

I-7000/M-7000 Comprehensive Manual

Convering Setup, Wiring, and various SDK

V1.0, Mar. 2025



Technical support: service@icpdas.com Author: Kevin, Wayne, David Editor: Janice

Warranty

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

Warning

ICP DAS assumes no liability for any damage resulting from the use of this product. ICP DAS reserves the right to change this manual at any time without notice. The information furnished by ICP DAS is believed to be accurate and reliable. However, no responsibility is assumed by ICP DAS for its use, not for any infringements of patents or other rights of third parties resulting from its use.

Copyright

Copyright @ 2025 by ICP DAS Co., Ltd. All rights are reserved.

Trademark

The names used for identification only may be registered trademarks of their respective companies.

Contact US

If you have any problem, please feel free to contact us. You can count on us for quick response. Email: service@icpdas.com

Revision History

This chapter provides revision history information to this document.

The table below shows the revision history.

Revision	Date	Description
V1.0	2025, 02	Initial issue

Content of Table

Revision History	3
Content of Table	4
Chapter 1 Introduction	9
1.1 Getting Started	10
1.2 Features	13
1.3 Product Information	23
1.3.1 Selection Guide	23
1.3.2 Catalog/ Download Center/ Data Sheet / FAQ	23
1.3.3 Specifications/ Similar Products	24
Chapter 2 Hardware Installation	25
2.1 Installation	25
2.2 Dimensions (Units: mm)	25
2.3 Connecting the I/O Module	26
2.3.1 System Architecture #1 (Bus Topology) - Converters	26
2.3.2 System Architecture #2 (Bus Topology) - Repeater	27
2.3.3 System Architecture #3 (Tree Topology) - Hub	28
2.4 Operating Switch and Parameters	29
Chapter 3 Software Tool - DCON Utility Pro	
3.1 Search I/O Modules & Online Configuration Page	
3.2 Open the Offline Configuration Page	32
3.3 Settings Page - Configuration	
3.3.1 Common Settings for I-7000/M-7000 Modules	33
3.3.2 AI or AO Settings	34
3.4 AI Settings Page	37
3.4.1 M-7004 Settings Page	41
3.4.2 Settings Page – User Defined Type (7005)	43
3.4.3 Settings Page - Linear Mapping	46
3.4.4 Settings Page – Logger Configuration (M-7017mC-16)	47
3.5 I/O Alarm Settings Page	48
3.5.1 Settings Page - AI/DO Alarm	48
3.5.2 Settings Page - DI/DO Alarm	49
3.5.3 Settings Page - Al Alarm	50
3.5.4 Settings Page - DO/Alarm	50

3.5.5 Settings Page - DO/Alarm (/LED) (7080/80B)	51
3.5.6 Settings Page - DO/Alarm Status (7005)	54
3.6 AO Settings Page	55
3.6.1 Settings Page - Excitation	56
3.7 DI Settings Page	57
3.7.1 Settings Page - DI/DI Latch	58
3.7.2 Settings Page - DI Counter	58
3.8 DO Settings Page	59
3.9 Counter, Frequency, and Encoder	60
3.9.1 Settings Page - PWM	60
3.9.2 Settings Page – Counter/Frequency (7080/80B)	61
Disable Options under Frequency Mode (7080/80B)	62
3.9.3 Settings Page - Encoder (I-7083, 7083B)	63
3.9.4 Settings Page - Counter Value (M-7084, 7088)	64
For the M-7084	64
For the 7088(D)	65
3.9.5 Settings Page - Counter Settings (M-7084)	66
3.9.6 Settings Page - Low Pass Filter (M-7084)	67
3.9.7 Settings Page - 7 Segment LED (7088D)	68
3.10 Settings Page – Host WDT	69
3.11 Settings Page - Commands Log	73
3.12 Settings Page - Summary	74
Chapter 4 DCON/Modbus Commands	75
4.1 Command Line Tool	76
Chapter 5 Software Development of I-7000 series	77
5.1 Using DCON Commands	77
5.2 Using PACSDK	79
5.3 Using OPC DA Server	84
5.4 Using LabVIEW (DCON)	86
5.5 Using Win-GRAF (DCON)	87
Chapter 6 Software Development of M-7000 series	91
6.1 Using Modbus Master Tool	91
6.2 Using Linux Modbus SDK	96
6.3 Using nModbus	97
6.3.1 Modify the Form	99
I-7000/M-7000 Comprehensive Manual v1.0	P5

6.3.2 Modify C# Code	99
6.3.3 Modify VB Code	104
6.3.4 Test the Demo Program (WinForm, C#)	108
6.4 Using LabVIEW (Modbus)	110
6.5 Using Win-GRAF (Modbus)	111
6.6 AVEVA Edge	119
6.6.1 Example1: M-7018 Configuration Setup	119
The M-7018 Webpage and Download Files	119
Configure M-7018 Parameters (DCON Utility Pro)	120
Engineering or 2's Complement AI Values	121
6.6.2 Example1: AVEVA Edge and the M-7018 Module	122
Create the Project and Tags	122
Add the Screen	124
Add the Text Object	125
Add a System Symbol	127
Add the MODBU (Modbus RTU) Communication Driver	128
Add a Driver Worksheet for Analog Inputs (Engineering)	130
Add a Driver Worksheet for Analog Inputs (2's Complement)	133
6.6.3 Example 2: M-7026 Configuration Setup	136
The M-7026 Webpage and Download Files	136
Configure M-7026 Parameters (DCON Utility Pro)	136
6.6.4 Example2: AVEVA Edge and the M-7026 Module	138
Create the Project and Tags	138
Add the Screen	139
Add the Text Object and Assign the Tag	140
Add the MODBU (Modbus RTU) Communication Driver	142
Add a Driver Worksheet for I/O (Engineering)	143
Add a Driver Worksheet for I/O (2's Complement)	152
Chapter 7 Application Notes	155
7.1 Common Descriptions	155
7.1.1 Module Output Status	155
7.1.2 Reset Status	155
7.1.3 Dual Watchdog Operation	156
7.1.4 Frame Ground (F.G.)	157
7.2 Descriptions of AI and AO	158

	7.2.1 Hexadecimal Data Conversion	158						
	7.2.2 High/Low Alarm159							
	7.2.3 Thermocouple	160						
7.2.4 Resistance Measurement								
7.2.5 Transmitter								
	7.2.6 Linear Mapping	163						
	7.2.7 Analog Output1							
	7.2.8 Slew Rate Control16							
	7.2.9 Analog Output Read-back	165						
7.3	Descriptions of DI and DO	166						
	7.3.1 Digital Input and Event Counter	166						
	7.3.2 Digital Output	166						
	7.3.3 Safe Value and Power-on Value of Digital Output	166						
	7.3.4 D/O Operation Principle	167						
7.4	Descriptions of Counter, Frequency, and Encoder							
	7.4.1 Counter/Frequency Input Mode Selection							
	7.4.2 Frequency Measurement							
	7.4.3 LED Display Format	169						
	7.4.4 Encoder & Synchronous Encoder	170						
	7.4.5 Preset Value of Encoder	170						
	7.4.6 Encoder Counting Sequence	170						
	7.4.7 XOR Control Bit Setting	171						
Appendix A	DCON Utility Pro – FAQ	173						
Appendix B	Type Code for AI Values (Modbus Protocol)	176						
B.1	M-7013P, M-7013PD	176						
B.2	M-7015, M-7015P	178						
B.3	M-7017/18/19 Series							
B.4	M-7024, M-7024R, M-7024L							
B.5	B.5 M-7024U, M-7026, M-702818							
B.6	5 M-7084							
Appendix C	Type Code for AI Values (DCON Protocol)							
C.1	7005 (Thermistor)							
C.2	I-7011							
C.3	I-7012/14 Series (AI)	190						
C.4	7013/15/33 Series (RTD)	191						
	I-7000/M-7000 Comprehensive Manual v1.0	P7						

C.5	7016	Series	195
C.6	7017/	/18/19 Series	196
	C.6.1	7017 Series	198
	C.6.2	7018 Series	199
	C.6.3	7019 Series	201
C.7	7021,	/22/24/28 Series	204
	C.7.1	I-7021 and I-7021P	204
	C.7.2	I-7022 and M-7022	204
	C.7.3	7024, 7024R, and M-7024L	205
	C.7.4	M-7024U and M-7028	205

Chapter 1 Introduction



The I-7000 and M-7000 series remote I/O module provide cost-effective protection and conditioning for a wide range of valuable industrial control system. The product line includes sensor-to-computer, computer-to-sensor, digital I/O, timer/counter, RS-232 to RS-485 converter, USB to RS-485 converter, RS-485 repeater, RS-485 hub and RS-232/422/485 to Fiber Optics.

The I-7000 supports DCON protocol, and the M-7000 supports Modbus RTU and DCON protocols. Many SCADA/HMI software and PLCs that support the Modbus RTU protocol can easily integrate with M-7000 modules.



1.1 Getting Started

The I-7000 series only supports the DCON protocol, while the M-7000 series supports both DCON and Modbus protocols. When the module is set to DCON mode, communication parameters must be configured in Init mode. <u>Note:</u> Only one module can be set at a time.

Step 1: Power on in INT mode.

Set the DIP switch to "Init" (or connect the "INIT" pin to "GND") before powering up the module.



Communication Parameters:

Parameter	Factory (Norma	Default l Mode)	In INIT mode, the initial value is fixed	
Woder	I-7000	M-7000	I-7000/M-7000	
Protocol	DCON	Modbus RTU	DCON	
Address	C)1	00	
Baud Rate	9600			
Parity	N,8,1			

Step 2: Connect the module to a PC and power supply.

The I-7000/M-7000 series modules are equipped with an RS-485 port, which can be connected to a PC using an RS-232 (or USB) to RS-485 converter.



Step 3: Download and install the DCON Utility Pro.

https://www.icpdas.com/en/product/guide+Software+Utility_Driver+DCON__Utility_Pro







7065D Firmware[B109]		×
Configuration DO	Host WDT DI Commands Log Summary	
Protocol (INIT*) Address Baud Rate (INIT*) Parity (INIT*)	DCON 0 to coordinate of the initial values are dissonant of the initial value are dissonant of the initial values are dissonant of the initial values are dissonant of the initial value are disso	splayed in odify the are below.
Checksum (INIT*)	Disabled V Protocol (INIT*) DCON	~
Response Delay	Address 2 Baud Rate (INIT*) 115200 Parity (INIT*) N,8,1 Checksum (INIT*) Disabled	[02H] ~ ~
8. Exit	7. Set	Module Configurations

Step 5: Set the module to Normal mode and reboot.

Set the switch back to the "**Normal**" position (or disconnect the INIT and GND pins) and restart the module to apply the new settings.



Step 6: Search for the module again to ensure the new settings have taken effect.

DCON Utility Pro V 4.3.0.6 Searching COM5							
₹▶॥ 🖻 🖨	смр	1			FAQ		
) Address	Baud Rate	Checksum	Format	Status	Description	Comments
70	065D 2[02h]	115200	Disabled	N,8,1	Remote I/O	[DCON]4*DI + 5*DO	Supported

1.2 Features

• RS-485 Industrial Multi-Drop Network

The I-7000/M-7000 series modules use the industrial EIA RS-485 communication interface to transmit and receive data at high speeds over long distances. All modules are easy to integrate with standard computers and controllers. Internal surge protection circuitry is used on the data lines to protect the modules from voltage spikes.

• I/O type and Range Programmable

The analog modules support various I/O types and data ranges, which can be configured remotely by issuing commands from the host.

• Easy Mounting and Connection

Users can choose between DIN rail or piggyback mounting for installation of the module.



• Dual Watchdog

The I-7000/M-7000 series modules feature both module and host watchdog functions to prevent errors and enhance the reliability and stability of the control system.

1) Module Watchdog:



The hardware watchdog is a circuit designed to monitor the operational status of the module. It uses a timer mechanism: during normal operation, the timer is periodically reset to zero and continues counting. If a timeout occurs, the module will automatically restart and load its default power-on values.

2) Host Watchdog:



The Host Watchdog is a software function designed to monitor the communication status between the host and the module. It uses the host's internal timer (e.g., PC, PLC, or PAC). Under normal operation, the host sends an "alive" signal to the module. If a timeout occurs, the module automatically loads the safe value. Once the timeout condition is cleared, the module restarts and loads the power-on value.

• Programmable Power-on Value and Safe Value



The DO and AO modules feature programmable power-on and safe values. When the host's watchdog mechanism is triggered, the DO or AO output will be set to its pre-configured safe value.

Advanced DI Functions

The DI channel is not only used to read the digital input status but also provides several advanced functions.

DI Latch Function

All DI channels feature a latch function that retains high/low events in the module's internal registers. Typically, the host polls each module individually to obtain the DI status. However, there are occasional instances where a DI channel might generate a very brief pulse signal that could be missed if it occurs outside the polling period. With the latch function enabled, short-duration signals (\geq 5 ms) will no longer be lost.



Low Speed Counter

The DI module automatically counts the DI signal in the background and can detect and count signals up to 100Hz.



Overvoltage Protection

Many of ICP DAS's analog input modules provide high overvoltage protection for the analog input channels. If the user accidentally connects the wrong line or a high voltage spike is applied to the analog input terminals, the module won't be damaged and will continue to provide accurate readings. This feature improves reliability, reduces maintenance needs, and makes the entire system more robust.

• Over-current Protection

For the current measurement module, introducing high currents or voltages into the current loop could damage the module. ICP DAS has upgraded the protection to handle up to ±120 VDC and ±1000 mA. This improvement ensures that high currents or voltages in the loop won't damage the module, keeping the entire system running smoothly.

The "R" and "Z" versions of the I-7000/M-7000 provide continuous overvoltage and overcurrent protection, effectively safeguarding equipment from damage caused by pulses or surges.



• Virtual Channel to Channel Isolation

The "R" and "Z" versions of the analog input modules provide ± 400 VDC virtual channel-to-channel isolation to prevent noise interference from adjacent channels in industrial environments. These modules include the I-7017R, I-7017Z, I-7018R, I-7018Z, I-7019R, and I-7019Z. While there is no physical channel-to-channel isolation, the leakage current between adjacent channels is only 1µA, resulting in minimal and negligible interference.



Physical Channel-to-Channel Isolation

To achieve the **Channel-to-Channel Isolation** specification, **a communication module** (7000 series) must work in conjunction with **a signal conditioning module** (SG-300 series). This combination provides 3000VDC Channel-to-Channel Isolation protection.

M-2217CI X 1pcs = M-7017 X 1pcs + SG-3071 X 8pcs

Advantages of Channel-to-Channel Isolation Protection:

- 1. Saves installation space
- 2. Simplifies wiring
- 3. Reduces costs



Model	I/O	Channel-to-Channel Protection	Communication Interface
ET-2217Cl ET-2217-4	8 AI 4 AI	3000VDC	2-Port Ethernet
ET-2228CI ET-2224CI	8 AO 4 AO	3000VDC	MQTT, SNMP V2c
ET-2218Cl ET-2218Cl-4	8 TC 4 TC	3000VDC	
ET-2215Cl ET-2215Cl-4	8 RTD 4 RTD	3000VDC	
M-2217Cl M-2217Cl-4	8 AI 4 AI	3000VDC	RS-485 X 1
M-2228CI M-2224CI	8 AO 4 AO	3000VDC	Protocol – Moubus Kro, DCON
M-2218Cl M-2218Cl-4	8 TC 4 TC	3000VDC	
M-2215Cl M-2215Cl-4	8 RTD 4 RTD	3000VDC	

In industrial field applications, using a module with channel-to-channel isolation protection improves system performance, ensures equipment safety, and enhances reliability by offering the following advantages:

1. Improve System Stability and Reliability

□ Prevent Signal Interference

In industrial control systems, multiple signal sources and paths are common. Without proper isolation, crosstalk can occur, leading to signal distortion or increased noise. Using an isolated module prevents interference between signal channels, enhancing system stability.

□ Reduce System Failures

Prevent a single channel issue, such as a short circuit or overload, from impacting other channels. This improves the system's fault tolerance and reliability.

2. Improve Measurement Accuracy

□ In industrial measurement applications such as temperature, pressure, and flow, channel isolation is crucial for maintaining accurate and reliable data. For example, in multi-channel data acquisition systems, a shared ground can introduce signal crosstalk, leading to distorted readings and inaccurate measurements. By implementing an isolated module, these interferences are eliminated, ensuring precise and stable signal acquisition for industrial control and monitoring systems.

3. Enhanced equipment security

□ Preventing the spread of electrical faults:

Industrial fields often encounter high-voltage or high-current environments. Channel-to-channel isolation prevents electrical faults (e.g., over-voltage, short circuits) in one channel from affecting others or the overall system, ensuring the safety of both equipment and personnel.

□ Prevent ground loop problems:

Inconsistent ground potentials between devices can cause ground loops, leading to noise, signal distortion, and potential damage to sensitive equipment. An isolated module effectively eliminates this issue, enhancing the overall system's safety and stability.

4. Reduces noise and interference

□ Improved Electromagnetic Compatibility (EMC):

Industrial environments often contain strong sources of electromagnetic interference (EMI), such as large mechanical or high-power equipment. Channel-to-channel isolation minimizes noise propagation, enhancing equipment immunity and overall electromagnetic compatibility (EMC). This is crucial for ensuring the proper operation of sensitive devices, such as measurement instruments and communication equipment.

□ Reduces the effect of external noise:

The isolation module can effectively reduce the influence of external electromagnetic noise or voltage fluctuations to ensure a clear and stable signal.

5. Flexible system scalability

□ In many industrial control systems, scalability becomes a key concern as the number of devices increases. Channel-to-channel isolated modules enable different equipment or control channels to operate independently, allowing system expansion or upgrades without disrupting other parts of the system.

6. Improved signal quality and data transfer speeds

□ In some high-speed data transmission applications, such as sensor data collection or remote control systems, channel-to-channel isolation helps to ensure signal quality and minimize data loss or transmission errors due to signal degradation or interference. This is important for industrial applications that require high precision control or real-time response.

7. Reduce maintenance costs

The isolated module limits the impact of faults, ensuring that a failure in one channel does not affect others. This reduces fault diagnosis and repair time. Maintenance personnel can quickly identify issues, minimizing downtime and lowering maintenance costs.

8. Enhanced equipment longevity

□ By minimizing interference and fault propagation between channels, systems with isolated modules operate more reliably, experience less wear and damage, and achieve a longer equipment lifespan.

Specific examples of industrial applications:

□ Power & Energy System:

Channel-to-channel isolation plays a crucial role in protecting low-voltage control systems from high-voltage faults, surges, or failures in other parts of a system. By electrically isolating the low-voltage and high-voltage channels, it prevents damage to sensitive components and minimizes the risk of system-wide failures. This isolation helps to ensure that any issues in the high-voltage side (such as a surge or fault) don't propagate into the low-voltage control circuitry, which could lead to equipment damage or malfunction.

□ Automation equipment:

In robotic control and production line automation, channel-to-channel isolation prevents signal interference between devices, ensuring more precise control.

□ Sensor and actuator systems:

In systems where multiple sensors and actuators are connected, isolated modules help ensure signal stability and prevent interference between channels.

□ Medical Equipment:

In the medical field, isolated modules protect patient vital sign monitoring devices from interference caused by other equipment. The application of isolated modules in medical devices is crucial, especially in safeguarding patient vital sign monitoring systems. Since medical equipment requires extremely high accuracy and stability, any electromagnetic interference or electrical faults from other devices may affect monitoring results and even compromise patient safety.

Isolated modules effectively separate the electrical connections between different systems, preventing high-frequency noise or voltage spikes from other equipment from impacting vital sign monitoring devices. For example, electrocardiograms (ECG), blood pressure monitors, and oxygen saturation meters may display incorrect data or fail entirely if subjected to interference from other devices.

□ Telecommunications:

In telecommunications, maintaining isolation between communication channels is essential to prevent signal interference, ensuring clear and reliable transmission. This isolation minimizes crosstalk, where a signal transmitted on one circuit or channel creates an undesired effect in another, which can degrade the quality of the transmitted information. By implementing effective isolation strategies, telecommunications systems can maintain high-quality signal transmission, free from unwanted interference between channels.

In conclusion, the use of Channel-to-Channel Isolated modules in industrial field applications can effectively improve system stability, safety, signal quality and measurement accuracy, as well as reduce maintenance costs and the risk of failure, which is important for the normal operation of equipment, improve production efficiency and extend the life of equipment.

