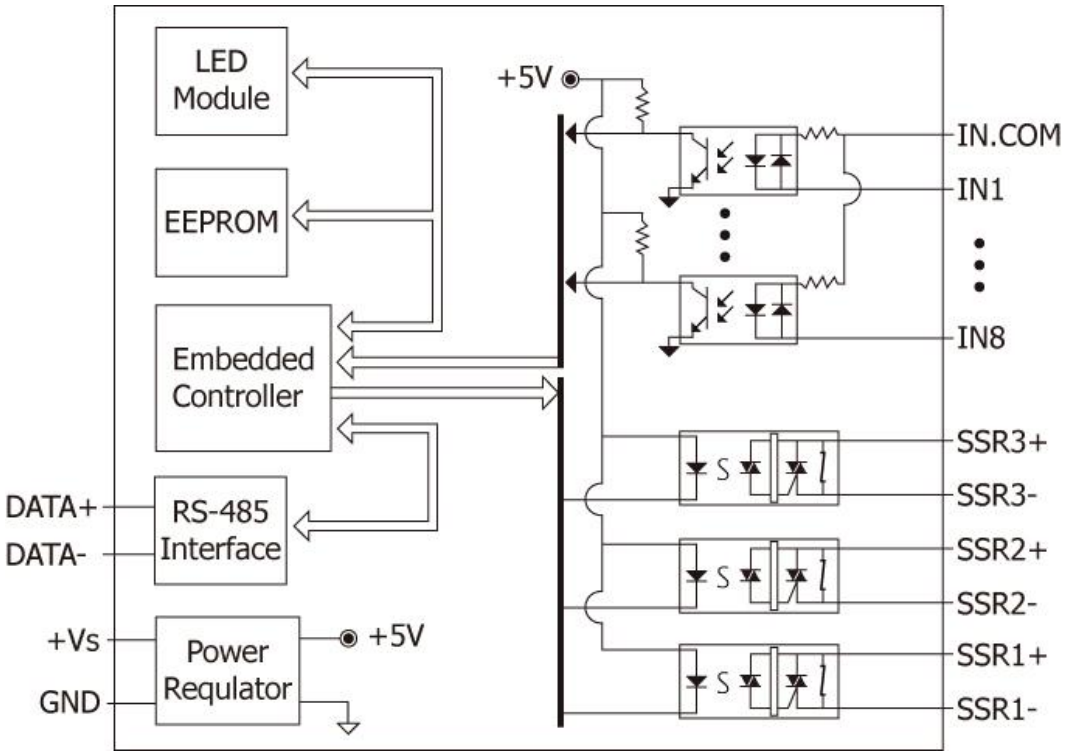


1.4.22 Block Diagram for the I-7063/63D

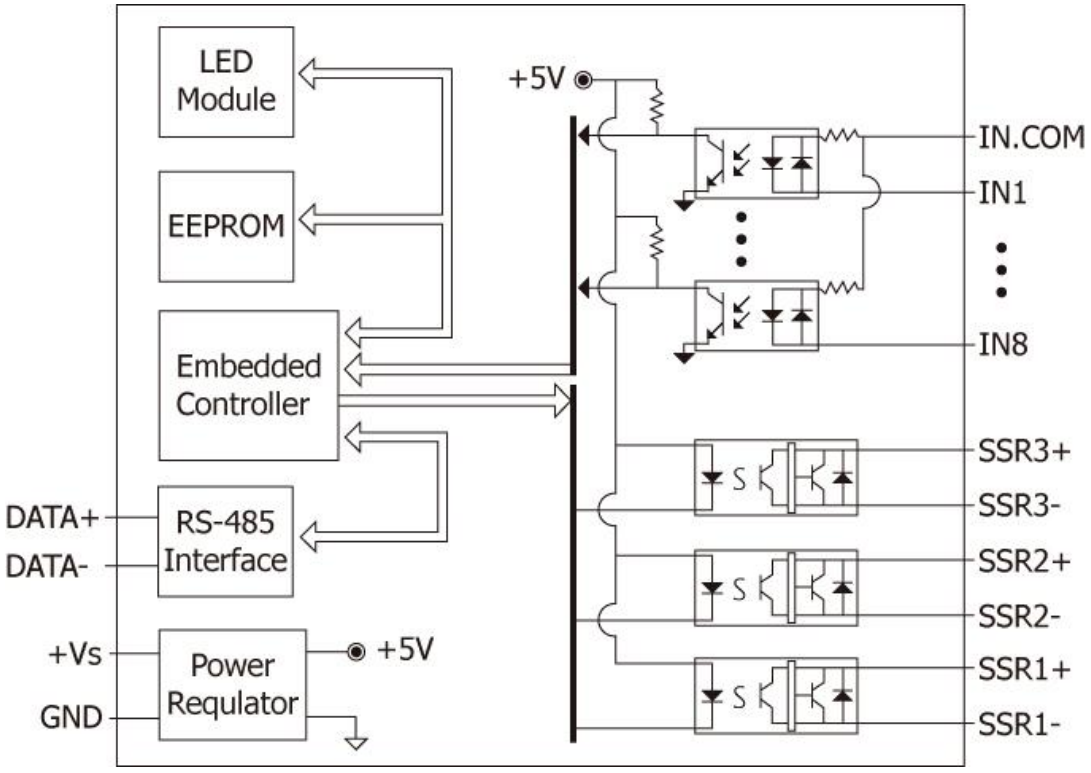


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1.4.23 Block Diagram for the I-7063A/63AD

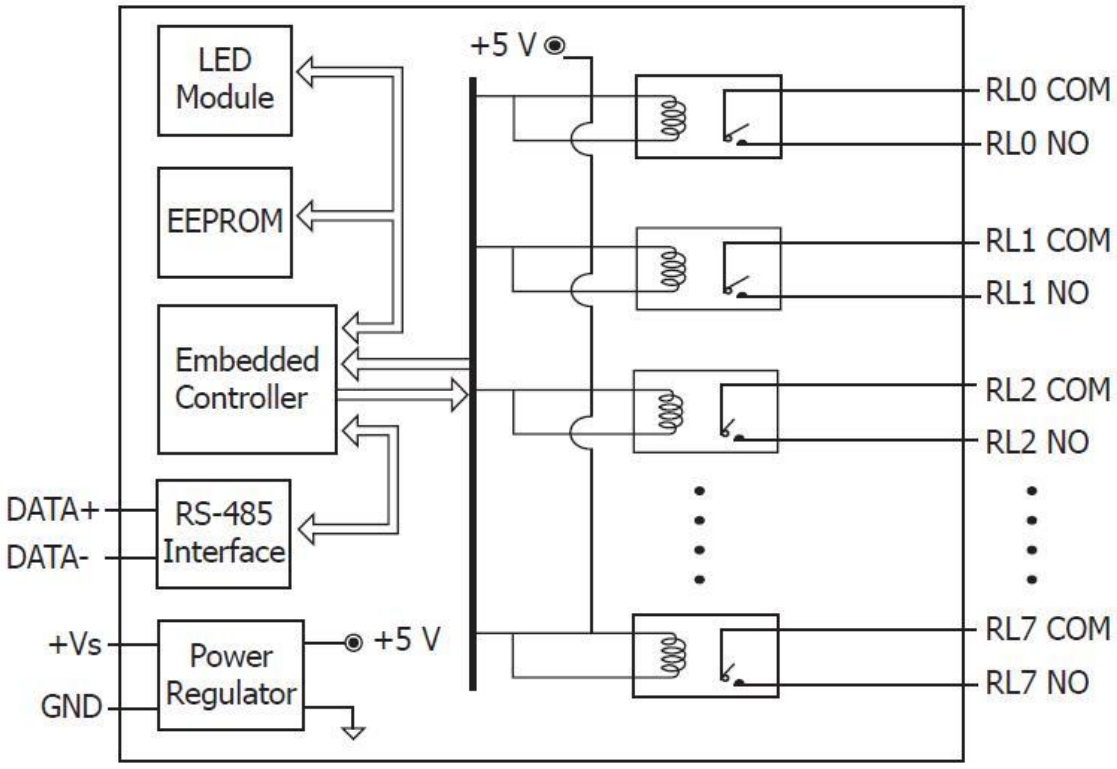


1.4.24 Block Diagram for the I-7063B/63BD

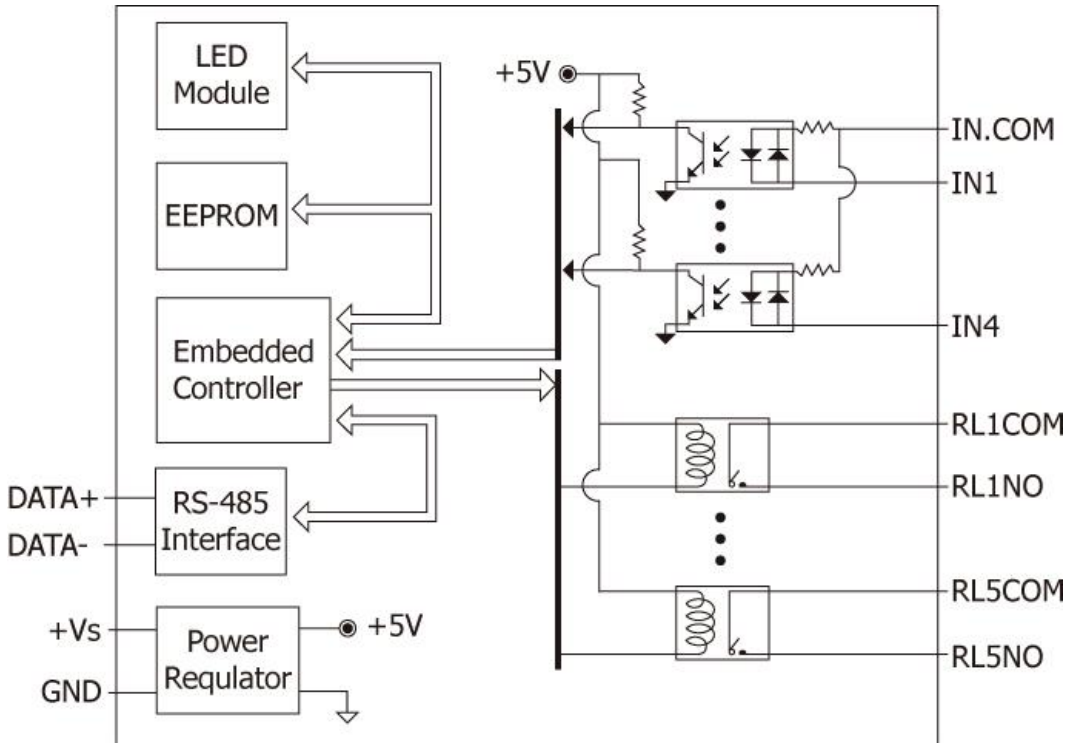


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1.4.25 Block Diagram for the M-7064/64D

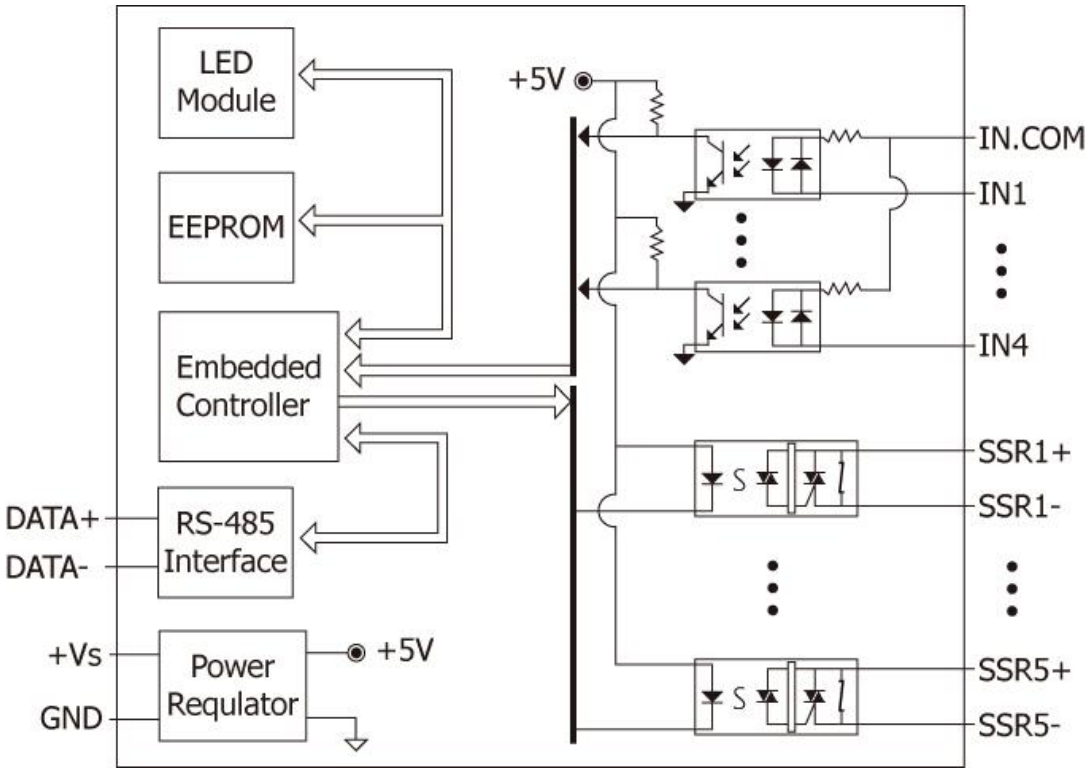


1.4.26 Block Diagram for the I-7065/65D

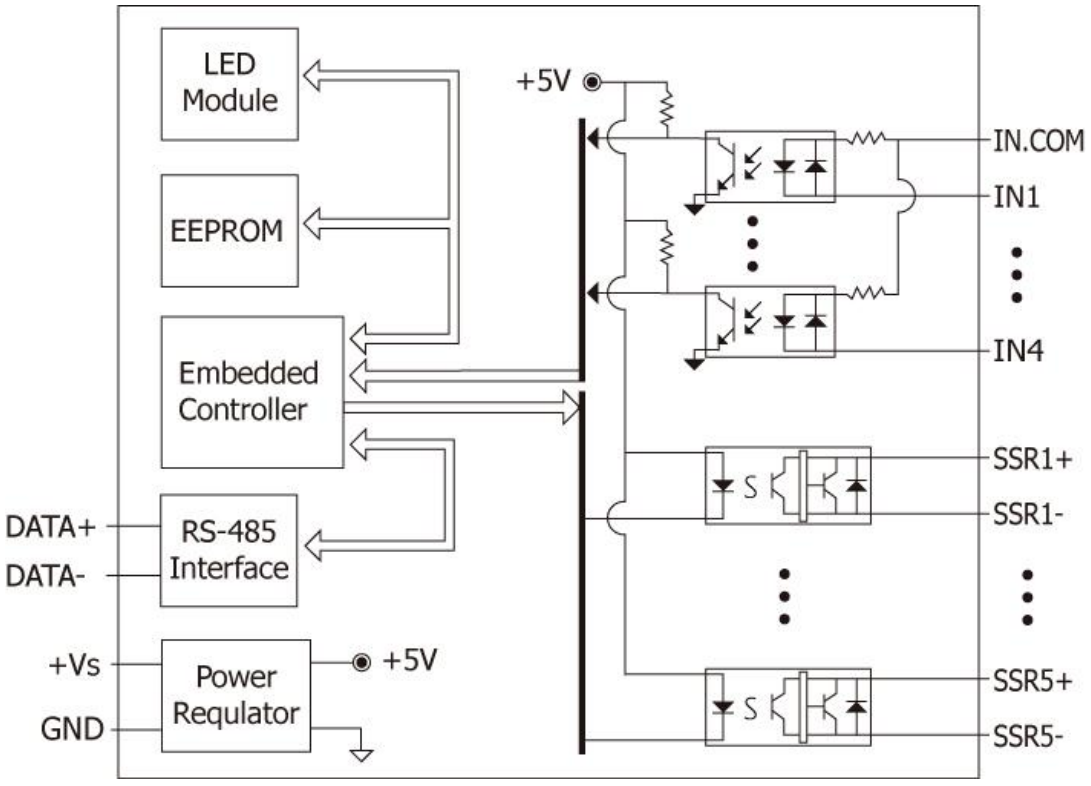


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1.4.27 Block Diagram for the I-7065A/65AD

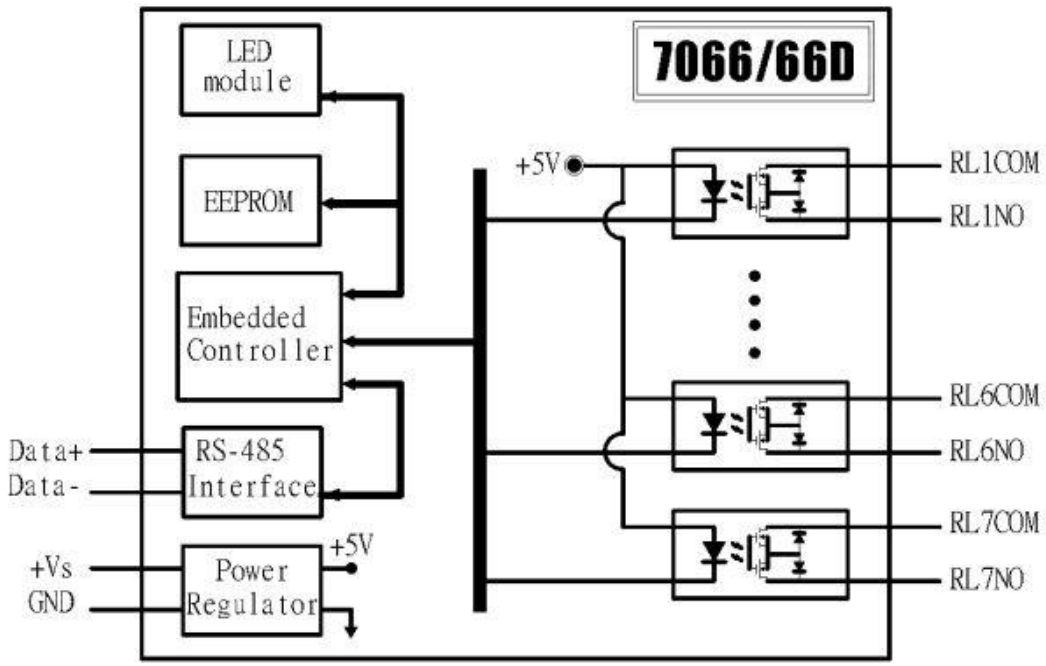


1.4.28 Block Diagram for the I-7065B/65BD

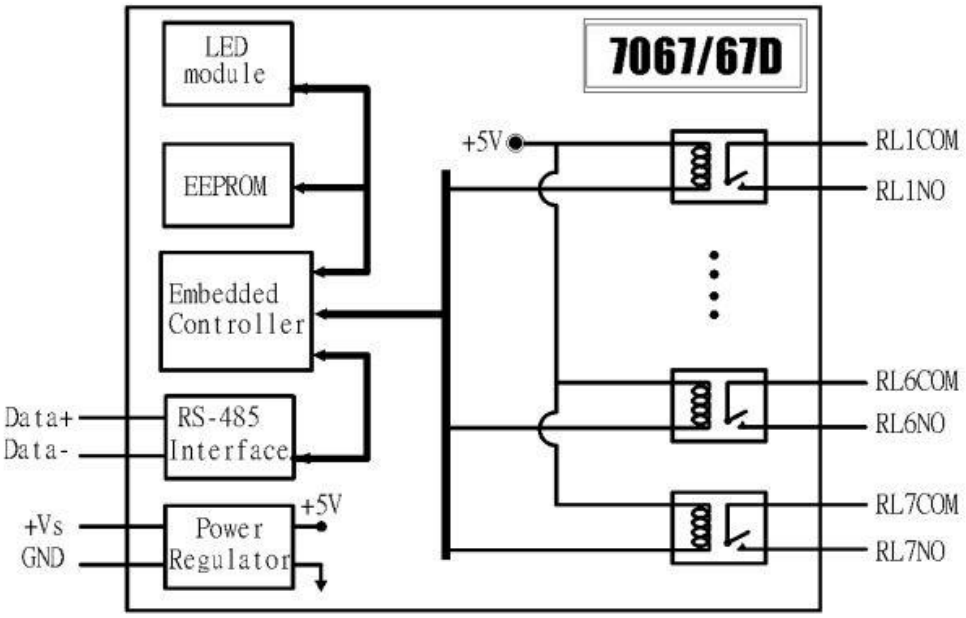


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1.4.29 Block Diagram for the I-7066/66D and M-7066P/66PD

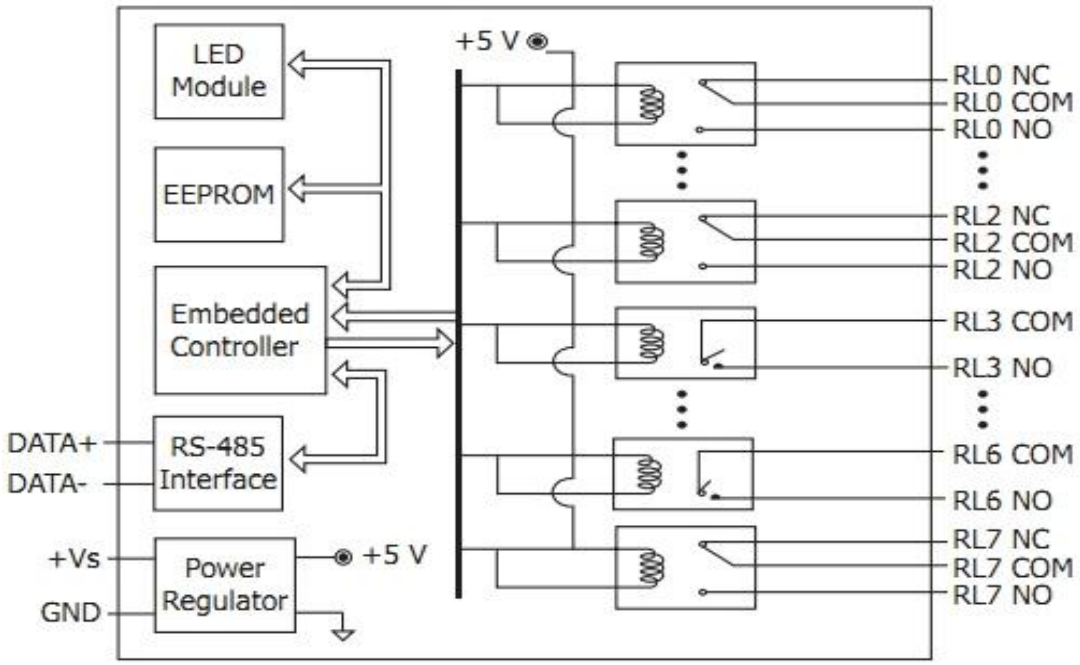


1.4.30 Block Diagram for the I-7067/67D and M-7067/67D



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1.4.31 Block Diagram for the M-7068/68D and M-7069/69D

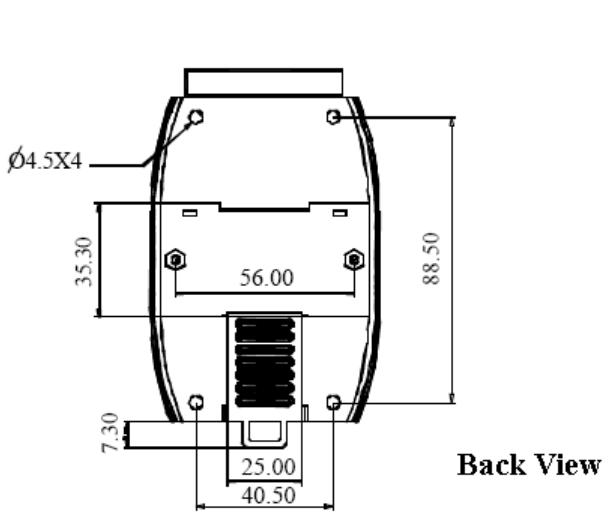


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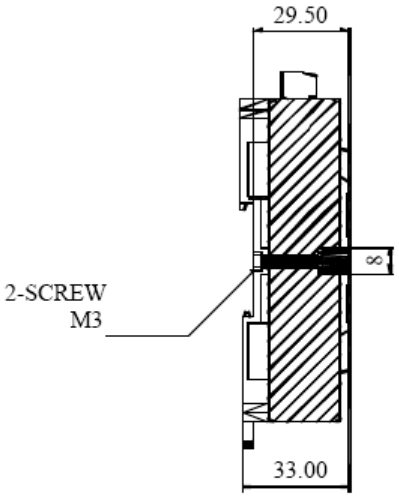
1.5 Dimensions

1.5.1 Modules without Frame Ground

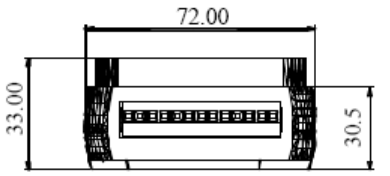
The dimensions of the I-7041/41D, M-7041/41D, I-7042/42D, I-7043/43D, M-7043/43D, I-7044/44D, I-7050 series, M-7050 series, I-7052/52D, M-7052/52D, I-7060/60D, M-7060/60D, I-7063 series, I-7065 series, I-7066/66D, I-7067/67D and M-7067/67D are as shown below.



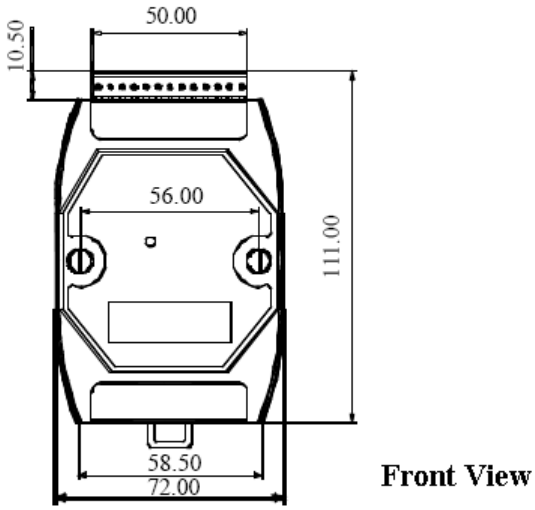
Back View



Side View



Top View



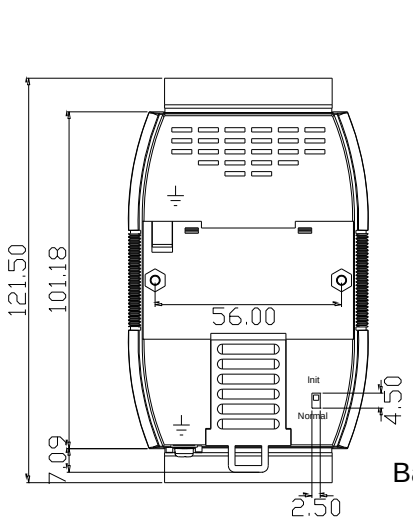
Front View

Unit : mm

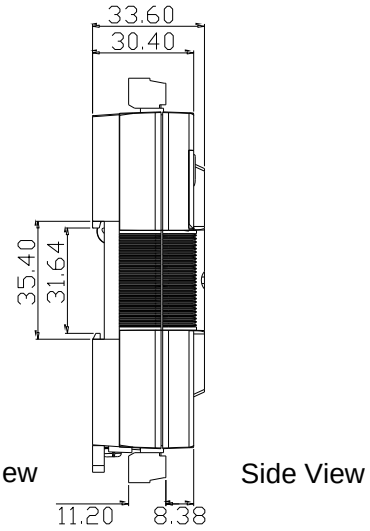
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1.5.2 Modules with Frame Ground

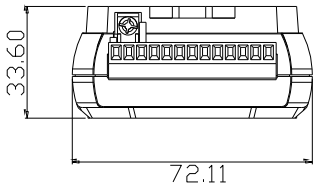
The dimensions of the I-7045/45D, M-7045/45D, I-7051/51D, M-7051/51D, I-7053_FG/53D_FG, M-7053/53D, I-7055/55D, M-7055/55D, I-7058/58D, I-7059/59D and M-7060P are as shown below.