• 3000 VDC Isolation

The I-7000 and M-7000 series have 3000 VDC isolation between the field and the internal logic circuit. This isolation prevents the noise from the field to the internal logic that can damage the module. Users are advised to utilize isolated modules on the RS-485 network to eliminate noise interference from adjacent modules.



Dual Communication Protocols (Request/Response)

All I-7000 and M-7000 modules use a simple command /response protocol for communication. M-7000 also supports the industrial standard Modbus RTU protocol. The user can use high-level language, such as C, VB, Delphi, and others to write their application programs. Some famous software package can control I-7000 and M-7000 directly, such as LabView, Indusoft, Tracemode, EZ data logger, EZ Prog, etc.

The I-700 series supports the DCON protocol The M-7000 series supports the Modbus RTU and DCON protocols

• Self-Tuner Inside

"Self-Tuner" is a patented ASIC. It auto-tunes the baud rate and data format in whole RS-485 network, and auto handles the direction of the RS-485 communication line. Since the unique features of this ASIC, the user can implement a very flexible remote I/O configuration via the RS-485 network.



Common-mode Voltage Protection

The typical application is to monitor the charging status of the batteries in series. The voltage of each battery is +10 VDC so the first battery is +10 VDC, the second battery is +20 VDC etc. The differential voltage of the 20th battery is only +10 VDC, while the common-mode voltage is around 200 VDC. If the common-mode voltage of the analog input module is not large enough, then it cannot measure the correct voltage of the battery in charging. ICP DAS analog input modules provide +/-200 VDC high common-mode voltage protection for industrial applications, which can effectively solve the measurement errors caused by insufficient common-mode voltage.



ESD Protection

In the industrial environment, there are many noises, spike, electrostatic, etc. If the module is not strong enough, it is very easy to be damaged. The I-7K and M-7K modules all pass +/-4 KV ESD contact and +/-8 KV ESD air tests by static electricity gun in our laboratory. The test procedures follow the IEC 61000-4-2 standard. The components used in ICP DAS modules can suppress and withstand the high voltages defined by the IEC 61000-4-2 standard, thereby protecting the modules from the effects of electrostatic discharge.



• Open Wire Detection

The thermocouple, RTD and thermistor sensors are widely used in temperature control applications. If the system can not monitor the open wire status of the sensors, it may be very dangerous and cause large damage to life and property. When the wire of sensor is broken and the controller does not know the open wire status, the system may heat the boiler continuously and result in fire or explosion. Our thermocouple, RTD, thermistor modules provide open wire detection and make the system safer.



1.3 Product Information

Users can find the product page by entering the model number into the search box on the ICP DAS website. (https://www.icpdas.com/)

1.3.1 Selection Guide

Check the product selection guide to explore various I/O module types. www.icpdas.com/en/product/guide+Remote__I_O__Module__and__Unit+RS-485__I_O__Modules+I-7000

	Product,Keyword				। ९ Solution,Tag			English 🔹	
	Search Bar		PRODUCT	S SOLUT	IONS NEWS 8	EVENTS SU	JPPORT COR	PORATE CO	ONTACT US
HOME > PRODUC	HOME > PRODUCTS > Remote I/O Module and Unit > RS-485 I/O Modules > I-7000								
Introduction Analog I/O Digital I/O Encoder/Frequency/Counter									
				Туре	2				
<u>Voltage & Current</u> Input	<u>Thermocouple</u>	<u>RTD</u>	<u>DS18B20</u>	<u>Sensor</u>	<u>Thermistor</u>	<u>Strain Gauge</u>	<u>Voltage & Cu</u> Outpu	<u>urrent</u> <u>Mult</u>	i-function
						Available s	oon 🕨 Will be p	ohased out 🕨	Phased out
Voltage & Curre	ent Input								
м	odel				Analog In	put			
DCON	DCON, Modbus/RTU	Channels	Resolution	Sampling Rate (total)	Range	Common Voltage Protection	Individual Channel Configurable	Overvoltage Protection	DIO
<u>1-7012-G</u>	-			10 Hz	± 150 mV, ± 50 mV, ± 1 V, ± 5 V)		+120,000	
<u>I-7012FD</u>	-	1 diff.		10/100 Hz	±10 V, ±20 m/ (Note1)	±100 VDC		± 120 VDC	Dix1 (Note2)
<u>I-7014D</u>	-			10 Hz	± 150 mV, ± 500 mV, ± 1 V, ± 5 V ± 10 V, ± 20 m/), -		±15 VDC	(Note3)

1.3.2 Catalog/ Download Center/ Data Sheet / FAQ

On the product page, click the icon to access related files.



Description of icons:

Catalog	Users can download catalogs, flyers, or posters.
Download Center	Users can download the user manual, quick start guide, utility & tool, SDK, etc.
Data Sheet	Users can access module information, including pin assignments, wire connections, and internal I/O structure.
FAQ	Users can understand some issues with software development, product functionality, installation & configuration, and troubleshooting.

1.3.3 Specifications/ Similar Products

Users can click a similar model listed above the 'Specifications' section on the product page for more information.

Similar Products		►Available soon	►Will be phased out	Phased out
I-7005	M-7005-G			
	•			
Specifications	Accessories		Related Products	
CPU Module				
Watchdog Timer	Module, Communication (Programmable)			
Isolation				
Intra-module Isolation	3000 VDC			
EMS Protection				
EFT (IEC 61000-4-4)	\pm 4 kV for Power Line			
ESD (IEC 61000-4-2)	\pm 4 kV Contact for Each Terminal			
Surge (IEC 61000-4-5)	\pm 0.5 kV for Power Line			

Chapter 2 Hardware Installation

2.1 Installation



DIN-Rail Mounting

Piggyback Mounting

2.2 Dimensions (Units: mm)



2.3 Connecting the I/O Module

2.3.1 System Architecture #1 (Bus Topology) - Converters



Converter	Input	Output	Power Input	Size	Driver
I-7520 series	00 222	RS-422/485		Palm-size	N/A
tM-7520U	K3-232	RS-485	10 30 VDC	Tiny size	N/A
I-7561 series		RS-232/422/485	LICD	Palm-size	Win7/8/10/11, Linux
tM-7561	RS-485		038	Tiny size	Win7/8/10/11, Linux
PDS-720			10 ~ 30 VDC	Palm-size	Win7/8/10/11
tDS-700 series	G-700 series Ethernet RS-232, RS-485		PoE or 12 ~ 48 VDC Jack	Tiny size	Win7/8/10/11

Note: The I-7520/A and I-7520R/AR feature isolation designs on different sides, allowing users to select the appropriate side for additional isolation protection, particularly for critical equipment. This design helps mitigate circuit damage caused by noise interference from the power input, enhancing overall system reliability.



2.3.2 System Architecture #2 (Bus Topology) - Repeater



The repeater is used to

1. Isolate two sides signal

If the signal gets worse on one side, it will not affect the other side.

2. Extend the communication distance

Repeater	Input	Output	Power Input	Size	Driver		
I-7510 series	RS-485 or	⁻ RS-422/485	S-422/485		2/485		NI/A
tM-7510U	RS	RS-485		Tiny size	N/A		

2.3.3 System Architecture #3 (Tree Topology) - Hub



- The best way to implement an RS-485 network that focuses on robustness and signal integrity is to use a daisy chain topology.
- In general, a tree topology cannot be realized with a "simple" RS-485.
- The reflections that would be caused by these long branches (connections between your main bus and the slave nodes) makes a reliable data transmission impossible.

Traditionally, a 120 Ω terminating resistor is placed at the end of one RS-485 branch, which often results in better signals on one branch, but worse signals on the others.

Hub	Input	Output	Power Input	Size	Driver
I-7520U4-G	RS-232	4-port RS-485			N/A
I-7513-G		3-port RS-485	10 ~ 30VDC		N/A
I-7514U-G	K3-465	4-port RS-485		Palm-size	N/A
I-7563-G					
I-7563U-G	USB	3-port RS-485	USB		Win //8/10/11, Linux

Each port is equipped with an individual driver to avoid mutual interference.

Note: I-7563U speeds up to 921 kbps. others, speed up to 115 kbps

2.4 Operating Switch and Parameters

I-7000/M-7000 series provides two operating modes, Init Mode and Normal Mode, which can be set by sliding the switch on the rear side of the module. For some modules, users need to wire the INIT* pin to GND on the front of the module.

Operating Switch



Normal Mode:

Normally, the operating switch of I-7000/M-7000 series module is set to "Run".

Init Mode:

If the communication parameters of the module are unknown, switch to the "Init" position and reboot the module. The settings are fixed and detailed in the following table:

Parameters	I-7K	M-7K
Protocol	DCON	
Address	0	
Baud Rate	9600 bps	
Parity	n,8,1-no parity	
Checksum	Disable	

Factory Defaults:

Parameters	I-7K	M-7K		
Protocol	DCON	Modbus		
Address	1			
The Baud Rate, Parity, and Checksum settings are the same as above table.				

Chapter 3 Software Tool - DCON Utility Pro

Users can configure the communication parameters and I/O settings for each module by using DCON Utility Pro. Visit the website to download the software and the user manual.



http://www.icpdas.com/en/product/guide+Software+Utility_Driver+DCON_Utility_Pro

3.1 Search I/O Modules & Online Configuration Page

Ensure that the PC is connected to the I/O module and turn on the power supply. Afterward, launch the DCON Utility Pro.

<u>Step 1</u>: Choose the PC's COM port and search options such as Baud Rate, Protocol, Checksum, and Format.

DCON Utility Pro V 4.3.	0.6
₹ ► "	FAQ
COM3:*	ID Address Baud Rate Checksum Format Status
	Connection Search Ontions
	COM3 Start 0 End 255 COM3 Format COM5 38400 19200 2 9600 4800 2400 1200
	Timeout 300 ms Search RU-87PN Addr. Mode Search and Get I/O Configurations
	Start Search Exit

Baud Rate: The user can select multiple options. The default setting is 9600.

Baud Rate Proto	col Checksum	Format	
2 115200	57600	38400	□ 19200
9600	□ 4800	□ 2400	□ 1200

<u>Protocol</u>: The settings is fixed "DCON" if power on the module in Init mode.

Baud Rate	Protocol Checksum	Format	
		-	
DCON	Modbus R	10	Modbus ASCII

Checksum: The default setting is "Disabled". •

Baud Rate Protoco Checks	um Format
Checksum Disabled	Checksum Enabled

<u>Format</u>: The default setting is "N,8,1". After completing the settings, click "**Start Search**" to search for the I/O module.

Baud Rate	Protocol Check	sun Format	
N,8,1	□ N,8,2	□ E,8,1	□ O,8,1
Timeout	300 ms		
Search F	RU-87PN Addr. I	Mode	
Search a	and Get I/O Con	figurations	
Start Se	arch		Exit

<u>Step 2</u>: After searching for a module, click **"Stop Search"** to end the search, then select the model (ID) to open the settings window.

DCON Utility Pro V 4.3.0.6 Searching COM5	5							
	СМД	I				FAQ		
COM3	ID	Address	Baud Rate	Checksum	Format	Status	Description	Comments
	7065D	2[02h]	115200	Disabled	N,8,1	Remote I/O	[DCON]4*DI + 5*DO	Supported

3.2 Open the Offline Configuration Page

The **"Remote I/O INIT* Quick Configuration**" function in the DCON Utility Pro allows users to view the settings page for each I-7000/M-7000 module offline.



In the **"Remote I/O Configuration"** window, click **"Configure in Offline Status"**, select the **"7K"** option, and choose a model from the dropdown list to open its settings page.

📳 Remote I/	O Configuration	
Remote I/C	INIT* Quick Configurat	ion
COM Po	COM3	 Please make sure the INIT* is connected to GND
(Configure in Offline St	atus
	Configure I/O by Fil	e Select I/O 7002 7003 7004
	2 7002 Firmware[0000] [C	Offline Configuration]
	Configuration AI	DO/Alarm DI Host WDT Commands Log Summary
	Protocol (INIT*)	DCON ~
	Address	0 ÷ [OOH]
	Baud Rate (INIT*)	9600 ~
	Parity (INIT*)	N,8,1 ~
	Checksum (INIT*)	Disabled ~
Exi	Analog Format	Engineering Form ~
	Sample Mode	Normal Mode ~
	60/50 Hz	60Hz V
	Response Delay	0 [Max.30ms] ?
	Exit Write Co	onfigurations to I/O Module Save configurations to the file

3.3 Settings Page - Configuration

The **Configuration** page of DCON Utility Pro is used to configure the communication parameters of the I/O module, along with certain AI or AO parameters.

Note:

DCON Utility Pro support to open multiple settings windows of the I/O module since version 3 (or later).

3.3.1 Common Settings for I-7000/M-7000 Modules

The communication parameters are fixed in **INIT** mode. Click the **Set Module Configurations** button if any changes were made. Then, reboot in **Normal** mode to apply the settings. Additionally, when the Protocol is set to **DCON**, items marked with "**INIT***" must be configured in INIT mode.



Protocol	Set the protocol, which can be DCON or Modbus RTU.				
Address	Set a unique address for the module. (Range: 0-255)				
Baud Rate	Set the baud rate, which can be 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200.				
Parity	Set the parity, which can be [N,8,1], [N,8,2], [E,8,1], or [O,8,1].				
Checksum	Set the checksum, which can be disabled or enabled.				
Response Delay	Add a delay time for the response. (Default: 0 ms, Range: 0-30 ms)				
Respons	e Delay 0 [Max.30ms] ? Click "?" for more details.				



3.3.2 AI or AO Settings

In addition to the common settings mentioned above, the **Configuration** page includes additional AI or AO settings depending on the model.

	19 7017F Firmware[0000] [Offline Configuration]							
(Configuration AI Commands Log Summ							
	Protocol (INIT*)	DCON ~						
	Address	0 🗘 [00H]						
	Baud Rate (INIT*)	9600 ~						
	Parity (INIT*)	N,8,1 ~						
	Checksum (INIT*)	Disabled ~						
	Analog Format	Engineering Form ~						
	Sample Mode	Normal Mode 🗸						
	60/50 Hz	60Hz v						
	Type Code	[08] +/- 10 V 🗸 🗸						

7013 Firmware[0000] [Offline Configuration]							
Configuration AI Summary							
Protocol (INIT*)	DCON ~						
Address	0 🔶 [00H]						
Baud Rate (INIT	*) 9600 ~						
Parity (INIT*)	N,8,1 ~						
Checksum (INIT*) Disabled ~						
Type Code	[20] +/- 100 ,PT 1 $\scriptstyle{\smallsetminus}$						
Analog Format	Engineering Form \sim						
60/50 Hz	60Hz v						
Sample Rate	10Hz ~						

The following items will be displayed on the **Configuration** page based on the **AI** or **AO** module type.

Analog Format	Set the data format, which can be Engineering Format, Percent Format, 2's Complement Format, or Ω (Ohms).
Sample Mode	Set the data sampling mode, which can be Normal Mode or Fast Mode.
Power Filter (60/50 Hz)	This function filters out 60/50 Hz power noise to prevent signal distortion.
Type Code	Set the data type code and range, e.g., [08] +/-10V, [0D] +/-20mA.
Sample Rate	The sample rate of 7013(P)(D) series can be set to 10 Hz or 1 Hz.

1 7021 Firmware[0000] [Offline Configuration]							
Configuration AO	Host WDT	Commands Log					
Protocol (INIT*)	DCON	~					
Address	0	÷ [00H]					
Baud Rate (INIT*)	9600	~					
Parity (INIT*)	N,8,1	~					
Checksum (INIT*)	Disabled	~					
Analog Format	Engineeri	ng Form \sim					
Slew Rate	immediate	• ~					
Туре	[32] 0 ~ +	10 V ~					

7088 Firmware[0000] [Offline Configuration]							
	CH:00	CH:01	CH:02	CH:03			
PWM	OFF	OFF	OFF	OFF			
DI Status OFF		OFF	OFF	OFF			
Configuration	PWM	Counter	Value W	DT Cor			
Protocol (I	NIT*)	DCON		~			
Address		0	÷ [00H]			
Baud Rate	e (INIT*)	9600		~			
Parity (INI	Г*)	N,8,1		~			
Checksum	(INIT*)	Disable	d	\sim			
Battery Ba	ckup	[50]No	Battery B	iz ~			

	Set the rate of change for voltage or current (V/sec, mA/sec), which controls how
Slew Rate	quickly the module outputs a value when the AO value changes. The setting is
	available for the 7021/21P, 7024/24L/24R modules.
Detter Deeluur	If enabled, the data can be retained in case of power failure. The setting is available
вашегу васкир	for the 7088(D) modules.

1 7080 Firmware[0000] [Offline Configuration]								
Configuration Counter/Frequency DO/Alarm								
Protocol (INIT*) DCON ~								
Address	0 🗘 [00H]							
Baud Rate (INIT*)	9600 ~							
Parity (INIT*)	N,8,1 ~							
Checksum (INIT*)	Disabled ~							
Mode Select	[50] Up Counter 🗸							
Freq.	0.1 Second V							

Mode Select	It can be set to either Up Counter or Frequency mode for the 7080(D) and 7080B(D) modules, with Battery Backup available for the 7080B(D).		
Freq.	The time interval for measuring frequency can be set for the 7080(D) and 7080B(D) modules, with options of 0.1 or 1.0 second.		

AI parameters on the Configuration page	Type Code	Analog Format	Sample Mode	60/50 Hz	Sample Rate	Response Delay	Slew Rate	
Voltage & Current Input								
7012(F)(D)	0	0	0	0	-	-	-	
7017	0	0	-	0	-	0	-	
7017F/17C/17A5/17FC/17R/17RC	0	0	0	0	-	0	-	
7017mC16	-	0	0	-	-	0	-	
7017Z	-	0	0	0	-	0	-	
Thermocouple Input								
7011(P)(D)	0	0	-	0	-	-	-	
7018/18-16/18P/18R	0	0	-	0	-	0	-	
7018Z/19/19R/19Z	_	0	-	0	-	0	-	
Transmitter Input								
7014(D)	0	0	-	0	-	-	-	
RTD Input			1			1		
7013(P)(D)	0	0	-	0	0	0	-	
7015(P)	-	0	-	0	-	-	-	
7033(D)	0	0	-	0	-	-	-	
DS18B20 Sensor Input								
7004	_	-	-	-	-	0	-	
Thermistor Input			1			1	1	
7005	_	0	-	-	-	0	-	
Strain Gauge			1			1	T	
7016(P)(D)	0	0	-	0	-	-	-	
Voltage & Current Output			1			1	T	
7021/21P	0	0	-	-	-	-	0	
7022/22A	-	0	-	-	-	0	-	
7024/24L/24R	0	0	-	-	-	0	0	
7024U(D)/28(D)	_	0	-	-	-	0	-	
Multi-Function								
7002/03/	-	0	0	0	-	0	-	
7026	-	0	-	О	-	0	-	

AI parameters	Type Code	Mode Select	Battery Backup	Freq.	Response Delay			
Counter/Frequency Input								
7080(D)/80B(D)	-	0	-	0	0			
7084	0	-	-	-	0			
Counter Input/PWM Output								
7088(D)	-	-	0	-	0			
3.4 AI Settings Page

DCON Utility Pro offers several settings pages, with different items displayed depending on the model. The following describes the settings shown on the module's offline page.

Refer to Section 3.2 to know how to open the offline page.

Note:

The available settings will vary depending on the model.

7017F Firmware[0000] [Offline Configuration]							
Configuration	AI	Commands Log	Summary				
[08] +/- 10	V						
	Al Valu	e					
CH:00	+000.0	00					
CH:01	+000.0	00					
CH:02	+000.0	00					
CH:03	+000.0	00					
CH:04	+000.0	00					
CH:05	+000.0	00					
CH:06	+000.0	00					
CH:07	+000.0	00					

AI Page	Index of channel	Type Code (Defaults)	Individual Channel Configuration	
7011/11D/11P/11PD		[05] +/-2.5V		
7012/12D/12F/12FD	00	[08] +/-10V		
7013/13D/13P/13PD		[20] +/-100, Pt100 α=0.00385		
7014(D)		[08] +/-10V	-	
7016P/16PD	00		-	
7016/16D	00~01	[05] +/-2.5V		
7033(D)	00 ~ 02	[20] +/-100, Pt100 α=0.00385		
7002	00 ~ 03	[08] +/-10V		
7015(P)	00 ~ 05	[20] +/-100, Pt100 α=0.00385		
7003	00 ~ 07	[08] +/-10V	Yes	
7005	00 ~ 07	[60] PreCon Type III 10K @ 25°C -30 ~ 240°F		
7017/17F		[08] +/-10V		
7017A5		[1B] +/-150V		
7017C/7017FC/RC	00 ~ 07	[0D] +/-20mA		
7017R		[08] +/-10V		
7018/18P		[05] +/-2.5V		
7018R		[05] +/-2.5V		
7019/19R		[08] +/-10V]	
7018Z	00 ~ 00	[05] +/-2.5V		
7019Z	00 * 09	[08] +/-10V	Yes	
7017Z 00 ~ 09 or 00 ~ 19 (10 Differential or 20 Single-ended		[08] +/-10V		
7017mC16	00 ~ 15	[07] 4 ~ 20mA		
7018-16	00 ~ 16	[05] +/-2.5V	-	

18 7019 Firmwar	e[0000] [Offline Config	uration]				[00] +/- 15 mV				
Configuration	Al Commands	Log Summary				[01] +/- 50 mV				
	Al Value	Type Code	CJC C	Offset	Temperature Offse	[02] +/- 100 mV [03] +/- 500 mV				
CH:00	+000.000	[0F] T/C K-type	~ 0.00	+ -	00.00 + -	[04] +/- 1.0 V [05] +/- 2.5 V				
CH:01	+000.000	[08] +/- 10 V	V 0.00	+ -	00.00 + -	[06] +/- 20 mA [07] 4 ~ 20mA				
CH:02	+000.000	[08] +/- 10 V	✓ 0.00	+ -	00.00 + -	[08] +/- 10 V [09] +/- 5 V				
CH:03	+000.000	[08] +/- 10 V	✓ 0.00	+ -	00.00 + -	[0A] +/- 1 V [0B] +/- 500 mV				
CH:04	+000.000	[08] +/- 10 V	✓ 0.00	+ -	00.00 + -	[0C] +/- 150 mV				
CH:05	+000.000	[08] +/- 10 V	~ 0.00	+ -	00.00 + -	[0D] +/- 20 mA [0E] T/C J-type				
CH:06	+000.000	[08] +/- 10 V	~ 0.00	+ -	00.00 + -	[0F] T/C K-type [10] T/C T-type				
CH:07	+000.000	[08] +/- 10 V	~ 0.00	+ -	00.00 + -	[11] T/C E-type [12] T/C R-type				
		Set all channels	s as Al:00]		[13] T/C S-type [14] T/C B-type [15] T/C N-type [16] T/C C-type				
CJC Tempe	erature 0.000	Enable	CJC Mo	dule CJ	C Offset 00.00	[17] T/C L-type [18] T/C M-type [19] T/C L2-type				
CH: xx		Check to display	the curre	nt Al va	lue.	[IA] 0 10 +20 IIA				
Type Code		Set the data type code and range. The available options will vary								
		depending on the model.								
Set all chann	els as AI:00	Set the type code for all channels to be the same as channel 0.								
		Set the CJC (Cold Junction Compensation) offset for each channel.								
		It's available for the 7018/18-16/18P/18Z/18R/19/19R/19Z.								
Tomporature	Offcot	Set offset for each channel to adjuster the temperature readings.								
Temperature	Temperature Onset		It's available for the 7005/15/15P/19/19R/19Z.							
			Read the module's CJC temperature.							
Cic remperature		It's available for the 7011/11P/18/18-16/18P/18Z/18R/19/19R/19Z.								
Enable CJC		This option is typically hidden and becomes available when the type code is set between [0E] and [19].								
		Set the module's	s CJC offse	t						
Module CJC (Jffset	It's available for	the 7011/	11P/18	/18-16/18P/18Z/1	8R/19/19R/19Z.				
L		1								

These model's AI page includes the DIO and alarm settings. For more details, refer to Section 3.5: I/O Alarm Settings Page.

Model	AI Channel	DI Channel	DO Channel	
7011(D)/11P(D)/12(D)/12F(D)/13P	1 (00)	1 (00)	2 (00 ~ 01)	

18 7005 Firmwar	e[0000] [(Offline Conf	iguration]								
Configuration	AI	Al Alarm	DO/Alarm	Status	Host WDT	User [Defined Type	Comman	ds Lo	og	Summary
	Al Valu	e	Туре	Code				Tempera	ture	Off	set
CH:00	+000.0	000	[60] F	reCon Ty	/pe III 10K @	25°C ·	-30 ~ 🗸	00.00	+	-	
CH:01	+000.0	000	[60] F	reCon Ty	/pe III 10K @	25°C -	-30 ~ 🗸	00.00	+	-	
CH:02	+000.0	000	[60] F	reCon Ty	/pe III 10K @	25°C -	-30 ~ 🗸	00.00	+	-	
CH:03	+000.0	000	[60] F	reCon Ty	/pe III 10K @	25°C -	-30 ~ 🗸	00.00	+	-	
CH:04	+000.0	000	[60] F	reCon Ty	/pe III 10K @	25°C -	-30 ~ 🗸	00.00	+	-	
CH:05	+000.0	000	[60] F	reCon Ty	/pe III 10K @	25°C -	-30 ~ 🗸	00.00	+	-	
CH:06	+000.0	000	[60] F	reCon Ty	/pe III 10K @	25°C -	-30 ~ 🗸	00.00	+	-	
CH:07	+000.0	000	[60] F	reCon Ty	/pe III 10K @	25°C -	-30 ~ 🗸	00.00	+	-	
			Set	all char	nels as Al:0	0	Temperatu	ire Forma	t	0	°C O °F

Temperature Format	The 7005 modules allow temperature unit settings in Celsius (°C, default) or
	Fahrenheit (°F).

1 7018R Firmware[0000] [Offline Configuration]								
Configuration	Al Commands I	log Summary						
	Al Value	Type Code	CJC Offset					
CH:00	+000.000	[0F] T/C K-type V	0.00 + -					
CH:01	+00.0000	[05] +/- 2.5 V 🛛 🗸	0.00 + -					
CH:02	+00.0000	[05] +/- 2.5 V 🛛 🗸	0.00 + -					
CH:03	+00.0000	[05] +/- 2.5 V 🗸	0.00 + -					
CH:04	+00.0000	[05] +/- 2.5 V 🛛 🗸	0.00 + -					
CH:05	+00.0000	[05] +/- 2.5 V 🗸	0.00 + -					
CH:06	+00.0000	[05] +/- 2.5 V 🛛 🗸	0.00 + -					
CH:07	+00.0000	[05] +/- 2.5 V 🛛 🗸	0.00 + -					
		Set all channels as	AI:00					
Thermocou	ple Open Detection	Disable	~					
CJC Tempe	CJC Temperature 0.000 Senable CJC Module CJC Offset 00.00 + -							

Thermocouple Open
DetectionThe 7018R modules allow enabling or disabling the open-wire detection.

1 7016D Firmwa	re[0000]	[Offline Confi	guration]					X
Configuration	AI	Excitation	Linear Mapping	DI/DO Alarm	WDT	Commands Log	Summary	
Channel Se [05] +/- 2.5 • CH:00	lected V +00.00	le Chann Single Ch 2-Channe	el (Selectable) v nannel (Selectable) I					
○ CH:01		K	LED Oper Host Control	ration ~	LED 2.45	Data Wr	rite LED Dat	ta
LED Oper Module Contro	ation	LE ~ +1.	D Data 2345	Write LED Da	ita			

Channel Selected	The 7016(D) modules include two AI channels, while the older firmware supports only one channel. Single Channel : Indicates that either CH:00 or CH:01 can be used (one channel only). 2-Channel : Indicates that both channels can be used.
	Note that the 7016 P (D) modules include only one AI channel.
LED Operation	Module Control: Display the AI readings from the module. Host Control: Enter the value to be displayed on the LED and click "Write LED Data".
	It's available for the 7011D/11PD/12D/12FD/13D/13PD/16D/16PD.

Configuration	Al Comma	nds Log Summary					
	Al Value	Type Code			Al Value	Type Code	
CH:00	+000.000	[08] +/- 10 V	~	CH:10	+000.000	[08] +/- 10 V	
CH:01	+000.000	[08] +/- 10 V	~	CH:11	+000.000	[08] +/- 10 V	
CH:02	+000.000	[08] +/- 10 V	~	CH:12	+000.000	[08] +/- 10 V	
CH:03	+000.000	[08] +/- 10 V	~	CH:13	+000.000	[08] +/- 10 V	
CH:04	+000.000	[08] +/- 10 V	~	CH:14	+000.000	[08] +/- 10 V	
CH:05	+000.000	[08] +/- 10 V	~	CH:15	+000.000	[08] +/- 10 V	
CH:06	+000.000	[08] +/- 10 V	~	CH:16	+000.000	[08] +/- 10 V	
CH:07	+000.000	[08] +/- 10 V	~	CH:17	+000.000	[08] +/- 10 V	
CH:08	+000.000	[08] +/- 10 V	~	CH:18	+000.000	[08] +/- 10 V	
CH:09	+000.000	[08] +/- 10 V	~	CH:19	+000.000	[08] +/- 10 V	
		Set all channe	els as Al	:00			

Differential/Single-ended	The 7017Z modules can be set to differential or single-ended mode.
	Differential mode: 10 channels; Single-ended mode: 20 channels.

3.4.1 M-7004 Settings Page

Temperature Page	Ports	DS18B20 Sensor	Maximum Cable Length	
M-7004	4	20 pcs per port	100 meters per port	

The M-7004 provides 4 ports, with each port capable of connecting up to 20 DS18B20 sensors. Each DS18B20 sensor has a unique 64-bit serial number, represented by 16 hexadecimal characters. When using the M-7004 to read the temperature from the DS18B20 sensors, the user must know the serial number of each DS18B20 sensor and assign a unique channel index for each one.

Upon startup, the M-7004 scans all connected DS18B20 sensors on each port and checks if a channel index has been assigned to each sensor. If a sensor does not have a channel index assigned, it will be added to the "undefined" list. The user must assign a channel index to all items in the undefined list. This process only needs to be done once, as all data will be stored in non-volatile memory.

18 7004 Firmware[0000] [Offline Configuration	on]						
Configuration Temperature Comman	ds Log Summary						
Select Port 0 V Refre	sh Set All As Defined	Remove All Defined	CH:0				Memo
				Sen	isor:00	000.00	
				Sen	isor:01	000.00	
Port 0				Sen	isor:02	000.00	
Undefined	Sensor 0 37000802	25B0C7010		Sen	isor:03	000.00	
- Undefined	Sensor 1 EF000802	5B23DE10		Sen	isor:04	000.00	
Undefined	Sensor_2_46000802	25AC79710		Sen	isor:05	000.00	
Port_ 1				Sen	isor:06	000.00	
Port_ 2				Sen	isor:07	000.00	
Port_ 3				Sen	isor:08	000.00	
				Sen	isor:09	000.00	
Undofino	A Concor V VVV	~~~~~	v	Sen	nsor:10	000.00	
Undermed			T	Sen	isor:11	000.00	
Channel In	dex 64-bi	t Serial Code		Sen	sor:12	000.00	
0	37000	8025B0C7010		Sen	isor:13	000.00	
1	FF000	R025823DF10		Sen	sor:14	000.00	
	L10000	JOZJDZJDLIU		Sen	isor:15	000.00	
2	46000	8025AC79710		Sen	isor:16	000.00	
	•			Sen	isor:17	000.00	
				Sen	sor:18	000.00	
				Sen	nsor:19	000.00	
				Sav	e Config	jurations Of Po	ort 0 Sensors

Select Port	Supports 4 Ports, Port 0 – 3.
Refresh	Rescan DS18B20 sensors connected to this port.
Set All As Defined	Set all channels to the last saved index value.
Remove All Defined	Clear all stored index values of all channels
Memo	Add notes for each Sensor
Save Configurations of Port x Sensors	Save the configuration of all sensors on port x

When the DS18B20 sensor is damaged and needs to be replaced, the index value of that channel must be removed. Then, click the 'Refresh' button to rescan the DS18B20 on the M-7004's port. The new DS18B20 will be found and listed in the undefined list. Double-click on the sensor and assign the original channel index to it.

18 7004 Firmware[0000] [Offline Configuration]	
Configuration Temperature Commands Log Summary	
Select Port 0 V Refresh Set All As Defin	Remove All Defined CH:0
 Port_ 0 Assigned Sensol 0 370008025B0C7010 Assigned_Sensol 1 460008025AC79710 Assigned_Sensol 2 F0008025B23DE10 Port_ 1 Port_ 2 Port_ 3 Port_ 1 Port_ 0 Undefined_Sensor_0_4A0008025ABFA110 Port_ 1 Port_ 2 Port_ 1 	 Double-click on the item to remove its index. Replace the DS18B20 sensor. (4A0008025ABFA110) Click "Refresh" to rescan the sensors connected to the port. Double-click the new DS18B20 to assign its index.
 Port_ 0 Assigned Sensor 0 370008025B0C7010 Assigned_Sensor_1_4A0008025ABFA110 Assigned_Sensor_2_EF0008025B23DE10 Port_ 1 Port_ 2 Port_ 3 	5. Click "Refresh" again to rescan the sensors.

3.4.2 Settings Page – User Defined Type (7005)

The **User Defined Type** page is available for the I-7005/M-7005 thermistor input modules only. The temperature-to-resistance tables for thermistors manufactured by different vendors may vary. Although the 7005 module already supports thermistors from several well-known brands, it still provides users the option to create their own conversion formulas to accommodate other thermistors.

First, go to the **AI** page to specify the channel and type code (e.g., Ch0, Type 70) to be used. Then, proceed to the **User Defined Type page** to configure the following settings.

18 7005 Firmwar	e[0000] [Offline Confi	guration]
Configuration	Al Al Alarm	DO/Alarm Status Host WDT User Defined Type Commands Log Summary
	Al value	Type Code Temperature Offset
CH:00	+000.000	[70] 0x70 User-defined -50 ~ 150 v 00.00 + -
CH:01	+000.000	[60] PreCon Type III 10K @ 25°C -30 ~ 240 [61] Type u Fenwell -50 ~ +150 °C 00.00 + -
CH:02	+000.000	[62] Type u Fenwell 0 ~ +150 °C [63] YSLL Mix 100 @ 25°C -80 ~ 100
CH:03	+000.000	[64] YSI L Mix 300 @ 25°C -80 ~ 100 [65] YSI L Mix 1000 @ 25°C -70 ~ 100 00.00 + -
CH:04	+000.000	[66] YSI B Mix 2252 @ 25°C -50 ~ 150 [67] YSI B Mix 2252 @ 25°C -50 ~ 150 [67] YSI B Mix 2000 @ 25°C -40 ~ 150
CH:05	+000.000	[67] YSI B Mix 5000 @ 25°C -40 ~ 150 [68] YSI B Mix 5000 @ 25°C -40 ~ 150 [68] YSI B Mix 5000 @ 25°C -40 ~ 150
CH:06	+000.000	[64] YSI B Mix 6000 @ 25°C -30 ~ 150 [6A] YSI B Mix 10000 @ 25°C -30 ~ 150 00.00 + -
CH:07	+000.000	[6B] YSI H Mix 10000 @ 25°C -30 ~ 150 [6C] YSI H Mix 30000 @ 25°C -10 ~ 200 00.00 + -
		[70] 0x70 User-defined -50 ~ 150 rature Format ● °C ○ °F [71] 0x71 User-defined -50 ~ 150 [72] 0x72 User-defined -50 ~ 150 rature Format ● °C ○ °F [73] 0x73 User-defined -50 ~ 150 [74] 0x74 User-defined -50 ~ 150 [75] 0x75 User-defined -50 ~ 150
Exit	Write Config	ural [76] $0x76$ User-defined -50 ~ 150 hs to the file
CH0_INPUT_RA	NGE[[70h]0x70 Us	[//] UX// User-defined -50 ~ 150 er-defined -50 ~ 150 j,> (No⊏nor)

Mode 1: The coefficient can be calculated using three sets of known data: (R1, T1), (R2, T2), and (R3, T3) from the temperature-to-resistance table provided by the thermistor manufacturer, as shown in the figure below.

Tabella valori temperatura resistenza sensore NTC 10K@25°C & 3435

51

Temp.	Valore di Resistenza		Temp.	Valore di Resistenza			Temp.	Valore di Resistenza			
	Max.	Tipico	Min.		Max.	Tipico	Min.	_	Max.	Tipico	Min.
°C	ΚΩ	ΚΩ	ΚΩ	°C	ΚΩ	ΚΩ	ΚΩ	°C	ΚΩ	ΚΩ	ΚΩ
-50	344,60	329,50	314,90	1	26,65	26,13	25,62	56	3,50	3,43	3,35
49	325,00	310,90	297,30	2	25,52	25,03	24,55	57	3,39	3,32	3,25
-48	306,60	293,50	280,90	3	24,44	23,99	23,54	58	3,28	3,22	3,15
-47	289,40	277,20	265,40	4	23,42	23,00	22,57	59	3,18	3,12	3,05
-46	273,40	262,00	251,00	5	22,45	22,05	21,66	60	3,09	3,02	2,95
-45	258,30	247,70	237,40	6	21,53	21,15	20,78	61	2,99	2,93	2,86
-44	244,20	234,30	224,70	7	20,64	20,30	19,95	62	2,90	2,84	2,77
43	231,00	221,70	212,80	8	19,81	19,48	19,15	63	2,82	2,75	2,69
42	218,60	209,90	201,60	9	19,01	18,70	18,39	64	2,73	2,67	2,61
-41	207,00	198,90	191,00	10	18,25	17,96	17,67	65	2,65	2,59	2,53

1. On the "**Set By Resistor and Temperature**" page, enter three sets of resistance values (R) and temperature values (°C), then click the "**Calculate**" button to compute the Steinhart coefficient.

It is recommended to follow the rule below to ensure accurate results.

(1) $-40^{\circ}C \leq T1, T2, T3 \leq 150^{\circ}C$ (2) $|T2 - T1| \leq 50^{\circ}C$ (3) $|T3 - T2| \leq 50^{\circ}C$

For example,

IJ

<u>Note</u>: If the resistance value exceeds 204800 Ω , it is considered to be under range.

18 7005 Firm	nware[0000] [Offline C	onfiguration]		
Configura	tion AI Al Alar	m DO/Alarm Statu	s Host WDT User	Defined Type Commands Log
Set By F	Resistor and Temper	ature Set By Steinł	art Coefficients Hel	р
	Temperature °C		Resistor Value	
T1	0	R1(ohms)	29490	
Т2	50	R2(ohms)	3893	Calculate
Т3	100	R3(ohms)	816.8	Clear
	Please input	temperature and r	esistor values	

 The "Set By Steinhart Coefficients" page will automatically appear, displaying the results. Click the "Setting" button to complete the configuration.



Mode 2: Typically, Steinhart coefficients for thermistors are provided by the manufacturers.

1. On the "Set By Steinhart Coefficients" page, enter the A, B, and C coefficients in float format.

Example: A thermistor with the component number **YSI H Mix 10000** has **Steinhart coefficients** as shown in the table below.

Coefficients	Float Format	Hexadecimal Format
А	1.02949264911967E-03	3A86F00B
В	2.39078592663805E-04	397AB12C
С	1.56816365983255E-07	3428615B

2. Click the **"Calculate"** button to display the coefficients in **hex format**. Then, click the **"Setting"** button to complete the configuration.



3.4.3 Settings Page - Linear Mapping

] 🛢 7014D Firmware[0000] [Off	line Configuratior)]			
Configuration AI Lin	near Mapping	I/DO Alarm WDT	Comma	ands Log	Summary
Enable Linear					
CH:0					
Source Low Value	-010.000	Target Low Va	lue	-010.000	
Source High Value	010.000	Target High Va	010.000		
Set Linear					

Source	Target	Check the "Enable Linear" option and specify the Source Low/High a				
High/Low Value		Target Low/High values. Then, click "Set Linear" to apply the settings.				
It's available for the 7014(D)/16(D)/16P(D)						

3.4.4 Settings Page – Logger Configuration (M-7017mC-16)

The **M-7017mC-16** is a 16-channel current input module with a built-in **data logger** capable of recording input values for all channels, including **date and time information**. It can store up to **100,000 records**, which can be downloaded.