Back View

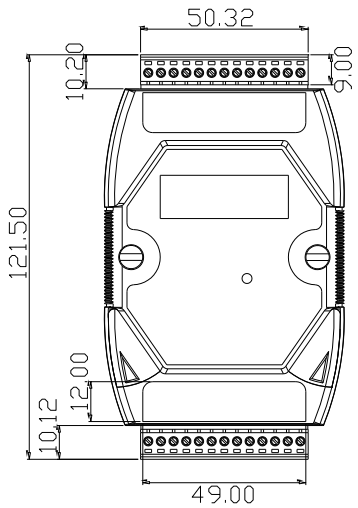


Side View

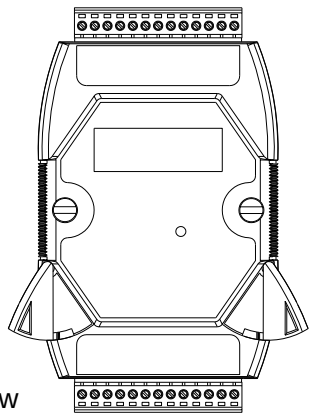


Top View

Unit : mm

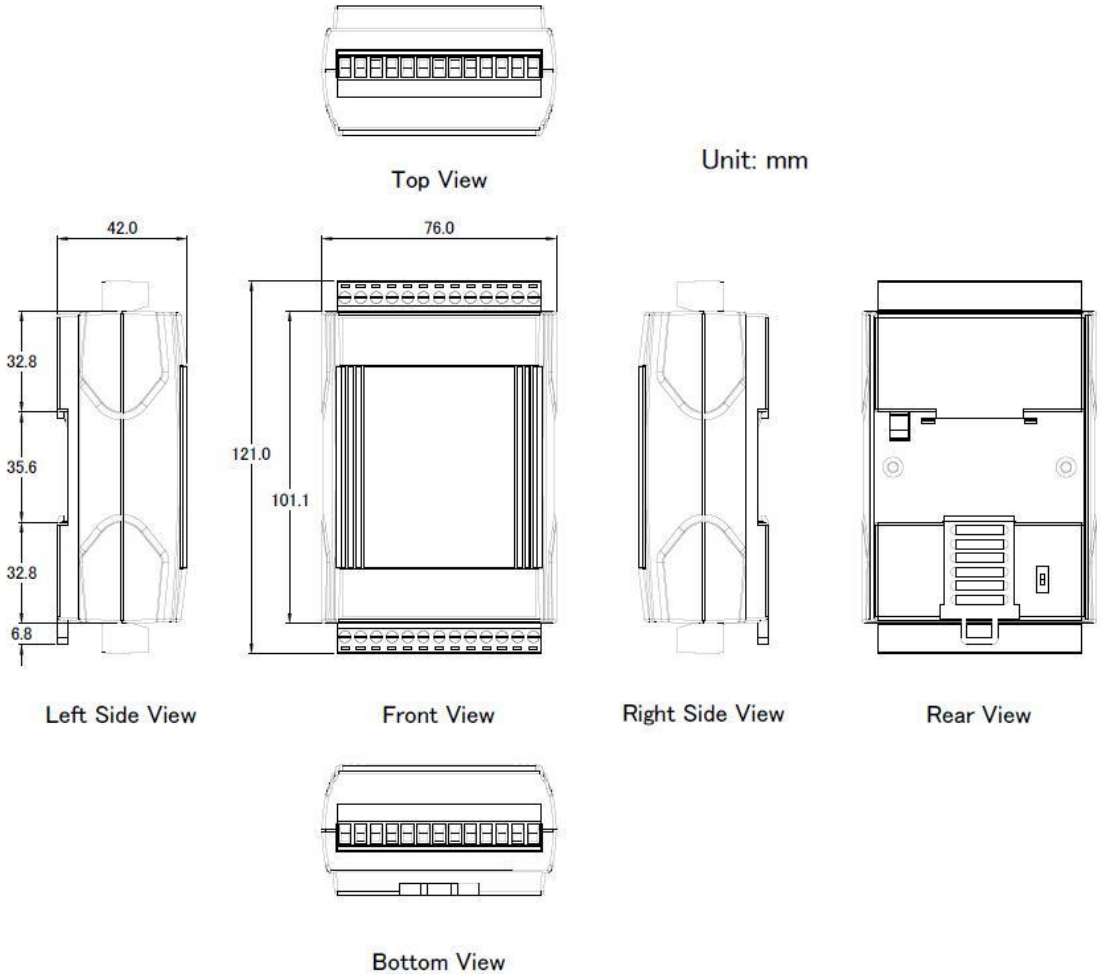


Front View



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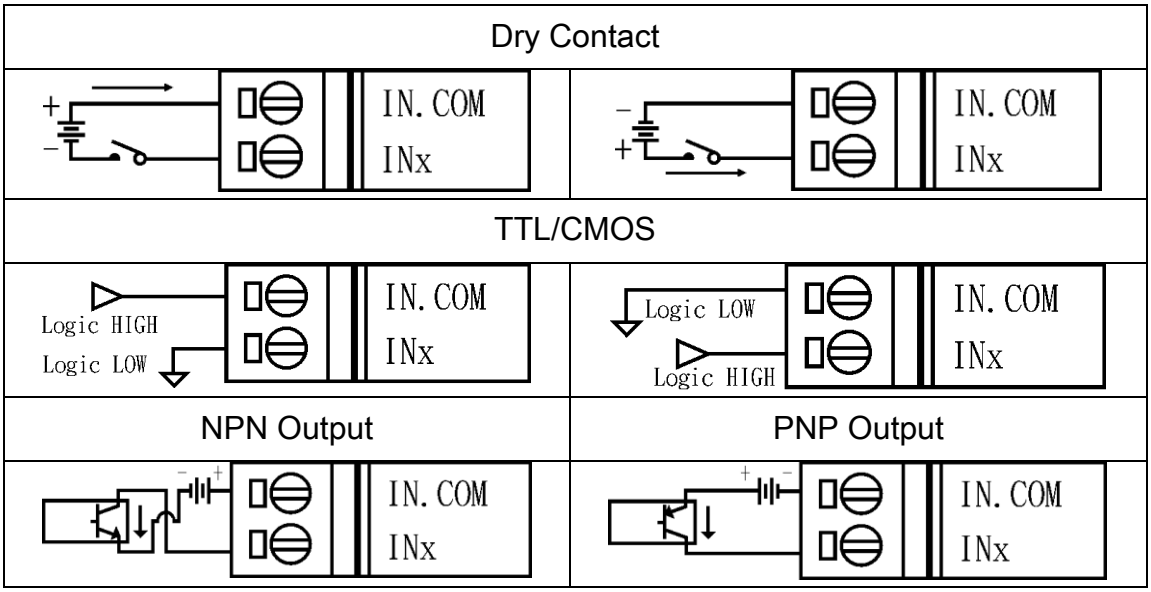
1.5.3 M-7058-16/58D-16 and M-7059-16/59D-16



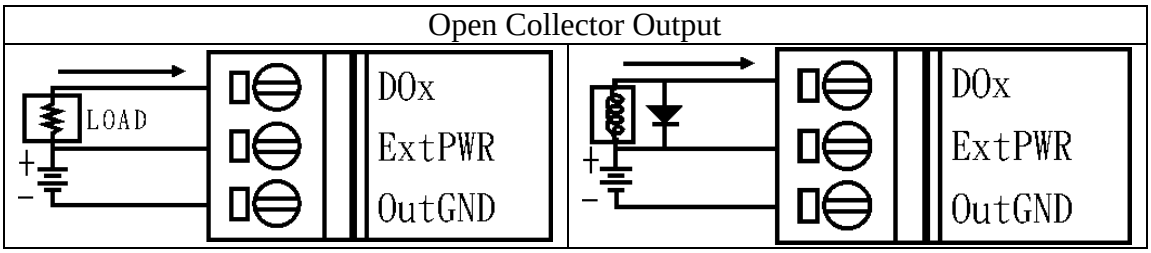
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1.6 Wiring

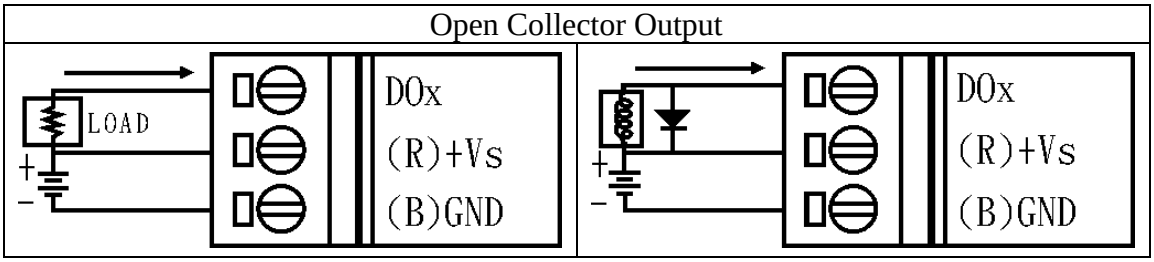
1.6.1 I-7041/41D, I-7041P/41PD, M-7041/41D and M-7041P/41PD wiring



1.6.2 I-7042/42D wiring

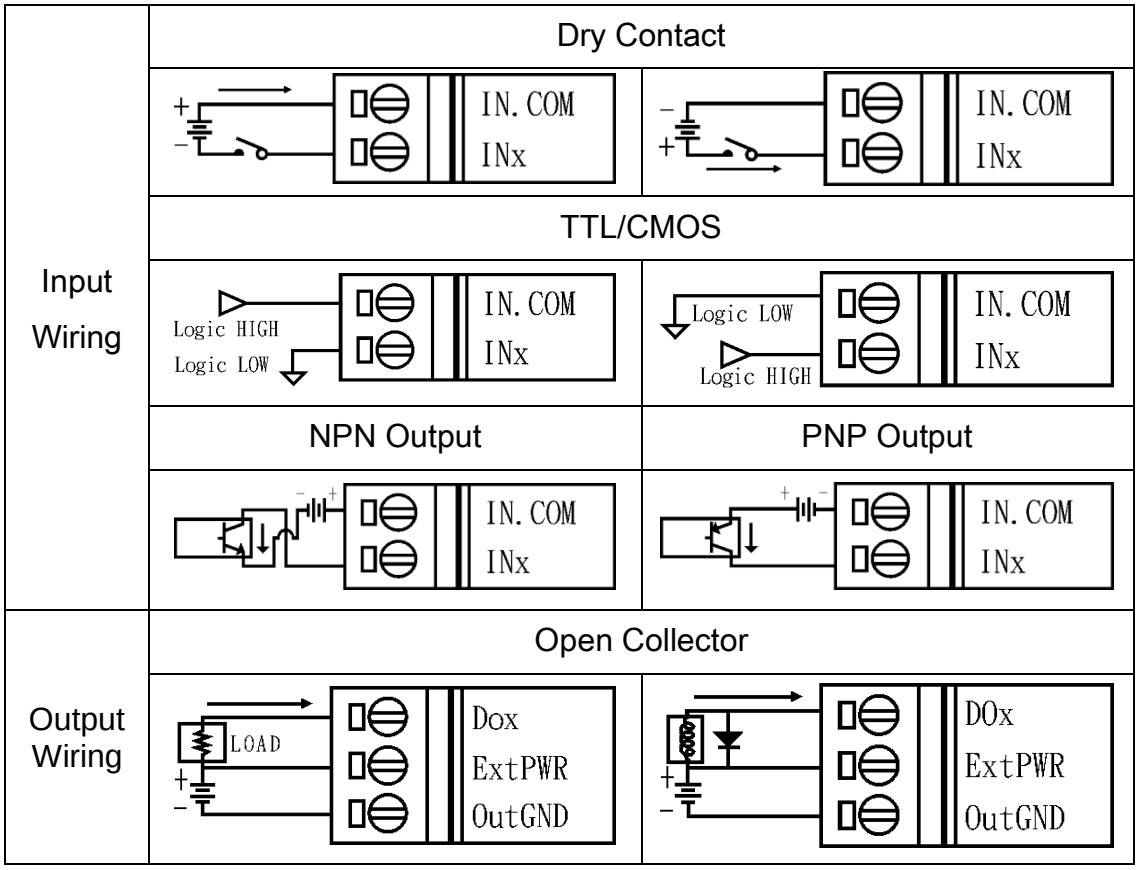


1.6.3 I-7043/43D and M-7043/43D wiring

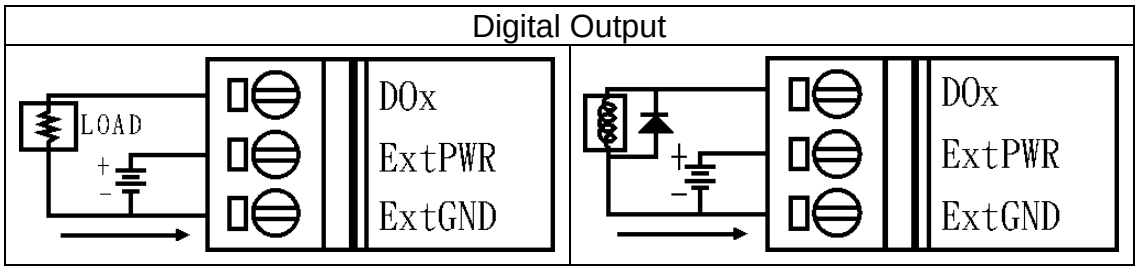


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1.6.4 I-7044/44D wiring

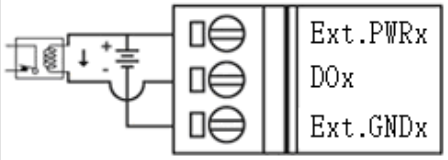
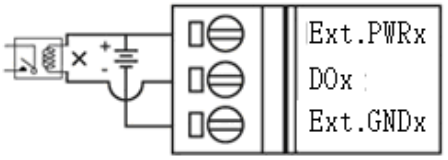
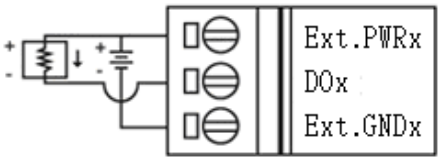
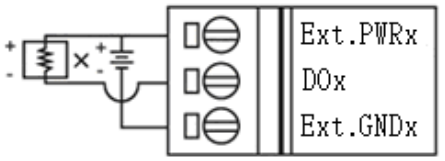


1.6.5 I-7045/45D and M-7045/45D wiring

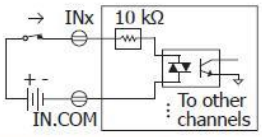
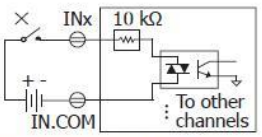
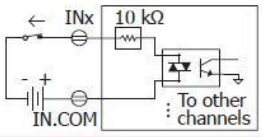
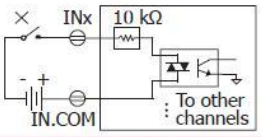
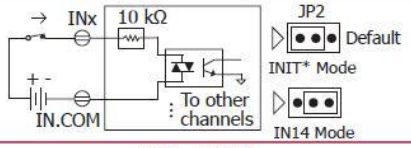
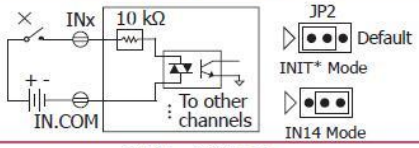
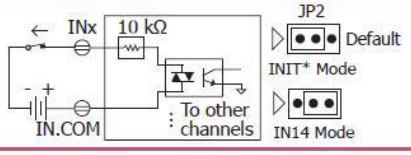
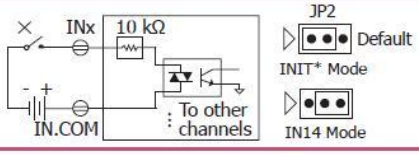


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1.6.6 I-7045-NPN, I-7045D-NPN, M-7045-NPN and M-7045D-NPN wiring

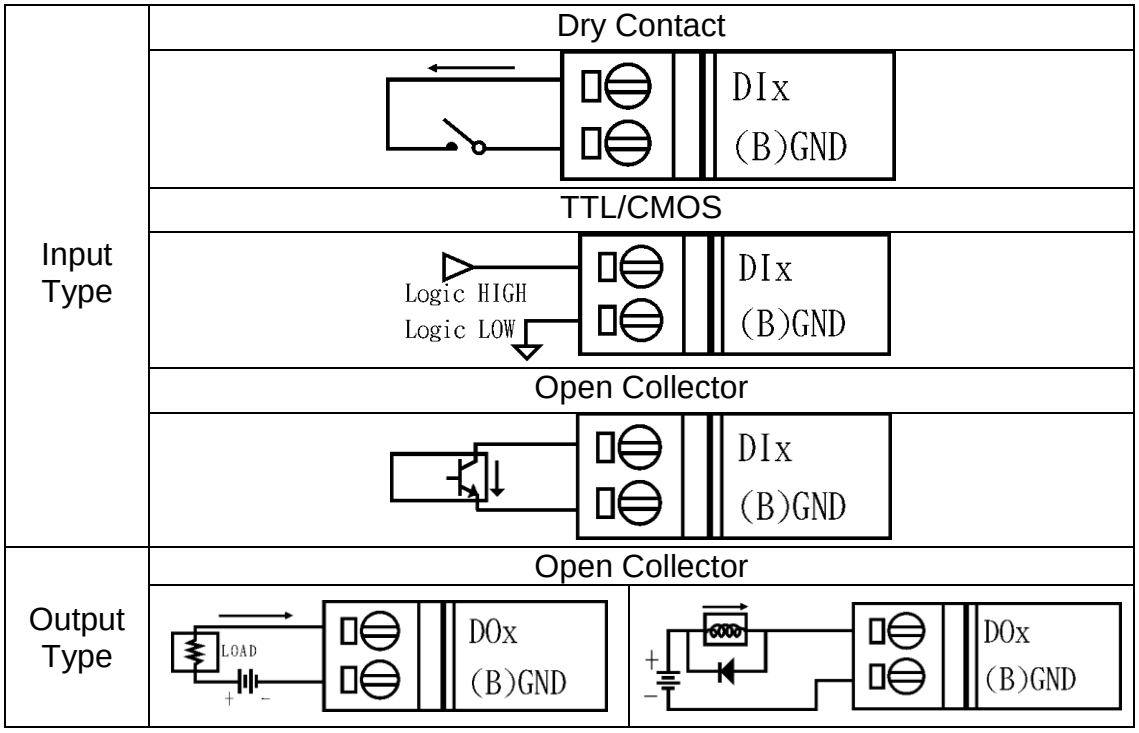
Output Type	ON State LED ON Readback as 1	OFF State LED OFF Readback as 0
	Relay ON	Relay Off
Drive Relay		
Resistance Load		

1.6.7 M-7046/46D wiring

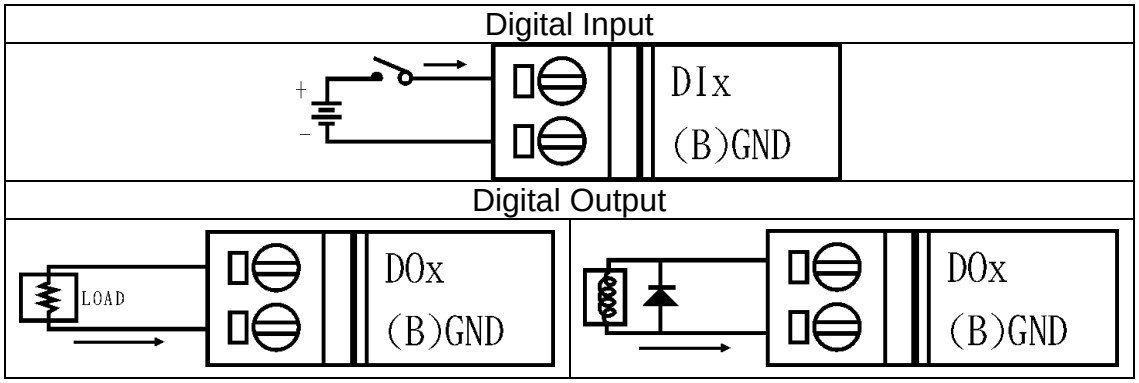
Digital Input/Counter	ON State Readback as 1	OFF State Readback as 0
Sink IN0 ~ IN13	+3.5 ~ +50 VDC 	OPEN or +1 VDC Max. 
Source IN0 ~ IN13	+3.5 ~ +50 VDC 	OPEN or +1 VDC Max. 
Sink IN14	+3.5 ~ +50 VDC 	OPEN or +1 VDC Max. 
Source IN14	+3.5 ~ +50 VDC 	OPEN or +1 VDC Max. 

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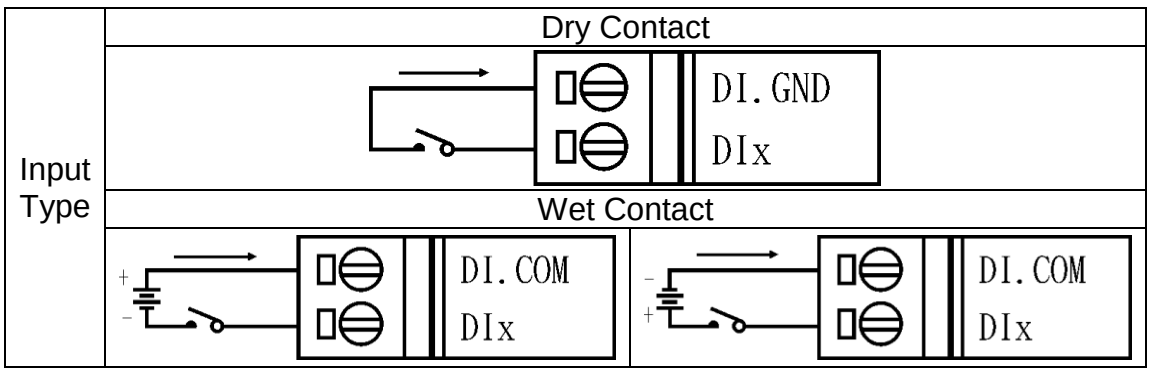
1.6.8 I-7050/50D and M-7050/50D wiring



1.6.9 I-7050A/50AD wiring

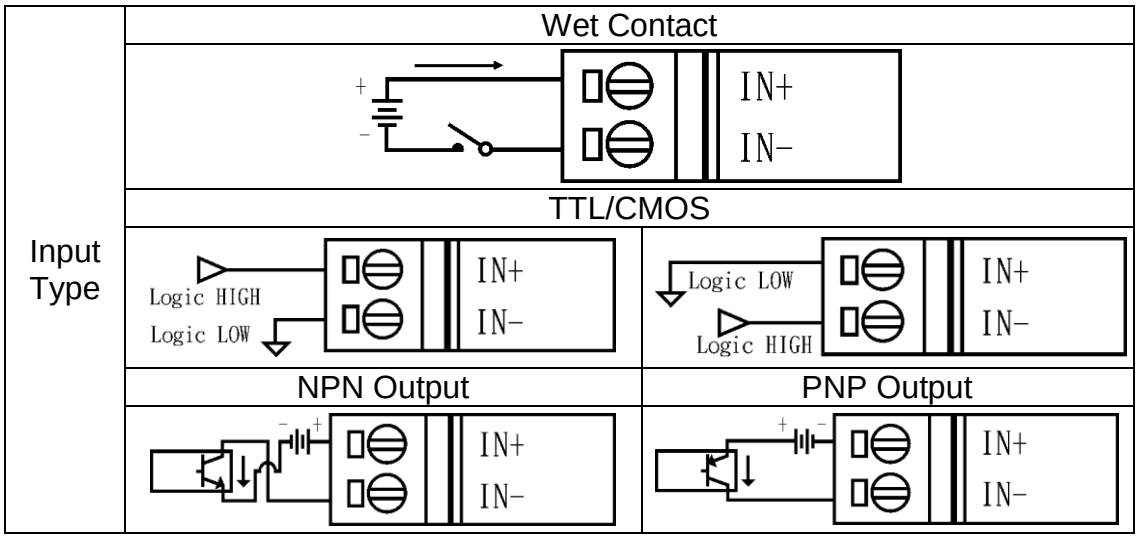


1.6.10 I-7051/51D and M-7051/51D wiring

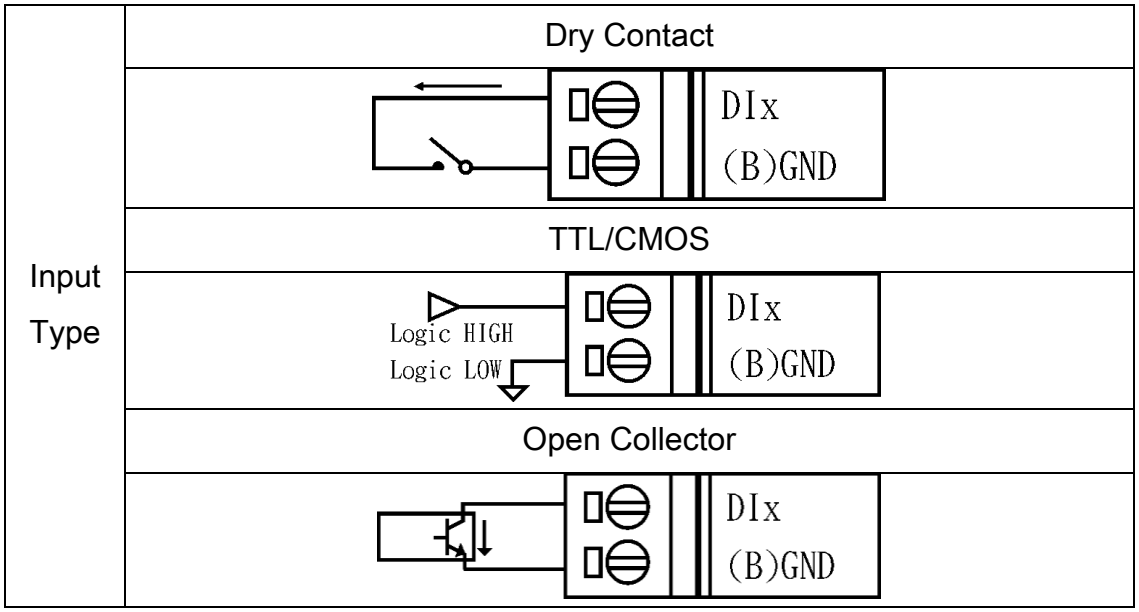


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1.6.11 I-7052/52D and M-7052/52D wiring

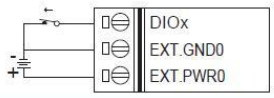
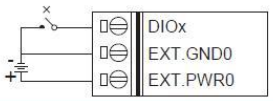
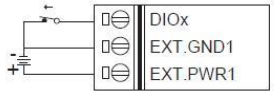
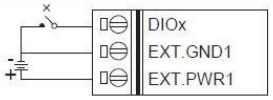


1.6.12 I-7053_FG/53D_FG and M-7053/53D wiring



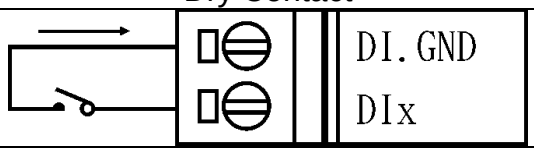
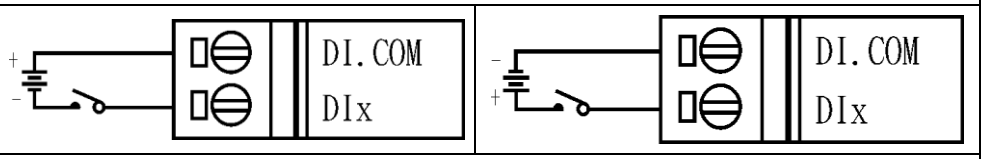
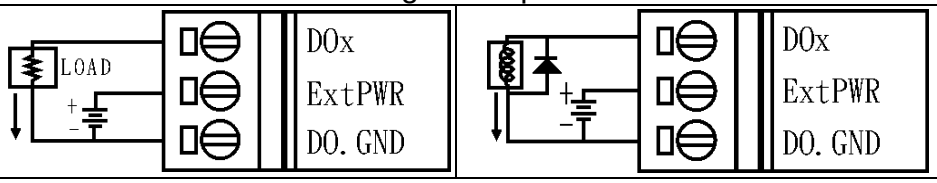
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1.6.13 M-7054/54D and M-7054P/54PD wiring

Input Type	ON State LED ON Readback as 1	OFF State LED OFF Readback as 0
	Close to GND	Open
Dry Contact DIO0 ~ DIO7		
Dry Contact DIO8 ~ DIO15		

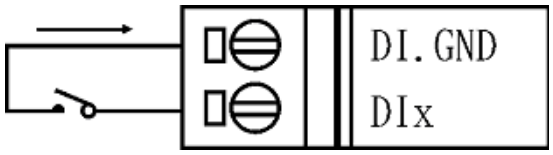
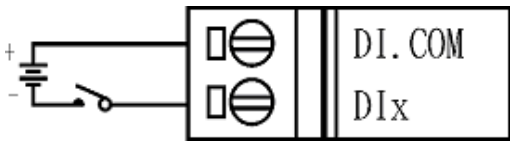
Output Type	ON State Readback as 1	OFF State Readback as 0
Drive Relay DIO0 ~ DIO7		
Drive Relay DIO8 ~ DIO15		

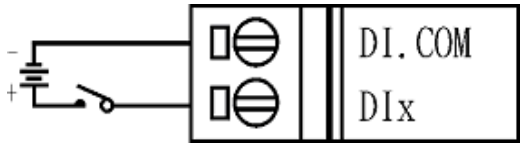
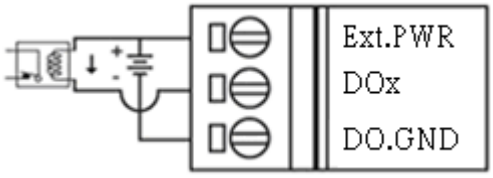
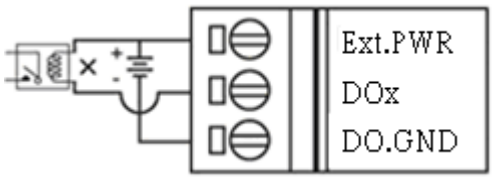
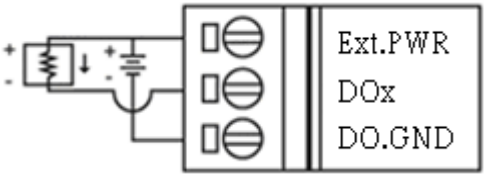
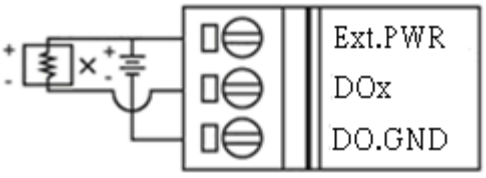
1.6.14 I-7055/55D and M-7055/55D wiring

Input Wiring	Dry Contact	
	Wet Contact	
Output Wiring	Digital Output	

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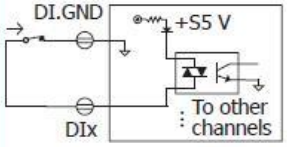
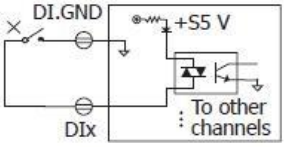
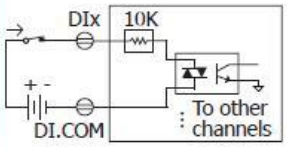
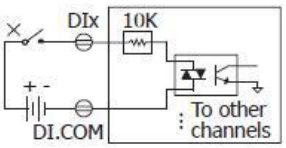
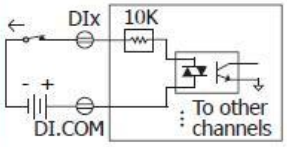
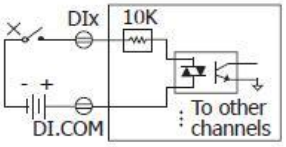
1.6.15 I-7055-NPN, I-7055D-NPN, M-7055-NPN and M-7055D-NPN wiring

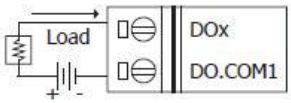
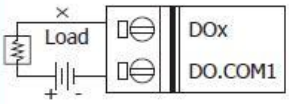
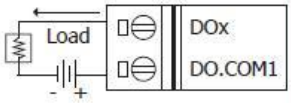
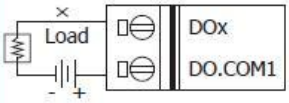
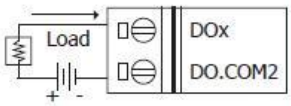
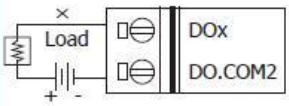
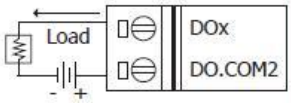
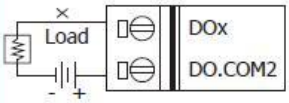
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<tr><td colspan="2">Wet Contact</td></tr>
<tr><td colspan="2">


</td></tr>
<tr><td rowspan="2">Output Type</td><td>ON State LED ON
Readback as 1</td><td>OFF State LED OFF
Readback as 0</td></tr>
<tr><td>Relay ON</td><td>Relay Off</td></tr>
<tr><td>Drive Relay</td><td>
</td><td>
</td></tr>
<tr><td>Resistance Load</td><td>
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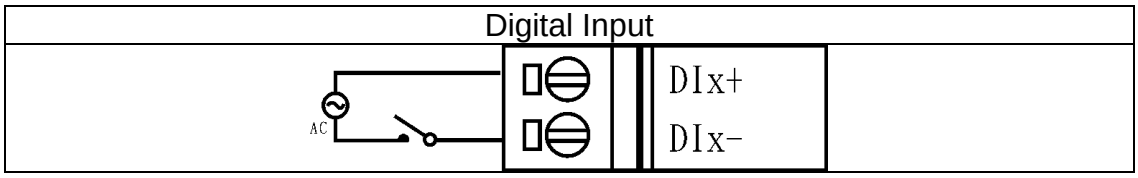
1.6.16 M-7055U/55UD

Input Type	ON State Readback as 1	OFF State Readback as 0
Dry Contact	Close to GND	Open
		
Wet Contact (Sink)	+10 ~ +50 VDC	+4 VDC Max.
		
Wet Contact (Source)	+10 ~ +50 VDC	+4 VDC Max.
		

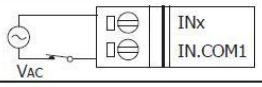
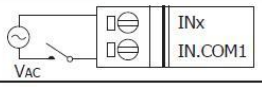
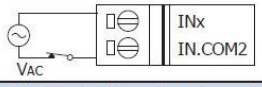
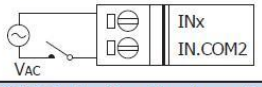
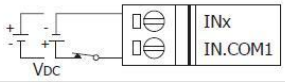
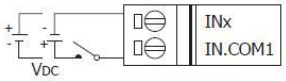
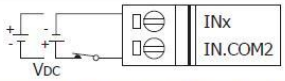
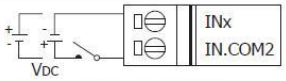
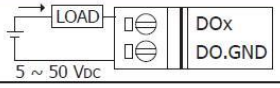
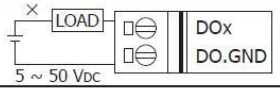
DO Group1	ON State Readback as 1	OFF State Readback as 0
DO0 ~ DO3 (Sink)		
DO0 ~ DO3 (Source)		
DO Group2	**ON State Readback as 1**	**OFF State Readback as 0**
DO4 ~ DO7 (Sink)		
DO4 ~ DO7 (Source)		

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1.6.17 I-7058/58D, I-7059/59D, M-7058/58D and M-7059/59D wiring

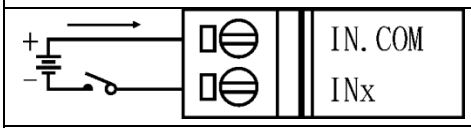
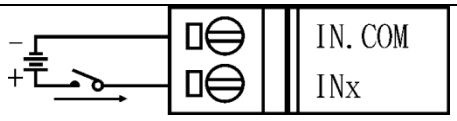
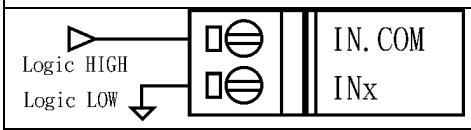
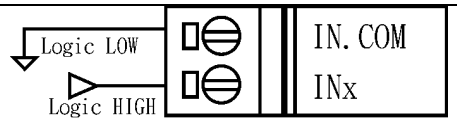
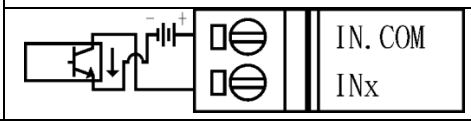
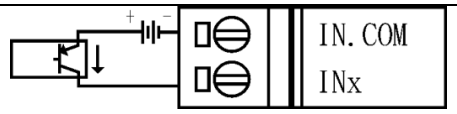
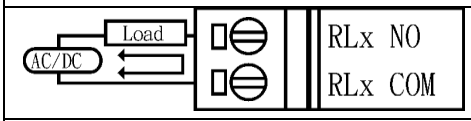
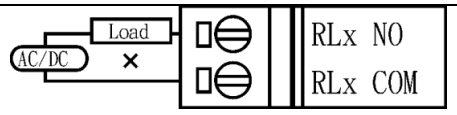
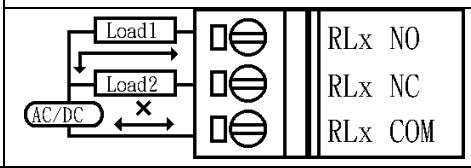
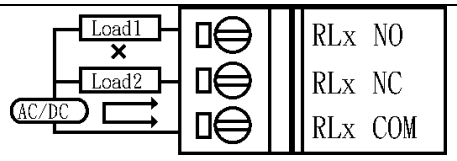


1.6.18 M-7058-16/58D-16 and M-7059-16/59D-16 wiring

Input Type	ON State Readback as 1	OFF State Readback as 0
AC Input IN0 ~ IN11	Close to GND	Open
		
AC Input IN12 ~IN15		
	ON State Readback as 1	OFF State Readback as 0
DC Input IN0 ~ IN11		
DC Input IN12 ~IN15		
Digital Output	ON State Readback as 1	OFF State Readback as 0
Open Collector (Sink)		

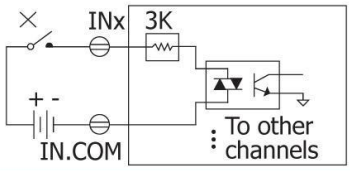
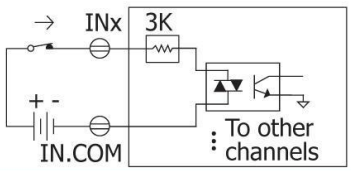
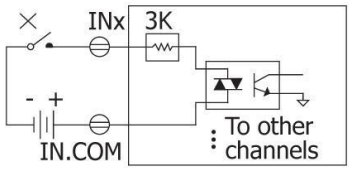
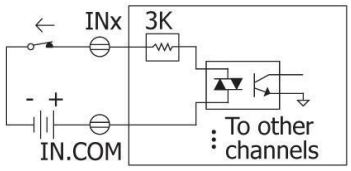
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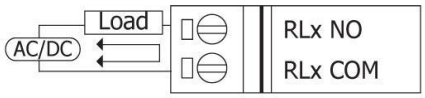
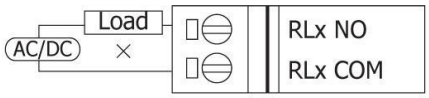
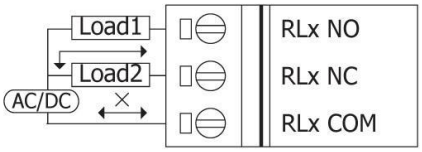
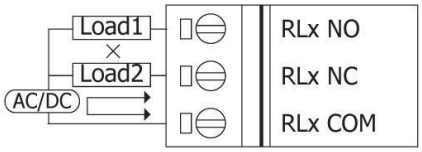
1.6.19 I-7060/60D and M-7060/60D wiring

<table>
<tr><td rowspan="6">Input
Wiring</td><td colspan="2">Dry Contact</td></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td colspan="2">TTL/CMOS</td></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td>NPN Output</td><td>PNP Output</td></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td rowspan="6">Output
Wiring</td><td colspan="2">Relay Output in RL1 and RL2</td></tr>
<tr><td>Relay ON</td><td>Relay OFF</td></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td colspan="2">Relay Output in RL3 and RL4</td></tr>
<tr><td>Relay ON</td><td>Relay OFF</td></tr>
<tr><td>
</td><td>
</td></tr>
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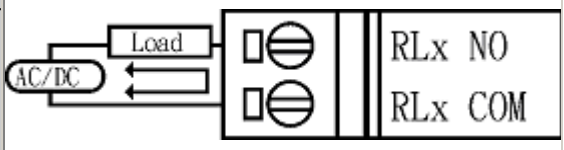
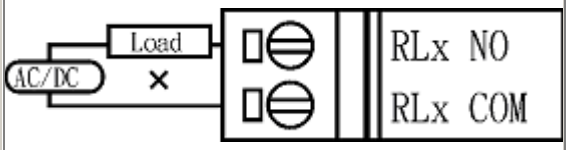
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1.6.20 M-7060P wiring

Digital Input/ Counter	ON State Readback as 1	OFF State Readback as 0
Sink	OPEN or <1 VDC	+4 ~ +30 VDC
		
Source	OPEN or <1 VDC	+4 ~ +30 VDC
		

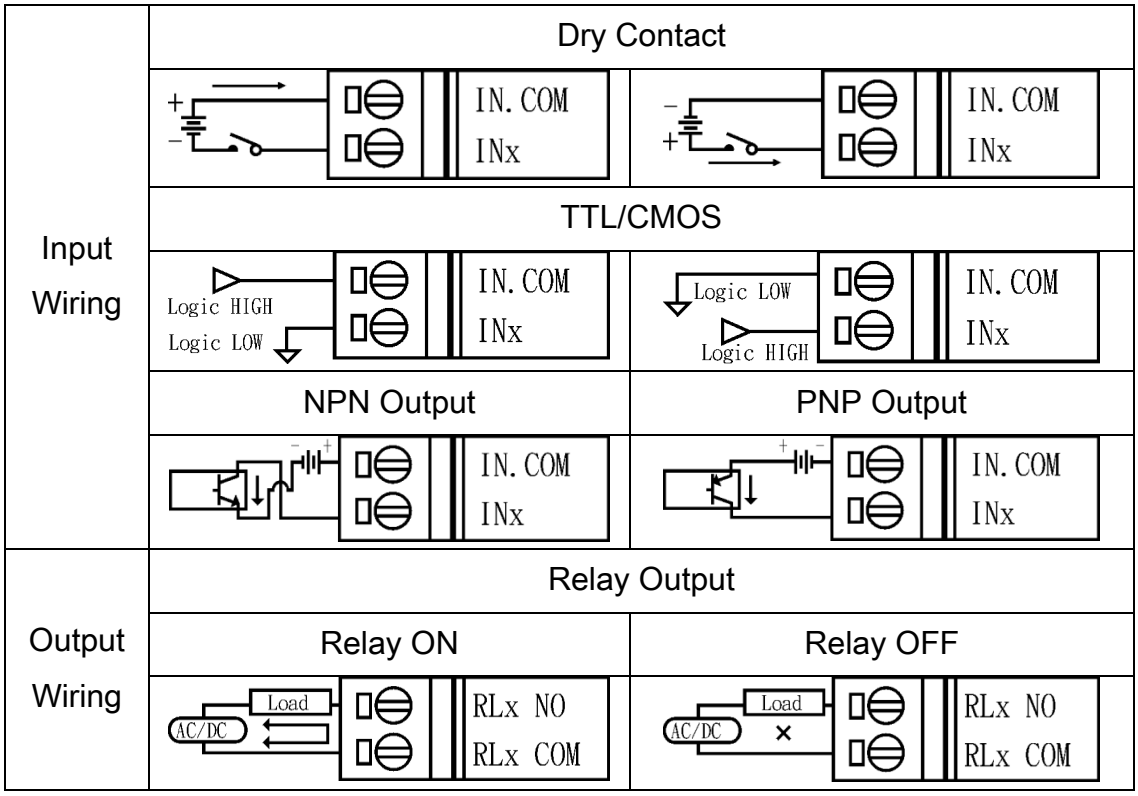
Output Type	ON State Readback as 1	OFF State Readback as 0
Relay Output in RL1 and RL2		
Relay Output in RL3 and RL4		

1.6.21 I-7061/61D and M-7061/61D wiring

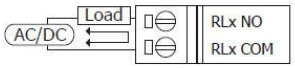
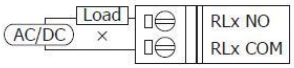
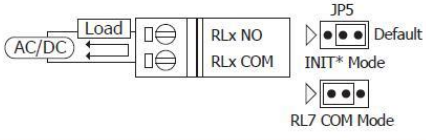
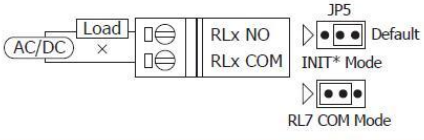
Output Type	Relay Output in RL1 and RL2	
	Relay On	Relay Off
		

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1.6.22 I-7063/63D, I-7063A/63AD, I-7063B/63BD, I-7065/65D, I-7065A/65AD and I-7065B/65BD wiring

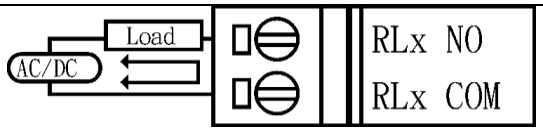
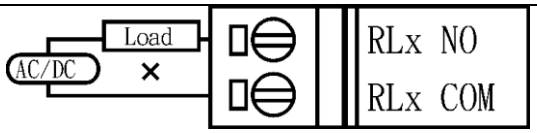


1.6.23 M-7064/64D wiring

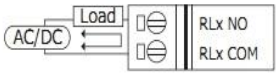
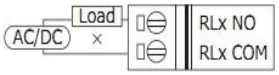
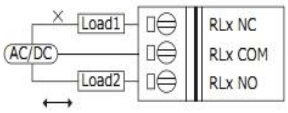
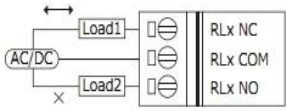
Output Type	ON State Readback as 1	OFF State Readback as 0
Relay Output RL0 ~ RL6		
Relay Output RL7		

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1.6.24 I-7066/66D, I-7067/67D, M-7066P/66PD and M-7067/67D wiring

Relay Output	
Relay ON	Relay OFF
	

1.6.25 M-7068/68D and M-7069/69D wiring

Relay Output	ON State Readback as 1	OFF State Readback as 0
Form A Relay in RL3 ~ RL6		
Form C Relay in RL0 ~ RL2 and RL7		

1.6.26 Wiring Recommendations

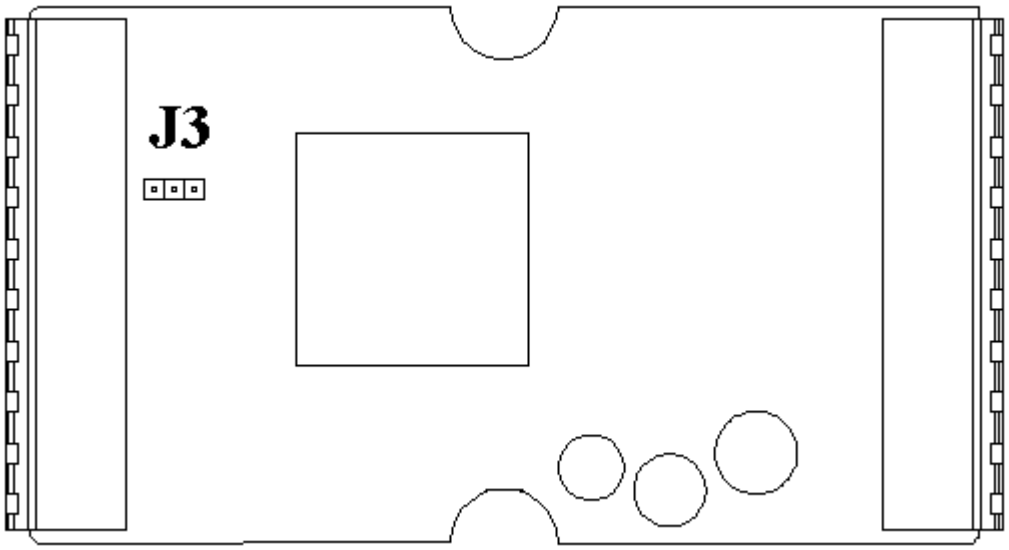
- Use 26-12 AWG wire for signal connections.
- Strip the wire to a length of 7±0.5mm.
- Use a crimp terminal for wiring.
- Avoid high-voltage cables and power equipment as much as possible.
- For RS-485 communication, use insulated and twisted pair 24 AWG wire, e.g. Belden 9841.

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1.7 Jumper Setting

Note: To access the jumper, the cover must be opened.

For the I-7043/43D and M-7043/43D modules, the INIT* terminal is shared with the DO15 terminal. The functionality of the terminal is set using the J3 jumper. The position of the J3 jumper is shown in the figure below.



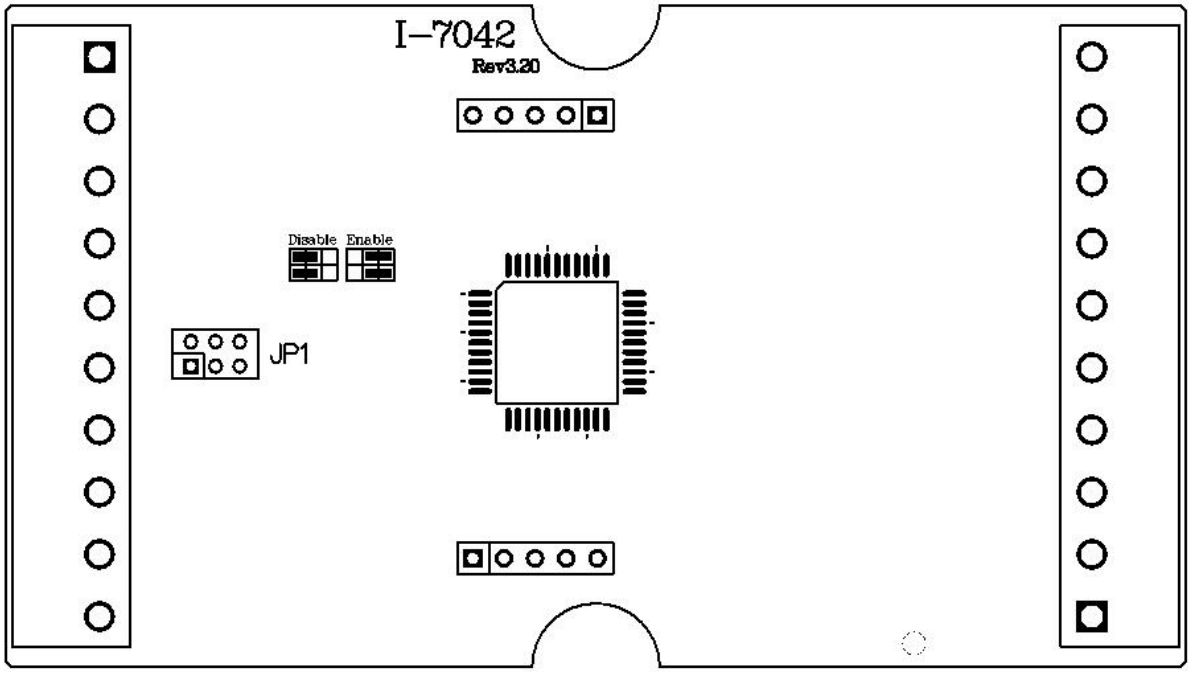
The settings for the J3 jumper are as follows.

J3 	**Terminal INIT*/DO15 is set to INIT*. The digital output channel 15 is disabled and INIT mode is available. (factory default)**
J3 	**Terminal INIT*/DO15 is set to DO15. The digital output channel 15 is enabled and INIT mode is not available.**

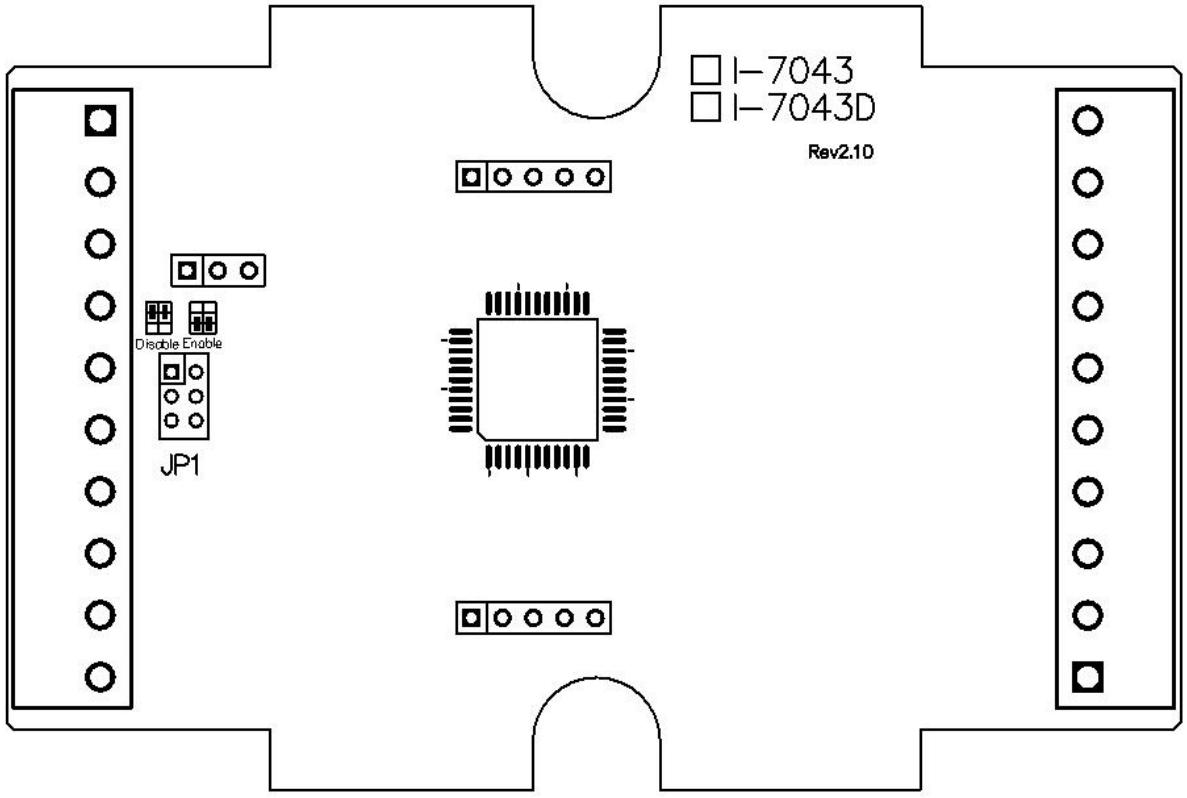
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1.7.1 Jumper to Enable/Disable RS-485 Bias

I-7042/42D (PCB V3.20 and later, JP1)

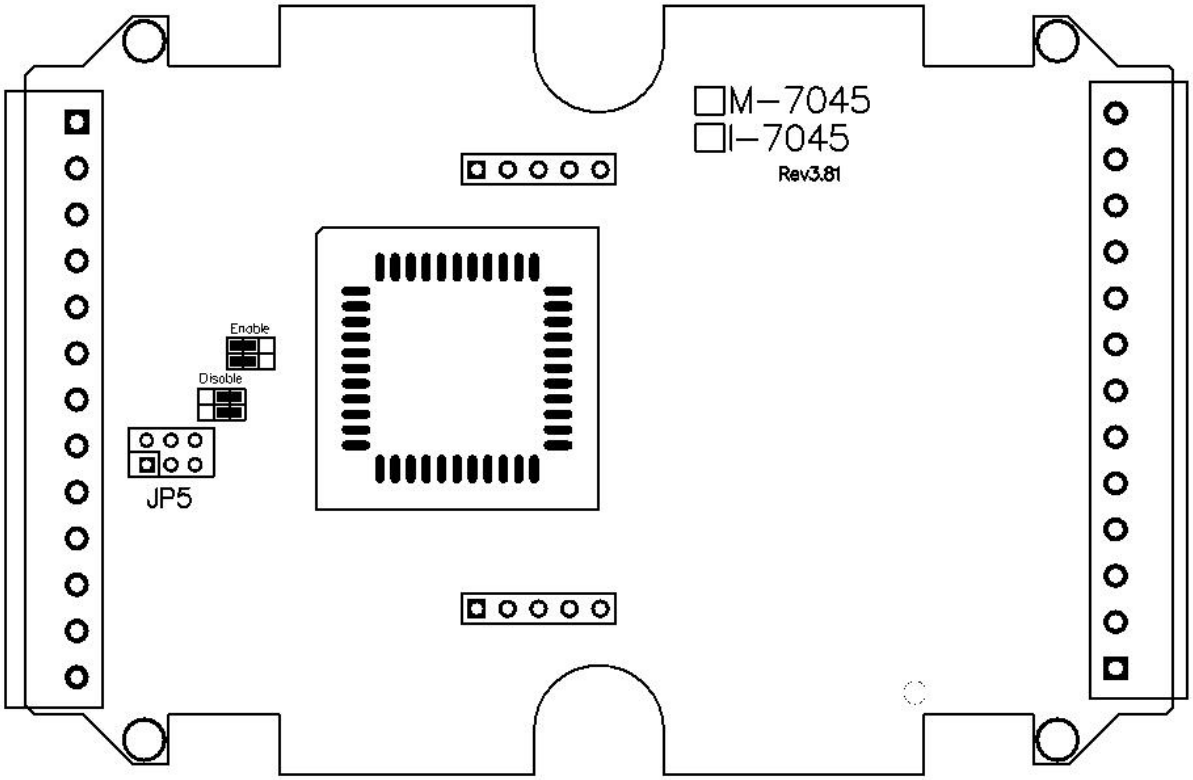


I-7043/43D and M-7043/43D (PCB V2.10 and later, JP1)

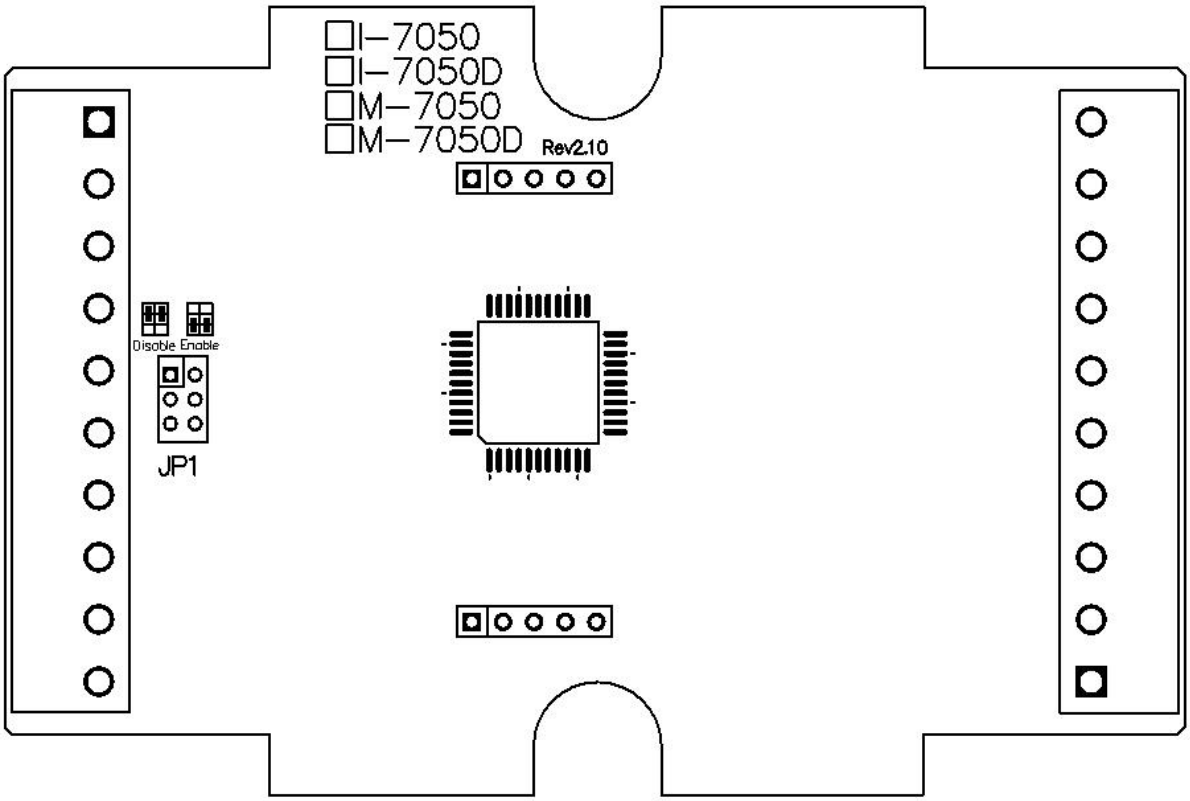


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I-7045/45D and M-7045/45D (PCB V3.81 and later, JP5)