7017mC16 Firmware[0000]	[Offline Configuration]
Configuration AI Log	gger Configuration Commands Log Summary
Real Time	YearMonthDayHourMinuteSecon2025020400000000
Log Status	Stop
Log Command	0: Stop 🗸
Overwrite Option	1: Yes Continue writing when data logger is full
Sample Period	Hour Minute Secon
Start Logger Time	YearMontDayHourMinuteSecon2016 \checkmark 10 \checkmark 00 \clubsuit 01 \clubsuit
End Logger Time	YearMontDayHourMinuteSeconApply2016100001
Overwrite Option Sample Period Start Logger Time End Logger Time	1: YesContinue writing when data logger is fullHour 00Minute 01Secon 00 00 00 01 Year 2016Mont 10Day 00Hour 00Minute 01Secon 01Year

Real Time	Set the current time. (Year/Month/Day/Hour/Minute/Second)				
Log Status	Display the current logging status.				
	Set the logging mode:				
	• 0: Stop – Stop logging.				
Log Command	• 1: Run – Start logging.				
	• 2: Run in Period Mode – Enables periodic logging.				
	Specifies whether to overwrite data:				
Overwrite Option	• 1: Yes – If the storage is full, new data will overwrite old data.				
	• 2: No – Stop logging when storage is full.				
Sample Period	Set the logging interval. (Hour/Minute/Second)				
Start Logger Time	Set the start time for periodic logging. (Year/Month/Day/Hour/Minute/Second)				
End Logger Time	Set the stop time for periodic logging. (Year/Month/Day/Hour/Minute/Second)				
Apply	Click this button to apply all settings.				

3.5 I/O Alarm Settings Page

Settings Pages	Model
AI/DO Alarm	7026
DI/DO Alarm	7014(D)/16(D)/16P(D)
AI Alarm	7005
DO/Alarm (1)	7002, 7003
DO/Alarm (2)	7080(D)/80B(D)
DO/Alarm Status	7005

In addition to the I/O setting, the following models provide the "Alarm" function.

Note: The DI/DO/Alarm setting for the 7011(D)/11P(D)/12(D)/12F(D)/13P are listed on the AI page. Refer to the following description.

3.5.1 Settings Page - AI/DO Alarm

Model	AI Channel	AO Channel	DI Channel	DO Channel
7026	6	2	3	3

18 7026 Firmwa	8 7026 Firmware[0000] [Offline Configuration]								
Configuration	AO AI/DO Alarm	Host WDT	Commands Log	Sı	ummary				
	Al Value	Type Code		Г	Alarm Mode	High Alar	m Limit	Low Alarn	n Limit
CH:00	+000.000	[08] +/- 10 V	~	T	Disable ~	10		-10	
CH:01	+000.000	[08] +/- 10 V	~	T	Disable ~	10		-10	
CH:02	+000.000	[08] +/- 10 V	~	I	Disable ~	10		-10	
CH:03	+000.000	[08] +/- 10 V	~		Set Alarm				
CH:04	+000.000	[08] +/- 10 V	~	T	DO Bit Status	High Alar	m Status	Low Alarn	n Status
CH:05	+000.000	[08] +/- 10 V	~	T	DO:00	AI:00	Clear	AI:00	Clear
				T	DO:01	AI:01	Clear	AI:01	Clear
		Set all channels	as Al:00	T	DO:02	AI:02	Clear	AI:02	Clear
				T	Set [Power-on	Value]	Set [S	afe Value]	
	Read DO								
	O Read Power-on Value								
					Read Safe Val	lue			

When **Alarm Mode = Disable**, **DO** can be configured.

	• Disable – Alarm function is disabled.
	• Momentary – If the value exceeds the alarm limit, an alarm is triggered and
Alarm Mode	remains active until the value returns to normal.
	 Latch – If the value exceeds the alarm limit, an alarm is triggered and
	remains active until manually cleared.
High Alarm Limit	Set the upper alarm threshold based on the Type Code setting.

Low Alarm Limit	Set the lower alarm threshold based on the Type Code setting.
Set Alarm	Click the "Set Alarm" button to apply all the above settings.
	Set the DO value, Power-On Value, or Safe Value.
DO Bit Status	Check DO: xx and click "Set Power-On/Safe Value" to configure its status.
	Otherwise, click "Read Power-On/Safe Value" to display its status.
High Alarm Status	Display or clear the alarm status
	1) A red indicator lights up when the value exceeds the alarm threshold.
Low Alarm Status	2) In Latch mode, click the " Clear " button to manually reset the alarm.

3.5.2 Settings Page - DI/DO Alarm

Model	AI Channel	AO Channel	DI Channel	DO Channel
7014(D)	1	-	1	2
7016P(D)	1	1	1	л
7016(D)	2		T	4

] 9 7014 Firmware[0000] [[Offline Configuration]	_		×
Configuration Al	Linear Mapping DI/DO	Alarm WDT	Commands Log	Summary
Alarm Mode	High Alarm Limit	Low Alarm Lin	nit	
Disable ~	10	-10		
		Set Alarm		
DO Bit Status	Alarm Status			se DI State (INIT*)
DO:00	Low		DI Bit Sta	atus 🕘 DI:00
DO:01	High Clear			
Set [Power-on	Value] Set [Sa	fe Value]		
Read DO			DI Coun	ter 0 Clear
O Read Power-o	on Value			
Read Safe Val	lue			

For more details on related settings, refer to Section 3.5.1: Settings Page - AI/DO Alarm.

DI Bit Status	Display the status of DIO
DI Counter	When the DI is used as a counter, the count value can be displayed and cleared.

3.5.3 Settings Page - AI Alarm

18 7005 Fin	9005 Firmware[0000] [Offline Configuration]							
Configura	Configuration AI (AI Alarm DO/Alarm Status Host WDT User Defined Type Commands Log Summary							
	Alarm Type	High Alarm Limit	Alarm DO	Alarm Type	Low Alarm Limit	Alarm DO		
CH:0	Disable ~	10	0 ~	Disable \lor	-10	0		
CH:1	Disable ~	10	0 ~	Disable ~	-10	0 0		
CH:2	Disable ~	10	0 ~	Disable 🗸	-10	0 1 2		
CH:3	Disable ~	10	0 ~	Disable 🗸	-10	0 3		
CH:4	Disable ~	10	0 ~	Disable 🗸	-10	0 5		
CH:5	Disable ~	10	0 ~	Disable 🗸	-10	0 ~		
CH:6	Disable ~	10	0 ~	Disable 🗸	-10	0 ~		
CH:7	Disable ~	10	0 ~	Disable 🗸	-10	0 ~		
Setting								

For more details on related settings, refer to Section 3.5.1: Settings Page - AI/DO Alarm.

Alarm DO When the AI value exceeds the alarm threshold, the DOx alarm will be trigger.

3.5.4 Settings Page - DO/Alarm

For more details on related settings, refer to Section 3.5.1: Settings Page - AI/DO Alarm.

Model	AI Channel	DI Channel	DO Channel
7002	4	5	4
7003	8	-	4

] e 7002 Firmware[0000]	[Offline Configuration]						
Configuration AI	DO/Alarm	Host WDT Commands Log	Summary				
Alarm Mode	High Alarm Limit	Low Alarm Limit	DO Bit Status	High Alar	m Status	Low Alarn	n Status
Disable v	10	-10	DO:00	AI:00	Clear	AI:00	Clear
	10	-10	DO:01	AI:01	Clear	AI:01	Clear
	10	-10	DO:02	AI:02	Clear	AI:02	Clear
Set Alarm	10	-10	DO:03	AI:03	Clear	AI:03	Clear
			Set [Power-or	Value]	Set [S	afe Value]	
			Read DO				
			O Read Power-	on Value			
			○ Read Safe Va	alue			

3.5.5 Settings Page - DO/Alarm (/LED) (7080/80B)

Model	Counter/Frequency Channel	DO Channel
7080(D), 7080B(D)	2	2

DO0 and DO1 can be used as general DO or alarm outputs in the following ways:

- 1. In **Frequency** mode, DO0/1 can function as general DO.
- 2. In **Counter** mode with Alarm disabled, DO0/1 can function as general DO.
- 3. In **Counter** mode with Alarm enabled, DO0/1 can function as an alarm output.

(Users can set the mode to Up Counter or Frequency on the "Configuration" page.)

Mode 0 (CH0, CH1)

d Options under Frequency Mode
elect Display
LED Data
e Data To LED

Alarm I	Mode	Set to Mode 0 or Mo	ode 1						
Mode 0 (CH0, CH1)									
Alarm S	Status	Enable or disable the	e alarm function.						
		When Alarm Status i	is disabled, DO(0) and DC	D(1) can function as gene	ral DO.				
DO(0),	DO(1)	Checked: ON ; Unch	ecked: OFF						
СН0, СІ	H1 Alarm	Set the upper limit v	alue of the alarm. (Defau	ılt = 4294967295)					
When Alarm Status = Disable, the DO status will display as follows:									
			[CH0 High Alarm]	[CH1 High Alarm]					
	Di Count	er (CHU, CHI)	DO0	D01					
	Counter 0/1 valu	ue < Alarm limits	OFF	OFF					
	Counter 0 value	\geqq Alarm limits	ON	-					
	Counter 1 value	≧ Alarm limits	-	ON					
Set Ala	rm	Click the "Set Alarm'	" button to apply the set	ings.					

When **Alarm Status** (CH0, CH1) is enabled, and Counter 0 reaches or exceeds the alarm limit, the test result is displayed as shown in the figure below.

18 7080D Firmware[A201]					
Configuration Counter/	Frequency DO/Alarm	/LED Comman	nds Log	Summary	Disabled Options under Frequency Mode
Alarm Mode	Mode 0 (CH0, CH1)	~			Select Display
Alarm Status CH:0 Alarm	Enable ~	Ch 0 High-	Alarm O	N	LED Data
CH:1 Alarm	Enable ~ 25	Ch 1 High-	Alarm O	FF	Write Data To LED
	Set Alarm				

Mode 1 (CH0)

7080D Firmware[0000]	[Offline Configuration]			
Configuration Counter	r/Frequency DO/Alarm/LE	D Commands Log	Summary	Disabled Options under Frequency Mode
Alarm Mode	Mode 1 (CH0)			Select Display
Alarm Status High Alarm	Enable Di 4294967295	s able Iable Ch 0 High-Alarm C)FF	Show CH:1 Show CH:1 LED Data Host Control
High-High Alarm	4294967295	Ch 0 High-High-Al	arm OFF	Write Data To LED

Alarm Mode	Set to Mode 0 or Mode 1					
Mode 1 (CH0)						
Alarm Status	Enable or disable the alarm function.					
	When Alarm Status is disabled, DO0 and DO1 can function as general DO.					
DO(0), DO(1)	Checked: ON ; Unchecked: OFF					
High Alarm	The High-High Alarm value must be set greater than the High Alarm value.					
High-High Alarm	(Default: 4,294,967,295)					
Set Alarm	Click the "Set Alarm" button to apply the settings.					
Select Display	Show CH:0/CH:1: Display the DO0/DO1 status on the module's LED display. Host Control: The DO status is controlled by the host.					
LED Data	When Host Control is selected, enter the value to be displayed on the module's LED, then click "Write Data To LED" to apply it.					

When Alarm Status = Enable , the DO status will display as follows:								
DL Counter [CH0] [CH0 High Alarm] [CH0 High-High Al								
	DO0	D01						
Counter value < High Alarm value	OFF	OFF						
High Alarm value ≤ Counter value < High-High Alarm value	ON	OFF						
Counter value ≥ High-High Alarm value	ON	ON						

When the alarm state (CH0) is enabled, and Counter 0 exceeds the High Alarm value but is still less than the High-High Alarm value, the test result is displayed as follows.

18 7080D Firmware[A20	01]				
Configuration Coun	ter/Frequency	DO/Alarm/LED	Commands Log	Summary	Disabled Options under Frequency Mode
Alarm Mode	Mode 1 (C	CH0) ~			Select Display
Alarm Status Enable		~	h 0 High-Alarm C	N	LED Data
					Write Data To LED
High-High Alarm	25 Set A		h 0 High-High-Ala	arm OFF	

When the **alarm state (CH0)** is enabled, and **Counter 0** exceeds the **High-High Alarm** value, the test result is displayed as follows.

18 7080D Firmware[A201]					
Configuration Counter/F	Frequency	DO/Alarm/LED	Commands Log	Summary	Disabled Options under Frequency Mode
Alarm Mode	Mode 1 (C	CH0) ~			Select Display
Alarm Status High Alarm	Enable 15		h 0 High-Alarm C	DN	LED Data
High-High Alarm	25 Set A	Alarm	h 0 High-High-Ala	arm ON	Write Data To LED

3.5.6 Settings Page - DO/Alarm Status (7005)

Model	AI Channel	DO Channel
7005	8	6

18 7005 Firmware[0000] [Offline Configuration]		
Configuration AI AI Alarm DO/Alarm Status Host WDT User Defined Type	Commands Log	Summary
DO/Alarm DO_0 Normal DO ON DO_1 Normal DO OFF DO_2 Normal DO OFF DO_3 Normal DO OFF DO_4 Normal DO OFF DO_5 Normal DO OFF		
Set [Power-on Value] Read R		
Set [Safe Value] O Read Safe Value		

	Set the DO Value, Power-On Value, or Safe Value:
	 Select DO_x, then click Set [Power-On/Safe Value] to configure the value. To view the current setting, click Read [Power-On/Safe Value].
	Typically, the DO Status is "Normal". It changes to Alarm when an alarm is
DO/Alarm Status	triggered. Additionally, the AI Alarm Status (Mode) is displayed.
	DO/Alarm
	□ ○ DO_0 Alarm DO OFF
	Al_0_Low_Alarm(Momentary)
	O Al_1_High_Alarm(Latch)

3.6 AO Settings Page

18 7024U F	7024U Firmware[0000] [Offline Configuration]											
Configura	ition AO	DO	DI	Host WDT	Con	nmands Log	Summary					
	\smile							Set AO Va	alue with Engin	eering Forma	ıt	
	Type Code		Slew Rate	e Batt	ery B	ackup	Wiring	AO Value	Read Back	Range	Output	
AO:00	[03] +/- 10 V	~	immediate	~		Set	Normal	00.000	00.000	+/- 10 V	00.000	Write
AO:01	[03] +/- 10 V	~	immediate	~		Set	Normal	00.000	00.000	+/- 10 V	00.000	Write
AO:02	[03] +/- 10 V	~	immediate	~		Set	Normal	00.000	00.000	+/- 10 V	00.000	Write
AO:03	[03] +/- 10 V	~	immediate	~		Set	Normal	00.000	00.000	+/- 10 V	00.000	Write
	Set Chann	el Ty	pe Code A	As AO:00				Set [Pov	ver-on Value]	Set [Safe Value]	
								• Read AO				
								O Read Pov	wer-on Value			
	○ Read Safe Value											
Set Channel Type Code As AO:00								 Read AO Read Pov Read Saf 	wer-on Value wer-on Value fe Value	Set	sale valuej	

AO Page	Channel Index	Type Code (Default)	Slew Rate	Battery Backup	Wiring	Individual Channel Configuration
7021/21P	00	[32] 0 ~ +10V	Section 3.3.2	-	-	-
7022/22A	00~01	[02] 0 ~ +10V	0	-	-	0
7024/24L/24R	00 ~ 02	[33] +/-10V	Section 3.3.2	-	-	-
7024U(D)	00 05		0	о	0	0
7028(D)	00 ~ 07	[03] +/-10V	0	о	0	0
7026	00~01		0	-	-	0

Type Code	Set the data type code and its range.								
Slew Rate	Set the rate of change for voltage or current (V/sec, mA/sec) outputs. This setting is on the Configuration page of the 7021/21P, 7024/24L/24R.								
Battery Backup	The output value of the 7024U(D) and 7028(D) can be retained in case of power failure.								
Set	Click the Set button to apply the above settings.								
Wiring	The 7024U(D) and 7028(D) provide the open-wire detection.								
Set AO value with the Engineering format	Easily set the AO value. For example, when the Type Code is set to ±10V and the Analog Format is 2's Complement , the data range is 8000 to 7FFF . Enabling this option lets users enter a value directly from -10 to +10 (e.g., 2.5).								
Type Code Slew R AO:00 [03] +/- 10 V → immedi	Image: Set AO Value with Engineering Format Rate Battery Backup Wiring AO Value Read Back Range Output iate Image Set Normal 0000 0000 8000~ 7FFF 0000 Write								
	Set AO Value with Engineering FormatAO ValueRead BackRangeOutput00.00000.000+/- 10 V00.000Write								

18 7024U Firmw	are[0000]	[Offlin	ne Configura	ation]								
Configuration	AO	DO	DI	Host WDT	Com	nmands Log	Summary					
								Set AO Va	alue with Engin	eering Format		
Тур	e Code		Slew Rate	e Batte	ery B	ackup	Wiring	AO Value	Read Back	Range	Output	
AO:00 [03]	+/- 10 V	~	immediate			Set	Normal	0000	0000	8000~ 7FFF	0000	Write
AO:01 [03]	+/- 10 V	~	immediate			Set	Normal	0000	0000	8000~ 7FFF	0000	Write
AO:02 [03]	+/- 10 V	~	immediate			Set	Normal	0000	0000	8000~ 7FFF	0000	Write
AO:03 [03]	+/- 10 V	~	immediate			Set	Normal	0000	0000	8000~ 7FFF	0000	Write
Se	Set Channel Type Code As AO:00 Set [Power-on Value] Set [Safe Value] Read AO Read Power-on Value Read Safe Value 											

AO Value	Display the configured AO value, power-on value, or safe value.						
Read Back	Display the current readback value of the analog output						
Note: If the Slew Rate is set,	the output value will not change immediately. As a result, the configured						
AO Value and the Rea	d Back value may differ.						
	Display the valid output range.						
Range	For example, when Analog Format = 2's Complement, the range is						
	displayed as 8000 ~ 7FFF.						
	Set the AO value, power-on value, or safe value.						
	Enter a value in the Output field, then click Write to set the AO Value .						
Output / Write	Alternatively, click Set Power-On Value or Set Safe Value to configure						
	those values.						
	Note: Modules 7021/7021P do not support reading the Power-On Value.						
Read AO, Power-on Value,	Upon selecting an item, the titles AO Value and Read Back will						
Safe Value	automatically update to reflect the selected item and show the readings.						

3.6.1 Settings Page - Excitation

1 7016 Firmware[0000] [Offline Configuration]										
Configuration AI Excitation	inear Mapping	DI/DO Alarm	WDT	Commands Log	Summary					
Excitation Voltage	00.000	0 ~ 10 V	Se	t Excitation Volta	ge					

Excitation Voltage	Enter the desired output voltage value, then click the Set Excitation Voltage button to apply the setting.
	It's available for the 7016(D)/16P(D).

3.7 DI Settings Page

7055D Firmware[0000] [Offline Configuration]										
Configuration DO Host WDT DI Commands Log Summary										
□ Reverse DI State (INIT*) DI Filter 10 1~65534 ms Set										
DI Bit Status	DI:00	DI:01	DI:02	DI:03	DI:04	DI:05	DI:06	DI:07		
High Latch	DI:00	DI:01	DI:02	DI:03	DI:04	DI:05	DI:06	DI:07		
Low Latch	DI:00	DI:01	DI:02	DI:03	DI:04	DI:05	DI:06	DI:07		
	Clear DI	Latch								
Enable 32-Bit	16-bit DI C	Counter ~	Counte	r Edge F	alling Edge	~				
DI Counter	0	0	0	0	0	0	0	0		
	Clear	Clear	Clear	Clear	Clear	Clea	r Cle	ar Clear		

DI Page	Channel	DI Reverse	DI Filter	DI Bit Status	DI Latch	DI Counter	Enable 32-Bit	Counter Edge
7026	2	0	-				-	-
7024U(D)							-	-
7044(D)	л	0	-					0
7060(D)	4						0	0
7065(D)/65A(D)/65B(D)			0					0
7002	5	0		О	О	0	_	
7024R	5	-	-				-	-
7050(D)/50A(D)	7	0	-				0	0
7052(D)		-	0					
7055(D)	o	0	0				0	0
7058(D)/59(D)	0	-	-					
7063(D)/63A(D)/63B(D)		0	0					

Reverse DI S	State	Enables DI status inversion. Configuration is only allowed in INIT mode.			
DI Filter		To prevent false triggering caused by high-frequency noise, users can specify a time (1 to 65534 ms), which defines how long a DI status change must persist before it is recognized as valid. Then, click Set to apply the setting.			
DI Bit Status		Display the status (ON/OFF) of each DI channel.			
	High Latch	Display the high-level latch status of each DI channel.			
DI Latch	Low Latch	Display the Low-level latch status of each DI channel.			
	Clear DI Latch	Clear the latch status of all DI channels.			
	Enable 32-Bit	Enable either 16-bit or 32-bit counter functionality.			
DI Counter	Counter Edge	Increment the counter by 1 when the DI signal transitions from High to Low or Low to High.			
	Clear	Clear the counter value of each DI channel.			