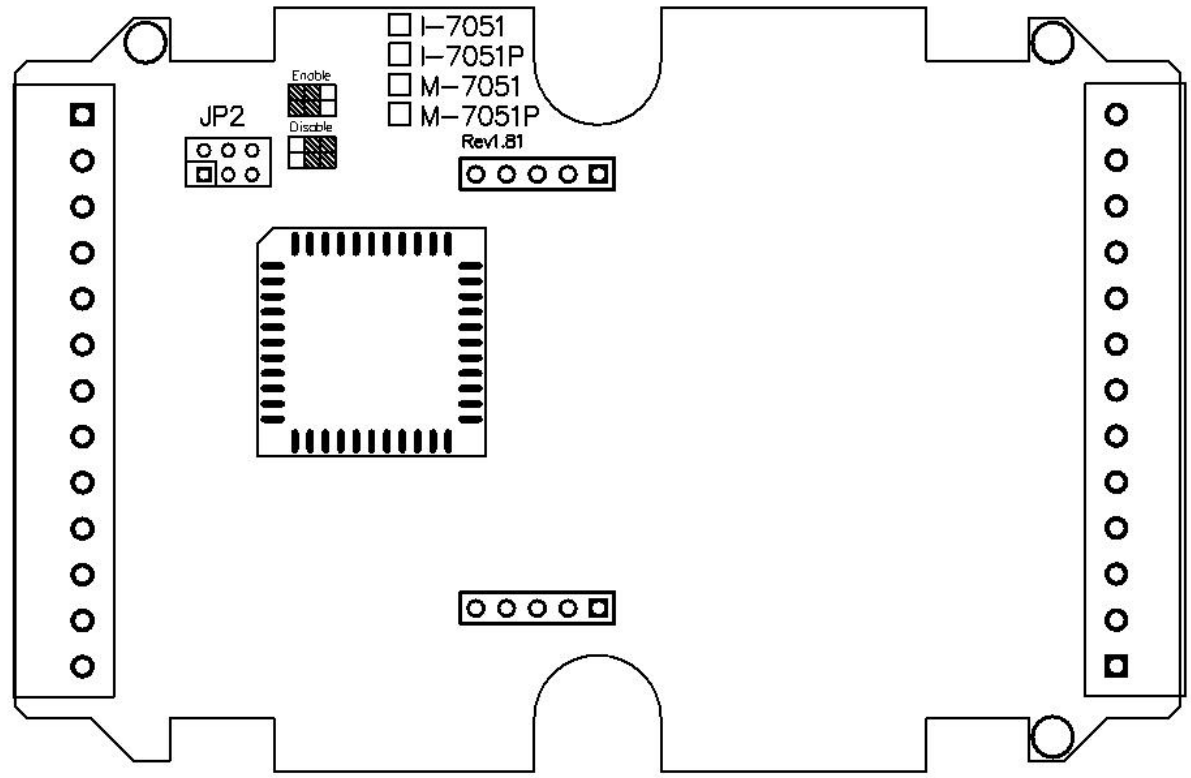


I-7050/50D and M-7050/50D (PCB V2.10 and later, JP1)

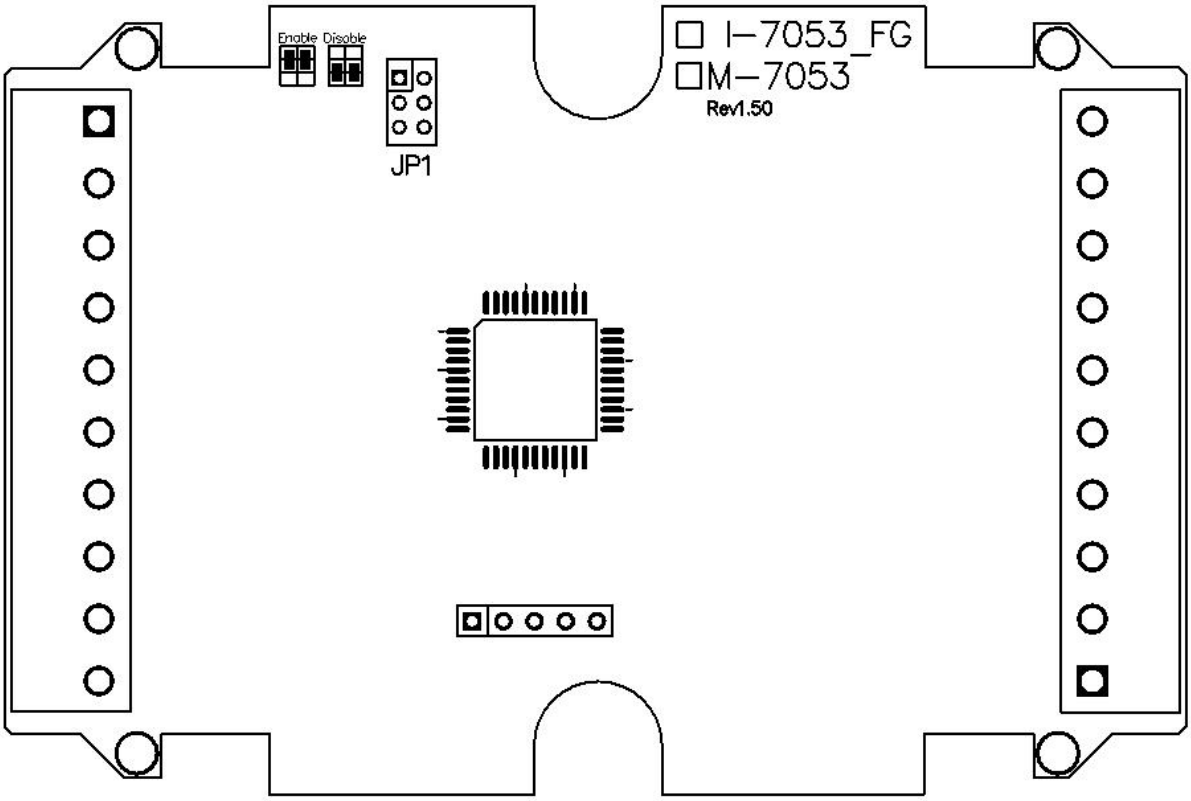


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I-7051/51D and M-7051/51D (PCB V1.81 and later, JP2)

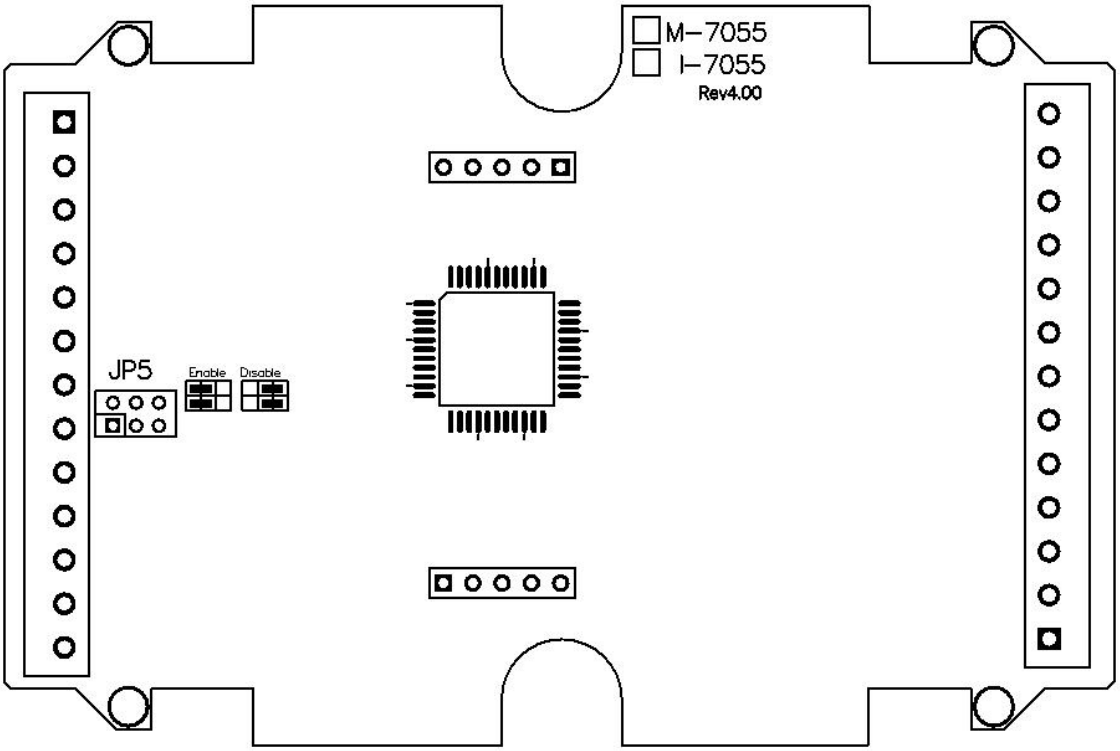


I-7053_FG/53D_FG and M-7053/53D (PCB V1.50 and later, JP1)

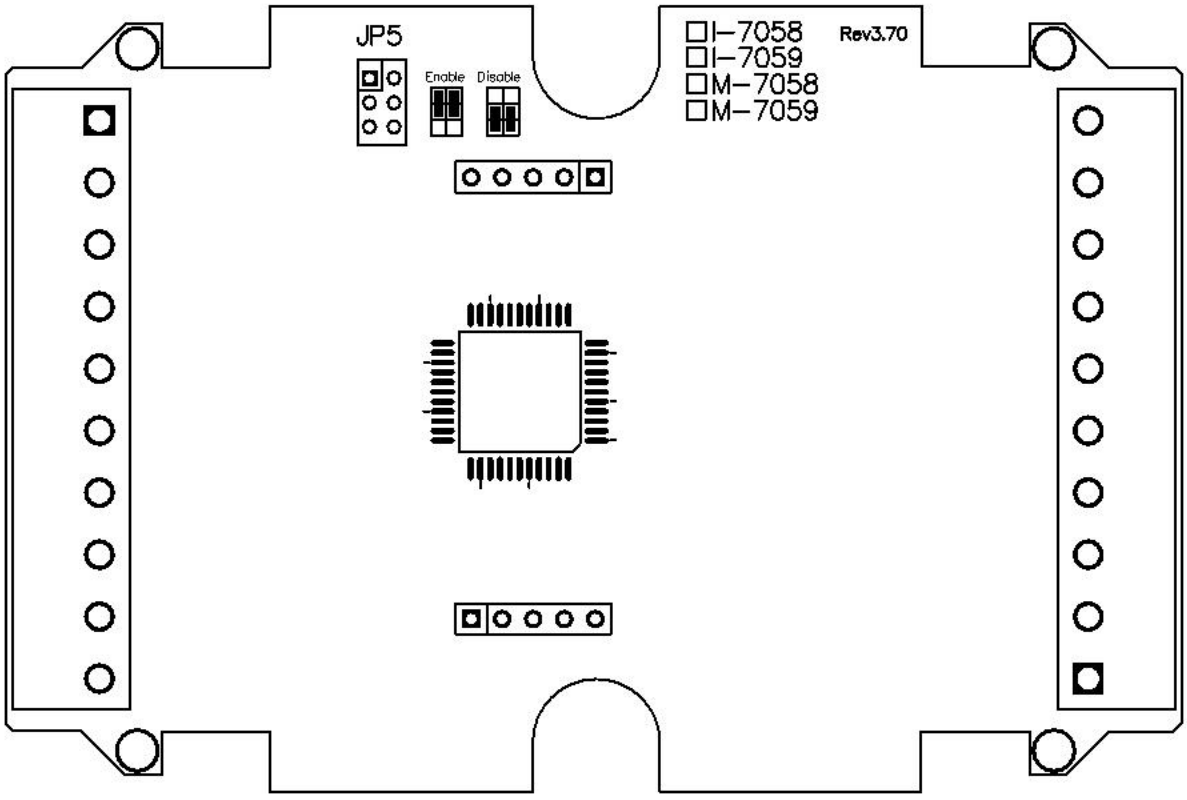


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I-7055/55D and M-7055/55D (PCB V4.00 and later, JP5)

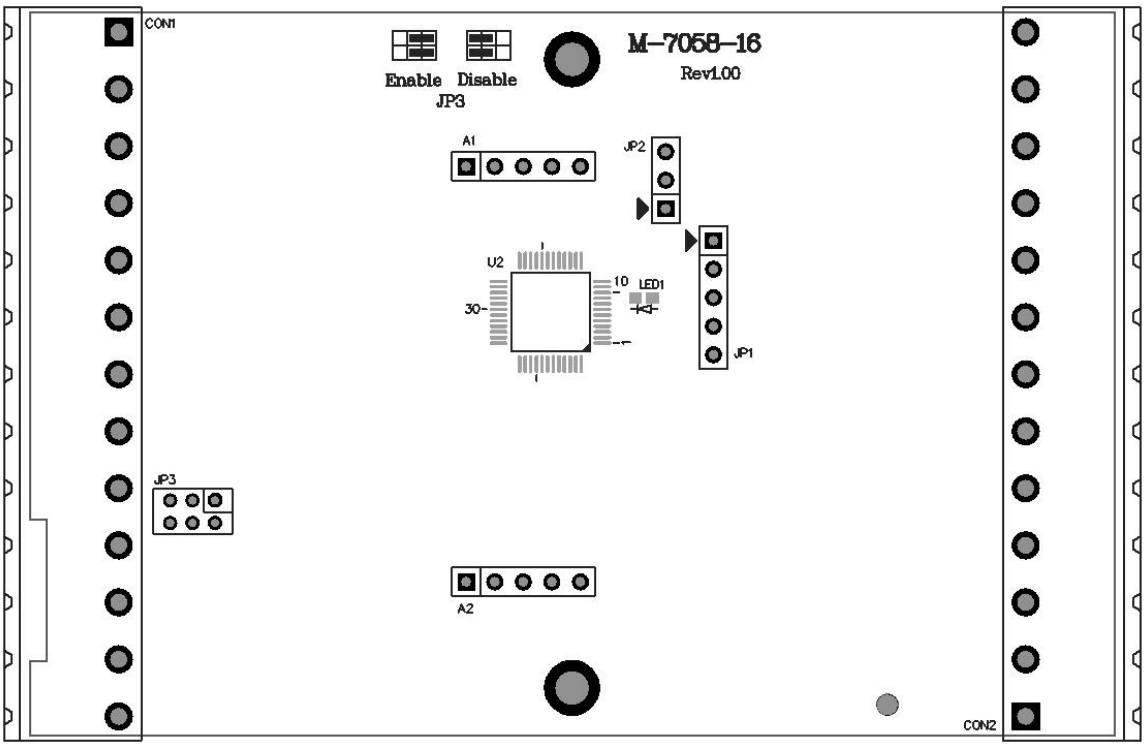


I-7058/58D, M-7058/58D, I-7059/59D and M-7059/59D (PCB V3.70 and later, JP5)

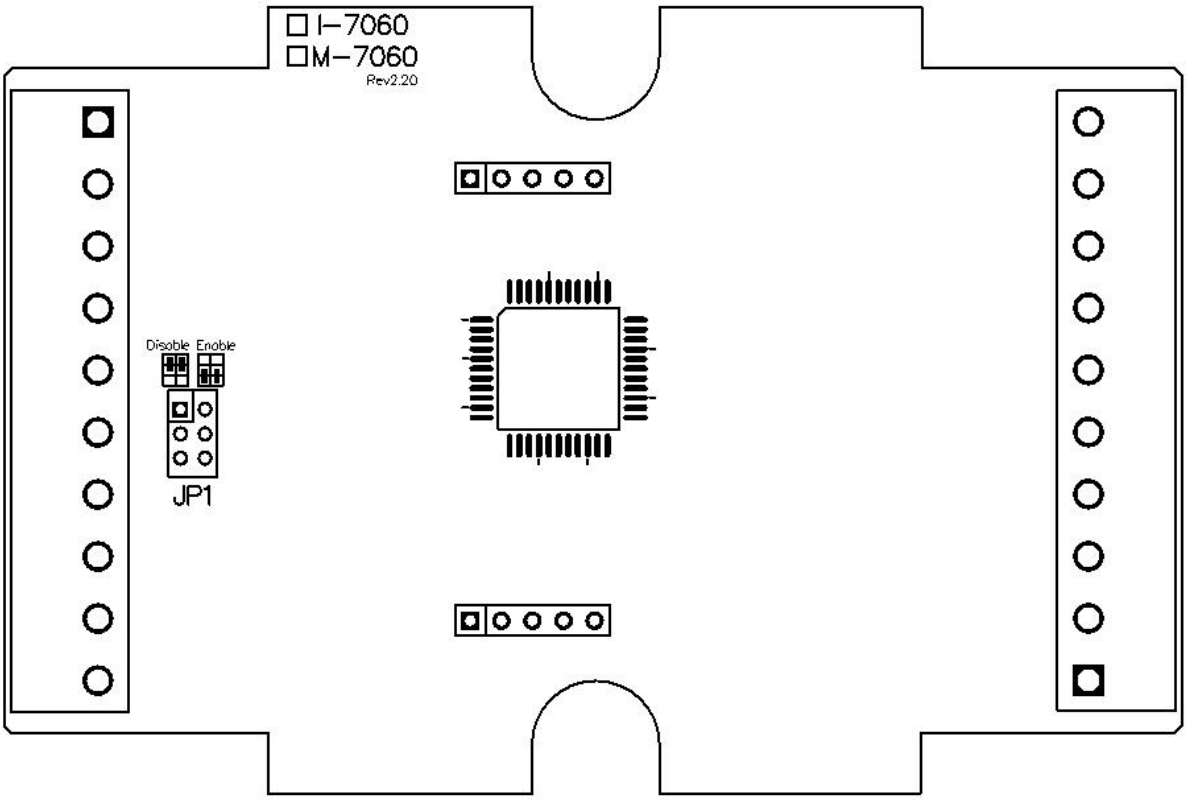


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M-7058-16/58D-16 and M-7059-16/59D-16 (PCB V1.00 and later, JP3)

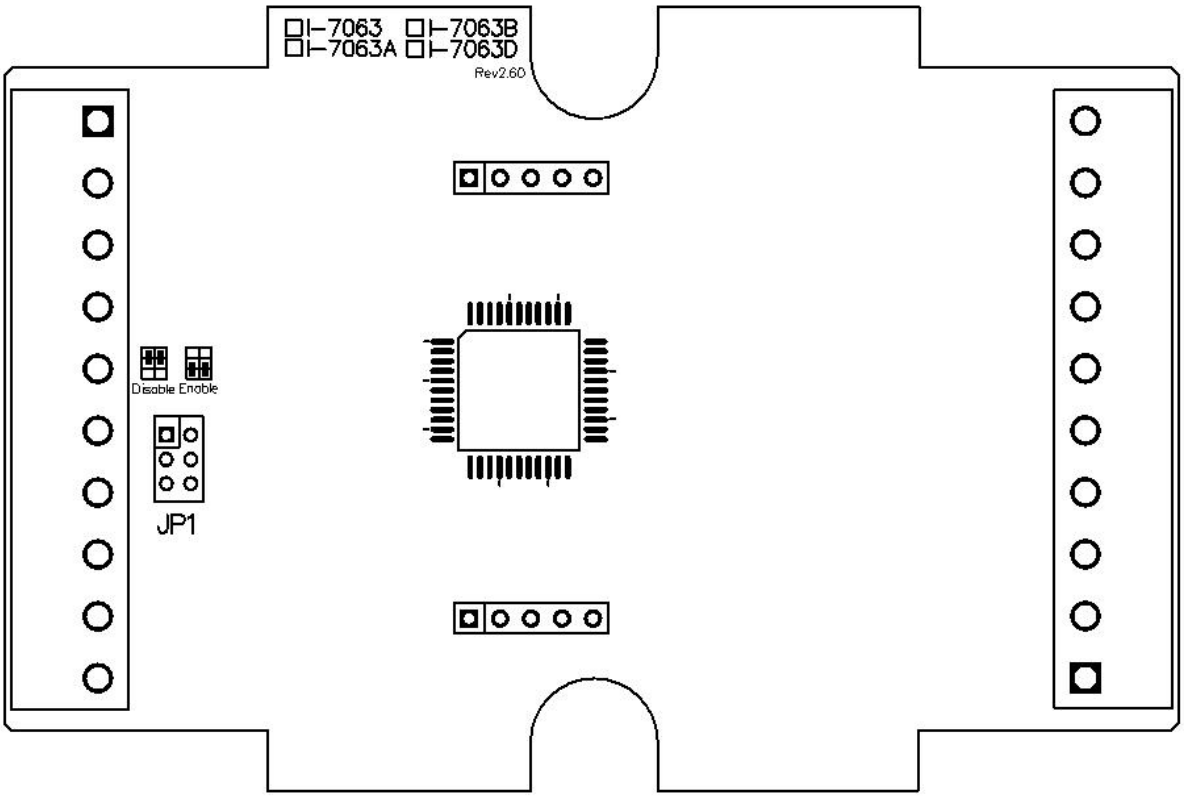


I-7060/60D and M-7060/60D (PCB V2.20 and later, JP1)

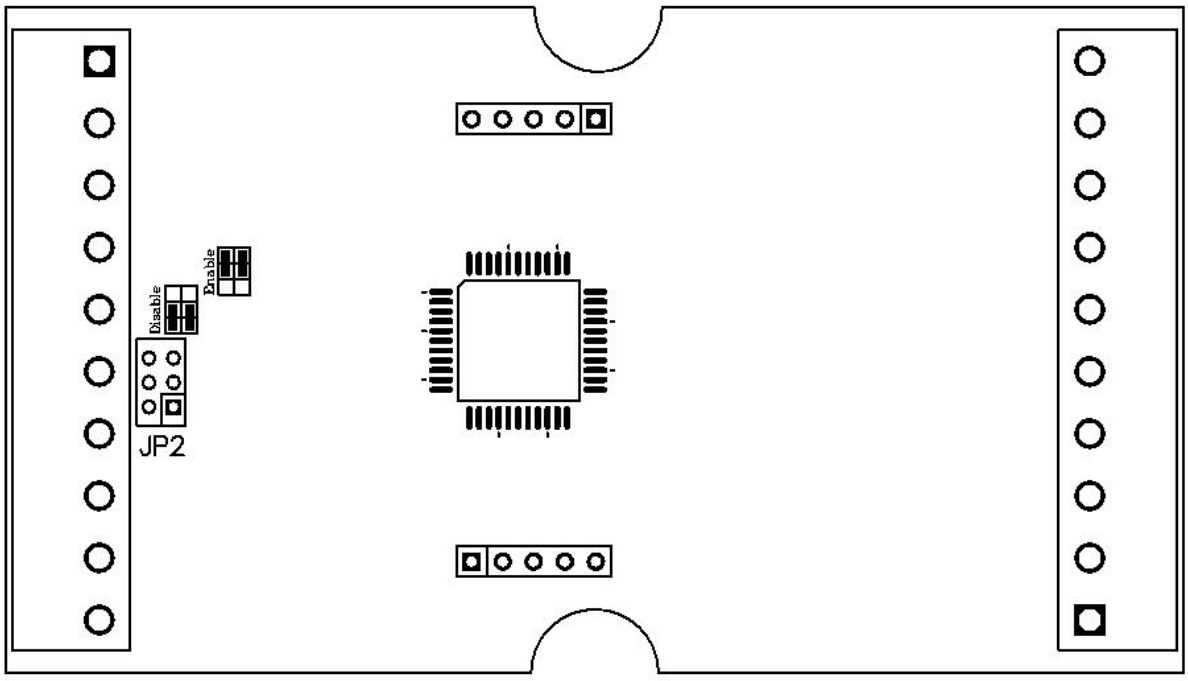


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I-7063/63D, I-7063A/63AD and I-7063B/63BD (PCB V2.60 and later, JP1)

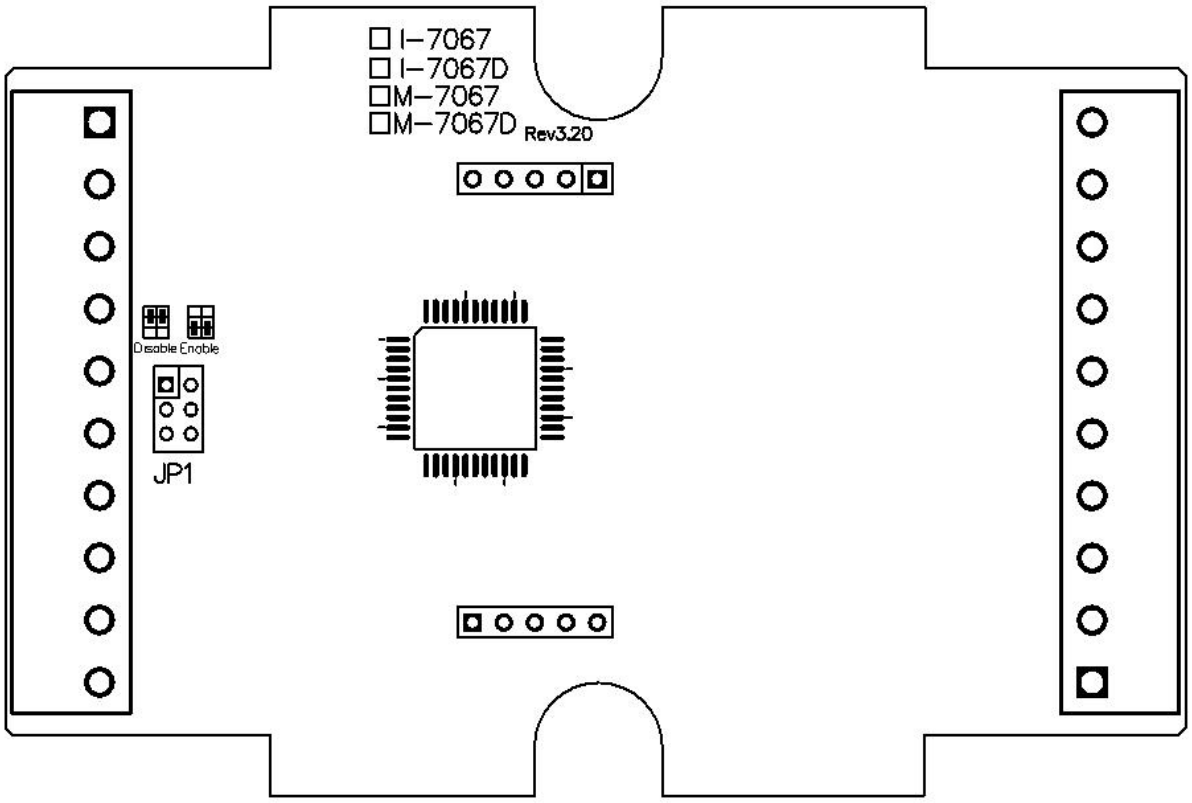


I-7065/65D and M-7065/65D (PCB V3.90 and later, JP2)

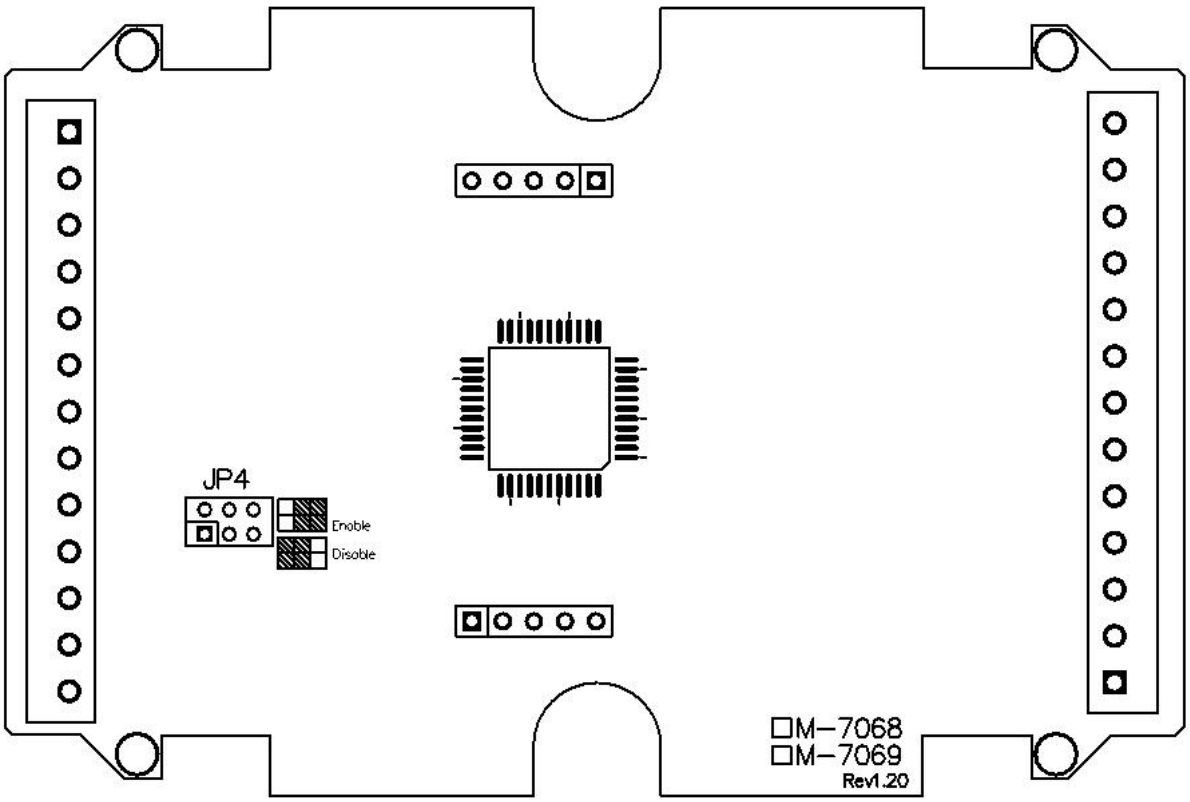


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I-7067/67D and M-7067/67D (PCB V3.20 and later, JP1)



M-7068/68D and M-7069/69D (PCB V1.00 and later, JP4)



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1.8 Quick Start

To install the module, follow the steps below:

1. Refer to Section 1.2 for the terminal assignment and Section 1.6 for the wiring diagram.
2. Connect the module to the RS-485 network using the DATA+ and DATA- terminals. See Section 1.2 for the terminal assignment. If the host is only equipped with an RS-232 interface, then an RS-232 to RS-485 converter will be required. Refer to the "**I-7000 Bus Converter User's Manual**" for more information.
3. Connect the module to the power supply using the +Vs and GND terminals. See Section 1.2 for the terminal assignment. Note that the voltage supplied to the module should be in the range of +10 to +30 VDC.
4. Configure the module by sending the %AANNTTCCFF command. See Section 2.1 for details. For M-7000 modules using the Modbus RTU protocol, configure the module using the following functions.
   - Sub-function 04h of Function 46h, see Section 3.7.2
   - Sub-function 06h of Function 46h, see Section 3.7.4

   The default settings for the module can be found in Section 1.9.
5. To read data from the input channels, send either the $AA6 or @AA commands to the module. See Sections 2.13 and 2.21 for details. For M-7000 modules using the Modbus RTU protocol, use Function 02h to read the data from the input channels. See Section 3.2 for details.
6. To write data to the output channels, send the @AA(data) command to the module. See Section 2.22 for details. Refer to Sections 2.3 ~ 2.8 for other setting digital output commands. For M-7000 modules using the Modbus RTU protocol, use Function 05h or 0Fh to write the data to the output channels. See Sections 3.5 and 3.6 for details.