3.7.1 Settings Page - DI/DI Latch

7051D Firmware[0000] [0	051D Firmware[0000] [Offline Configuration]										
Configuration DI/DI	Latch DI Co	ounter Com	mands Log	Summary							
C Reverse DI	State (INIT*)		DI Filt	ter 10	1~655	5 <mark>34 ms</mark>	Set				
DI Bit Status	DI:00	DI:01	DI:02	DI:03	DI:04	DI:05	DI:06	DI:07			
	DI:08	DI:09	DI:10	DI:11	DI:12	DI:13	DI:14	DI:15			
High Latch	DI:00	DI:01	DI:02	DI:03	DI:04	DI:05	DI:06	DI:07			
	DI:08	DI:09	DI:10	DI:11	DI:12	DI:13	DI:14	DI:15			
Low Latch	DI:00	DI:01	DI:02	DI:03	DI:04	DI:05	DI:06	DI:07			
	DI:08	DI:09	DI:10	DI:11	DI:12	DI:13	DI:14	DI:15			
Clear DI Late	h										

For more details on related settings, refer to Section 3.7: DI Settings Page.

Pag	e		DI/I	DI Counter			
Model	Channel	DI Reverse	DI Filter	DI Bit Status	High/Low Latch	Enable 32-Bit	Counter Edge
7041(D)	14	0	0				
7046(D)	15	0	-				
7051(D)			0			•	
7053(D)		0	-	0	0	0	0
7054(D)	16		-				
7054P(D)			-				
7058-16		-	-				

3.7.2 Settings Page - DI Counter

For more details on related settings, refer to Section 3.7: DI Settings Page.



3.8 DO Settings Page

7043D Firmwa	043D Firmware[0000] [Offline Configuration]									
Configurati	Configuration DO Host WDT Commands Log Summary									
Bit Stat	Bit Status									
CH:	00 CH:01	CH:02	CH:03	CH:04	CH:05	CH:06	CH:07			
	08 CH:09	CH:10	CH:11	CH:12	CH:13	CH:14	CH:15			
Set [Power-on Value]	Set [Safe	Value]							
O Rea	d DO									
⊖ Rea	O Read Power-on Value									
⊖ Rea	O Read Safe Value									

Bit Status	Set the status of DOx. - Checked: ON - Unchecked: OFF
Set [Power-on Value] Set [Safe Value]	Select the checkbox for CH: xx , then click the Set Power-on Value or Set Safe Value button to configure the respective value.
Read DO, Read Power-on Value, Read Safe Value	Select one of these options to view the current settings.

DO Page	Channel	Bit Status	Set/Read Power-on Value	Set/Read Safe Value
7058-16	2			
7063(D)/63A(D)/63B(D)	3			
7024U(D)/60(D)	4			
7065(D)/65A(D)/65B(D)	5			
7066(D)/67(D)	7	о	0	0
7044(D)/50(D)/50A(D)/55(D)/64(D)/68(D)/69(D)	8			
7061(D)	12			
7042(D)	13			
7043(D)/45(D)/54(D)/54P(D)	16			

3.9 Counter, Frequency, and Encoder

3.9.1 Settings Page - PWM

The PWM (Pulse Width Modulation) function outputs a waveform with an adjustable duty cycle and frequency through DO signals, allowing control of analog circuits such as motor position/speed, lamp brightness, and fan speed.

19 7088D Fir	mware[0000]	[Offline Co	onfiguration]	2 01-04		24:07	100000111	
	CH.00	CH.01	CH.02 CH.0	13 CH.04	CH.05 CH.06	CH.07	DI Reve	erse Flag
PWM	OFF	OFF	OFF OFF	- OFF	OFF OFF	OFF	Normal	1; Active (~
DI Status	OFF	OFF	OFF OFF	OFF	OFF OFF	OFF		
Configura	tion PWM	Counter	Value WDT	7 Segment L	ED Commands Log	Summary	1	
Fre	equency (Hz)	Duty	Pulse Mode	Burst Count	Hardware Trigger	Sync. Ch		Start PWM
CH:00	1000	50.0	Burst Count ~	1	Disable Trigger 🗸		Apply PWM	
CH:01	1000	50.0	Burst Count ~	1	Disable Trigger 🗸		Apply PWM	
CH:02	1000	50.0	Burst Count ~	1	Disable Trigger \lor		Apply PWM	
CH:03	1000	50.0	Burst Count ~	1	Disable Trigger 🗸		Apply PWM	
CH:04	1000	50.0	Burst Count ~	1	Disable Trigger 🗸		Apply PWM	
CH:05	1000	50.0	Burst Count ~	1	Disable Trigger 🗸		Apply PWM	
CH:06	1000	50.0	Burst Count ~	1	Disable Trigger \lor		Apply PWM	
CH:07	1000	50.0	Burst Count ~	1	Disable Trigger 🗸		Apply PWM	
Start	Synchroniz	ed	Stop Synchro	onized	Save All PWM Con	figurations		

Frequency (Hz)	Set the frequency. (Range: 1 Hz to 500 KHz)
Duty	Set the duty cycle which represents the proportion of time the
Duty	system remains "active" within a cycle. (Range: 0.1 ~ 99.9 %)
Pulse Mode	Set the pulse mode: Burst Count or Continuous.
Burst Count	Set the number of pulses in a burst. (Range: 1 ~ 65535)
	Set the trigger mode:
	• Disable Trigger – Software trigger mode.
Hardware Irigger	 Trigger Start – Activate hardware trigger.
	 Trigger Stop – Deactivate hardware trigger.
Sunc Ch	Checked: Enable synchronized output.
Sync. Ch	Unchecked: Output independently.
Apply PWM	Click this button to apply PWM settings.
Start PWM	Enable the PWM function when checked.
Start Synchronized	Click this button to activate synchronized PWM output.
Stop Synchronized	Click this button to deactivate synchronized PWM output.
Save All PWM Configurations	Click this button to save all PWM settings

3.9.2 Settings Page – Counter/Frequency (7080/80B)

18 7080BD Fin	mware[0000] [Offline Configuration]			
Configuratio	Counter/Frequency DO/Alar	m/LED C	commands Log Summary Disabled C	ptions under Frequency Mode
Counte	Input Signal Counter Data	~	High Level Voltage (0 ~5V)	2.4 V
CH:0	TTL ~ 0 [00000000]	Clear	· · · · · · · · · · · · · · · · · · ·	
🕑 CH:1	TTL ~ 0 [0000000]	Clear	Low Level Voltage (0 ~5V)	0.8 V
	Preset Value			
CH:0	0	Set	High Level Width(2~65535us)	2 us
CH:1	0	Set		
	Max. Value		Low Level Width(2~65535us)	2 us
CH:0	4294967295	Set		
CH:1	4294967295	Set	Enable Filter	et Filters

	In Frequency mode, this setting is ignored. In Counter mode, the gate control function is disabled by default.				
Counter Gate Mode	[0] Low Active: The counter is enabled only when the gate input is Low.				
	[1] High Active: The counter is enabled only when the gate input is High.				
	[2] None: The counter is always enabled.				
Input Signal	The input signal can be selected as either TTL (Transistor-Transistor Logic) or				
	Photo (Isolated).				
Counter Data	Display the current counter value.				
Clear	Reset the counter to the initial value and clear the overflow flag.				
Preset Value	Set the initial value of the counter, with a default of 0. This setting can be ignored in Frequency mode.				
Max. Value	Set the maximum counter value.				
Set	Click this button to apply the configured value.				
High Level Voltage	Set the high-level trigger voltage (Default: 2.4V).				
Low Level Voltage	Set the low-level trigger voltage (Default: 0.8V).				
High Level Width	Set the minimum width of the input signal at high level. (Default: 2 μ s).				
Low Level Width	Set the minimum width of the input signal at low level. (Default: 2 μs).				
Enable Filter	Check this box to enable the digital filter.				
Set Filters	Click this button to apply the filter settings.				

> Disable Options under Frequency Mode (7080/80B)

When the 7080(D)/80B(D) module is set to **Frequency** mode, certain settings on the **Count/Frequency** page will be disabled.

18 7080BD Firmware[0000]	[Offline Configurat	ion]			
Configuration Counter/	Frequency DO//	Alarm/LED	Commands Log	Summary	Disabled Options under Frequency Mode
Protocol (INIT*)	DCON	~			
Address	0 🔹 [[00H]			
Baud Rate (INIT*)	9600	~			
Parity (INIT*)	N,8,1	~			
Checksum (INIT*)	Disabled	~			
Mode Select	[50] Up Counter	~			
Freq.	[50] Up Counter [51] Frequency [52] Battery Bac	ckup			
Response Delay	0 [Max	.30ms]	?		

The following settings will be disabled in **Frequency** mode.

Configuration Counter/Frequency DO/Alarm/LED Commands Log Summary Disabled Options under Frequency Mo	ency Mode
Counter Gate Mode Input Signal Counter Data CH:0 Clear High Level Voltage (0 ~5V) V High Level Width(2~65535us) Use Low Level Width(2~65535u) Use Low Level Width(2~65535u) Use Low Level Width(2~65535u) Use Low Level Width(2~65535u) Use Filters	

3.9.3 Settings Page - Encoder (I-7083, 7083B)

7083 Firmware	[0000] [Offline	Configuration]			
Configuratio	n Encoder	Commands Log Su	immary		
Encode	r 0 0	Z 0	Reset	Stop 🔽 🗆 XO	R
Preset	0	Set	Battery	CW/CCW	
Encode	r 1 0	Z 1	Reset	Stop A/B Phase XO	R
Preset	0	Set	Battery	r	
Encode	r 2 0	Ζ2	Reset	Stop ~ 🗆 XO	R
Preset	0	Set	Battery	,	
Read En	coder	Normal Encoder V	alue	Latch Synchronous	Encoder
		Synchronous Enco	oder Value		

Encoder 0/1/2	Display the current value of Encoder 0, 1, or 2.
Preset	Enter the initial counting value, then click the Set button to apply the setting.
Z 0/1/2	Display the status of Z0, 1, or 2 as Hi or Lo .
Reset	Clear the encoder value.
Battery Backup	Enables value retention during power failure when checked.
Encoder Mode	Set the encoder mode to one of the following:
Encoder Mode	- Stop - CW/CCW - Pulse/Dir - A/B Phase
	- Stop - CW/CCW - Pulse/Dir - A/B Phase Built-in XOR logic circuit; controls whether the encoder input triggers on
XOR	 Stop - CW/CCW - Pulse/Dir - A/B Phase Built-in XOR logic circuit; controls whether the encoder input triggers on High Level or Low Level.
XOR	 Stop - CW/CCW - Pulse/Dir - A/B Phase Built-in XOR logic circuit; controls whether the encoder input triggers on High Level or Low Level. Normal Encode Value: Read the current encoder value.
XOR Read Encoder	 Stop - CW/CCW - Pulse/Dir - A/B Phase Built-in XOR logic circuit; controls whether the encoder input triggers on High Level or Low Level. Normal Encode Value: Read the current encoder value. Synchronous Encoder Value: Read the synchronous encoder value.
XOR Read Encoder Latch Synchronous	 Stop - CW/CCW - Pulse/Dir - A/B Phase Built-in XOR logic circuit; controls whether the encoder input triggers on High Level or Low Level. Normal Encode Value: Read the current encoder value. Synchronous Encoder Value: Read the synchronous encoder value. Synchronizes and latches encoder values from all I-7083 modules on the

3.9.4 Settings Page - Counter Value (M-7084, 7088)

For the M-7084

7084 Firmware	[0000] [Offline Configu	ration]						
Configuration	Counter Value 0.0	unter Setting	s Low P	ass Filter	Commands Log	Summary		
	Counter	Value	Overflo	W	Frequency Mod	e	DI+XOR	DI+LPF
CH:A0	[51] Frequency 🗸	0	0	Clear	Normal	V 🗆 XOR	0	0
CH:B0	[50] Up Counter [51] Frequency	0	0	Clear	Normal		0	0
CH:A1	[54] Up/Down Count [55] Pulse Direction	0	0	Clear	Normal		0	0
CH:B1	[56] AB Phase	0	0	Clear	Normal		0	0
CH:A2	[50] Up Counter \sim	0	0	Clear	Normal		0	0
CH:B2	[50] Up Counter \sim	0	0	Clear	Normal		0	0
CH:A3	[50] Up Counter 🗸	0	0	Clear	Normal		0	0
CH:B3	[50] Up Counter 🗸	0	0	Clear	Normal		0	0
Free	quency Timeout 10		Unit (10	0ms)	Set Frequenc	y Timeout		

	Counter Mode: [50] Up Counter, [54] Up/Down Counter					
Counter	Frequency Mode: [51] Frequency					
	Encoder Mode: [55] Pulse Direction, [56] AB Phase					
Value	Display the current counter value.					
	In Type Code [50] mode,					
	0: No overflow ; 1: Overflow					
Overflow	In Type Code [54] – [56] mode,					
	00: No overflow ; 01: Upper limit overflow ;					
	10: Lower limit overflow ; 11: Not applicable					
Clear	Resets the counter to the preset value and clear the overflow status flag.					
Frequency Mode	In Frequency Mode , the measurement speed can be set to "Normal" or "High Speed".					
XOR	Check this option to enable XOR masking.					
DI+XOR	Display the input status after applying XOR masking.					
DI+LPF	Display the input status after applying a low-pass filter (LPF).					
Frequency Timeout	Set the timeout period for frequency measurement (0.1 to 25.5 seconds).					
Set Frequency Timeout	Click this button to apply the timeout setting .					

For the 7088(D)

📕 7088 Firmware	[0000] [Of	fline Conf	iguration]						
PWM	CH:00 OFF	CH:01 OFF	CH:02 OFF	CH:03 OFF	CH:04 OFF	CH:05 OFF	CH:06 OFF	CH:07 OFF	DI Reverse Flag
DI Status	OFF								
Conliguration	PVVIVI	Counter	value		nmanus i	Log Sum	mary		
	Preset	N	lax. Value	;		Counte	r Value		
CH:A0	0	42	29496729	5 App	bly	0		Clear	
CH:B0	0	42	29496729	5 App	bly	0		Clear	
CH:A1	0	43	29496729	5 App	bly	0)	Clear	
CH:B1	0	42	29496729	5 App	bly	0		Clear	
CH:A2	0	42	29496729	5 App	bly	0)	Clear	
CH:B2	0	42	29496729	5 App	bly	0)	Clear	
CH:A3	0	4	29496729	5 App	bly	0)	Clear	
CH:B3	0	4	29496729	5 App	bly	0)	Clear)

Preset	Set the initial counter value.
Max. Value	Set the maximum counter value.
Apply	Click this button to apply the settings.
Counter Value	Display the current counter value.
Clear	Reset the counter to the initial (preset) value.

3.9.5 Settings Page - Counter Settings (M-7084)

7084 Firmw	7084 Firmware[0000] [Offline Configuration]							
Configurat	ion Counter Val	ue Counter Sett	ings lo	w Pass Filter	Commands Log	Summary		
	Preset Value	Max. Value						
CH:A0	0	4294967295	Set	🔽 Stop W	hen Overflow	Battery Backup		
CH:B0	0	4294967295	Set	🛃 Stop W	hen Overflow	Battery Backup		
CH:A1	0	4294967295	Set	🛃 Stop W	hen Overflow	Battery Backup		
CH:B1	0	4294967295	Set	🛃 Stop W	hen Overflow	Battery Backup		
CH:A2	0	4294967295	Set	🛃 Stop W	hen Overflow	Battery Backup		
CH:B2	0	4294967295	Set	🛃 Stop W	hen Overflow	Battery Backup		
CH:A3	0	4294967295	Set	🛃 Stop W	hen Overflow	Battery Backup		
CH:B3	0	4294967295	Set	🛃 Stop W	hen Overflow	Battery Backup		

Preset Value	Set the initial counter value			
Max. Value	Set the maximum counter value.			
Set	Click this button to apply the settings.			
Stop When Overflow	If checked, counting stops when an overflow occurs. (Applicable only to [50] Up Counter.)			
Battery Backup	If checked, the counter value is retained during a power failure. (Not applicable to [51] Frequency mode.)			

3.9.6 Settings Page - Low Pass Filter (M-7084)

7084 Firmware[0000] [Offline Configuration]							
Configurati	on Counter Value Counter Se	ttings Low P	ass Filter Com	mands Log Summary			
CH:A0	Enable Low Pass Filter	1	Unit:(us)	Set Low Pass			
CH:B0	Enable Low Pass Filter	1	Unit:(us)	Set Low Pass			
CH:A1	Enable Low Pass Filter	1	Unit:(us)	Set Low Pass			
CH:B1	Enable Low Pass Filter	1	Unit:(us)	Set Low Pass			
CH:A2	Enable Low Pass Filter	1	Unit:(us)	Set Low Pass			
CH:B2	Enable Low Pass Filter	1	Unit:(us)	Set Low Pass			
CH:A3	Enable Low Pass Filter	1	Unit:(us)	Set Low Pass			
CH:B3	Enable Low Pass Filter	1	Unit:(us)	Set Low Pass			

Enable Low Pass Filter	Check this option to enable the low-pass filter.				
Unit (μs)	Set the time constant of the low-pass filter. (Range: 1 to 32767 μs).				
Set Low Pass	Click this button to apply the configured time constant.				

3.9.7 Settings Page - 7 Segment LED (7088D)

18 7088D Firmware	e[0000] [Offline Co	nfiguration]			
PWM DI Status Configuration	CH:00 CH:01 OFF OFF OFF OFF PWM Counter	CH:02 CH:03 OFF OFF OFF OFF Value WDT 7	CH:04 CH:05 OFF OFF OFF OFF Segment LED Cor	CH:06 CH:07 OFF OFF OFF OFF	DI Reverse Flag Normal 1; Active (~
LED Host Co CH:0 CH:1 CH:2 CH:3 CH:4 CH:5 CH:6 CH:7 8 Chann Host Co	Operation Introl	LED Data Max. = 999	Write LED 99. , Min. = 0.000	Data)	

	CH: 0 to 7:				
	Display the counter value of the specified channel on the LED display.				
LED Operation	8 Channel in turn:				
	Sequentially displays the counter values of all 8 channels.				
	Host Control:				
	Display a custom value specified by the host/PC.				
LED Data	When Host Control is selected, enter the desired value to display on the LED				
Write LED Data	Click this button to write and display the entered value.				

3.10 Settings Page – Host WDT

The **Host Watchdog** monitors whether the host is operational. A **Host Watchdog Timeout** occurs when the module does not receive a communication OK signal from the host. In this case, the module automatically outputs the **safe values** configured by the user on the **AO** or **DO** page.

The mechanisms for using the Host Watchdog differ between DCON and Modbus RTU, as follows: Determining Whether Host Communication is Normal:

DCON: The host must send an additional broadcast command to all **I-7000 modules** on the same RS-485 network.

Modbus RTU: Only the module receives any valid Modbus RTU command.

After a Host Timeout Occurs and the Host Recovers:

DCON: The host must send a specific command to each module individually to clear the timeout status before it can update **AO or DO** output values as usual.

Modbus RTU: The host can ignore the module's timeout status and directly send Modbus RTU commands to update **AO or DO** output values.