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7. If the host is a PC with a Windows operating system installed, the DCON Utility can be used to allow easy configuration and reading of data. The DCON Utility can be downloaded from the ICP DAS website (http://www.icpdas.com). The documentation for the DCON Utility can be found in the ”**Getting Started For I-7000 Series Modules**” manual.

Please refer to the “**I-7000 Bus Converter User’s Manual**” and ”**Getting Started For I-7000 Series Modules**” manuals for more details. The “**Getting Started For I-7000 Series Modules**” manual can be downloaded from the ICP DAS website (http://www.icpdas.com).

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1.9 Default Settings

Default settings for the I-7000 DIO modules are as follows:

- Module Address: 01
- DIO Type: Type 40
- Baud Rate: 9600 bps
- Checksum disabled
- J3 set to INIT mode enabled for I-7043/43D and M-7043/43D.

Default settings for the M-7000 DIO modules are as follows:

- Protocol: Modbus RTU
- Module Address: 01
- DIO Type: Type 40
- Baud Rate: 9600 bps

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1.10 Configuration Tables

Baud Rate Setting (CC)

Code	03	04	05	06	07	08	09	0A
Baud rate	1200	2400	4800	9600	19200	38400	57600	115200

Note: The data bits are fixed at one start bit, eight data bits, no parity and one stop bit for both the I-7000 and M-7000 series.

Type Setting (TT)

For I-7000 and M-7000 DIO modules, the type code is fixed to 40.

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Data Format Setting (FF)

7	6	5	4	3	2	1	0
CU	CS	reserved			CD		

Key	Description
CD	Code I-7050: 0 (read only) I-7052: 2 (read only) I-7053: 3 (read only) I-7060: 1 (read only) For other modules, the code value can be changed by %AANNTTCCFF command and the default code value is 0.
CS	Checksum setting 0: Disabled 1: Enabled
CU	Counter update 0: The counter is updated when there is a falling edge in the input signal. 1: The counter is updated when there is a rising edge in the input signal.

Note: The reserved bits should be zero.

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Digital Input/Output Data Format Table

The data format of the response of the **$AA4**, **$AA6** and **$AALS** commands is: (**the First Data**)(**the Second Data**)00.
The data format of the response of the **@AA** command is: (**the First Data**)(**the Second Data**).
Note: both the First Data and the Second Data are in two hexadecimal digits format.

Module	The First Data		The Second Data	
I-7041Series	DI8 ~ DI13	00 ~ 3F	DI0 ~ DI7	00 ~ FF
I-7042/42D	DO8 ~ DO12	00 ~ 1F	DO0 ~ DO7	00 ~ FF
I-7043/43D	DO8 ~ DO15	00 ~ FF	DO0 ~ DO7	00 ~ FF
I-7044/44D	DO1 ~ DO8	00 ~ FF	DI1 ~ DI4	00 ~ 0F
I-7045 Series	DO8 ~ DO15	00 ~ FF	DO0 ~ DO7	00 ~ FF
I-7050 Series	DO0 ~ DO7	00 ~ FF	DI0 ~ DI6	00 ~ 7F
I-7051/51D	DI8 ~ DI15	00 ~ FF	DI0 ~ DI7	00 ~ FF
I-7052/52D	DI0 ~ DI7	00 ~ FF		00
I-7053/53D	DI8 ~ DI15	00 ~ FF	DI0 ~ DI7	00 ~ FF
I-7055 Series	DO0 ~ DO7	00 ~ FF	DI0 ~ DI7	00 ~ FF
I-7058/58D	DI0 ~ DI7	00 ~ FF		00
I-7059/59D	DI0 ~ DI7	00 ~ FF		00
I-7060/60D	DO1 ~ DO4	00 ~ 0F	DI1 ~ DI4	00 ~ 0F
I-7061/61D	DO8 ~ DO11	00 ~ 0F	DO0 ~ DO7	00 ~ FF
I-7063 Series	DO1 ~ DO3	00 ~ 07	DI1 ~ DI8	00 ~ FF
I-7065 Series	DO1 ~ DO5	00 ~ 1F	DI1 ~ DI4	00 ~ 0F
I-7066/66D	DO1 ~ DO7	00 ~ 7F		00
I-7067/67D	DO1 ~ DO7	00 ~ 7F		00

Notes for M-7054 series:
1. the response is (DO8~DO15) (DO0~DO7)(DI8~DI15) (DI0~DI7)
2. for the channels used as input, the corresponding output value, power-on value and safe value all should be set to 0.

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Notes for M-7058-16 and M-7059-16 series:

1. the response is (DO0~DO1)(DI8~DI15) (DI0~DI7)

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1.11 DIO Active States

The DIO read value of the I-7000 and M-7000 modules are as follows:

	DIO	Inactive	Active
I-7041/M-7041	14DI	ON	OFF
I-7042	13DO	OFF	ON
I-7043/M-7043	16DO	OFF	ON
I-7044	8DO	OFF	ON
	4DI	ON	OFF
I-7045/M-7045	16DO	OFF	ON
I-7050/M-7050	8DO	OFF	ON
	7DI	ON	OFF
I-7050A	8DO	OFF	ON
	7DI	OFF	ON
I-7051/M-7051	16DI	OFF	ON
I-7052/M-7052	8DI	OFF	ON
I-7053/M-7053	16DI	ON	OFF
M-7054	16DI	OFF	ON
	16DO	OFF	ON
I-7055/M-7055	8DO	OFF	ON
	8DI	OFF	ON
I-7060/M-7060	4DO	OFF	ON
	4DI	ON	OFF
I-7061/M-7061	12DO	OFF	ON
I-7063	3DO	OFF	ON
	8DI	ON	OFF
I-7065	5DO	OFF	ON
	4DI	ON	OFF
I-7066	7DO	OFF	ON
I-7067/M-7067	7DO	OFF	ON

ON means the DIO read value is 1.
OFF means the DIO read value is 0.
For the modules not listed, they are OFF for inactive and ON for active.

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The DIO active states can be changed by the DCON command ~AADVV or the Modbus register 00265 and 00266. Please refer to section 2.32 and 3.8 for details.

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1.12 M-7000 Notes

The main difference between the I-7000 and M-7000 series is that the M-7000 series has additional support for the Modbus RTU communication protocol, which is the default protocol of the M-7000 series. The communication Baud Rates for the Modbus RTU protocol can be in the range of 1200 bps to 115200 bps, and the parity, data and stop bits are fixed as no parity, 8 data bits and 1 stop bit.

Modbus functions supported by the module are described in Chapter 3.

1.12.1 Protocol Switching

To switch to the DCON protocol:

1. Uses sub-function 06h of the function 46h and set byte 8 to a value of 1. See Section 3.7.4 for details.
2. After a power-on reset, the communication protocol will be changed to DCON.

To switch to the Modbus RTU protocol:

1. Sends the $AAPN command and set N to a value of 1. Note that for the modules without frame ground, the INIT* terminal should be connected to the GND terminal, and for the modules with frame ground, the slide switch on the rear side of the module should be set to the INIT position, see the figure on the next page. See Section 2.20 for details.
2. After a power-on reset, the communication protocol will be changed to the Modbus RTU protocol.

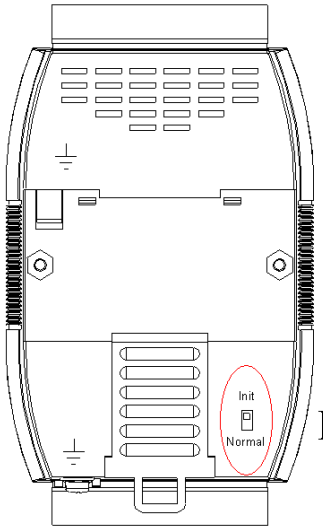
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1.12.2 INIT Mode

When the module is powered on, with the rear slide switch set to the INIT position as shown in the figure below for modules with frame ground, or with the INIT* pin connected to the GND pin for modules without frame ground, the module is in INIT mode, (see Section A.1 for details), and the communication settings are as follows:

1. Address: 00
2. Baud Rate: 9600 bps
3. No checksum
4. Protocol: DCON

If communication with the module is not possible, set the module to the INIT mode and use the above settings to communicate with the module. To read the current settings, send the commands $AA2, (see Section 2.10), and $AAP, (see Section 2.19). To set new settings, send the commands %AANNTTCCFF, (see Section 2.1) and $AAPN, (see Section 2.20). The new communication settings will be effective after the next power-on reset.

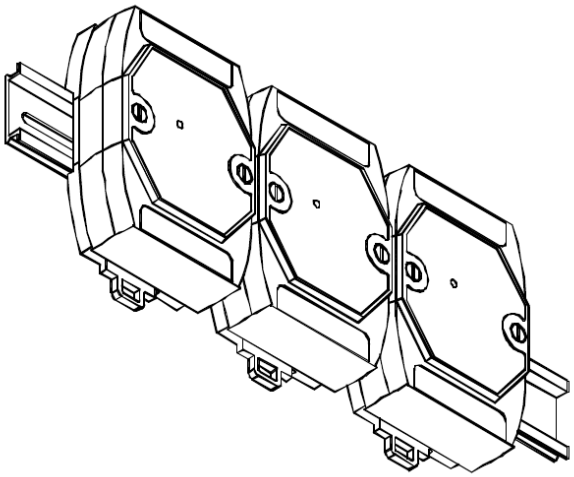


INIT Switch

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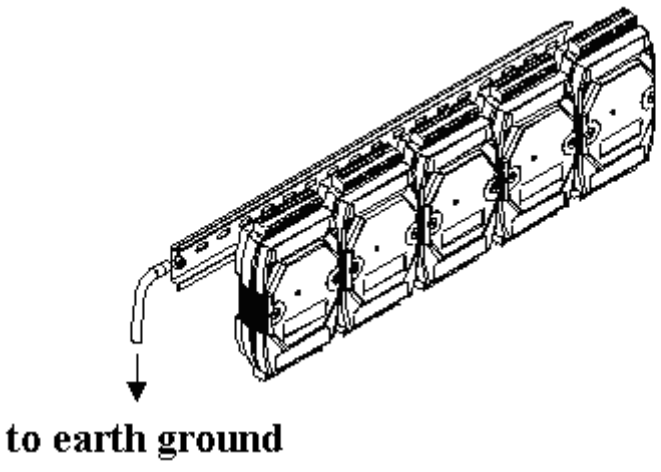
1.13 Mounting

1.13.1 Din-Rail Mounting



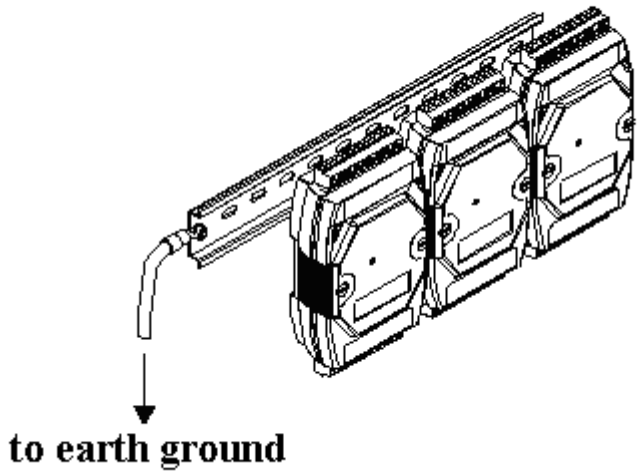
There are three new DIN rail models available. Each is made of stainless steel, which is stronger than those made of aluminum. There is a screw at one end and a ring terminal is included so that it can be easily connected to the earth ground. The three new DIN rail models are as follows.

Part number	Max. number of modules	Dimensions
DRS-360	5	360mm x 35mm

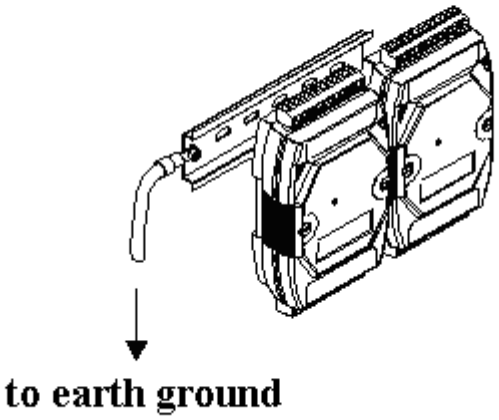


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Part number	Max. number of modules	Dimensions
DRS-240	3	240mm x 35mm



Part number	Max. number of modules	Dimensions
DRS-125	2	125mm x 35mm

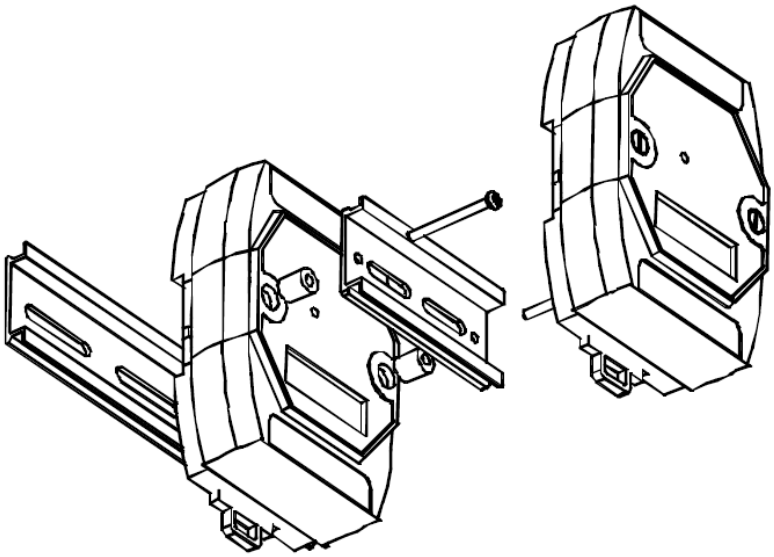


Note: It is recommended that a 16 – 14 AWG wire is used to connect the DIN rail to the earth ground.

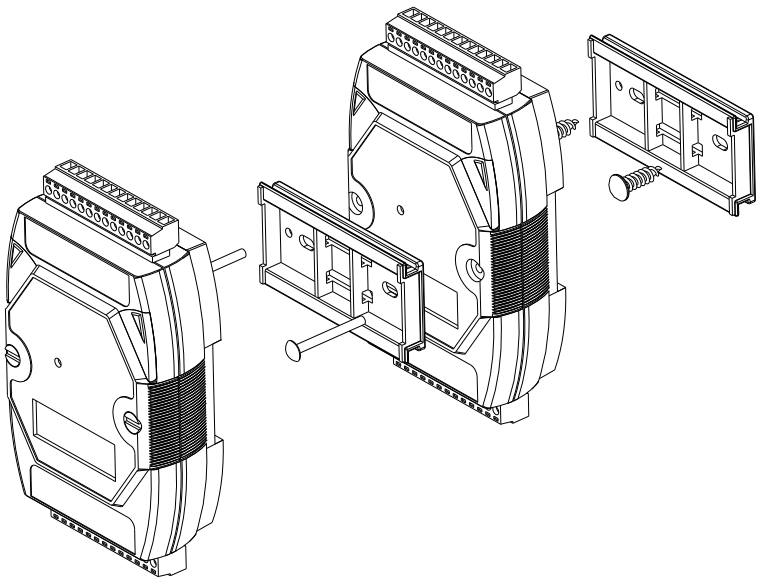
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1.13.2 Piggyback Mounting

For I-7041/41D, M-7041/41D, I-7042/42D, I-7043/43D, M-7043/43D, I-7044/44D, I-7050 series, M-7050 series, I-7052/52D, M-7052/52D, I-7060/60D, M-7060/60D, I-7063 series, I-7065 series, I-7066/66D, I-7067/67D and M-7067/67D modules

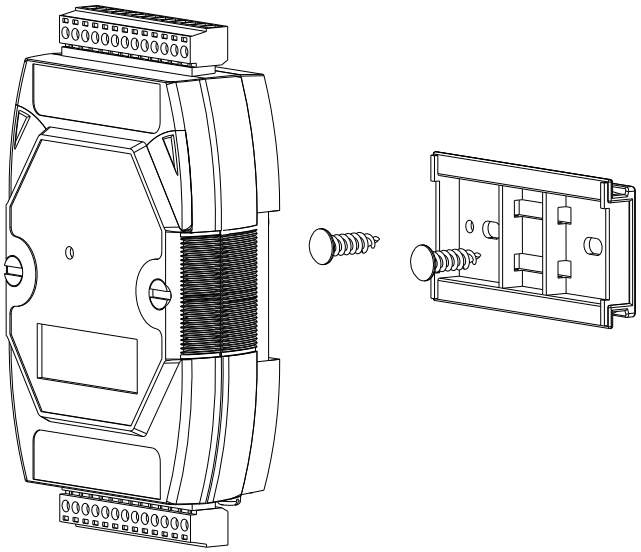


For I-7045/45D, M-7045/45D, I-7051/51D, M-7051/51D, I-7053_FG/53D_FG, M-7053/53D, I-7055/55D, M-7055/55D, I-7058/58D, I-7059/59D, and M-7060P modules



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1.13.3 Wall Mounting



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1.14 Technical Support

Should you encounter any problems while using the I-7000 and M-7000 module, and are unable to find the help you need in this manual or on our website, please contact ICP DAS Product Support.

Email: service@icpdas.com
Website:
http://www.icpdas.com.tw/contact_us/contact_us.html

When requesting technical support, be prepared to provide the following information about your system:

1. Module name and serial number: The serial number can be found printed on the barcode label attached to the cover of the module.
2. Firmware version: See Sections 2.16 and 3.7.5 for information regarding the command used to identify the firmware version.
3. Host configuration (type and operating system)
4. If the problem is reproducible, please give full details describing the procedure used to reproduce the problem.
5. Any specific error messages displayed. If a dialog box with an error message is displayed, please include the full text of the dialog box, including the text in the title bar.
6. If the problem involves other programs or hardware devices, please describe the details of the problem in full.
7. Any comments and suggestions related to the problem are welcome.

ICP DAS will reply to your request by email within three business days.

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2. DCON Protocol

All communication with I-7000 modules consists of commands generated by the host and responses transmitted by the I-7000 modules. Each module has a unique ID number that is used for addressing purposes and is stored in non-volatile memory. The ID is 01 by default and can be changed using a user command. All commands to the modules contain the ID address, meaning that only the addressed module will respond. The only exception to this is commands #** (Section 2.2) and ~** (Section 2.24), which are sent to all modules, but in both of these cases, the modules do not reply to the command.

Command Format:

Leading Character	Module Address	Command	[CHKSUM]	CR

Response Format:

Leading Character	Module Address	Data	[CHKSUM]	CR

CHKSUM A 2-character checksum which is present when the checksum setting is enabled. See Sections 1.10 (Data Format Setting) and 2.1 for details.

CR End of command character, carriage return (0x0D)

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Checksum Calculation:

1. Calculate the ASCII code sum of all the characters in the command/response string except for the carriage return character (CR).
2. The checksum is equal to the sum masked by 0FFh.

Example:

Command string: $012(CR)

1. Sum of the string = “$”+”0”+”1”+”2” = 24h+30h+31h+32h = B7h
2. Therefore the checksum is B7h, and so CHKSUM = “B7”
3. The command string with the checksum = $012B7(CR)

Response string: !01200600(CR)

1. Sum of the string = “!”+”0”+”1”+”2”+”0”+”0”+”6”+”0”+”0” = 21h+30h+31h+32h+30h+30h+36h+30h+30h = 1AAh
2. Therefore the checksum is AAh, and so CHKSUM = “AA”
3. The response string with the checksum = !01200600AA(CR)

Note:

All characters should be in upper case.

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General Command Sets			
Command	**Response**	**Description**	**Section**
%AANNTTCCFF	!AA	Sets the Module Configuration	2.1
#**	No Response	Synchronized Sampling	2.2
#AA00(Data)	>	Sets the Digital Output	2.3
#AA0A(Data)	>	Sets the Digital Output	2.4
#AA0B(Data)	>	Sets the Digital Output	2.5
#AA1cDD	>	Sets the Digital Output	2.6
#AAAcDD	>	Sets the Digital Output	2.7
#AABcDD	>	Sets the Digital Output.	2.8
#AAN	!AA(Data)	Reads the Digital Input Counter	2.9
$AA2	!AANNTTCCFF	Reads the Module Configuration	2.10
$AA4	!S(Data)	Reads the Synchronized Data	2.11
$AA5	!AAS	Reads the Reset Status	2.12
$AA6	!(Data)	Reads the Digital I/O Status	2.13
$AAC	!AA	Clears the Latched DI Status	2.14
$AACN	!AA	Clears the Digital InputCounter	2.15
$AAF	!AA(Data)	Reads the firmware Version	2.16
$AALS	!(Data)	Reads the Latched DI Status	2.17
$AAM	!AA(Data)	Reads the Module Name	2.18
$AAP	!AASC	Reads the communication protocol	2.19
$AAPN	!AA	Sets the communication protocol	2.20
@AA	>(Data)	Reads the Digital I/O Status	2.21
@AA(Data)	>	Sets the Digital Output Channels	2.22
~AAO(Name)	!AA	Sets the Module Name	2.23
~AAD	!AAVV	Reads the miscellaneous settings of a module.	2.31
~AADVV	!AA	Sets the miscellaneous settings of a module.	2.32
~AASF	!AAVV	Reads the digital software filter setting of a module	2.33
~AASFVV	!AA	Sets the digital software filter setting of a module	2.34

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Host Watchdog Command Sets			
Command	**Response**	**Description**	**Section**
~**	No Response	Host OK	2.24
~AA0	!AASS	Reads the Status	2.25
~AA1	!AA	Resets the Status	2.26
~AA2	!AAVV	Reads the Timeout Settings	2.27
~AA3EVV	!AA	Sets the Timeout Settings	2.28
~AA4V	!AA(Data)	Reads the PowerOn/Safe Value	2.29
~AA5V	!AA	Sets the PowerOn/Safe Value	2.30

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2.1 %AANNTTCCFF

Description:

Sets the configuration of a module.

Syntax:

%AANNTTCCFF[CHKSUM](CR)

% Delimiter character

AA Address of the module to be configured in hexadecimal format (00 to FF)

NN New address of the module in hexadecimal format (00 to FF)

TT Type code, should be 40 for DIO module.

CC New Baud Rate code, see Section 1.10 for details. The INIT* pin must be connected to ground in order to change Baud Rates. For the module with frame ground, this is achieved by moving the rear slide switch to the INIT position. See Section A.1 for details.

FF Used to set the counter update direction and checksum (Section 1.10). The INIT* pin must be connected to ground in order to change the checksum setting. For the module with frame ground, this is achieved by moving the rear slide switch to the INIT position. See Section A.1 for details.

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Response:

Valid Command: **!AA[CHKSUM](CR)**
Invalid Command: **?AA[CHKSUM](CR)**

! Delimiter for a valid command

? Delimiter for an invalid command. If the **Baud Rate** or **checksum** settings are changed without connecting the INIT* pin to ground or switching the rear slide switch to the INIT position, the module will return an invalid command.

AA Address of the module in hexadecimal format (00 to FF)

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:

Command: %0102400600 Response: !02

Changes the address of module 01 to 02. The module returns a valid response.

Command: %0101200A00 Response: ?01

Changes the Baud Rate of module 01 to 115200bps. The module returns an invalid command, because it is not in INIT* mode.

Command: %0101200A00 Response: !01

Changes the Baud Rate of module 01 to 115200bps and the module is in INIT* mode. The module returns a valid response.

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Related Commands:
Section 2.10 $AA2

Related Topics:
Section 1.10 Configuration Tables, Section A.1 INIT* pin Operation

Notes:
Changes to the address and counter update direction settings take effect immediately after a valid command is received. Changes to the Baud Rate and checksum settings take effect on the next power-on reset.

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2.2 #**

Description:
When the command is received, it will allow all modules to read data and will store the data for later retrieval.

Syntax:
#[CHKSUM](CR)**

#	Delimiter character
**	Synchronized sampling command

Response:
There is no response with this command. To access the data, another command, $AA4, must be sent, see Section 2.11 for details.

Examples:
Command: #** No response

Sends the synchronized sampling command.

Command: $014 Response: !10F0000

Sends a command to read the synchronized data. The status byte of the response is 1, which means that it is the first time the synchronized data has been read after the previous #** command.

Command: $014 Response: !00F0000

Sends a command to read the synchronized data. The status byte of the response is 0, which means that it is **NOT** the first time the synchronized data has been read after the previous #** command.

Related Commands:
Section 2.11 $AA4

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2.3 #AA00(Data)

Description:

Sets the digital output value of the lower eight channels.

Syntax:

#AA00(Data)[CHKSUM](CR)

#	Delimiter character
AA	Address of the module to be set (00 to FF)
00	Command to set the digital output value of the lower eight channels
(Data)	A two-digit hexadecimal value, where bit 0 corresponds to DO0, bit 1 corresponds to DO1, etc. When the bit is 1, it denotes that the digital output channel is on, and 0 denotes that the digital output channel is off.

Response:

Valid command: **>[CHKSUM](CR)**
Invalid command: **?[CHKSUM](CR)**
Ignored command: **![CHKSUM](CR)**

>	Delimiter character for a valid command
?	Delimiter character for an invalid command
!	Delimiter character for an ignored command. A host watchdog timeout has occurred, the digital output channel s are set to safe value, and the digital output value that was sent is ignored.

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

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Examples:

Command: #010033 Response: >

Sets DO0, DO1, DO4 and DO5 to on, and DO2, DO3, DO6, DO7 to off, and the module returns a valid response.

Related Commands:

Section 2.4 #AA0A(data), Section 2.5 #AA0B(data), Section 2.6 #AA1cDD, Section 2.7 #AAAcDD, Section 2.8 #AABcDD, Section 2.13 $AA6, Section 2.21 @AA

Related Topics:

Section 1.11 DIO Active States

Notes:

1. This command is only applicable to the modules with digital output channels.
2. This command is the same as the #AA0A(Data) command.

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2.4 #AA0A(Data)

Description:

Sets the digital output value of the lower eight channels.

Syntax:

#AA0A(Data)[CHKSUM](CR)

#	Delimiter character
AA	Address of the module to be set (00 to FF)
0A	Command to set the digital output value of the lower eight channels
(Data)	A two-digit hexadecimal value, where bit 0 corresponds to DO0, bit 1 corresponds to DO1, etc. When the bit is 1, it denotes that the digital output channel is on, and 0 denotes that the digital output channel is off.

Response:

Valid command: **>[CHKSUM](CR)**
Invalid command: **?[CHKSUM](CR)**
Ignored command: **![CHKSUM](CR)**

>	Delimiter character for a valid command
?	Delimiter character for an invalid command
!	Delimiter character for an ignored command. A host watchdog timeout has occurred, the digital output channel s are set to safe value, and the digital output value that was sent is ignored.

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

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Examples:

Command: #010A33 Response: >

Sets DO0, DO1, DO4 and DO5 to on, and DO2, DO3, DO6, DO7 to off, and the module returns a valid response.

Related Commands:

Section 2.3 #AA00(data), Section 2.5 #AA0B(data), Section 2.6 #AA1cDD, Section 2.7 #AAAcDD, Section 2.8 #AABcDD, Section 2.13 $AA6, Section 2.21 @AA

Related Topics:

Section 1.11 DIO Active States

Notes:

1. This command is only applicable to the modules with digital output channels.
2. This command is the same as the #AA00(Data) command.

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2.5 #AA0B(Data)

Description:

Sets the digital output value of the upper eight channels.

Syntax:

#AA0B(Data)[CHKSUM](CR)

#	Delimiter character
AA	Address of the module to be set (00 to FF)
0B	Command to set the digital output value of the upper eight channels
(Data)	A two-digit hexadecimal value, where bit 0 corresponds to DO8, bit 1 corresponds to DO9, etc. When the bit is 1, it denotes that the digital output channel is on, and 0 denotes that the digital output channel is off.

Response:

Valid command: **>[CHKSUM](CR)**
Invalid command: **?[CHKSUM](CR)**
Ignored command: **![CHKSUM](CR)**

>	Delimiter character for a valid command
?	Delimiter character for an invalid command
!	Delimiter character for an ignored command. A host watchdog timeout has occurred, the digital output ports are set to safe value, and the digital output value that was sent is ignored.

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

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Examples:

Command: #010B33 Response: >

Sets DO8, DO9, DO12 and DO13 to on, and DO10, DO11, DO14, DO15 to off, and the module returns a valid response.

Related Commands:

Section 2.3 #AA00(data), Section 2.4 #AA0A(data), Section 2.6 #AA1cDD, Section 2.7 #AAAcDD, Section 2.8 #AABcDD, Section 2.13 $AA6, Section 2.21 @AA

Related Topics:

Section 1.11 DIO Active States

Notes:

This command is only applicable to the modules with the number of digital output channels larger than eight.

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2.6 #AA1cDD

Description:

Sets a single digital output channel of the lower eight channels.

Syntax:

#AA1cDD[CHKSUM](CR)

#	Delimiter character
AA	Address of the module to be set (00 to FF)
1	Command to set a single digital output channel of the lower eight channels
c	Specifies the digital output channel to be set (0 to 7).
DD	00: set the digital output channel to off. 01: set the digital output channel to on.

Response:

Valid command: **>[CHKSUM](CR)**
Invalid command: **?[CHKSUM](CR)**
Ignored command: **![CHKSUM](CR)**

>	Delimiter character for a valid command
?	Delimiter character for an invalid command
!	Delimiter character for an ignored command. A host watchdog timeout has occurred, the digital output ports are set to safe value, and the digital output value that was sent is ignored.

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

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Examples:

Command: #011201 Response: >

Sets DO2 to on, and the module returns a valid response.

Related Commands:

Section 2.3 #AA00(data), Section 2.4 #AA0A(data), Section 2.5 #AA0B(data), Section 2.7 #AAAcDD, Section 2.8 #AABcDD, Section 2.13 $AA6, Section 2.21 @AA

Related Topics:

Section 1.11 DIO Active States

Notes:

1. This command is only applicable to the modules with digital output channels.
2. This command is the same as the #AAAcDD command.

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2.7 #AAAcDD

Description:

Sets a single digital output channel of the lower eight channels.

Syntax:

#AAAcDD[CHKSUM](CR)

#	Delimiter character
AA	Address of the module to be set (00 to FF)
A	Command to set a single digital output channel of the lower eight channels
c	Specifies the digital output channel to be set (0 to 7).
DD	00: set the digital output channel to off. 01: set the digital output channel to on.

Response:

Valid command: **>[CHKSUM](CR)**
Invalid command: **?[CHKSUM](CR)**
Ignored command: **![CHKSUM](CR)**

>	Delimiter character for a valid command
?	Delimiter character for an invalid command
!	Delimiter character for an ignored command. A host watchdog timeout has occurred, the digital output ports are set to safe value, and the digital output value that was sent is ignored.

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

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Examples:

Command: #01A201 Response: >

Sets DO2 to on, and the module returns a valid response.

Related Commands:

Section 2.3 #AA00(data), Section 2.4 #AA0A(data), Section 2.5 #AA0B(data), Section 2.6 #AA1cDD, Section 2.8 #AABcDD, Section 2.13 $AA6, Section 2.21 @AA

Related Topics:

Section 1.11 DIO Active States

Notes:

1. This command is only applicable to the modules with digital output channels.
2. This command is the same as the #AA1cDD command.

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2.8 #AABcDD

Description:

Sets a single digital output channel of the upper eight channels.

Syntax:

#AABcDD[CHKSUM](CR)

#	Delimiter character
AA	Address of the module to be set (00 to FF)
B	Command to set a single digital output channel of the upper eight channels
c	Specifies the digital output channel to be set (0 to 7), where 0 stands for channel 8, 1 stands for channel 9, etc.
DD	00: set the digital output channel to off. 01: set the digital output channel to on.

Response:

Valid command: **>[CHKSUM](CR)**
Invalid command: **?[CHKSUM](CR)**
Ignored command: **![CHKSUM](CR)**

>	Delimiter character for a valid command
?	Delimiter character for an invalid command
!	Delimiter character for an ignored command. A host watchdog timeout has occurred, the digital output ports are set to safe value, and the digital output value that was sent is ignored.

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There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:

Command: #01B201 Response: >

Sets DO10 to on, and the module returns a valid response.

Related Commands:

Section 2.3 #AA00(data), Section 2.4 #AA0A(data), Section 2.5 #AA0B(data), Section 2.6 #AA1cDD, Section 2.7 #AAAcDD, Section 2.13 $AA6, Section 2.21 @AA

Related Topics:

Section 1.11 DIO Active States

Notes:

This command is only applicable to the modules with the number of digital output channels larger than eight.

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2.9 #AAN

Description:

Reads the digital input counter of channel N.

Syntax:

#AAN[CHKSUM](CR)

#	Delimiter character
AA	Address of the module to be read (00 to FF)
N	The channel to be read (0 to F).

Response:

Valid Command: **!AA(Data)[CHKSUM](CR)**

Invalid Command: **?AA[CHKSUM](CR)**

!	Delimiter character for a valid command
?	Delimiter character for an invalid command. An invalid command is returned if the specified channel is incorrect.
(Data)	Five decimal digits representing the digital input counter data of the specified channel (00000 to 65535).
AA	Address of the responding module (00 to FF)

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

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Examples:

Command: #032 Response: !0300103

Reads data from channel 2 of module 03 and the returned counter value is 103.

Command: #029 Response: ?02

Reads data from channel 9 of module 02. An error is returned because channel 9 is invalid.

Related Commands:

Section 2.15 $AACN

Notes:

This command is only applicable to the module with digital inputs.

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2.10 $AA2

Description:

Reads the module configuration.

Syntax:

$AA2[CHKSUM](CR)

$	Delimiter character
AA	Address of the module to be read (00 to FF)
2	Command to read the module configuration

Response:

Valid Command: **!AATTCCFF[CHKSUM](CR)**

Invalid Command: **?AA[CHKSUM](CR)**

!	Delimiter character for a valid command
?	Delimiter character for an invalid command
AA	Address of the responding module (00 to FF)
TT	Type code of the module, should be 40 for DIO module.
CC	Baud Rate code of the module, see Section 1.10 for details.
FF	Checksum and counter update direction settings of the module, see Section 1.10 for details.

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

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Examples:

Command: $012 Response: !01400600

Reads the configuration of module 01.

Related Commands:

Section 2.1 %AANNTTCCFF

Related Topics:

Section 1.10 Configuration Tables

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2.11 $AA4

Description:

Reads the synchronized data that was retrieved by the last #** command.

Syntax:

$AA4[CHKSUM](CR)

$	Delimiter character
AA	Address of the module to be read (00 to FF)
4	Command to read the synchronized data

Response:

Valid Command: **!S(Data)[CHKSUM](CR)**

Invalid Command: **?AA[CHKSUM](CR)**

!	Delimiter character for a valid command
?	Delimiter character for an invalid command
AA	Address of the responding module (00 to FF)
S	Status of the synchronized data 1: first read 0: not the first read
(Data)	Synchronized data. See Section 1.10 for the data format.

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

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Examples:

Command: $014 Response: ?01

Reads the synchronized data for module 01. An invalid command is returned because the #** command has not been issued in advance.

Command: #** No response

Sends the synchronized sampling command.

Command: $014 Response: !1000F00

Reads the synchronized data for module 01. The module returns the synchronized data and sets the status byte to 1 to indicate that this is the first time the synchronized data has been read.

Command: $014 Response: !0000F00

Reads the synchronized data for module 01. The module returns the synchronized data and sets the status byte to 0 to indicate that the synchronized data has been read.

Related Commands:

Section 2.2 #**

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2.12 $AA5

Description:

Reads the reset status of a module.

Syntax:

$AA5[CHKSUM](CR)

$	Delimiter character
AA	Address of the module to be read (00 to FF)
5	Command to read the module reset status

Response:

Valid Command: **!AAS[CHKSUM](CR)**

Invalid Command: **?AA[CHKSUM](CR)**

!	Delimiter character for a valid command
?	Delimiter character for an invalid command
AA	Address of the responding module (00 to FF)
S	Reset status of the module 1: This is the first time the command has been sent since the module was powered on. 0: This is not the first time the command has been sent since the module was powered on, which denotes that there has been no module reset since the last $AA5 command was sent.

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

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Examples:

Command: $015 Response: !011

Reads the reset status of module 01. The response shows that it is the first time the $AA5 command has been sent since the module was powered-on.

Command: $015 Response: !010

Reads the reset status of module 01. The response shows that there has been no module reset since the last $AA5 command was sent.

Related Topics:

Section A.4 Reset Status

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2.13 $AA6

Description:

Reads the status of the digital input/output channels.

Syntax:

$AA6[CHKSUM](CR)

$	Delimiter character
AA	Address of the module to be read (00 to FF)
6	Command to read the digital input/output channels

Response:

Valid command: **!(Data)[CHKSUM](CR)**

Invalid command: **?AA[CHKSUM](CR)**

!	Delimiter character for a valid command
?	Delimiter character for an invalid command
AA	Address of the responding module (00 to FF)
(Data)	Status of the digital input/output channels, a four-digit hexadecimal value followed by 00. See Section 1.10 for details.

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

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Examples:

Command: $016 Response: !0F0000

Reads the digital input/output channel status of module 01 (I-7060) and returns 0F0000h, which denotes that RL1, RL2, RL3 and RL4 are on and IN1, IN2, IN3 and IN4 are off.

Related Commands:

Section 2.21 @AA

Related Topics:

Section 1.10 Configuration Tables

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2.14 $AAC

Description:

Clears the status of the latched digital input and output channels.

Syntax:

$AAC[CHKSUM](CR)

$ Delimiter character

AA Address of the module to be cleared (00 to FF)

C Command to clear the status of the latched digital input channels

Response:

Valid command: **!AA[CHKSUM](CR)**

Invalid command: **?AA[CHKSUM](CR)**

! Delimiter character for a valid command

? Delimiter character for an invalid command

AA Address of the responding module (00 to FF)

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

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Examples:

Command: $01L0 Response: !FFFF00

Sends the command to read the status of the low latched digital input channels of module 01 and returns FFFF.

Command: $01C Response: !01

Sends the command to clear the status of the latched digital input channels of module 01 and returns a valid response.

Command: $01L0 Response: !000000

Sends the command to read the status of the low latched digital input channels of module 01 and returns 0000.

Related Commands:

Section 2.17 $AALS

Notes:

1. This command is only applicable to the modules with digital input channels.
2. Both the status of the low and high latched digital input channels are cleared.

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2.15 $AACN

Description:

Clears the digital input counter of channel N.

Syntax:

$AACN[CHKSUM](CR)

$	Delimiter character
AA	Address of the module to be cleared (00 to FF)
C	Command to clear the digital input counter
N	The channel to be cleared (0 to F).

Response:

Valid Command: **!AA[CHKSUM](CR)**

Invalid Command: **?AA[CHKSUM](CR)**

!	Delimiter character for a valid command
?	Delimiter character for an invalid command. An invalid command is returned if the specified channel is incorrect.
AA	Address of the responding module (00 to FF)

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

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Examples:

Command: #032 Response: !0300103

Reads counter data from channel 2 of module 03 and the returned counter value is 103.

Command: $03C2 Response: !03

Clears the counter value of channel 2 of module 03 and returns a valid response.

Command: #032 Response: !0300000

Reads counter data from channel 2 of module 03 and the returned counter value is 3.

Related Commands:

Section 2.9 #AAN

Notes:

This command is only applicable to the module with digital inputs.

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2.16 $AAF

Description:

Reads the firmware version of a module.

Syntax:

$AAF[CHKSUM](CR)

$	Delimiter character
AA	Address of the module to be read (00 to FF)
F	Command to read the firmware version

Response:

Valid command: **!AA(Data)[CHKSUM](CR)**

Invalid command: **?AA[CHKSUM](CR)**

!	Delimiter character for a valid command
?	Delimiter character for an invalid command
AA	Address of the responding module (00 to FF)
(Data)	Firmware version string of the module

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:

Command: $01F Response: !01A2.0

Reads the firmware version of module 01, and shows that it is version A2.0.

Command: $02F Response: !02B1.1

Reads the firmware version of module 02, and shows that it is version B1.1.

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2.17 $AALS

Description:

Reads the status of the latched digital input and output channels.

Syntax:

$AALS[CHKSUM](CR)

$	Delimiter character
AA	Address of the module to be read (00 to FF)
L	Command to read the latched status
S	0: read the low latched status 1: read the high latched status

Response:

Valid command: **!(Data)[CHKSUM](CR)**

Invalid command: **?AA[CHKSUM](CR)**

!	Delimiter character for a valid command
?	Delimiter character for an invalid command
AA	Address of the responding module (00 to FF)
(Data)	Status of the latched digital input channels, a four-digit hexadecimal value followed by 00. See Section 1.10 for details.

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

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Examples:

Command: $01L0 Response: !FFFF00

Sends the command to read the status of the low latched digital input channels of module 01 and returns FFFF.

Command: $01C Response: !01

Sends the command to clear the status of the latched digital input channels of module 01 and returns a valid response.

Command: $01L0 Response: !000000

Sends the command to read the status of the low latched digital input channels of module 01 and returns 0000.

Related Commands:

Section 2.14 $AAC

Related Topics:

Section 1.10 Configuration Tables

Notes:

This command is only applicable to the modules with digital input channels.

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2.18 $AAM

Description:

Reads the name of a module.

Syntax:

$AAM[CHKSUM](CR)

$	Delimiter character
AA	Address of the module to be read (00 to FF)
M	Command to read the module name

Response:

Valid command: **!AA(Data)[CHKSUM](CR)**

Invalid command: **?AA[CHKSUM](CR)**

!	Delimiter character for a valid command
?	Delimiter character for an invalid command
AA	Address of the responding module (00 to FF)
(Name)	Name string of the module

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:

Command: $01M Response: !017042

Reads the module name of module 01 and returns the name “7042”.

Related Commands:

Section 2.23 ~AAO(Name)

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2.19 $AAP

Description:

Reads the communication protocol information.

Syntax:

$AAP[CHKSUM](CR)

$	Delimiter character
AA	Address of the module to be read (00 to FF)
P	Command to read the communication protocol

Response:

Valid Response: !AASC[CHKSUM](CR)

Invalid Response: ?AA[CHKSUM](CR)

!	Delimiter character for a valid response
?	Delimiter character for an invalid response
AA	Address of the responding module (00 to FF)
S	The protocols supported by the module 0: only DCON protocol is supported 1: both the DCON and Modbus RTU protocols are supported
C	The current protocol that is saved in the EEPROM that will be used at the next power-on reset 0: the protocol set in the EEPROM is DCON 1: the protocol set in the EEPROM is Modbus RTU

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

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Examples:

Command: $01P Response: !0110

Reads the communication protocol of module 01 and returns a response of 10 meaning that it supports both the DCON and Modbus RTU protocols and the protocol that will be used at the next power-on reset is DCON.

Related Commands:

Section 2.20 $AAPN

Supported modules

M-7060/M-7060D/M-7067/M-7067D/M-7050/M-7050D/M-7051/M-7051D/M-7052/M-7052D/M-7053/M-7053D/M-7055/M-7055D/M-7041/M-7041D/M-7045/M7045D

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2.20 $AAPN

Description:

Sets the communication protocol.

Syntax:

$AAPN[CHKSUM](CR)

$	Delimiter character
AA	Address of the module to be read (00 to FF)
P	Command to set the communication protocol
N	0: DCON protocol 1: Modbus RTU protocols Before using this command, the rear slide switch must be in the INIT position. The new protocol is saved in the EEPROM and will be effective after the next power-on reset.

Response:

Valid Response: !AASC[CHKSUM](CR)

Invalid Response: ?AA[CHKSUM](CR)

!	Delimiter character for a valid response
?	Delimiter character for an invalid response
AA	Address of the responding module (00 to FF)

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

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Examples:

Command: $01P1 Response: ?01

Sets the communication protocol of module 01 to Modbus RTU and returns an invalid response because the module is not in INIT mode.

Command: $01P1 Response: !01

Sets the communication protocol of module 01 to Modbus RTU and returns a valid response.

Related Commands:

Section 2.19 $AAP

Supported modules

M-7060/M-7060D/M-7067/M-7067D/M-7050/M-7050D/M-7051/M-7051D/M-7052/M-7052D/M-7053/M-7053D/M-7055/M-7055D/M-7041/M-7041D/M-7045/M7045D

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2.21 @AA

Description:

Reads the status of the digital input/output ports.

Syntax:

@AA[CHKSUM](CR)

@	Delimiter character
AA	Address of the module to be read (00 to FF)

Response:

Valid command: **>(Data)[CHKSUM](CR)**

Invalid command: **?AA[CHKSUM](CR)**

>	Delimiter character for a valid command
?	Delimiter character for an invalid command or invalid type code
AA	Address of the responding module (00 to FF)
(Data)	Status of the digital input/output ports, a four-digit hexadecimal value. See Section 1.10 for details.

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

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Examples:

Command: @01 Response: >0F00

Reads the digital input/output port status of module 01 (I-7060) and returns 0F00h, which denotes that RL1, RL2, RL3 and RL4 are on and IN1, IN2, IN3 and IN4 are off.

Related Commands:

Section 2.13 $AA6

Related Topics:

Section 1.10 Configuration Tables

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2.22 @AA(Data)

Description:

Sets the digital output channels.

Syntax:

@AA(Data)[CHKSUM](CR)

@	Delimiter character
AA	Address of the module to be set (00 to FF)
(Data)	Data to be written to the digital output channels. For the I-7060 and I-7063 series, it is a one-digit hexadecimal value. For the I-7044, I-7050, I-7055, I-7065, I-7066 and I-7067 series, it is a two-digit hexadecimal value. For the I-7042, I-7043 and I-7045 series, it is a four-digit hexadecimal value. Bit 0 of the value corresponds to DO0 and bit 1 of the value corresponds to DO1, etc. When the bit is 1, it denotes that the digital output channel is on, and 0 denotes that the digital output channel is off.

Response:

Valid command: **>[CHKSUM](CR)**
Invalid command: **?[CHKSUM](CR)**
Ignored command: **![CHKSUM](CR)**

>	Delimiter character for a valid command
?	Delimiter character for an invalid command
!	Delimiter character for an ignored command. A host watchdog timeout has occurred, the digital output ports are set to safe value, and the digital output value that was sent is ignored.

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There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:

Command: @017 Response: >

For the I-7060 module, sets DO0 to on, DO1 to on, DO2 to on, and DO3 to off, and the module returns a valid response.

Command: @0207 Response: >

For the I-7050 module, sets DO0 to on, DO1 to on, DO2 to on, and other channels to off, and the module returns a valid response.

Command: @030001 Response: >

For the I-7045 module, sets DO0 to on and other channels to off, and the module returns a valid response.

Related Commands:

Section 2.21 @AA

Related Topics:

Section 1.11 DIO Active States

Notes:

This command is only applicable to the modules with digital output channels.

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2.23 ~AAO(Name)

Description:

Sets the name of a module.

Syntax:

~AAO(Name)[CHKSUM](CR)

~	Delimiter character
AA	Address of the module to be set (00 to FF)
O	Command to set the module name
(Name)	New name of the module (max. 6 characters).

Response:

Valid command: **!AA[CHKSUM](CR)**

Invalid command: **?AA[CHKSUM](CR)**

!	Delimiter character for a valid command
?	Delimiter character for an invalid command
AA	Address of the responding module (00 to FF)

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

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Examples:

Command: ~01O7050N Response: !01

Sets the name of module 01 to be “7050N” and returns a valid response.

Command: $01M Response: !017050N

Reads the name of module 01 and returns the name “7050N”.

Related Commands:

Section 2.18 $AAM

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2.24 ~**

Description:
Informs all modules that the host is OK.

Syntax:
~[CHKSUM](CR)**

~ Delimiter character

** Host OK command

Response:
No response.

Examples:
Command: ~** No response

Sends a “Host OK” command to all modules.

Related Commands:
Section 2.25 ~AA0, Section 2.26 ~AA1, Section 2.27 ~AA2, Section 2.28 ~AA3EVV, Section 2.29 ~AA4V, Section 2.30 ~AA5V

Related Topics:
Section A.2 Dual Watchdog Operation

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2.25 ~AA0

Description:

Reads the host watchdog status of a module.

Syntax:

~AA0[CHKSUM](CR)

~	Delimiter character
AA	Address of the module to be read (00 to FF)
0	Command to read the module status

Response:

Valid command: **!AASS[CHKSUM](CR)**

Invalid command: **?AA[CHKSUM](CR)**

!	Delimiter character for a valid command
?	Delimiter character for an invalid command
AA	Address of the responding module (00 to FF)
SS	Two hexadecimal digits that represent the host watchdog status, where: Bit 7: 0 indicates that the host watchdog is disabled, and 1 indicates that the host watchdog is enabled, Bit 2: 1 indicates that a host watchdog timeout has occurred, and 0 indicates that no host watchdog timeout has occurred. The host watchdog status is stored in EEPROM and can only be reset by using the ~AA1 command.

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There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:

Command: ~010 Response: !0100

Reads the host watchdog status of module 01 and returns 00, meaning that the host watchdog is disabled and no host watchdog timeout has occurred.

Command: ~020 Response: !0204

Reads the host watchdog status of module 02 and returns 04, meaning that a host watchdog timeout has occurred.

Related Commands:

Section 2.24 ~**, Section 2.26 ~AA1, Section 2.27 ~AA2, Section 2.28 ~AA3EVV, Section 2.29 ~AA4V, Section 2.30 ~AA5V

Related Topics:

Section A.2 Dual Watchdog Operation

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2.26 ~AA1

Description:

Resets the host watchdog timeout status of a module.

Syntax:

~AA1[CHKSUM](CR)

~	Delimiter character
AA	Address of the module to be reset (00 to FF)
1	Command to reset the host watchdog timeout status

Response:

Valid command: **!AA[CHKSUM](CR)**

Invalid command: **?AA[CHKSUM](CR)**

!	Delimiter character for a valid command
?	Delimiter character for an invalid command
AA	Address of the responding module (00 to FF)

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

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Examples:

Command: ~010 Response: !0104

Reads the host watchdog status of module 01 and shows that a host watchdog timeout has occurred.

Command: ~011 Response: !01

Resets the host watchdog timeout status of module 01 and returns a valid response.

Command: ~010 Response: !0100

Reads the host watchdog status of module 01 and shows that no host watchdog timeout has occurred.

Related Commands:

Section 2.24 ~**, Section 2.25 ~AA0, Section 2.27 ~AA2, Section 2.28 ~AA3EVV, Section 2.29 ~AA4V, Section 2.30 ~AA5V

Related Topics:

Section A.2 Dual Watchdog Operation

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2.27 ~AA2

Description:

Reads the host watchdog timeout value of a module.

Syntax:

~AA2[CHKSUM](CR)

~	Delimiter character
AA	Address of the module to be read (00 to FF)
2	Command to read the host watchdog timeout value

Response:

Valid command : **!AAEVV[CHKSUM](CR)**

Invalid command: **?AA[CHKSUM](CR)**

!	Delimiter character for a valid command
?	Delimiter character for an invalid command
AA	Address of the responding module (00 to FF)
E	1: the host watchdog is enabled 0: the host watchdog is disabled
VV	Two hexadecimal digits to represent the timeout value in tenths of a second, for example, 01 denotes 0.1 seconds and FF denotes 25.5 seconds.

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

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Examples:

Command: ~012 Response: !011FF

Reads the host watchdog timeout value of module 01 and returns FF, which denotes that the host watchdog is enabled and the host watchdog timeout value is 25.5 seconds.

Related Commands:

Section 2.24 ~**, Section 2.25 ~AA0, Section 2.26 ~AA1, Section 2.28 ~AA3EVV, Section 2.29 ~AA4V, Section 2.30 ~AA5V

Related Topics:

Section A.2 Dual Watchdog Operation

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2.28 ~AA3EVV

Description:

Enables/disables the host watchdog and sets the host watchdog timeout value of a module.

Syntax:

~AA3EVV[CHKSUM](CR)

~	Delimiter character
AA	Address of the module to be set (00 to FF)
3	Command to set the host watchdog
E	1: enable the host watchdog 0: disable the host watchdog
VV	Two hexadecimal digits to represent the timeout value in tenths of a second, for example, 01 denotes 0.1 seconds and FF denotes 25.5 seconds.

Response:

Valid command: **!AA[CHKSUM](CR)**

Invalid command: **?AA[CHKSUM](CR)**

!	Delimiter character for a valid command
?	Delimiter character for an invalid command
AA	Address of the responding module (00 to FF)

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

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Examples:

Command: ~013164 Response: !01

Enables the host watchdog of module 01 and sets the host watchdog timeout value to 10.0 seconds. The module returns a valid response.

Command: ~012 Response: !01164

Reads the host watchdog timeout value of module 01. The module returns 164, which denotes that the host watchdog is enabled and the host watchdog timeout value is 10.0 seconds.

Related Commands:

Section 2.24 ~**, Section 2.25 ~AA0, Section 2.26 ~AA1, Section 2.27 ~AA2, Section 2.29 ~AA4V, Section 2.30 ~AA5V

Related Topics:

Section A.2 Dual Watchdog Operation

Notes:

When a host watchdog timeout occurs, the host watchdog is disabled. The ~AA3EVV command should be sent again to reenable the host watchdog.

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2.29 ~AA4V

Description:

Reads the power-on DO value or the safe DO value of a module.

Syntax:

~AA4V[CHKSUM](CR)

~	Delimiter character
AA	Address of the module to be read (00 to FF)
4	Command to read the power-on DO value or the safe DO value
V	P: Reads the power-on DO value S: Reads the safe DO value

Response:

Valid command : **!AA(Data)[CHKSUM](CR)**

Invalid command: **?AA[CHKSUM](CR)**

!	Delimiter character for a valid command
?	Delimiter character for an invalid command
AA	Address of the responding module (00 to FF)
(Data)	Power-on DO value or safe DO value. For the I-7042/42D/43/43D/45/45D modules, they are four hexadecimal digits. For other modules, they are two hexadecimal digits followed by 00.

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

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Examples:

Command: ~014S Response: !010000

Reads the safe DO value of module 01 and returns 0000.

Command: ~014P Response: !01FF00

Reads the power-on DO value of module 01 and returns FF00.

Related Commands:

Section 2.30 ~AA5V

Related Topics:

Section 1.11 DIO Active States, Section A.2 Dual Watchdog Operation

Notes:

This command is only applicable to the modules with digital output channels.

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2.30 ~AA5V

Description:

Sets the current DO value as the power-on DO value or the safe DO value.

Syntax:

~AA5V[CHKSUM](CR)

~	Delimiter character
AA	Address of the module to be set (00 to FF)
5	Command to set the power-on value or the safe DO value
V	P: Sets the power-on DO value S: Sets the safe DO value

Response:

Valid command: **!AA[CHKSUM](CR)**

Invalid command: **?AA[CHKSUM](CR)**

!	Delimiter character for a valid command
?	Delimiter character for an invalid command
AA	Address of the responding module (00 to FF)

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

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Examples:

Command: @01AA Response: >

Sets the DO value of module 01 to AA and the module returns a valid response.

Command: ~015P Response: !01

Sets the power-on DO value and the module returns a valid response.

Command: @0155 Response: >

Sets the DO value of module 01 to 55 and the module returns a valid response.

Command: ~015S Response: !01

Sets the safe DO value and the module returns a valid response.

Command: ~014P Response: !01AA00

Reads the power-on DO value of module 01. The module returns AA00, which denotes that the power-on DO value is AA.

Command: ~014S Response: !015500

Reads the safe DO value of module 01. The module returns 5500, which denotes that the safe DO value is 55.

Related Commands:

Section 2.29 ~AA4V

Related Topics:

Section A.2 Dual Watchdog Operation

Notes:

This command is only applicable to the modules with the digital output channels.

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2.31 ~AAD

Description:

Reads the miscellaneous settings of a module.

Syntax:

~AAD[CHKSUM](CR)

~	Delimiter character
AA	Address of the module to be read (00 to FF)
D	Command to read the miscellaneous settings

Response:

Valid Command: **!AAVV[CHKSUM](CR)**

Invalid Command: **?AA[CHKSUM](CR)**

!	Delimiter character for a valid command
?	Delimiter character for an invalid command
AA	Address of the responding module (00 to FF)
VV	Two hexadecimal digits that represent the miscellaneous settings as follows:

7	6	5	4	3	2	1	0
Reserved						OA	IA

Key	Description
OA	DO active state 0: output value 1 for relay active output value 0 for relay inactive 1: output value 0 for relay active output value 1 for relay inactive
IA	DI active state 0: input value 1 for non-signal or the low voltage; input value 0 for high voltage 1: input value 0 for non-signal or the low voltage; input value 1 for high voltage

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There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:

Command: ~01D Response: !0101

Reads the miscellaneous settings of module 01 and returns 01.

Related Commands:

Section 2.32 ~AADVV

Notes:

This command is only applicable to the M-7000 DIO modules.

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2.32 ~AADVV

Description:

Sets the miscellaneous settings of a module.

Syntax:

~AADVV[CHKSUM](CR)

~ Delimiter character

AA Address of the module to be set (00 to FF)

D Command to set the miscellaneous settings

VV Two hexadecimal digits that represent the miscellaneous settings as follows:

7	6	5	4	3	2	1	0
Reserved						OA	IA

Key	Description
OA	DO active state 0: output value 1 for relay active output value 0 for relay inactive 1: output value 0 for relay active output value 1 for relay inactive
IA	DI active state 0: input value 1 for non-signal or the low voltage; input value 0 for high voltage 1: input value 0 for non-signal or the low voltage; input value 1 for high voltage

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Response:

Valid Command: **!AA[CHKSUM](CR)**
Invalid Command: **?AA[CHKSUM](CR)**

!	Delimiter character for a valid command
?	Delimiter character for an invalid command
AA	Address of the responding module (00 to FF)

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:

Command: ~01D01 Response: !01

Sets the miscellaneous settings of module 01 to 01, and returns a valid response.

Related Commands:

Section 2.31 ~AAD

Notes:

This command is only applicable to the M-7000 DIO modules.

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2.33 ~AASF

Description:
Reads the digital software filter setting of a module.

Syntax:
~AASF[CHKSUM](CR)

~	Delimiter character
AA	Address of the module to be read (00 to FF)
SF	Command to read the digital software filter setting

Response:
Valid Command: **!AAVV[CHKSUM](CR)**
Invalid Command: **?AA[CHKSUM](CR)**

!	Delimiter character for a valid command
?	Delimiter character for an invalid command
AA	Address of the responding module (00 to FF)
VV	Two hexadecimal digits that represent the digital software time in milliseconds.

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:
Command: ~01SF Response: !0103
Reads the digital software filter setting of module 01 and returns 03.

Related Commands:
Section 2.34 ~AASFVV

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Notes:

1. For a pulse signal to be not filtered, both the interval of the high and low levels must be larger than the filter time.
2. The modules which support the command are as follows.
   I-7041/M-7041 firmware version B3.0 and later
   I-7050 firmware version B2.1 and later
   I-7051/M-7051 firmware version B3.0 and later
   I-7052/M-7052 firmware version B3.0 and later
   I-7053/M-7053 firmware version B2.5 and later
   I-7055 firmware version B2.1 and later
   M-7055 firmware version B3.0 and later
   I-7060/M-7060 firmware version B3.0 and later
   I-7065/M-7065 firmware version B3.0 and later

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2.34 ~AASFVV

Description:

Sets the digital software filter setting of a module.