	19 7026 Firmware[0B01]				
	Configuration AO	AI/DO Alarm DI	Host WDT	Commands Log	Summary
	Protocol	DCON	~		
	Address	DCON Modbus RTU			
	Baud Rate	9600	7		
			\frown		
	Configuration AO	AI/DO Alarm DI	Host WDT	Commands Log	Summary
Protocol	Enable WDT	Auto Send Host O	К		
	WDT Timeout	25.50	Set Tim	ier	
		(0.1 ~ 25.5 sec	:)		
	Reset Watchdog	Status			
	Configuration AO		Host WDT	Commanda Los	Summany
<u>Modbus RTU</u>	Configuration AO	Arbo Alam DI	HOSE WOT	Commanus Log	Summary
<u>Protocol</u>	Enable WDT	Enable Output Whether the second s	nen WDT Tim	neout	
	WDT Timeout	25.50	Set Tim	er	
		(0.1 ~ 25.5 sec	;)		
	Reset Watchdog	Status			

Enable WDT	Checked: Enable the Watchdog function.				
	(Available only when Protocol is set to DCON)				
	Checked:	Simulate a "Host OK" signal in DCON Utility, preventing the			
Auto Send Host OK		safe value from being triggered.			
	Unchecked:	Simulate a "Host Failed" signal in DCON Utility. The safe			
		value will be triggered after a timeout.			
	(Available or	nly when Protocol is set to Modbus RTU)			
	Checked (Recommended):				
Enable Output When	Allow AO/DO values to be changed after a timeout occurs.				
	Unchecked: Automatically output the safe value after a timeout. Users				
	must clear the Timeout Status before changing output values.				
W/DT Timoout / Sot Timor	Set the Watchdog timeout period and click the Set Timer button to apply				
wDT filleout / Set filler	the setting.				
	Click this button to clear the Timeout Status. The Timeout Status must be				
Bosot Watchdog Status	cleared before changing AO/DO values.				
Reset Walchuog Status	Note: Users	can also clear the Timeout Status by writing ${\bf 0}$ to ${\bf Modbus}$			
	address 40492 or using the DCON command ~AA1.				

The supported number of AO and DO channels for the following models is shown in the table below.

Model	AO	DO
7021/21P	1	-
7022/22A	2	-
7011(D)/11P(D)/12(D)/12F(D)/13P/14(D)/58-16/80(D)/80B(D)	-	2
7026	2	3
7063(D)/63A(D)/63B(D)	-	3
7002/03/60(D)	-	4
7016(D)/16P(D)	1	4
7024U(D)	4	4
7024/24L/24R	4	-
7065(D)/65A(D)/65B(D)	-	5
7005	-	6
7066(D)/67(D)	-	7
7028(D)/88(D)	8	-
7044(D)/50(D)/50A(D)/55(D)/64(D)/68(D)/69(D)	-	8
7061(D)	-	12
7042(D)	-	13
7043(D)/45(D)/54(D)/54P(D)	-	16

Follow the Steps to test the Function:

1. First, go to the **AO** or **DO** page to configure the power-on value and save value.

<u>A0</u>						
Configura	ation AO AI/DO A	Alarm DI Host WDT	Commands Log	Summary		
AO:00 AO:01	Type Code SI [05] +/- 5 V im [05] +/- 5 V im Set Channel Type	ew Rate mediate v Set mediate v Set code As AO:00	1 Set AO AO Value 03.000 00.000 Set [Po O Read AO O Read AO O Read Sa	Value with Eng Read Back 03.000 00.000 ower-on Value] D ower-on Value afe Value	ineering Format Range +/- 5 V +/- 5 V Set [Safe 4	Output 3 03.000 Write 00.000 Write Value] Value
DO Configurati	ion AO Al/DO Alarm	DI Host WDT Com	mands Log Summa	ry		
	Al Value	Type Code	Ala	arm Mode	High Alarm Limit	Low Alarm Limit
CH:0	0 03001 [+03.0010]	[09] +/- 5 V 🗸	Dis	able ~	5	-5
CH:0	1 00000 [+000.000]	[08] +/- 10 V v	Dis	able ~	10	-10
CH:0	2 00000 [+000.000]	[08] +/- 10 V	Dis	able ~	10	-10
	3	[08] +/- 10 V	5	Set Alarm		
	4			Dit Otatua		
	-				Al:00 Clear	Al:00 Clear
☐ CH:0	0	[U0] +/- 10 V V	$\mathbf{\nabla}$	DO:00	Al:01 Clear	Al:01 Clear
		Set all channels as Al	:00	DO:02	Al:02 Clear	Al:02 Clear
			5	Set [Power-on Va	alue] Set [S	afę Value]
			0	Read DO		
				Read Power-on	Value	•
			(3)	Read Safe Value	e	

2. Set the "**WDT Timeout**" to "**5**" seconds and click the "Set Timer" button, then check the "Enable WDT" option.

	Configuration	AO	AI/DO Alarm	DI	Host WDT	Commands Log	Summary	
3	Enable W	VDT (Enable Out $ \frac{1}{100} \frac{5.00}{(0.1 \sim 25)} $	put Whe	en WDT Tim Set Tim	eout		
	Reset Watchdog Status							

3. Re-open the module window, wait for 5 seconds, the status bar will display the message "**Host WDT Timeout....**", then DO (or AO) will automatically output the safe value. In this case, users can try to change the DO value.

Configuration	AO Al/DO Alarm	DI Host WDT	Commands Log	Summary				
	Al Value	Type Code		Alarm Mode	High Alari	m Limit	Low Alarr	n Limit
CH:00	03001 [+03.0010]	[09] +/- 5 V	~	Disable ~	5		-5	
CH:01	00000 [+000.000]	[08] +/- 10 V 🗸		Disable 🗸	10		-10	
CH:02	00000 [+000.000]	[08] +/- 10 V		Disable ~	10		-10	
CH:03		[08] +/- 10 V	~	Set Alarm				
CH:04		[08] +/- 10 V	~	DO Bit Status	High Aları	m Status	Low Alarr	n Status
CH:05		[08] +/- 10 V	~	🗹 DO:00	AI:00	Clear	AI:00	Clear
	Host WDT Timeout		>	C DO:01	AI:01	Clear	AI:01	Clear
				0:02	AI:02	Clear	AI:02	Clear
	Module Enter Safe Value, Clear WDT Status Before Output			Set [Power-on	Set [Power-on Value]		Set [Safe Value]	
When setting the output value, a dialog box appears prompting the user to clear the timeout status first.								
Warning,Host WDT Timeout!==>Module Enter Safe Value,Clear WDT Status Before Output								

Next, click the "Reset Watchdog Status" button to clear the timeout status.

Configuration AO AI/	DO Alarm DI	Host WDT	ommands Log	Summary			
Enable WDT Enable Output When WDT Timeout							
WDT Timeout	5.00	Set Time	er				
Reset Watchdog Status							
Exit							
GET_WDT_OVERWRITE[Disabled]; ==> (NoError)							

- Note: Users can also clear the timeout status by writing '0' to Modbus address 40492 or using the DCON command "~AA1".
- 4. Upon reboot, the **DO (or AO)** will be set to the **Power-On Value**. If the **timeout status** is not cleared, the **DO (or AO)** will be set to the **Safe Value** after rebooting.
3.11 Settings Page - Commands Log

All models support this feature except the following:

Unsupported Model

7013(D)/13P(D)/15/15P/33(D)

When **"Enable Log Configured Commands"** is selected, the sent commands and response results will begin recording. Users can click the **"Save to ...\log_report"** button to save the data as a **.txt** file.



Click the "**Export Commands**" button to export the DCON commands related to the module. Otherwise, click the "**Clear**" button to clear the screen.

7065D Firmware[B109]				
Configuration DO Host WDT DI Commands Log Summary				
Enable Log Configured C	Commands			
OUTPUT_DO cmd = @000A rec = > READ DI HIGH LATCH	File Edit View File Edit View File Edit View			
cmd = \$00L1 rec = !0B0F00 READ_DI_LOW_LATCH cmd = \$00L0 rec = !1F0000	<pre>\$ Set_MODULE_CONFIG \$ Soop => GET_MODULE_CONFIG \$ Soop => GET_MODULE_CONFIG \$ Soop => GET_MODULE_CONFIG</pre>			
READ_CH0_DI_COUNTER cmd = #000 rec = !0200000 READ_CH1_DI_COUNTER cmd = #001 rec = !0200000	\$00P => GET_MODULE_PROTOCOL %0002400600 => SET_MODULE_CONFIG \$00P1 => SET_MODULE_PROTOCOL @000A => OUTPUT_DO \$00L1 => READ_DI_HIGH_LATCH \$00L0 => READ_DI_LOW_LATCH			
READ_CH2_DI_COUNTER cmd = #002 rec = !0200000 READ_CH3_DI_COUNTER	Ln 13, Col 39 1,201 characters 100% Windows (CRLF) UTF-8			
Save to\log_report\	Export Commands Clear			

3.12 Settings Page - Summary

The I-7000/M-7000 series modules support the "**Summary**" page. The left pane of this page displays the module settings read by DCON Utility Pro. Users can click the **"Save to …\cmd_config"** button to save the data as a **.txt** file.

70	65D Firmware[{	B109]			\sim	×	<
	Configuration	DO	Host WDT	DI	Commands Log Summar	ry	
	Configuratio	ons load	led from con	necte	d module	Configurations loaded from file	
	MODULE_CC DO_SAFE_V SET_DO_SA DO_POWER	ONFIG = NN[02h],TT[40h],CC[0Ah]Baud rate 1152 /ALUE = 0Ah √FE_VALUE = NONE & ON_VALUE = 02h		C[0Ah]Baud rate 115200 Fc	File Path: \DCON_Utility_Pro_PC\cmd_config		
	SET_DO_PO	WER_O	N_VALUE =		7065D_A02_BA_C0_N81_P0_Conf	fi File Name:	
	CLEAR_WDT	FLAG	= NONE	File	Edit View	7065D_A02_BA_C0_N81_P0_Confg.txt	
	I_REVERSE = None ESPONSE_DELAY_TIME = 64r		Friday, Eebruary 7, 2025 COM5, 7065D: [4,5,0,0,0,0];2[02h];1 MODULE_CONFIG = NN[02h],TT[4 Disabled DI counter update at fall DO_SAFE_VALUE = 0Ah SET_DO_SAFE_VALUE = NONE DO_POWER_ON_VALUE = 02h SET_DO_POWER_ON_VALUE = NC SET_WDT_STATUS_TIMER = WDT CLEAR_WDT_FLAG = NONE DI_REVERSE = None		115200;Disabled;N,8,1;Remote I/O;[DCON]4*14 + 5*DO;B1.9;0;; [40h],CC[0Ah]Baud rate 115200 Format N81,FF[00h]Checksum alling edge IONE T Disabled, Timer 25sec		
	save	to\cm	nd_config\	RESF	PONSE_DELAY_TIME = NONE Col 1 460 characters	100% Windows (CRLF) UTF-8 with BOM)-



If the user has saved a configuration file using the "Save/Load Project" function (see Appendix A - FAQ _01_002), they can verify the contents of the connection module and the loaded file in the window.

065D Firmware[B109]				
Configuration DO Host WDT DI Commands Log Summa	ary			
Configurations loaded from connected module	Configurations loaded from file			
VERSION = B1.9 MODULE_CONFIG = NN[02h] TT[40h] CC[0Ah]Baud rate 115200 Format N81 FF[00h]Checksum Disabled DI counter update at DO_SAFE_VALUE = 0Ah SET_DO_SAFE_VALUE = NONE DO_POWER_ON_VALUE = 02h SET_DO_POWER_ON_VALUE = NONE SET_WDT_STATUS_TIMER = WDT Disabled, Timer 25sec CLEAR_WDT_FLAG = NONE DI_REVERSE = None RESPONSE_DELAY_TIME = NONE Data ma	VERSION = B1.9 MODULE_CONFIG = NN[02h] TT[40h] CC[0Ah]Baud rate 115200 Format N81 FF[00h]Checksum Disabled DI counter update at DO_SAFE_VALUE = 0Ah SET_DO_SAFE_VALUE = NONE DO_POWER_ON_VALUE = 02h SET_DO_POWER_ON_VALUE = NONE SET_WDT_STATUS_TIMER = WDT Disabled, Timer 25sec CLEAR_WDT_FLAG = NONE DI_REVERSE = None RESPONSE_DELAY_TIME = NONE			
save to\cmd_config\				

Chapter 4 DCON/Modbus Commands

Visit the Selection Guide webpage for more information about products.

The manuals for specific models are listed below. '**70xx**' in the table indicates support for both **I-70xx** and **M-70xx** series.

An	Analog I/O					
htt	https://www.icpdas.com/en/product/guide+RemoteI_OModuleandUnit+RS-485I_OModules+I-7000#461					
1		I-7012(D)_I-7012F(D)_I-7014D_I-7017_I-7017F_en.pdf	<u>Link</u>			
2	Voltage & Current Input	I-7017_I-7018_I-7019_M-7017_M-7018_M-7019_en.pdf	<u>Link</u>			
3		I-7011(D)_I-7011P(D)_I-7018_I-7018P_en.pdf	<u>Link</u>			
-	Transmitter Input: I-7014D Thermocouple Input: 7018/18	R/18Z/19R, I-7018P, M-7018-16/19Z				
4	Thermistor Input	I-7005_M-7005_en.pdf	<u>Link</u>			
5	DS18B20 Sensor	M-7004_M-2004_en.pdf	<u>Link</u>			
6	RTD Input	I-7013_I-7015_I-7033_M-7015_M-7033_en.pdf	<u>Link</u>			
7	Strain Gauge	I-7016(D)_I-7016P(D)_en.pdf	<u>Link</u>			
8	Voltage & Current Output	I-7021_I-7021P(D)_I-7022_I-7024_I-7024R_M-7022_ M-7024_M-7024L_M-7024R_M-7024U(D)_M-7028_en.pdf	<u>Link</u>			
		AI/DI: M-7002_en.pdf	<u>Link</u>			
-	Multi-function	AI/DO: M-7003_en.pdf	<u>Link</u>			
		AI/AO/DI/DO: M-7026_en.pdf	<u>Link</u>			
En	Encoder/Frequency /Counter					
htt	https://www.icpdas.com/en/product/guide+RemoteI_OModuleandUnit+RS-485I_OModules+I-7000#464					
9	Counter/Frequency Input	I-7080(D)_I-7080B(D)_en.pdf	<u>Link</u>			
10	Encoder/Counter Input	I-7083(D)_I-7083B(D)_en.pdf	<u>Link</u>			
11	Counter/Frequency/Encoder Input	M-7084_en.pdf	<u>Link</u>			
12	Counter Input & PWM Output	I-7088(D)_M-7088(D)_en.pdf	<u>Link</u>			
Digital I/O						
htt	https://www.icpdas.com/en/product/guide+Remote_I_O_Module_and_Unit+RS-485_I_O_Modules+I-7000#462					
13	Digital Input/Output	I-7000_M-7000_DIO_en.pdf (7041 ~ 7069)	<u>Link</u>			

4.1 Command Line Tool

The **"Command Line"** function in DCON Utility Pro can be used to test and debug I/O modules. It supports both DCON and Modbus protocol commands.

Note: Only one module should be configured at a time.

- 1. Search the I/O module and then click the "CMD" button to open the settings window.
- In the "Terminal Command Line Tool" window, the module settings will automatically be loaded. Simply click the desired default commands and click the Send button.



Export Commands	Export all supported commands for this module. " \DCON_Utility_Pro_NoFAQ\dcon\ 70xx_DCONCmdTable.txt "
Clear	Clear the command response Window.
Save to \logger_report\	Click this button to automatically save testing commands. "\DCON Utility Pro\logger_report\ Command_Line_Result_Log_ m_dd_xx .txt"

Chapter 5 Software Development of I-7000 series

5.1 Using DCON Commands

The **"Command Line"** function in DCON Utility Pro provides commonly used DCON/Modbus commands (see Section 4.1 for reference) based on the detected I-7000/M-7000 modules. Users can also click the links on the window to learn more about the available software development kits (SDKs).

DCON Utility Pro:

https://www.icpdas.com/en/product/guide+Software+Utility_Driver+DCON__Utility_Pro

Download DCON Utility Pro (PC):

https://www.icpdas.com/en/download/show.php?num=1046



Users can refer to Chapter 4: DCON/Modbus Protocol Commands in the module-specific manual to view detailed DCON commands. For example, the **#AAN** command is used to read the analog input value from a specified channel.

2.4 #AAN					
Descr	iption : Read Analog Input from channel N				
Synta	x : #AAN[CHK](cr)				
#	delimiter character				
AA	address of reading module (00 to FF)				
Ν	channel to read, from 0 to 7				
Respo	onse : Valid Command : >(Data)[CHK](cr)				
	Invalid Command : ?AA[CHK](cr)				
	Syntax error or communication error may get no				
	response.				
>	delimiter for valid command				
?	delimiter for invalid command				
AA	address of response module (00 to FF)				
(Data)) analog input value, reference Sec. 1.10 for its format				
Exam	ple :				
Comn	nand : #032 Receive : >+02.513				
R	ead address 03 channel 2, get data successfully.				
Comn	Command : #029 Receive : ?02				
Read address 02 channel 9, return error channel number.					
Related Command :					
Sec.2.1 %AANNTTCCFF, Sec.2.7 \$AA2					
Related Topics :					
Sec.1.10 Configuration Tables					
Note : The command is for I-7017/17F only					
-					
28	28 I-7012, I-7014, I-7017 User's Manual Rev:B1.2				

5.2 Using PACSDK

PACSDK are software development toolkits that can be used on a PC or PAC (e.g., XPAC, WinPAC, and ViewPAC series). PACSDK includes header files, libraries, documentation, and tools that can be used to develop VC/C#/VB.net applications to access I/O data of I-7000 series module.



<u>Note:</u> PACSDK only supports the DCON protocol.

PACSDK

Items		PACSDK	Items	
Header file		PACSDK.h	Using libraries when developing VC applications on Windows	
Library files		PACSDK.lib	PC or PAC.	
DLL files	For C program	PACSDK.dll	Loading libraries when executing VC applications on PC or PAC.	
	For .NET program (i.e., C#, VB)		 Using management libraries when developing .NET applications Load libraries when executing .NET applications on PC or PAC. 	

Download Files:

1) PACSDK:



Users can download SDK according to the development platform (i.e., PC or PAC). When using the following development platform – PC, XP-8000-WES7, XP-9000-IoT, iPPC (IoT/WES7), copy PACSDK.dll and PACNET.dll to the folder where the applications (.exe file) is located after downloading.

For PC		
https://www.io	cpdas.com/en/product/guide+Software+DevelopmentTools+PACSDK	
SDK & Demo	X86: https://www.icpdas.com/en/download/show.php?num=1050 X64: https://www.icpdas.com/en/download/show.php?num=1846	

XP-8000-WES7 \ XP-9000-IoT \ iPPC (IoT/WES7)

https://www.icpdas.com/en/download/show.php?num=2540

When developing applications on **XPAC (CE6)**, **WinPAC (CE5)**, or **WinPAC/ViewPAC (CE7)** platforms, visit the webpage to download and install the necessary files.

Development Tools: Visual Studio 2008 Professional or earlier version

WinPAC/ViewPAC (CE7)
WinCE7.0 PACs/ViewPACs without I/O Slot(s) https://www.icpdas.com/en/download/show.php?num=2409
WinCE7.0 PACs/ViewPACs with I/O Slot(s) https://www.icpdas.com/en/download/show.php?num=2348
XPAC (CE6)
WinCE6.0 PACs https://www.icpdas.com/en/download/show.php?num=2473
WinPAC (CE5)
WinCE5.0 PACs without I/O Slot(s) https://www.icpdas.com/en/download/show.php?num=2594 WinCE5.0 PACs with I/O Slot(s) https://www.icpdas.com/en/download/show.php?num=2593

2) The PAC API Manual:



To learn about PACSDK installation, development environment settings, and PAC_IO API functions, refer to the manual (pac_standard_api_manual_x.x.x.pdf).

The manuals for each platform are listed in the table below.

PC https://www.icpdas.com/en/download/show.php?num=1049	
PAC (WES/IoT)	https://www.icpdas.com/en/download/show.php?num=2527
PAC (WinCE)	https://www.icpdas.com/en/download/show.php?num=2407



The following API manuals are available for **XPAC** usage.

https://www.icpdas.com/web/product/download/pac/wince/document/api/pac_standard_api_manual_en.pdf



Demo Program:



Example Code in C# Language:

float fValue;

PACNET.PAC_IO.ReadAI (hPort, PACNET.PAC_IO.PAC_REMOTE_IO(iAddr), 1, 4, ref fValue);

// This I-7000 module includes 4 AI channels. Read the AI value from channel 1 and store it in the fValue variable.