Syntax:

~AASFVV[CHKSUM](CR)

~	Delimiter character
AA	Address of the module to be set (00 to FF)
SF	Command to set the digital software filter setting
VV	Two hexadecimal digits that represent the digital software filter time in milliseconds (00 to FF).

Response:

Valid Command: **!AA[CHKSUM](CR)**

Invalid Command: **?AA[CHKSUM](CR)**

!	Delimiter character for a valid command
?	Delimiter character for an invalid command
AA	Address of the responding module (00 to FF)

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:

Command: ~01SF14 Response: !01

Sets the digital software filter time of module 01 to 0x14, 20 milliseconds, and returns a valid response.

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Related Commands:

Section 2.33 ~AASF

Notes:

1. For a pulse signal to be not filtered, both the interval of the high and low levels must be larger than the filter time.
2. The modules which support the command are as follows.
   I-7041/M-7041 firmware version B3.0 and later
   I-7050 firmware version B2.1 and later
   I-7051/M-7051 firmware version B3.0 and later
   I-7052/M-7052 firmware version B3.0 and later
   I-7053/M-7053 firmware version B2.5 and later
   I-7055 firmware version B2.1 and later
   M-7055 firmware version B3.0 and later
   I-7060/M-7060 firmware version B3.0 and later
   I-7065/M-7065 firmware version B3.0 and later

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3. Modbus RTU Protocol

The Modbus protocol is developed by Modicon Inc., originally developed for Modicon controllers. Detailed information can be found at http://www.modicon.com/techpubs/toc7.html. You can also visit http://www.modbus.org to find more valuable information.

M-7000 series modules support the Modbus RTU protocol. The communication Baud Rates range from 1200bps to 115200bps. The parity, data bits and stop bits are fixed as no parity, 8 data bits and 1 stop bit. The following Modbus functions are supported.

Function code	Description	Section
01 (0x01)	Read coils	3.1
02 (0x02)	Read discrete inputs	3.2
03 (0x03)	Read multiple registers	3.3
04 (0x04)	Read multiple input registers	3.4
05 (0x05)	Write single coil	3.5
15 (0x0F)	Write multiple coils	3.6
70 (0x46)	Read/write module settings	3.7

If the function specified in the message is not supported, then the module responds as follows.

Error Response

00	Address	1 Byte	1 to 247
01	Function code	1 Byte	Function code + 0x80
02	Exception code	1 Byte	01

If a CRC mismatch occurs, the module will not respond.

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3.1 01 (0x01) Read Coils

This function code is used to read the current digital output read back value of the M-7000 DIO module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x01
02 ~ 03	Starting channel numbers	2 Bytes	0x0000~0x001F for DO read back value 0x0020~0x003F for DI value 0x0040~0x005F for DIO Latch high value 0x0060~0x007F for DIO Latch low value
04 ~ 05	Output channel number	2 Bytes	0x0001 ~ 0x001F

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x01
02	Byte count	1 Byte	1
03	Output channel read back value	1 Byte	Refer to the Supported Modules section for the details of the value

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x81
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

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Supported Modules

M-7060/M-7060D:

Valid starting channel	0x0000~0x 0003 for DO read back value
	0x0020~0x0023 for DI value
	0x0040~0x0043 for DI Latch high value 0x0044~0x0047 for DO Latch high value
	0x0060~0x0063 for DI Latch low value 0x0064~0x0067 for DO Latch low value

M-7061/M-7061D:

Valid starting channel	0x0000~0x 000B for DO read back value
	0x0040~0x004B for DO Latch high value
	0x0060~0x006B for DO Latch low value

M-7064/M-7064D:

Valid starting channel	0x0000~0x 0007 for DO read back value
	0x0040~0x0047 for DO Latch high value
	0x0060~0x0067 for DO Latch low value

M-7067/M-7067D:

Valid starting channel	0x0000~0x 0006 for DO read back value
	0x0040~0x0046 for DO Latch high value
	0x0060~0x0066 for DO Latch low value

M-7055/M-7055D/M-7055U/M-7055UD:

Valid starting channel	0x0000~0x 0007 for DO read back value
	0x0020~0x0027 for DI value
	0x0040~0x0047 for DI Latch high value 0x0048~0x004F for DO Latch high value
	0x0060~0x0067 for DI Latch low value 0x0068~0x006F for DO Latch low value

M-7052/M-7052D:

Valid starting channel	0x0020~0x0027 for DI value
	0x0040~0x0047 for DI Latch high value
	0x0060~0x0067 for DI Latch low value

M-7053/M-7053D:

Valid starting channel	0x0020~0x002F for DI value
	0x0040~0x004F for DI Latch high value
	0x0060~0x006F for DI Latch low value

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M-7058/M-7058D/M-7059/M-7059D:

Valid starting channel	0x0020~0x0027 for DI value
	0x0040~0x0047 for DI Latch high value
	0x0060~0x0067 for DI Latch low value

M-7058-16/M-7058D-16/M-7059-16/M-7059D-16:

Valid starting channel	0x0000~0x 0001 for DO read back value
	0x0020~0x002F for DI value
	0x0040~0x004F for DI Latch high value 0x0050~0x0051 for DO Latch high value
	0x0060~0x006F for DI Latch low value 0x0070~0x0071 for DO Latch low value

M-7041/M-7041D:

Valid starting channel	0x0020~0x002D for DI value
	0x0040~0x004D for DI Latch high value
	0x0060~0x006D for DI Latch low value

M-7043/M-7043D:

Valid starting channel	0x0000~0x 000F for DO read back value
	0x0040~0x004F for DO Latch high value
	0x0060~0x006F for DO Latch low value

M-7045/M-7045D:

Valid starting channel	0x0000~0x 000F for DO read back value
	0x0040~0x004F for DO Latch high value
	0x0060~0x006F for DO Latch low value

M-7046/M-7046D:

Valid starting channel	0x0020~0x002E for DI value
	0x0040~0x004E for DI Latch high value
	0x0060~0x006E for DI Latch low value

M-7051/M-7051D:

Valid starting channel	0x0020~0x002F for DI value
	0x0040~0x004F for DI Latch high value
	0x0060~0x006F for DI Latch low value

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M-7050/M-7050D:

Valid starting channel	0x0000~0x 0007 for DO read back value
	0x0020~0x0026 for DI value
	0x0040~0x0046 for DI Latch high value 0x0048~0x004F for DO Latch high value
	0x0060~0x0066 for DI Latch low value 0x0068~0x006F for DO Latch low value

M-7054/M-7054D:

Valid starting channel	0x0000~0x 000F for DO readback value
	0x0020~0x002F for DI value
	0x0040~0x004F for DI Latch high value 0x0050~0x005F for DO Latch high value
	0x0060~0x006F for DI Latch low value 0x0070~0x007F for DO Latch low value

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3.2 02 (0x02) Read Discrete Inputs

This function code is used to read the current digital input value of the M-7000 DIO module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x02
02 ~ 03	Starting channel	2 Bytes	0x0000 ~ 0x001F
04 ~ 05	Input channel number	2 Bytes	0x0001 ~ 0x0020

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x02
02	Byte count	1 Byte	1
03	Input channel data	1 Byte	Refer to the Supported Modules section for details of the value.

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x82
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported Modules

M-7060/M-7060D:

Valid starting channel	0x0000~0x 0003 for DI value

M-7055/M-7055D/M-7055U/M-7055UD:

Valid starting channel	0x0000~0x 0007 for DI value

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M-7052/M-7052D:

Valid starting channel	0x0000~0x0007 for DI value

M-7053/M-7053D:

Valid starting channel	0x0000~0x000F for DI value

M-7058/M-7058D/M-7059/M-7059D:

Valid starting channel	0x0000~0x0007 for DI value

M-7058-16/M-7058D-16/M-7059-16/M-7059D-16:

Valid starting channel	0x0000~0x000F for DI value

M-7041/M-7041D:

Valid starting channel	0x0000~0x000D for DI value

M-7046/M-7046D:

Valid starting channel	0x0000~0x000E for DI value

M-7051/M-7051D:

Valid starting channel	0x0000~0x000F for DI value

M-7050/M-7050D:

Valid starting channel	0x0000~0x 0006 for DI value

M-7054/M-7054D:

Valid starting channel	0x0000~0x 000F for DI value

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3.3 03 (0x03) Read Multiple Registers

This function code is used to read the current digital input counter value of the M-7000 DIO module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x03
02 ~ 03	Starting channel numbers	2 Bytes	0x0000 ~ 0x001F
04 ~ 05	Input channel number	2 Bytes	0x0001 ~ 0x0020

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x03
02	Byte count	1 Byte	1
03~	Input channel counter value	*N x 2 Bytes	Each channel can record a maximum counter value up to 65535 (0xFFFF).

*N = Number of input channels

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x83
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported Modules

M-7060/M-7060D:

Valid starting channel	0x0000~0x 0003 for DI counter value

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M-7055/M-7055D/M-7055U/M-7055UD:

Valid starting channel	0x0000~0x 0007 for DI counter value

M-7052/M-7052D:

Valid starting channel	0x0000~0x 0007 for DI counter value

M-7053/M-7053D:

Valid starting channel	0x0000~0x000F for DI counter value

M-7058/M-7058D/M-7059/M-7059D:

Valid starting channel	0x0000~0x 0007 for DI counter value

M-7058-16/M-7058D-16/M-7059-16/M-7059D-16:

Valid starting channel	0x0000~0x 000F for DI counter value

M-7041/M-7041D:

Valid starting channel	0x0000~0x000D for DI counter value

M-7046/M-7046D:

Valid starting channel	0x0000~0x000E for DI counter value

M-7051/M-7051D:

Valid starting channel	0x0000~0x000F for DI counter value

M-7050/M-7050D:

Valid starting channel	0x0000~0x0006 for DI counter value

M-7054/M-7054D:

Valid starting channel	0x0000~0x000F for DI counter value

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3.4 04 (0x04) Read Multiple Input Registers

This function code is used to read the current digital input counter value of the M-7000 DIO module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x04
02 ~ 03	Starting channel numbers	2 Bytes	0x0000 ~ 0x001F
04 ~ 05	Input channel number	2 Bytes	0x0001 ~ 0x0020

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x04
02	Byte count	1 Byte	1
03~	Input channel counter value	*N x 2 Bytes	Each channel can record the maximum counter value up to 65535 (0xFFFF).

*N = Number of input channels

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x84
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported Modules

M-7060/M-7060D:

Valid starting channel	0x0000~0x 0003 for DI counter value

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M-7055/M-7055D/M-7055U/M-7055UD:

Valid starting channel	0x0000~0x 0007 for DI counter value

M-7052/M-7052D:

Valid starting channel	0x0000~0x 0007 for DI counter value

M-7053/M-7053D:

Valid starting channel	0x0000~0x000F for DI counter value

M-7058/M-7058D/M-7059/M-7059D:

Valid starting channel	0x0000~0x 0007 for DI counter value

M-7058-16/M-7058D-16/M-7059-16/M-7059D-16:

Valid starting channel	0x0000~0x 000F for DI counter value

M-7041/M-7041D:

Valid starting channel	0x0000~0x000D for DI counter value

M-7046/M-7046D:

Valid starting channel	0x0000~0x000E for DI counter value

M-7051/M-7051D:

Valid starting channel	0x0000~0x000F for DI counter value

M-7050/M-7050D:

Valid starting channel	0x0000~0x0006 for DI counter value

M-7054/M-7054D:

Valid starting channel	0x0000~0x000F for DI counter value

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3.5 05 (0x05) Write Single Coil

This function code is used to write the digital output value of the M-7000 DIO module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x05
02 ~ 03	Output channel numbers	2 Bytes	0x0000 ~ 0x001F 0x0100 to clear the latch value 0x0200~0x021F to clear the DI counter value
04 ~ 05	Output value	2 Bytes	A value of 0xFF00 sets the output to ON. A value of 0x0000 sets it to OFF. All other values are illegal and will not affect the coil.

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x05
02 ~ 03	Output channel numbers	2 Bytes	The value is the same as byte 02 and 03 of the Request
04 ~ 05	Output value	2 Bytes	The value is the same as byte 04 and 05 of the Request

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x85
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

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Supported Modules

M-7060/M-7060D:

Valid output channel	0x0000~0x0003 for DO output
	0x0100, for firmware version 199 and earlier, or 0x0107, for firmware version 200 and later, to clear the DIO latch value. If setting this channel to ON, the latch value will become 0. 0x0200~0x0203 to clear the DI counter value

M-7061/M-7061D:

Valid starting channel	0x0000~0x 000B for DO output
	0x0100, for firmware version 199 and earlier, or 0x0107, for firmware version 200 and later, to clear the DO latch value. If setting this channel to ON, the latch value will become 0.

M-7064/M-7064D:

Valid starting channel	0x0000~0x 0007 for DO output
	0x0100, for firmware version 199 and earlier, or 0x0107, for firmware version 200 and later, to clear the DO latch value. If setting this channel to ON, the latch value will become 0.

M-7067/M-7067D:

Valid starting channel	0x0000~0x 0006 for DO output
	0x0100, for firmware version 199 and earlier, or 0x0107, for firmware version 200 and later, to clear the DO latch value. If setting this channel to ON, the latch value will become 0.

M-7055/M-7055D/M-7055U/M-7055UD:

Valid output channel	0x0000~0x 0007 for DO output
	0x0100, for firmware version 199 and earlier, or 0x0107, for firmware version 200 and later, to clear the DIO latch value. If setting this channel to ON, the latch value will become 0. 0x0200~0x0207 to clear the DI counter value

M-7052/M-7052D:

Valid output channel	0x0100, for firmware version 199 and earlier, or 0x0107, for firmware version 200 and later, to clear the DI latch value. If setting this channel to ON, the latch value will become 0. 0x0200~0x0207 to clear the DI counter value

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M-7053/M-7053D:

Valid output channel	0x0100, for firmware version 199 and earlier, or 0x0107, for firmware version 200 and later, to clear the DI latch value. If setting this channel to ON, the latch value will become 0. 0x0200~0x020F to clear the DI counter value

M-7058/M-7058D/M-7059/M-7059D:

Valid output channel	0x0100, for firmware version 199 and earlier, or 0x0107, for firmware version 200 and later, to clear the DI latch value. If setting this channel to ON, the latch value will become 0. 0x0200~0x0207 to clear the DI counter value

M-7058-16/M-7058D-16/ M-7059-16/M-7059D-16:

Valid starting channel	0x0000~0x 0001 for DO output
	0x0107 to clear the DO latch value. If setting this channel to ON, the latch value will become 0. 0x0200~0x020F to clear the DI counter value

M-7041/M-7041D:

Valid output channel	0x0100, for firmware version 199 and earlier, or 0x0107, for firmware version 200 and later, to clear the DI latch value. If setting this channel to ON, the latch value will become 0. 0x0200~0x020D to clear the DI counter value

M-7043/M-7043D:

Valid starting channel	0x0000~0x 000F for DO output
	0x0100, for firmware version 199 and earlier, or 0x0107, for firmware version 200 and later, to clear the DO latch value. If setting this channel to ON, the latch value will become 0.

M-7045/M-7045D:

Valid starting channel	0x0000~0x 000F for DO output
	0x0100, for firmware version 199 and earlier, or 0x0107, for firmware version 200 and later, to clear the DO latch value. If setting this channel to ON, the latch value will become 0.

M-7046/M-7046D:

Valid output channel	0x0100, for firmware version 199 and earlier, or 0x0107, for firmware version 200 and later, to clear the DI latch value. If setting this channel to ON, the latch value will become 0. 0x0200~0x020E to clear the DI counter value

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M-7051/M-7051D:

Valid output channel	0x0100, for firmware version 199 and earlier, or 0x0107, for firmware version 200 and later, to clear the DI latch value. If setting this channel to ON, the latch value will become 0. 0x0200~0x020F to clear the DI counter value

M-7050/M-7050D:

Valid output channel	0x0000~0x 0007 for DO output
	0x0100, for firmware version 199 and earlier, or 0x0107, for firmware version 200 and later, to clear the DIO latch value. If setting this channel to ON, the latch value will become 0. 0x0200~0x0206 to clear the DI counter value

M-7054/M-7054D:

Valid output channel	0x0000~0x 000F for DO output
	0x0100, for firmware version 199 and earlier, or 0x0107, for firmware version 200 and later, to clear the DIO latch value. If setting this channel to ON, the latch value will become 0. 0x0200~0x020F to clear the DI counter value

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3.6 15 (0x0F) Write Multiple Coils

This function code is used to write the digital output value of the M-7000 DIO module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x0F
02 ~ 03	Starting channel	2 Bytes	0x0000 ~ 0x001F for DO output 0x0200~0x021F to clear the DI count value
04 ~ 05	Number of output channels	2 Bytes	0x0001 ~ 0x0020
06	Byte count (N)	1 Byte	Number of bytes of the following output values, 0x01 ~ 0x02
07	Data of output channels	N Bytes	A bit corresponds to a channel. When the bit is 1 it denotes that the value of the channel that was set is ON. If the bit is 0 it denotes that the value of the channel that was set is OFF.

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x0F
02 ~ 03	Starting channel	2 Bytes	The value is the same as byte 02 and 03 of the Request
04 ~ 05	Number of output channels	2 Bytes	The value is the same as byte 04 and 05 of the Request

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x8F
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

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Supported Modules

M-7060/M-7060D:

Valid starting channel	0x0000~0x0003 for DO output
	0x0200~0x0203 to clear the DI counter value

M-7061/M-7061D:

Valid starting channel	0x0000~0x000B for DO output

M-7064/M-7064D:

Valid starting channel	0x0000~0x0007 for DO output

M-7067/M-7067D:

Valid starting channel	0x0000~0x0006 for DO output

M-7055/M-7055D/M-7055U/M-7055UD:

Valid starting channel	0x0000~0x0007 for DO output
	0x0200~0x0207 to clear the DI counter value

M-7052/M-7052D:

Valid starting channel	0x0200~0x0207 to clear the DI counter value

M-7053/M-7053D:

Valid starting channel	0x0200~0x020F to clear the DI counter value

M-7058/M-7058D/M-7059/M-7059D:

Valid starting channel	0x0200~0x0207 to clear the DI counter value

M-7058-16/M-7058D-16/ M-7059-16/M-7059D-16:

Valid starting channel	0x0000~0x0001 for DO output
	0x0200~0x020F to clear the DI counter value

M-7041/M-7041D:

Valid starting channel	0x0200~0x020D to clear the DI counter value

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M-7043/M-7043D:

Valid starting channel	0x0000~0x000F for DO output

M-7045/M-7045D:

Valid starting channel	0x0000~0x000F for DO output

M-7046/M-7046D:

Valid starting channel	0x0200~0x020E to clear the DI counter value

M-7051/M-7051D:

Valid starting channel	0x0200~0x020F to clear the DI counter value

M-7050/M-7050D:

Valid starting channel	0x0000~0x0007 for DO output
	0x0200~0x0206 to clear the DI counter value

M-7054/M-7054D:

Valid starting channel	0x0000~0x000F for DO output
	0x0200~0x020F to clear the DI counter value

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3.7 70 (0x46) Read/Write Module Settings

This function code is used to read the settings of the module or change the settings of the module. The following sub-function codes are supported.

Sub-function Code	Description	Section
00 (0x00)	Read the module name	3.7.1
04 (0x04)	Set the module address	3.7.2
05 (0x05)	Read the communication settings	3.7.3
06 (0x06)	Set the communication settings	3.7.4
32 (0x20)	Read the firmware version	3.7.5
33 (0x21)	Set the DI count edge	3.7.6
34 (0x22)	Read the DI count edge setting value	3.7.7
39 (0x27)	Set the DO power-on value	3.7.8
40 (0x28)	Read the DO power-on value	3.7.9
41 (0x29)	Set the DI/O active states	3.7.10
42 (0x2A)	Read the DI/O active states	3.7.11

If the module does not support the sub-function code specified in the message, then it responds as follows:

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0xC6
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

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3.7.1 Sub-function 00 (0x00) Read module name

This sub-function code is used to read the name of a module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x00

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x00
03 ~ 06	Module name	4 Bytes	0x00 0x70 0x60 0x00 for M-7060/M-7060D modules 0x00 0x70 0x67 0x00 for M-7067/M-7060D modules

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0xC6
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported Modules

M-7060/M-7060D/M-7064/M-7064D/M-7067/M-7067D/M-7050/M-7050D/M-7051/M-7051D/M-7052/M-7052D/M-7053/M-7053D/M-7054/M-7054D/M-7055/M-7055DM-7055U/M-7055UD/M-7041/M-7041D/M-7043/M-7043D/M-7045/M-7045D/M-7046/M-7046D

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3.7.2 Sub-function 04 (0x04) Set module address

This sub-function code is used to set the address of a module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x04
03	Address	1 Byte	1 ~ 247
04~ 06	Reserved	3 Bytes	0x00 0x00 0x00

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x04
03	Set address result	1 Byte	0: OK Others: error
04~ 06	Reserved	3 Bytes	0x00 0x00 0x00

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0xC6
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported Modules

M-7060/M-7060D/M-7064/M-7064D/M-7067/M-7067D/M-7050/M-7050D/M-7051/M-7051D/M-7052/M-7052D/M-7053/M-7053D/M-7054/M-7054D/M-7055/M-7055D/M-7055U/M-7055UD/M-7041/M-7041D/M-7043/M-7043D/M-7045/M-7045D/M-7046/M-7046D

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3.7.3 Sub-function 05 (0x05) Read communication settings

This sub-function code is used to read the communication protocol settings of a module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x05
03	Reserved	1 Byte	0x00

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x05
03	Reserved	1 Byte	0x00
04	Baud Rate	1 Byte	Baud rate code, see Section 1.10 for details.
05~ 07	Reserved	3 Bytes	0x00 0x00 0x00
08	Mode	1 Byte	0: DCON protocol 1: Modbus RTU protocol
09~10	Reserved	2 Bytes	0x00 0x00

Note: This information is the data saved in the EEPROM and will be used for the next power-on reset. It is not the currently used settings.

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0xC6
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported Modules

M-7060/M-7060D/M-7064/M-7064D/M-7067/M-7067D/M-7050/M-7050D/M-7051/M-7051D/M-7052/M-7052D/M-7053/M-7053D/M-7054/M-7054D/M-7055/M-7055D/M-7055U/M-7055UD/M-7041/M-7041D/M-7043/M-7043D/M-7045/M-7045D/M-7046/M-7046D

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3.7.4 Sub-function 06 (0x06) Set communication settings

This sub-function code is used to set the communication protocol of a module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x06
03	Reserved	1 Byte	0x00
04	Baud Rate	1 Byte	Baud rate code, see Section 1.10 for details.
05~ 07	Reserved	3 Bytes	0x00 0x00 0x00
08	Mode	1 Byte	0: DCON protocol 1: Modbus RTU protocol
09~10	Reserved	2 Bytes	0x00 0x00

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x06
03	Reserved	1 Byte	0x00
04	Baud Rate	1 Byte	0: OK, others: error
05~ 07	Reserved	3 Bytes	0x00 0x00 0x00
08	Mode	1 Byte	0: OK, others: error
09~10	Reserved	2 Bytes	0x00 0x00

Note: The new baud rate and protocol will be effective after the next power-on reset.

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Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0xC6
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported Module

M-7060/M-7060D/M-7064/M-7064D/M-7067/M-7067D/M-7050/M-7050D/M-7051/M-7051D/M-7052/M-7052D/M-7053/M-7053D/M-7054/M-7054D/M-7055/M-7055D/M-7055U/M-7055UD/M-7041/M-7041D/M-7043/M-7043D/M-7045/M-7045D/M-7046/M-7046D

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3.7.5 Sub-function 32 (0x20) Read firmware version

This sub-function code is used to read the firmware version information of a module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x20

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x20
03	Major version	1 Byte	0x00~0xFF
04	Minor version	1 Byte	0x00~0xFF
05	Build version	1 Byte	0x00~0xFF

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0xC6
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported Modules

M-7060/M-7060D/M-7064/M-7064D/M-7067/M-7067D/M-7050/M-7050D/M-7051/M-7051D/M-7052/M-7052D/M-7053/M-7053D/M-7054/M-7054D/M-7055/M-7055D/M-7055U/M-7055UD/M-7041/M-7041D/M-7043/M-7043D/M-7045/M-7045D/M-7046/M-7046D

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3.7.6 Sub-function 33 (0x21) Set digital input counter trigger edge

This sub-function code is used to set the digital input counter trigger edge value of a module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x21
03	Edge setting value	1 Byte	*0x00~0x0F

*1 = rising edge, 0 = falling edge. For example 0x03 denotes that channels 0~1 are set as rising edge and channels 2~3 are set as falling edge.

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x21
03	Edge setting value	1 Byte	0: OK others: error

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0xC6
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported Modules

M-7060/M-7060D/M-7051/M-7051D/M-7052/M-7052D/M-7053/M-7053D/M-7054/M-7054D/M-7055/M-7055D / M-7055U/M-7055UD/M-7041/M-7041D/M-7046/M-7046D

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3.7.7 Sub-function 34 (0x22) Read digital input counter trigger edge value

This sub-function code is used to read the digital input counter trigger edge value of a module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x22

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x22
03	Edge setting value	1 Byte	*0x00~0x0F

*1 = rising edge, 0 = falling edge. For example 0x03 denotes that channels 0~1 are set as rising edge and channels 2~3 are set as falling edge.

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0xC6
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported Modules

M-7060/M-7060D/M-7050/M-7050D/M-7051/M-7051D/M-7052/M-7052D/M-7053/M-7053D/M-7054/M-7054D/M-7055/M-7055D/ M-7055U/M-7055UD/M-7041/M-7041D/M-7046/M-7046D

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3.7.8 Sub-function 39 (0x27) Set the power-on value

This sub-function code is used to set the power-on value of a module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x27
03	Power-on Value	1 Byte	*0x00~0xFF

*0x00~0x0F for M-7060/M-7060D
0x00~0x7F for M-7067/M-7067D

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x28
03	Power-on value	1 Byte	0: OK, others: error

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0xC6
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported Modules

M-7060/M-7060D/M-7064/M-7064D/M-7067/M-7067D/M-7050/M-7050D/M-7054/M-7054D/M-7055/M-7055D/ M-7055U/M-7055UD/M-7043/M-7043D/M-7045/M7045D

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3.7.9 Sub-function 40 (0x28) Read the power-on value

This sub-function code is used to read the power-on value of a module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x28

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x28
03	Power-on value	1 Byte	*0x00~0xFF

*0x00~0x0F for M-7060/M-7060D
0x00~0x7F for M-7067/M-7067D

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0xC6
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported Modules

M-7060/M-7060D/M-7064/M-7064D/M-7067/M-7067D/M-7050/M-7050D/M-7054/M-7054D/M-7055/M-7055D/ M-7055U/M-7055UD/M-7043/M-7043D/M-7045/M7045D

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3.7.10 Sub-function 41 (0x29) Set DI/O active states

This sub-function code is used to set the DI/O active states of a module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x29
03	DI/O active states	1 Byte	*0x00~0x03 Refer to the table below.

*0x00~0x03 for M-7060/M-7060D
0x00 and 0x02 for M-7067/M-7067D

DI/O active states:

7	6	5	4	3	2	1	0
Reserved						OAS	IAS

Key	Description
OAS	DO active state 0: output value 1 for relay active output value 0 for relay inactive 1: output value 0 for relay active output value 1 for relay inactive
IAS	DI active state 0: input value 1 for non-signal or the low voltage; input value 0 for high voltage 1: input value 0 for non-signal or the low voltage; input value 1 for high voltage

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x29
03	Power-on value	1 Byte	0: OK others: error

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Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0xC6
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported Modules

M-7060/M-7060D/M-7064/M-7064D/M-7067/M-7067D/M-7050/M-7050D/M-7051/M-7051D/M-7052/M-7052D/M-7053/M-7053D/M-7054/M-7054D/M-7055/M-7055D/ M-7055U/M-7055UD/M-7041/M-7041D/M-7043/M-7043D/M-7045/M-7045D/M-7046/M-7046D

Note: After using the command, the DIO active states will immediately change and will simultaneously clear the DI counter and latch values.

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3.7.11 Sub-function 42 (0x2A) Read DI/O active states

This sub-function code is used to read the DI/O active states of a module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x2A

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x2A
03	DI/O active status	1 Byte	*0x00~0x03

*0x00~0x03 for M-7060/M-7060D
0x00 and 0x02 for M-7067/M-7067D

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0xC6
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported modules

M-7060/M-7060D/M-7064/M-7064D/M-7067/M-7067D/M-7050/M-7050D/M-7051/M-7051D/M-7052/M-7052D/M-7053/M-7053D/M-7054/M-7054D/M-7055/M-7055D/ M-7055U/M-7055UD/M-7041/M-7041D/M-7043/M-7043D/M-7045/M-7045D/M-7046/M-7046D

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3.8 Modbus Address Mapping

<table>
<tr><th>Address</th><th>Description</th><th>Attribute</th></tr>
<tr><td>30001 ~ 30016</td><td>Counter value of digital input</td><td>R</td></tr>
<tr><td>40001 ~ 40016</td><td>Counter value of digital input</td><td>R</td></tr>
<tr><td>40481*1</td><td>Firmware version (low word)</td><td>R</td></tr>
<tr><td>40482*1</td><td>Firmware version (high word)</td><td>R</td></tr>
<tr><td>40483*1</td><td>Module name (low word)</td><td>R</td></tr>
<tr><td>40484*1</td><td>Module name (high word)</td><td>R</td></tr>
<tr><td>40485*1</td><td>Module address, valid range: 1 ~ 247</td><td>R/W</td></tr>
<tr><td>40486*1</td><td>Bits 5:0
Baud rate, 0x03 ~ 0x0A
<table>
<tr><td>Code</td><td>0x03</td><td>0x04</td><td>0x05</td><td>0x06</td></tr>
<tr><td>Baud</td><td>1200</td><td>2400</td><td>4800</td><td>9600</td></tr>
<tr><td>Code</td><td>0x07</td><td>0x08</td><td>0x09</td><td>0x0A</td></tr>
<tr><td>Baud</td><td>19200</td><td>38400</td><td>57600</td><td>115200</td></tr>
</table>
Bits 7:6
00: no parity, 1 stop bit
01: no parity, 2 stop bits
10: even parity, 1 stop bit
11: odd parity, 1 stop bit</td><td>R/W</td></tr>
<tr><td>40488*1</td><td>Modbus response delay time in ms, valid range: 0 ~ 30</td><td>R/W</td></tr>
<tr><td>40489*1</td><td>Host watchdog timeout value, 0 ~ 255, in 0.1s</td><td>R/W</td></tr>
<tr><td>40492*1</td><td>Host watchdog timeout count, write 0 to clear</td><td>R/W</td></tr>
<tr><td>40498*3</td><td>Digital software filter time in millisecond, 1 ~ 255</td><td>R/W</td></tr>
<tr><td>10001 ~ 10016</td><td>Digital input value</td><td>R</td></tr>
<tr><td>00001 ~ 00016</td><td>Digital output value</td><td>R/W</td></tr>
<tr><td>00033 ~ 00048</td><td>Digital input value of channel 0 ~ 7</td><td>R</td></tr>
<tr><td>00065 ~ 00096</td><td>High latched values of DIO</td><td>R</td></tr>
<tr><td>00097 ~ 00128</td><td>Low latched values of DIO</td><td>R</td></tr>
<tr><td>00129 ~ 00144</td><td>Safe value of digital output channel</td><td>R/W</td></tr>
<tr><td>00161 ~ 00176</td><td>Power on value of digital output channel</td><td>R/W</td></tr>
<tr><td>00193*1 ~ 00208</td><td>Counter update trigger edge of digital input channel</td><td>R/W</td></tr>
<tr><td>00257*2</td><td>Write 1 to clear latch values</td><td>W</td></tr>
</table>

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Address	Description	Attribute
00257*1	Protocol, 0: DCON, 1: Modbus RTU	R/W
00258*1	0: Modbus RTU, 1: Modbus ASCII	R/W
00260*1	Modbus host watchdog mode 0: same as I-7000 1: can use write DO command to clear host watchdog timeout status	R/W
00261*1	1: enable, 0: disable host watchdog	R/W
00264*1	Write 1 to clear latched DIO	W
00265*1	DI active state, 0: normal, 1: inverse	R/W
00266*1	DO active state, 0: normal, 1:inverse	R/W
00270*1	Host watch dog timeout status, write 1 to clear host watch dog timeout status	R/W
00273*1	Reset status, 1: first read after powered on, 0: not the first read after powered on	R
00513 ~ 00528	Write 1 to clear counter value of digital input channel	W

Note:
*1: only available with firmware version 200 and later
*2: only available with firmware version 199 and earlier
*3: only available for the following modules
M-7041 firmware version B300 and later
M-7051 firmware version B300 and later
M-7052 firmware version B300 and later
M-7053 firmware version B205 and later
M-7055 firmware version B300 and later
M-7060 firmware version B300 and later
M-7065 firmware version B300 and later

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4. Troubleshooting

If you are having difficulty using the I-7000 or M-7000 module, here are some suggestions that may help. If you cannot find the answers you need in these guides, contact ICP DAS Product Support. Contact information is located in Section 1.14.

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4.1 Communicating with the module

If you attempt to communicate with the module and receive no response, first check the following:

- Ensure that the supplied power is within the range of +10 to +30 V DC. If the supplied power is OK, then the power LED should be on.
- Ensure that the RS-485 converter provides the bias. The RS-485 converters manufactured by ICP DAS all provide the bias. If the RS-485 converter does not provide the bias and the module is listed in section 1.7.1, then you can open the cover to adjust the jumper to enable the RS-485 bias.
- When the module receives a command, the power LED is set to "off". The power LED is shown as "on" after the module responds. This method can be used to check whether the module has received a command sent from the host.
- If possible, use another device to check whether the host can communicate with the device through the same RS-485 network.
- If the host is a PC installed with a Windows operating system, then execute the DCON Utility to determine whether the module can be found. The DCON Utility can be downloaded from the ICP DAS website http://www.icpdas.com. The DCON Utility documentation can be found in the "**Getting Started For I-7000 Series Modules**" manual.
- Set the module to "INIT mode" and communicate with the module using the following settings: address 00, Baud Rate 9600bps and no checksum. See Section A.1 for details.

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A. Appendix

A.1 INIT Mode

Each I-7000 and M-7000 module has a built-in EEPROM to store configuration information such as module address, type code, Baud Rate, etc. Occasionally, the configuration of a module may be forgotten and there are no visual indications of the configuration of the module. It is difficult to communicate with the module when the configuration of the module is unknown. To help avoid this problem, the I-7000 and M-7000 series has a special mode called **"INIT mode"**. When the module is powered on in **"INIT mode"** the configuration of the module is reset as follows, allowing it to be operated as normal.

1. Address: 00
2. Baud Rate: 9600 bps
3. No checksum
4. Protocol: DCON

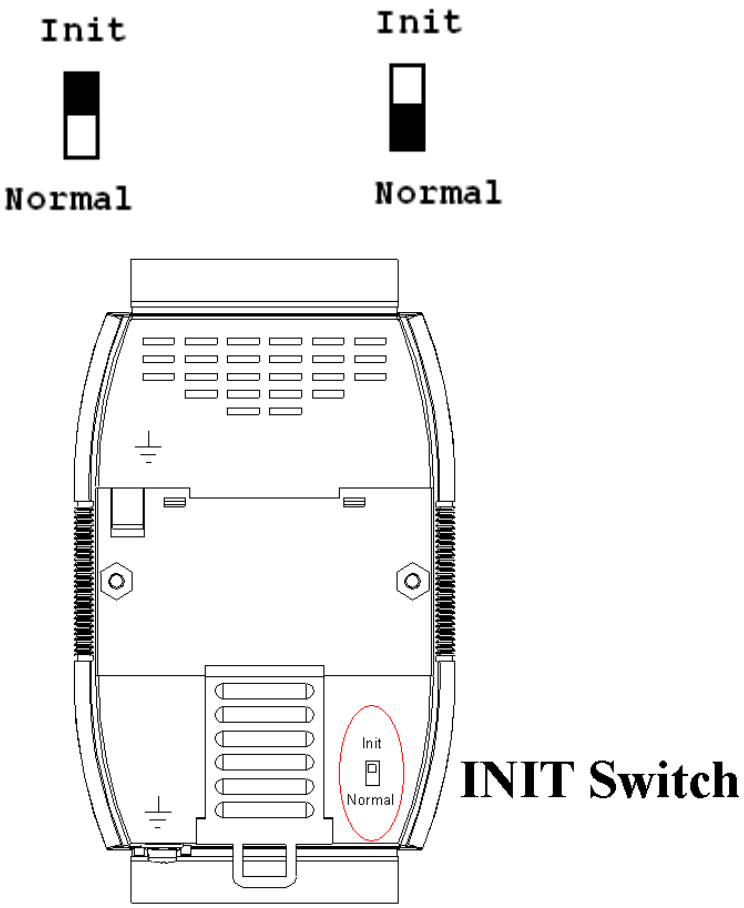
The configuration information stored in the EEPROM is not changed and can be read by sending the $002(CR) command at 9600bps.

There are commands that require the module to be in INIT mode. They are:

1. %AANNTTCCFF when changing the Baud Rate and checksum settings. See Section 2.1 for details.
2. $AAPN, see Section 2.20 for details.

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Originally, the INIT mode is accessed by connecting the INIT* terminal to the GND terminal. New I-7000 and M-7000 modules have the INIT switch located on the rear side of the module to allow easier access to the INIT mode. For these modules, INIT mode is accessed by sliding the INIT switch to the Init position as shown below.



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A.2 Dual Watchdog Operation

Dual Watchdog = Module Watchdog + Host Watchdog

The Module Watchdog is a hardware reset circuit that monitors the operating status of the module. While working in harsh or noisy environments, the module may be shut down by external signals. The circuit allows the module to work continuously without disruption.

The Host Watchdog is a software function that monitors the operating status of the host. Its purpose is to prevent problems due to network/communication errors or host malfunctions. When a host watchdog timeout occurs, the module will reset all outputs to a safe state in order to prevent any erroneous operations of the controlled target.

I-7000 and M-7000 series modules include an internal Dual Watchdog, making the control system more reliable and stable.

For more information regarding the Dual Watchdog, please refer to Chapter 5 of the "**Getting Started For I-7000 Series Modules**" manual that can be downloaded from the ICP DAS website http://www.icpdas.com.

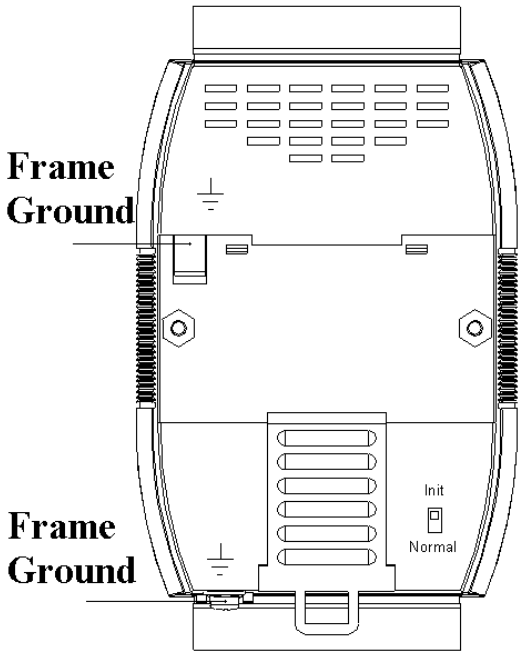
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A.3 Frame Ground

Electronic circuits are constantly vulnerable to Electro-Static Discharge (ESD), which become worse in a continental climate area. Some I-7000 and M-7000 modules feature a new design for the frame ground, which provides a path for bypassing ESD, allowing enhanced static protection (ESD) capability and ensures that the module is more reliable.

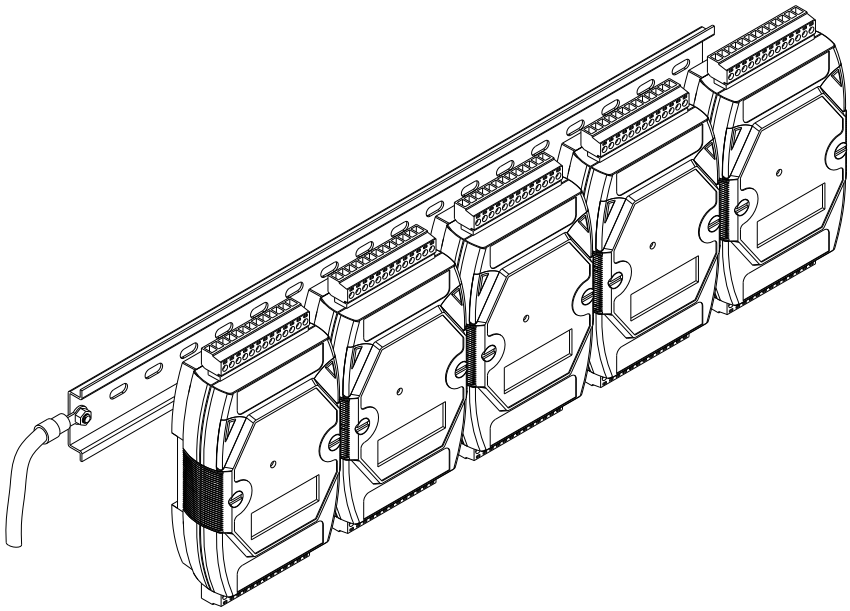
Either of the following options will provide a better protection for the module:

1. If the module is DIN rail mounted, connect the DIN rail to the earth ground because the DIN rail is in contact with the upper frame ground as shown in the figure below.
2. Alternatively, connect the lower frame ground terminal to a wire and connect the wire to the earth ground, as shown in the figure below.



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New DIN rail models are available that can easily be connected to the earth ground. Each is made of stainless steel, which is stronger than those made of aluminum. There is a screw at one end and a ring terminal is included as shown in the figure below. Refer to Section 1.13.1 for more information about the new DIN rail models.



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A.4 Reset Status

The reset status of a module is set when the module is powered-on or when the module is reset by the module watchdog. It is cleared after the responding of the first $AA5 command. This can be used to check whether the module had been reset. When the $AA5 command responds that the reset status is cleared, that means the module has not been reset since the last $AA5 command was sent. When the $AA5 command responds that the reset status is set and it is not the first time $AA5 command is sent, it means the module has been reset and the digital output value had been changed to the power-on value.

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A.5 Safe Value and Power-on Value of Digital Output

Besides setting by the set digital output commands, the digital outputs can be set under two other conditions.

When the host watchdog is enabled and a host watchdog timeout occurs, the "**safe value**" is loaded into the digital output ports. The set digital output commands have no effect on the digital output ports until the host watchdog timeout status is cleared. The host watchdog timeout status is saved in the EEPROM. The status is not changed even after power-on reset. It can be cleared only by the reset host watchdog timeout status command ~AA1. See Section A.2 for host watchdog details.

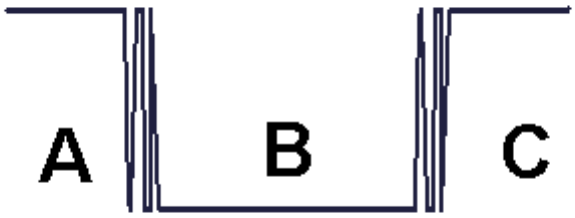
When the module is powered on and the host watchdog timeout status is cleared, the "**power-on value**" is loaded into the digital output ports. If the host watchdog timeout status is not cleared on power-on, then the safe value is loaded into the digital output ports.

Both the safe value and power-on value are set by the ~AA5V command. Refer to Section 2.30 for details.

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A.6 Latched Digital Input

The I-7000 and M-7000 DIO modules provide commands to read the latched high digital input and latched low digital input status. Following is an example to show the usefulness of the latched digital input. When we want to read the key stroke of a key switch connected to the digital input channel of a module, the input signal of the key stroke is a pulse signal as shown in the following figure.

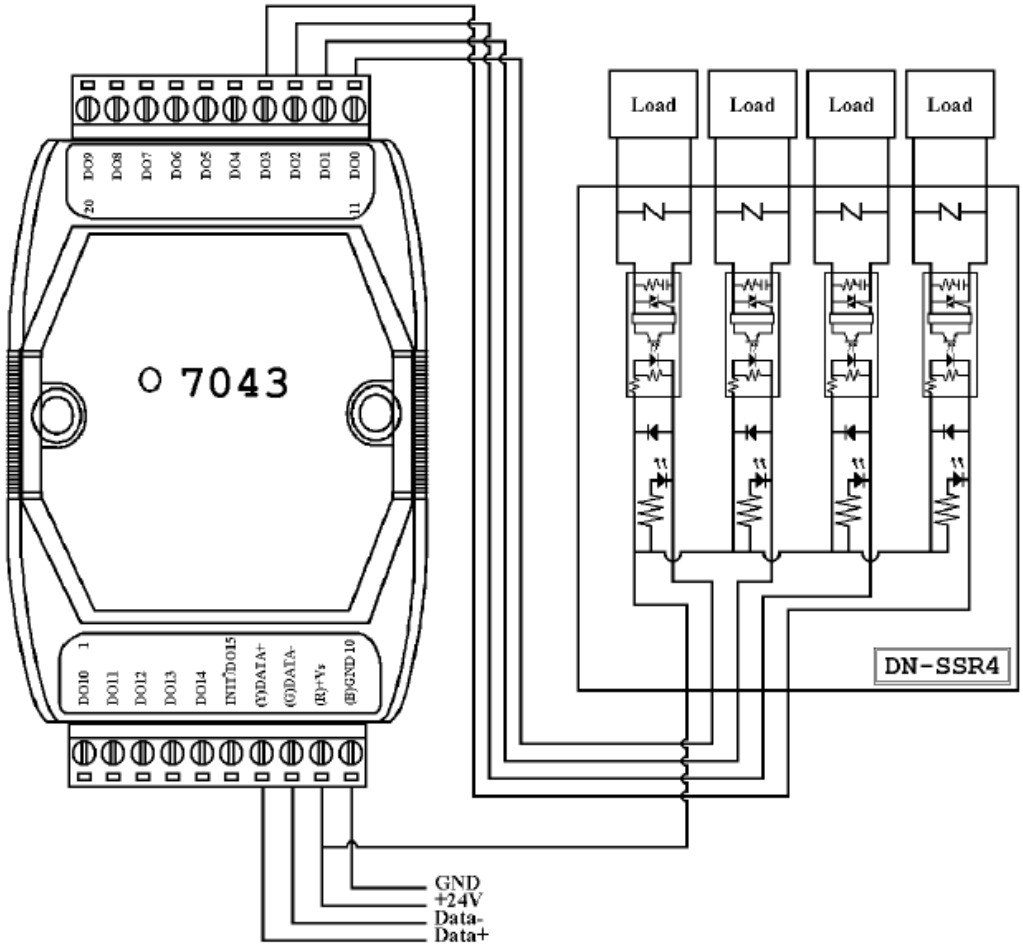


If we just use the read digital input status command to read the signal and we cannot send the command during the B period due to some reasons, then we will lose the key stroke information. However, with the read latched digital input command, we can still get the key stroke information even we are not able to send command in B period. For details of the read latched digital input command, please refer to Sections 2.17 and 3.1.

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A.7 DN Module

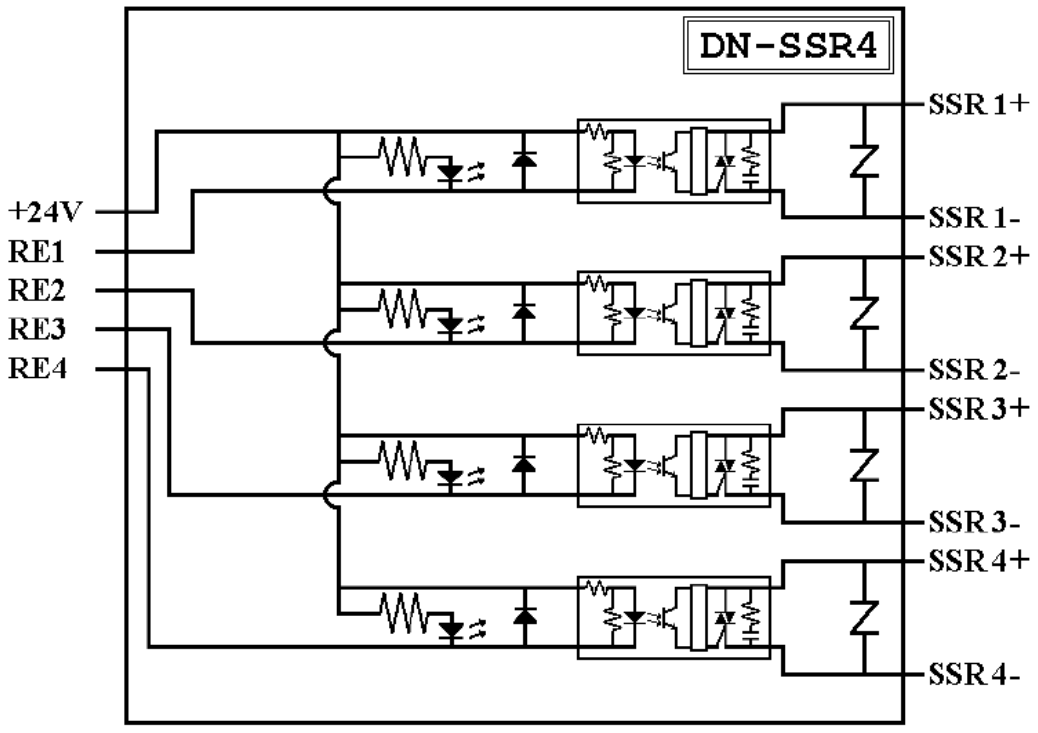
The DN modules are the I/O extension of the I-7000 and M-7000 modules. They can drive more power and heavy load. User may use I-7000 and M-7000 modules to control the DN modules to drive the loads. Following is an example of using the I-7043 with the DN module.



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A.7.1 DN-SSR4

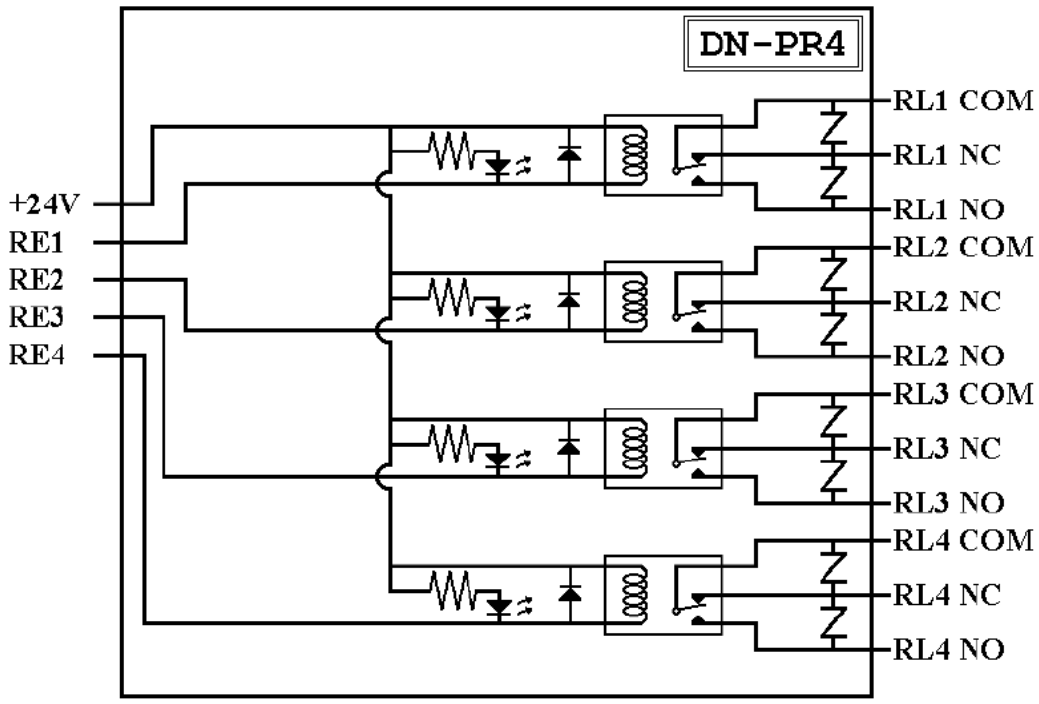
Output Channel	4 solid state relay contact
Output Specifications	
Type	Zero-cross AC solid-state relay output
Rated Load Voltage	200 to 240 VAC
Rated Load Current	4 A_{rms}
Surge Current	50 A
Max. Off-State Leakage Current	5.0 mA
Operate Time	1/2 cycle of voltage sine wave + 1ms
Input Impedance	1.5K Ohms
Power Input	+24 VDC
DIN-Rail Mounted	



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A.7.2 DN-PR4

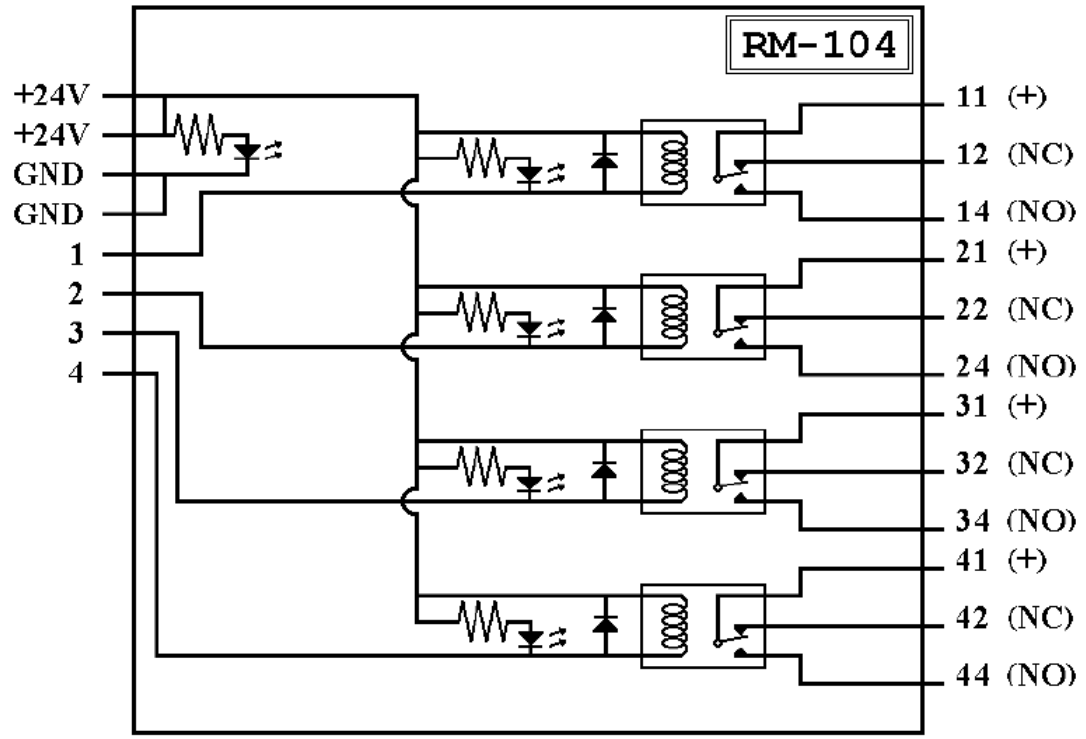
Output Channel	4 relay contact
Output Specifications	
Type	1 Form C relay contact
Nominal Load	5A@250VAC, 5A@30VDC
Max. Switching Power	1250 VA
Max. Switching Voltage	250 VAC, 150 VDC
Max. Switching Current	5 A
Mechanical Life	10 x 10^6 operations min.
Electric Life	100 x 10^3 operations min.
Operate/Release Time	Max. 10 ms / 5 ms
Dielectric Strength	2000 VAC 1 minute
Nominal Coil Power	360 mW
Power Input	+24 VDC
DIN-Rail Mounted	



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A.7.3 RM-104, RM-108, and RM-116

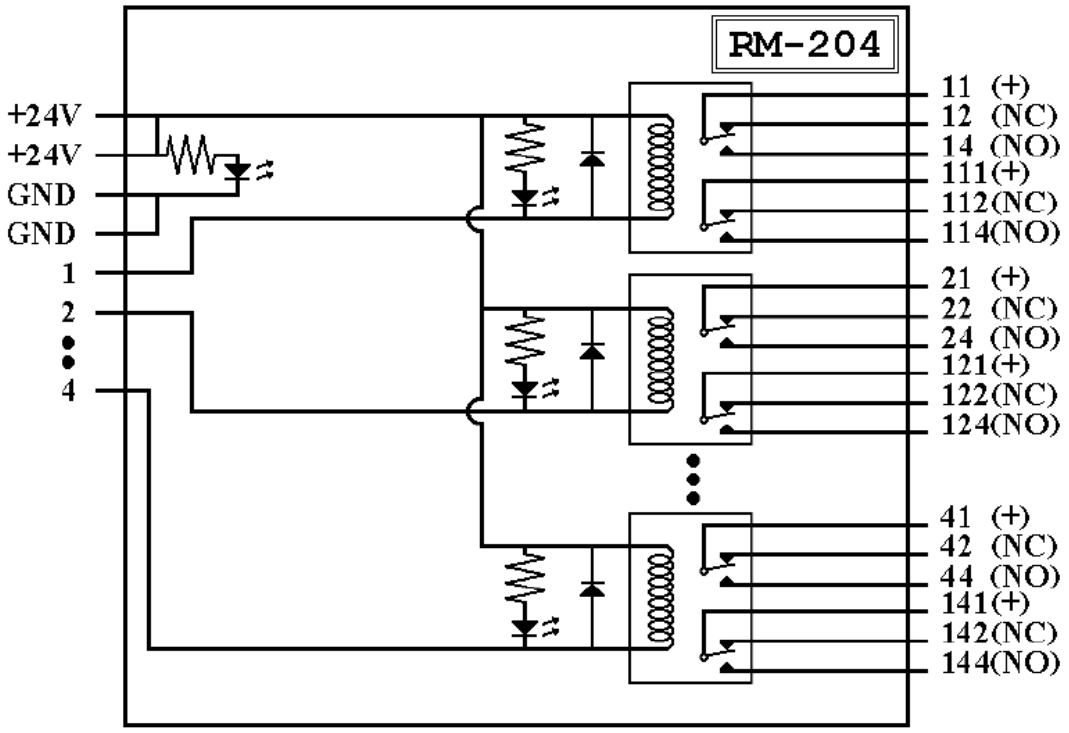
Output Channel	4/8/16 relay contact
Output Specifications	
Type	1 Form C relay contact
Rated Load	16A@250VAC
Max. Switching Voltage	400 VAC
Max. Peak Current	30 A
Contact Material	AgCdO
Min. Life	100,000 operations
Dimensions	
RM-104	78 mm x 77 mm
RM-108	135 mm x 77 mm
RM-116	270 mm x 77 mm
Power Input	+24 VDC
DIN-Rail Mounted	



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A.7.4 RM-204, RM-208, RM-216

Output Channel	4/8/16 relay contact
Output Specifications	
Type	2 Form C relay contact
Rated Load	5A@250VAC
Max. Switching Voltage	400 VAC
Max. Peak Current	10 A
Contact Material	AgNi
Min. Life	100,000 operations
Dimensions	
RM-204	78 mm x 77 mm
RM-208	135 mm x 77 mm
RM-216	270 mm x 77 mm
Power Input	+24 VDC
DIN-Rail Mounted	



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Revision History

Revision	Date	Changes Made
B2.8	2020/3/31	Modify section 1.7 and 4.1 to include RS-485 bias setting
B2.9	2023/3/27	Change section 1.3 M-7059-16 input impedance to 30k
B3.0	2024/4/11	Modify section 1.11 to add description to change DIO active states.
B3.1	2025/3/17	Add sections 2.33 and 2.34 to add digital software filter setting. Modify section 3.8 to add Modbus register 40498 for digital software filter setting.

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