PACNET.PAC_IO.WriteAO (hPort, PACNET.PAC_IO.PAC_REMOTE_IO(iAddr), 1, 2, 2.0);

// This I-7000 module includes 2 AO channels. Outputs a value of "2.0" to channel 1.

PACNET.PAC_IO.ReadDI (hPort, PACNET.PAC_IO.PAC_REMOTE_IO(iAddr), 4, ref DiValue);

// This I-7000 module includes 4 DI channels. Read all DI values and store them in the DiValue variable.

PACNET.PAC_IO.WriteDO (hPort, PACNET.PAC_IO.PAC_REMOTE_IO(iAddr), 4, 3);

//This I-7000 module includes 4 DO channels. Outputs a value of "3", which sets DO0 and DO1 to ON, and DO2 and DO3 to OFF. Each bit represents the status of a channel; bit 0 represents the first channel, bit 1 represents the second channel, and so on.

PACNET.UART.Close(hPort);

// Close the COM port and terminate communication.

Example Code in C Language:

HANDLE hPort = uart Open("COM3,9600,N,8,1");

```
// Open COM3 port with baud rate 9600 bps and data format N, 8, 1
```

```
if(hPort == INVALID_HANDLE_VALUE)
```

printf("Open COM port Error...");

return 0;

// Exit the program if the COM port fails to open.

int iAddr=1; // In this example, the module's ID is set to 1

float fAI Value;

pac_ReadAI (hPort, PAC_REMOTE_IO(iAddr), 1, 4, &fAI Value);

// This I-7000 module includes 4 AI channels. Read the AI value from channel 1 and store it in the &fAI Value variable.



pac_ReadDI (hPort, PAC_REMOTE_IO(iAddr), 4, &IDI_Val);

// This I-7000 module includes 4 DI channels. Read all DI values and store them in the IDI Val variable.



C++ pac_WriteDOBit (hPort,PAC_REMOTE_IO(iAddr),4,3,1); BOOL pac WriteDOBit(//This function can control one DO channel at a time. This module HANDLE hPort includes 4 DO and the DO3 is set to ON. int slot, Address int IDO TotalCm uart_Close(hPort); Refer to Section 2.7.3 ,pac_WriteDOBit, int iChannel. // Close the COM port and in the API manual. int iBitValue terminate communication.);

5.3 Using OPC DA Server



The Product Page:

https://www.icpdas.com/en/product/guide+Software+Applications+NAPOPC__DA__Server

Download the NAPOPC DA Server (ST):

https://www.icpdas.com/en/download/show.php?num=3293



K ICPDAS - NAPOPC_ST DA Server (Ver 3.61)	
File Add Edit View Options Help	
New Open Save Device roup Tag Multi 7024(1) 1 Name	Gener arch Expand Shrink Monito
Select Device 2	NameTypeChannel/LocaCh00Analog Output0Ch01Analog Output1Ch02Analog Output2Ch03Analog Output3
C DCON O FRnet O Modbus	Click "Generator" to automatically add all I/O tags for the specific module.
Device 7024(1) I-7K/I-8K/I-87K/ZB-2K I/O Module Module Setting Remote 7K 7024 ZT/ZB-2K O With Controller Controller 87K 8K = 87K Address 1 (0~255) Timeout (mSec) 500 Slot 0 (0~7 for 8K Modules) Checksum Dis I EnableWDT WDT Timeout 1 Sec COM Port Setting COM 5 • Parity None Baud Rate 115200 • Parity 8 Stop Bits 1 O RPC Controller Setting ID A H Lee 192168 2551 Part 505 Time to 192168 2551	▼ >0 sable ▼ ▼ ▼ ▼
□ Simulate I/O □ Pending Time 1000 ms	
OK Cancel	

5.4 Using LabVIEW (DCON)

LabVIEW (Laboratory Virtual Instrumentation Engineering Workbench) is a system-design platform and development environment for a visual programming language from National Instruments. LabVIEW provides an easy-to-use graphical interface and supports a variety of hardware drivers and software analysis tools that help users to speed up the amount of time to develop applications. LabVIEW has been widely used for the test, measurement, and automated control in various laboratories or industries.

Visit the LabVIEW webpage for more information:

https://www.icpdas.com/en/product/guide+Software+Development__Tools+LabVIEW__Tools#3089

Note: Before the PC communicates with I-7000 series module, refer to Chapter 3: Settings Page - Configurations to configure the parameters (e.g., Address, Baud Rate).

Download demo programs (For DCON module, I-7000 series) https://www.icpdas.com/en/download/show.php?num=1845



5.5 Using Win-GRAF (DCON)

Win-GRAF supports the **DCON** protocol for connecting to I-7000 series modules. Unlike M-7000 series modules, **I-7000 series** modules allow certain I/O parameters to be configured directly in Win-GRAF Workbench (e.g., enabling the DI Counter, setting the analog type for AI/AO modules, etc.). However, the module's **Address** and **Baud Rate** must be configured using **DCON Utility Pro**. The following example demonstrates how to use an **XP-8xxx-CE6** PAC to connect to **I-7055** (8 DI, 8 DO) and **I-7018** (8 AI) I/O modules via **COM3**.

1	7055 Firmware[B117]		
\mathbf{V}	Configuration DO	Host WDT DI	Commands Log
	Protocol (INIT*)	DCON	~
	Address	1 🗘	01H
	Baud Rate (INIT*)	9600	~
	Parity (INIT*)	N,8,1	~
	Checksum (INIT*)	Disabled	~

Ĭ	2 7018 Firmwar [B405]		
	Configuration AI	Commands Log	Summary
	Protocol (INIT*)	DCON	~
ſ	Address	2	[02H]
	Baud Rate (INIT*)	9600	~
	Parity (INIT*)	N,8,1	~
	Checksum (INIT*)	Disabled	~
	Analog Format	Engineering Fo	v mrv
	60/50 Hz	60Hz	~
	Type Code	[05] +/- 2.5 V	~

Visit the Win-GRAF Workbench webpage for more information:

Web: https://www.icpdas.com/en/product/guide+Software+Development__Tools+Win-GRAF Manual: https://www.icpdas.com/en/download/show.php?num=8110

Configuration Instructions:

- 1. Click the "Open Fieldbus Configuration" button to open the "I/O Drivers" window.
- Click the "Insert Configuration" button, expand the "All" category, select "Remote I/O (ICP DAS)", and then click OK.



Click the "Insert Master/Port" button and the default settings COM0:9600,N,8,1 will be displayed.
 Double-click the Value field to modify the settings (e.g., COM3:9600,N,8,1).

I/O	D	riv	ers '	t									
臣	4	•6	Rem	iote I/O (ICP E	DAS)	Name	Valu	e	🝸 Nam	e	Туре	Dim.	Attrib.
쁆)	ſ	ж C	OM3 : 9600,N	N,8,1	COM Port	СОМ	COM 0 (WinPAC	On Board)	⊾ba	l variable	es	
н ж.,		_				Baud Rate	9600		n Board)	TA	IN variab	les	
	ſ		<mark>∘</mark> 8 R	emote I/O (ICP	DAS)	Parity	N, 8,	COM 3		in			
			붋	🖁 COM0 : 9600),N,8,1	Checks	Disab	COM 4					
25		_				Watchdo	0	COM 6		aria	ables		
								COM 7			abres		
l∎+ [A	ddr	ess	Series	Туре	Note	DI				Value	1	уре
÷								COM 9 COM 10					
. <u>↑</u> .								COM 11		ovli	ist		
	,		N					COM 12					
	`		* 1	I/O Drivers	×								

4. Click the "Insert Slave/Data Block" button to open the Module Select window. Enter the model number in the "Srarch" field to quickly locate the module. Double-click "I-7055D" to open the settings window.

	/ers * Remote I/O (ICP DAS) ♣ COM3 : 96 Module Sele Series: All Types: All Search: 2 Search:	Name ector I-7055D	Value 5D 3 55W 3 Global DI DO Request	X The address must be set in the DCON Utility Pro.
Module Selector Series: All	Module I-7005	ICPCON IN Jose Series	Address 1 Note Activation Periodic 10 On Call On Change	000 ms
Types: All AI AI AI DI DIO DO MIO	I-7013D I-7017 I-7017C I-7017F I-7017FC I-7017R I-7017R-A5 I-7017RC I-7017Z		Timeout 10 Command Retry 0 Calling Period 10	0 * 100 ms 0 * 100 ms OK Cancel
Iemperature	The " Series " field inc The " Types " field inc	cludes options such cludes options such	as "I-7K, I-87K, as "AI, AO, DO,	I-97K". DO,".

The available tab may vary depending on the model. The **DI Counter** function can be enabled in the **DI** tab, while the **Power-On Value** and **Safe Value** can be set in the **DO** tab. After completing the configuration, click **OK** to apply the settings.



5. After adding the module, the corresponding I/O types for the I-7055D will be automatically displayed. To add a variable, enter the name in the Symbol field. Alternatively, right-click on Global Variables and select Add Variable (or press the Insert key) to add the DIO and DOO variables (BOOL), and then choose the variable name in the Symbol field.



6. Click the "Online" button to connect to the PAC and download the demo program. Afterward, users can view the I-7055's I/O status. Additionally, double-click on a **DO** to change its status.



Users can follow Step 4 to add an I-7018 data block. Ensure that the module is configured with Address=2 and Baud Rate=9600 in DCON Utility Pro. In the Global tab, set the Signal Type to T/C K-Type. After downloading the program, users will see the current temperature displayed as 31.3°C.

1-7018		I/O Drivers]		
	Global Request Address 2 Note Analog Format Engineering Signal Type T/C K-Type CJC Enabl Activation Periodic 1000 ms On Call	Image: A triangle of the second s	Name Address Series Type Note DriverVe.	Value 2 I-7K Temperature	
	On Change Error Timeout 10 * 100 ms Command Retry 0 Calling Period 10 * 100 ms	Symbol ??? Al0=31.3 ??? ??? ??? ???	Type DWORD DWORD REAL REAL REAL REAL	Note (IN) Erro (IN) Sca (In) Ana (In) Ana (In) Ana (In) Ana	or code in time. (ms) log Input Ch log Input Ch log Input Ch log Input Ch
	OK Cancel	777 777	REAL	(In) Ana (In) Ana	log Input Ch log Input Ch

Chapter 6 Software Development of M-7000 series

Modbus Mapping Table: https://www.icpdas.com/en/download/show.php?num=9270

M-7002		M-7018Z								
M-7004		Address				Des	cription			Attribute
M-7005		30001 ~ 30010 40001 ~ 40010	Anal	log input	value of cl	nannel 0 to	9			R
M-7011		30129 40129	CJC	CJC temperature in 0.01°C					R	
M-7013P		40257 ~ 40266	Туре	e code of	channel 0	to 9				R/W
M-7015/M-7015P	•	40353 ~ 40362	CJC 128	offset of for –12.8	channel 0	to 9 in 0.1	°C. 1 for 0	.1, 127 for	12.7, 255 for -0.1,	R/W
M-7016		40481 Firmware version (low word)				R				
M-7017/M-7017R/M-7		40482	Firmware version (high word)						R	
017C/M-7017RC/M-70		40483	Module name (low word)							R
17R-A5		40484	Mod	dule name	e (high wo	rd)				R
M-7017RMS		40485	Mod	dule addre	ess, valid r	ange: 1 ~ 2	247			R/W
M-7017Z			Bits	5:0						
M-7018/M-7018R			Bau	d rate, Ox Code	03 ~ 0x0A 0x03	0x04	0x05	0x06		
M-7018Z				Baud Code	1200 0x07	2400 0x08	4800 0x09	9600 0x0A		
M-7018-16		40486	Bits	Baud 7:6	19200	38400	57600	115200		R/W

6.1 Using Modbus Master Tool

Modbus Master Tool supports Modbus RTU/ASCII protocol that can be used to simulate and test I/O modules on a PC (or PAC). The download URL are as follows.

Web: http://www.icpdas.com/en/product/guide+Software+Development__Tools+Modbus__Tool#674 Tool: http://www.icpdas.com/en/download/show.php?num=1026 (PC or WinCE)

		Slave ID = 2, F	C = 1	Security Constant Sec		
Error = 0	Volue Departmention	Error = 0	Deeped	Value Description		
Base 0(Hex) Base 1	Value Description	Base U(Hex)	Base 1	value Description		
33 (0x21) 10034 =	1 DI1	1 (0x1)	00001 =	1 001		
34 (0x22) 10035 =	0 012	2 (0x2)	00002 =	0 002	=	
35 (0x23) 10036 =	1 DI3	3 (0x3)	00004 =	1 DO 3		
36 (0x24) 10037 =	0 DI4	4 (0x4)	00005 =	0 DO 4		
37 (0x25) 10038 =	1 DI 5	5 (0x5)	00006 =	1 DO 5		
38 (0x26) 10039 =	0 DI6	6 (0x6)	00007 =	0 DO 6		
39 (0x27) 10040 =	1 DI7	7 (0x7)	00008 =	1 DO 7		
<		*0				
Connection is established. Serial Port= CC	MI				in.	
			DC		DC APE	
	KOrco	The second se	NJ-	+0J	n3-403	a
	224					0 4 -4
in the second seco	3					1-
/	ALL I THE					
	A DESCRIPTION OF THE OWNER OF THE	1		- Entrance	RANKE CO.	
	1000					

Hardware Wiring (For testing) :



In this example, the M-7000 series DI and DO modules will be used. Please follow the steps below to complete the configuration.

Model	I/O	Slave ID	Baud Rate	Protocol	Modbus Address (Base 1)
M-7026	3 DI	1	0600	Modbus	10033 ~ 10035 (Read DI)
M-7005	3 DO	2	9000	RTU	00001 ~ 00003 (Read /Write DO)

Step1: Open the Modbus Master Tool software

Method 1: Open a Configuration File

Note: When using this method, all function windows supported by the specific model will be opened. If only a single function needs to be configured, refer to Method 2.

Click "Open" in the "File" menu, navigate to the .../Configuration File/M-7000 folder, select the required model, and then click "Open" to load the configuration file with address base 1.



Open a Configuration File				×
\leftarrow \rightarrow \checkmark \uparrow Configuration File > M-70	000 ~ C	Search M-7000		Q
Organize 🔻 New folder		88	•	?
m-7002.mmt	🗋 m-7005.mmt			
m-7011.mmt	🗋 m-7015.mmt			
m-7015p.mmt	🗋 m-7016.mmt			
File name: m-7005.mmt	~	Modbus Master To	ool Files (*.m	r ~
		Open	Cancel	

🔛 Mo	dbus Mast	er Tool V1.1.7.0	2021/	'06/04C:\Users\	Jani	ice\Desktop\Modbus!	MasterTool	PC_20240823\Con	figu	ration File\M-7000\m-70	005.mmt	_		×
File	Setup	Connection	Wind	low About										
M	aster0				1 I	Master1			٦Ĭ	Master2				3
Slave	e ID = 1	FC = 1				Slave ID = 1 FC	; = 4			Slave ID = 1 FC =	- 3			
Error	= 0					Error = 0				Error = 0		_		_
DC) (0x) Ba	ase 1 Valu	e D	escription		AI (3x) Base 1	Value	Description		AO (4x) Base 1	Value	Des	cription	1
	00001	=	0 D	000		30001 =	0	AI 0		40001 =	0	AI 0		
	00002	=	0 D	01		30002 =	0	AI 1		40002 =	0	AI 1		
	00003	=	0 D	02		30003 =	0	AI 2		40003 =	0	AI 2		
	00004	=	0 D	0 3		30004 =	0	AI 3		40004 =	0	AI 3		
	00005	=	0 D	004		30005 =	0	AI 4		40005 =	0	AI 4		
	00006	=	0 D	05		30006 =	0	AI 5		40006 =	0	AI 5		
						30007 =	0	AI 6		40007 =	0	AI 6		1
						30008 =	0	AI 7		40008 =	0	AI 7		

Method 2: Create a Configuration File

Click "**New**" in the "**File**" menu to add a configuration file and then save it.

File	Setup	Connection	ו
	New	Ctrl+N	
2	Open	Ctrl+O	
2	My List		
	Save	Ctrl+S	
	Save As	Ctrl+A	
	Exit	Ctrl+X	

Under the **.../Configuration File/UserDefined** folder, enter a file name, and click the **"Save**" button to save the file.

📓 Create a New I	ile		×
$\leftarrow \rightarrow \lor$	↑ Configuration File > UserDefined ∨ C Search UserDefined		Q
Organize 🔻	New folder	- 68	3
MyFileV	Vork.mmt		
File nar Save as ty	ne: M-7026(3DI)_7005(3DO) pe: Modbus Master Tool Files (*.mmt)		~
∧ Hide Folders	Save	Cancel	

Step 2: Set DI and DO Configurations

Click "Definition" in the "Setup" menu to set DI configurations, and click OK.

File	Setup	Connection	Window		Model	Slave ID	Modbus Address (Base 1)
	C	efinition			M-7026	1	10033 ~ 10035 (3 DI)
Slave	Ν	lew Window			M-7005	2	00001 ~ 00003 (3 DO)
Error	S	et Value					
	S	🔟 Definition					×
AI (3	.,	Slave ID:	1			C	DK 🕨
	Type:			Read Input Status (1xxxx) for DI			
		Addresses:	O Base 0	• Base	1	Ca	ncel
		Address:	33				
		Length:	3	10033	to	10035	
		Format:	Hex	~			
		Descriptions	Clear All	Descriptions			

Click "New Window" in the "Setup" menu to set DO configurations, and click OK.

	🔟 Definition						×		
	Slave ID:	2					OK 🕨		
	Type:	Read Coils S	tatus (0xxx	x) for [00	~			
	Addresses:	O Base 0	O Base	e 1			Cancel		
	Address:	1							
	Length:	3	00001		to	000	003		
	Format:	Hex	~						
	Descriptions	Clear All D	escriptions						
File Set	up Connection	n Window A	About			Dout field	ple-click the	e " Description " es.	
File Set	up Connection	Window	About	Mast	er1	Dout field	ble-click the	e "Description" es.	
File Set	$\frac{1}{1} FC = 2$	Window	About 83 Sli Er	Maste ave II ror =	er1) = 2,	Douk field FC = 1	ble-click the	e "Description" es.	
File Set	EXAMPLE Connection	Window A	About Sla On	Mast ave II ror = DO	er1) = 2, 0 (0x) B	Dout field FC = 1 ase 1	ole-click the to add note	e "Description" es. Description	
File Set Master Slave ID Error = 0 DI (1x) I 1003	End FC = 2 Base 1 Valu	Window A Description 0 DI0	About Sli On	Maste ave II ror = DO	er1) = 2, 0 (0x) B	Doub field FC = 1 ase 1	ole-click the to add note Value 0	e "Description" es. Description DO0	
File Set Master Slave ID Error = 0 DI (1x) I 1003	Example Connection FC = 2 Base 1 Value 33 = 34 =	Window Window Description DIO DIO DI1	About Sla On	Master aver IE ror = DO	er1 0 = 2, 0 (0x) B 00001 00002	Doub field FC = 1 ase 1 =	value 0 0 0	e "Description" es. Description D00 D01	
File Set Master Slave ID Error = 0 DI (1x) I 1003 1003	Example Connection FC = 2 Base 1 Value 33 = 34 = 35 =	Window A Description DIO DIO DI1 DI2	About Sla On	Maste aver II ror = DO	er1 0 = 2, 0 (0x) B 00001 00002 00003	Doub field FC = 1 ase 1 = =	value Value 0 0	e "Description" es. Description DO0 DO1 DO2	

Step 3: Establish a Serial Port Connection

Click "**Connect**" in the "**Connection**" menu. In this example, the M-7000 module communicates with the PC's COM5 port via the Modbus RTU protocol. Configure the parameters as shown and click "**OK**".

Connection Windo	w <u>Note:</u>	The communic DCON Utility P	ation p ro.	parameters must be prede	fined in the
Disconnect Con	nect				×
	Interface:	COM5	~	Scan Interval(ms):	440
	Baudrate:	9600	~	Timeout(ms):	200
	Data Bit:	8	~	Delay Between Poll(ms):	20
	Parity:	0-None Parity	~		
	Stop Bit:	1	~		
	Mode:	• RTU O AS	CII	Cancel	ок 📐

Step 4: Test the DI and DO Modules

The M-7005 is preset to invert the DI status. When the DO is set to ON (1), the DI will change from ON (1) to OFF (0). Note that users can click **"Disconnect"** in the **"Connection"** to cancel the connection.



6.2 Using Linux Modbus SDK

ICP DAS LinPAC family is embedded with flexible and open source Linux system which can be used to control M-7000 series module via DCON or Modbus protocols. The following describes three kinds of Modbus tools that for users to develop various applications.

Modbus Development Tools	Download			
C Programming Language				
★ LinPAC SDK ★ libmodbus	Go to the LinPAC product page to download the LinPAC SDK. Go to the libmodbus website to download the libmodbus library.			
Python Programming Language				
★ modbus-tk	Go to the Python website to download the Modbus tool			
Perl Programming Language				
★ Device-Modbus	Go to Perl website to download Modbus tool.			

Visit the website for more information:

https://www.icpdas.com/en/product/guide+Software+Development__Tools+Modbus__Tool#2844

6.3 Using nModbus



nModbus is a C# 3.0 implementation of the Modbus protocol. It is developed and maintained on a voluntary basis and provided free of charge. ICP DAS verified and improved the DLL based on the official released NModbus_net-2.0_1.11.0.0-source.zip.

Programmers can use the DLL released by ICP DAS to develop a Modbus application for regular Windows based PCs, PAC, or WinCE based devices.

Users can download files on the nModbus webpage: http://www.icpdas.com/en/product/guide+Software+Development__Tools+Modbus__Tool

nModbus API Manual:

https://www.icpdas.com/en/download/show.php?num=1024

Download the Demo Program:

https://www.icpdas.com/en/download/show.php?num=1025

• <u>PC version</u>:

DLL: log4net.dll, nmodbuspc.dll

• WinCE version:

DLL: cabc.dll, fc19.dll, nmodbusce.dll

The user can download the demo program for either the WinForm or WinCE version and unzip the file.



After downloading the **WinForm** demo program, open the "**ModbusRTU_Master.exe**" in the folder. For example, .../nModbus_demo_WinForm**c#.net**\modbus_rtu\ master\ModbusRTU_Master\ModbusRTU_Master\bin\Release





The Modbus address (Base 0 or Base1) and the number of I/O tags may vary depending on the module. The user can modify the program to suit the specific model. In this example, the M-7026 is used, with the address in the program starting from "0." All the APIs used are listed in the table below.

I/O	Address (Base 0)		nModbus API
DO0 - DO2	0 - 2	(starting address: 0, reading length: 3)	ReadCoils, WriteSingleCoil
DI0 - DI2	32 - 34	(starting address: 32, reading length: 3)	ReadInputs
AI0 - AI5	0 - 5	(starting address: 0, reading length: 6)	ReadInputRegisters
AO0 - AO1	32 - 33	(starting address: 32, reading length: 2)	ReadHoldingRegisters, WriteSingleRegister



The following steps describe how to modify the Modbus RTU Master demo program (in C# and VB) to match the M-7026's Modbus address (Base1) and I/O quantity.

Click the link to view the M-7026's Modbus address (Base1) mapping table.

https://www.icpdas.com/web/product/download/io_and_unit/rs-485/document/manual/7000/M-7000 _address_mapping_table.pdf

I/O	Modbus Address (Base1)
DO0 - DO2	00001 - 00003
DI0 - DI2	10033 - 10035
AI0 - AI5	30001 - 30006
AO0 - AO1	40033 - 40034

6.3.1 Modify the Form

First, modify the number of I/O objects in the form. For example, the M-7026 includes 3 DI, 3 DO, 6 AI, and 2 AO. In the "**Properties**" window, configure the "**Name**" fields and set the "**Click**" fields for the AO/DO objects.



6.3.2 Modify C# Code

In this example, the module's address is set to "1". If the address is "2", all instances of "**slaveID**" in the program must be assigned the value "2"







Read DI Tags (Base 0)

Before modifying

```
//read DI(1xxxx)
bool[] status = master BeadInputs(slaveID, startAddress, numofPoints);
for (int i = 0; i < numofPoints; i++)
{
    if (status[i] == true)
        listDI[i].BackColor = Color.DodgerBlue;
    else
        listDI[i].BackColor = Color.Navy;
}</pre>
```

After modifying

```
//read DI(1xxxx)
bool[] status = master.ReadInputs(slaveID, startAddress_DI, numofPoints_DI);
for (int i = 0; i < numofPoints_DI; i++)
{
    if (status[i] == true)
        listDI[i].BackColor = Color.DodgerBlue;
    else
        listDI[i].BackColor = Color.Navy;
}</pre>
```

```
Read DO Tags (Base 0)
Before modifying
 //read DO(0xxxx)
 bool[] coilstatus = master.ReadCoils(slaveID_startAddress, numofPoints
 for (int i = 0; i < numofPoints; i++)</pre>
 £
     if (coilstatus[i] == true)
         listDO[i].BackColor = Color.Red;
     else
         listDO[i].BackColor = Color.DarkRed;
 }
After modifying
  //read DO(0xxxx)
  bool[] coilstatus = master.ReadCoils(slaveID, startAddress_DO, numofPoints_DO)
  for (int i = 0; i < numofPoints_D0; i++)</pre>
  {
      if (coilstatus[i] == true)
           listDO[i].BackColor = Color.Red;
      else
           listDO[i].BackColor = Color.DarkRed;
  }
```

If users need to convert AI/AO values for display in a specific unit, refer to **Appendix B**: Type Code for AI Values (Modbus Protocol)

Read AI Tags (Base 0)

```
Before modifying
 //read AI(3xxxx)
 ushort[] register = master.ReadInputRegisters(slaveID, startAddress, numofPoints);
 for (int i = 0; i < numofPoints; i++)</pre>
 {
     listAI[i].Text = register[i].ToString();
     //If you need to show the value with other unit, you have to caculate the gain and offset
     //eq. 0 to 0kg, 32767 to 1000kg
     //0 (kg) = gain * 0 + offset
     //1000 (kg) = gain *32767 + offset
     //=> gain=1000/32767, offset=0
     //double value = (double)register[i] * 10.0 / 32767;
     //listAI[i].Text = value.ToString("0.00");
 }
After modifying
 //read AI(3xxxx)
 ushort[] register = master.ReadInputRegisters(slaveID, startAddress_AI, numofPoints_AI);
 for (int i = 0; i < numofPoints_AI; i++)</pre>
     listAI[i].Text = register[i].ToString();
     //If you need to show the value with other unit, you have to caculate the gain and offset
     //eq. 0 to 0kg, 32767 to 1000kg
     //0 (kg) = gain * 0 + offset
     //1000 (kg) = gain *32767 + offset
     //=> gain=1000/32767, offset=0
     //double value = (double)register[i] * 10.0 / 32767;
     //listAI[i].Text = value.ToString("0.00");
 }
```

Read AO Tags (Base 0) Before modifying //read AO(4xxxx) master.ReadHoldingRegisters(slaveID, startAddress, numofPoints) ushort[] holdingregister for (int i = 0; i < numofPoints; i++)</pre> { listAO[i].Text = holdingregister[i].ToString(); //If you need to show the value with other unit, you have to caculate the gain and offset //eq. 0 to 0 mA, 32767 to 20 mA //0 (mA) = gain * 0 + offset //20 (mA) = gain *32767 + offset //=> gain=20/32767, offset=0 //double holdvalue = (double)holdingregister[i] * 20.0 / 32767; //listAO[i].Text = holdvalue.ToString("0.00"); }

```
After modifying
```

```
//read A0(4xxxx)
ushort[] holdingregister moster ReadHoldingRegisters(slaveID_startAddress_AO, numofPoints_AO);
for (int i = 0; i < numofPoints_AO; i++)
{
    listAO[i].Text = holdingregister[i].ToString();
    //If you need to show the value with other unit, you have to caculate the gain and offset
    //eq. 0 to 0 mA, 32767 to 20 mA
    //0 (mA) = gain * 0 + offset
    //20 (mA) = gain * 32767 + offset
    //=> gain=20/32767, offset=0
    //double holdvalue = (double)holdingregister[i] * 20.0 / 32767;
    //listAO[i].Text = holdvalue.ToString("0.00");
}
```

Write AO Tags (Base 0)

Before modifying

```
//set AO
private void AO_click(object sender, EventArgs e)
ł
    byte slaveID = 1;
    frmInputValue inputvalue = new frmInputValue();
    if (serialPort.IsOpen == true)
    {
        ushort index = ushort.Parse(((TextBox)sender).Tag.ToString());
        inputvalue.StringValue = ((TextBox)sender).Text;
        inputvalue.ShowDialog();
        if (inputvalue.DialogResult == DialogResult.OK)
        ł
            double value = inputvalue.Value;
            ushort aovalue = (ushort)value;
            //use gain=20/32767, offset=0
            //ushort aovalue = (ushort)(value * 32767 / 20.0);
            master.WriteSingleRegister(slaveID, index, aovalue);
        }
    }
}
```

After modifying

```
//set AO
private void A0_click(object sender, EventArgs e)
{
   byte slaveID = 1;
    frmInputValue inputvalue = new frmInputValue();
    if (serialPort.IsOpen == true)
    {
        ushort index = ushort.Parse((Convert.ToInt16(((TextBox)sender).Tag.ToString()) + 32).ToString());
        inputvalue.StringValue = ((TextBox)sender).Text;
        inputvalue.ShowDialog();
        if (inputvalue.DialogResult == DialogResult.OK)
        {
            double value = inputvalue.Value;
            ushort aovalue = (ushort)value;
            //use gain=20/32767, offset=0
            //ushort aovalue = (ushort)(value * 32767 / 20.0);
            master.WriteSingleRegister(slaveID, index, aovalue);
        3
    }
}
```

6.3.3 Modify VB Code

In this example, the module's address is set to "1". If the address is "2", all instances of "**slaveID**" in the program must be assigned the value "2".





```
Read DI Tags (Base 0)
Before modifying
   Try
       'read DI(1xxxx)
      Dim status() As Boolean = master.ReadInputs(slaveID, startAddress, numOfPoints)
       For i As Integer = 0 To numOfPoints - 1
           If status(i) = True Them
               listDI(i).BackColor = Color.DodgerBlue
           Else
               listDI(i).BackColor = Color.Navy
           End If
       Next
After modifying
  Try
       'read DI(1xxxx)
      Dim status() As Boolean = master.ReadInputs(slaveID, startAddress_DI, numOfPoints_DI
      For i As Integer = 0 To numOfPoints_DI - 1
```

```
If status(i) = True Then
listDI(i).BackColor = Color.DodgerBlue
Else
listDI(i).BackColor = Color.Navy
End If
Next
```

```
Read DO Tags (Base 0)
Before modifying
   'read DO(0xxxx)
   Dim coils() As Boolean = master.ReadCoils(slaveID, startAddress, numOfPoints)
   For i As Integer = 0 To numOfPoints - 1
        If coils(i) = True Then
           listDO(i).BackColor = Color.Red
        Else
           listDO(i).BackColor = Color.DarkRed
        End If
   Next
After modifying
    'read DO(0xxxx)
   Dim coils() As Boolean = master.ReadCoils(staveID startAddress_DO, numOfPoints_DO)
   For i As Integer = 0 To numOfPoints_DO - 1
        If coils(i) = True Them
            listDO(i).BackColor = Color.Red
        Else
            listDO(i).BackColor = Color.DarkRed
        End If
   Next
```

If users need to convert AI/AO values for display in a specific unit, refer to **Appendix B**: Type Code for AI Values (Modbus Protocol)

Read AI Tags (Base 0)

Before modifying

```
'read AI(3xxxx)
Dim register() As UShort = master.ReadInputRegisters(slaveID, startAddress, numOfPoints)
For i As Integer = 0 To numOfPoints - 1
    'If you need to show the value with other unit, you have to caculate the gain and offset
    'eq. 0 to 0kg, 32767 to 1000kg
    '0 (kg) = gain * 0 + offset
    '1000 (kg) = gain *32767 + offset
    '=> gain=1000/32767, offset=0
    'Dim value As Double = CDbl(register(i) * 1000.0 / 32767)
    'listAI(i).Text = value.ToString("0.00")
    listAI(i).Text = register(i).ToString()
Next
```

After modifying

```
'read AI(3xxxx)
Dim register() As UShort = master.ReadInputRegisters(slaveID, startAddress_AI, numOfPoints_AI)
For i As Integer = 0 To numOfPoints_AI - 1
    'If you need to show the value with other unit, you have to caculate the gain and offset
    'eq. 0 to 0kg, 32767 to 1000kg
    '0 (kg) = gain * 0 + offset
    '1000 (kg) = gain * 32767 + offset
    '=> gain=1000/32767, offset=0
    'Dim value As Double = CDbl(register(i) * 1000.0 / 32767)
    'listAI(i).Text = value.ToString("0.00")
    listAI(i).Text = register(i).ToString()
Next
```

Read AO Tags (Base 0)

```
Before modifying
```

```
'read AO(4xxxx)
Dim holding_register() Ar USNORT = master.ReadHoldingRegisters(slaveID_startAddress, numOfPoints)
For i As Integer = 0 To numOfPoints - 1
    'If you need to show the value with other unit, you have to caculate the gain and offset
    'eq. 0 to 0 mA, 32767 to 20 mA
    '0 (mA) = gain * 0 + offset
    '20 (mA) = gain *32767 + offset
    '=> gain=20/32767, offset=0
    'Dim value As Double = CDbl(holding_register(i) * 20.0 / 32767)
    'listAO(i).Text = value.ToString("0.00")
    listAO(i).Text = holding_register(i).ToString()
Next
```

After modifying

'read AO(4xxxx)
Dim holding_register() Ar OShort = master.ReadHoldingRegisters(slaveID, startAddress_AO, numOfPoints_AO)
For i As Integer = 0 To numOfPoints_AO - 1
'If you need to show the value with other unit, you have to caculate the gain and offset
'eq. 0 to 0 mA, 32767 to 20 mA
'0 (mA) = gain * 0 + offset
'20 (mA) = gain *32767 + offset
'=> gain=20/32767, offset=0
'Dim value As Double = CDbl(holding_register(i) * 20.0 / 32767)
'listAO(i).Text = value.ToString("0.00")
listAO(i).Text = holding_register(i).ToString()
Next

Write AO Tags (Base 0)

Before modifying





6.3.4 Test the Demo Program (WinForm, C#)

1. Before using the M-7026 module, refer chapter 3 to configure the following parameters by using DCON Utility Pro.

M-7026	The "Configuration" Page	
Protocol	Modbus RTU	
Address	1	
Baud Rate = 9600 Parity= N,8,1 Analog Format= Engineering		

M-7026	The "AO" Page	The "AI/DO Alarm" Page
Type Code	Vout0 = [08] +/-10V Vout1 = [00] 0 ~ +20 mA	Vin0 = [08] +/-10V Vin1 = [1A] 0 ~ +20 mA

Hardware Wiring (For testing) :

In this example, an M-7026 module is used to test DI, DO, AI, and AO statuses. Connect all devices as shown in the wiring diagram below. The M-7000 module includes an internal jumper that allows users to select between voltage or current measurement. To configure **M-7026#1** for current measurement on **Vin1/Vout1**, adjust the **J2** and **J8** jumpers accordingly. For detailed instructions, refer to Page 3 of the M-7026 Data Sheet.

www.icpdas.com/web/product/download/io_and_unit/rs-485/document/data_sheet/M-7026_en.pdf


Double-click **ModbusRTU_Master.exe** to open the window. Configure the PC's COM port and the baud rate setting, then click "**Open COM**" to establish communication.



🖳 Modb	ous RTU_Master					– 🗆 X
Com	COM5 ~	Baud.	9600 ~	Data Bit 8 🗸	Parity None ~	Stop Bit 1
DI						Open COM
DO						Close COM
AI						
AO						

If the communication is successful, users can test the demo by clicking the "DO" button to turn the DI "ON" or the "AO" button to output a value to the AI.



6.4 Using LabVIEW (Modbus)

LabVIEW (Laboratory Virtual Instrumentation Engineering Workbench) is a system-design platform and development environment for a visual programming language from National Instruments. LabVIEW provides an easy-to-use graphical interface and supports a variety of hardware drivers and software analysis tools that help users to speed up the amount of time to develop applications. LabVIEW has been widely used for the test, measurement, and automated control in various laboratories or industries.

Visit the LabVIEW webpage for more information:

https://www.icpdas.com/en/product/guide+Software+Development__Tools+LabVIEW__Tools#3089

Note: Before communicating with M-7000 series module, refer to Chapter 3: Settings Page - Configurations to configure the parameters (e.g., Address, Baud Rate).

Download demo programs (For Modbus module, M-7000 series) https://www.icpdas.com/en/download/show.php?num=1029

		Modbus RTU Too	I RS-485	Remote I/O Module (Modbus Protocol)	
Modbus Tool					
This tool is used to acce Version: LabVIEW 8.5 ar	ess remote I/O modules v nd later	vith Modbus protocol.			
Download	Applied Products				
	tET/tPET Series	ET-7000/ET-7200	<u>ET-2200</u>	<u>l-8k/l-87k</u> Modbus based I (ET-8KPn-MTCP, iP-8x4	modules in O Expansion Unit <u>1-MTCP, iP-8x11-MRTU</u>)
	<u>M-7000</u>	<u>M-2000</u>	<u>M-6000</u>	USB-4018HS	

6.5 Using Win-GRAF (Modbus)



Before using the M-7000 series module, refer to Chapter 3: Settings Page - Configurations to configure the parameters. Ensure that the "Analog Format" field is set to "Engineering Format".

	\frown		
Configuration DO Host WDT DI Commands Log	Configuration AI	Commands Log	Summary
Protocol (INIT*) Modbus RTU ~	Protocol (INIT*)	Modbus RTU	~
Address 1 [01H]	Address	2 🗘 [02H]
Baud Rate (INIT*)	Baud Rate (INIT*)	115200	~
Parity (INIT*) N,8,1 ~	Parity (INIT*)	N,8,1	~
Checksum (INIT*) Disabled ~	Checksum (INIT*)	Disabled	×
	Analog Format	Engineering For	m ~
For DIO or Counter module (e.g., M-7055/60).	Sample Mode	Normal Mode	~
	60/50 Hz	60Hz	~
For AIO module (e.g., M-7015/17/18/19).	Type Code	[08] +/- 10 V	~
	Response Delay	0 [Max	.30ms]

Win-GRAF supports the **Modbus RTU** protocol for connecting to **M-7000** series modules. It includes built-in Modbus commands, allowing users to select the model and the desired read/write functions, thereby eliminating the need to manually reference tables and configure settings.

The following example demonstrates how to use an **XP-8xxx-CE6** PAC to connect to **M-7055** (8 DI, 8 DO) to read from or write to I/O modules via **COM3**. It also covers the procedure for downloading the program to the PAC, checking the module's status, and adding an additional module (**M-7017**).

Visit the Win-GRAF Workbench webpage for more information:

Web: https://www.icpdas.com/en/product/guide+Software+Development__Tools+Win-GRAF Manual: https://www.icpdas.com/en/download/show.php?num=8110

Configuration Instructions:

1. Open Fieldbus: Click the "Open Fieldbus Configuration" button to open the "I/O Drivers" window.



2. Add the MODBUS Master

Click the "Insert Configuration" button and select "MODBUS Master", and then click OK.



3. Select the MODBUS-RTU

Click the **"Insert Master/Port"** button and select **"Serial MODBUS-RTU"**. Enter **COM3:115200,N,8,1** in the **"Com. Port"** field and click the **OK** button. Note that the COM settings should be configured according to the application requirements.

File Edit View Insert Project Tool	s Window Help		
□ ■ B' 号 炎 ∿ 亩 X 敦 ┶ ッ ୯ 鍿	🏭 🏯 🗂 ⋿ §g 🖽 🎦 🎽 🍠		
Workspace I/O Dri	vers *		
Workspace Workspace Call View Insett Project Food Workspace Call Programs Call Projects (All Projects) No Dri Call Projects No Dri No Dri N	Image: Solution of the point of the po	Name Value Enable OK Cancel	Name Type Dim.
	Try to reconnect after communication e Manage diagnostic info for slaves Disabled (do not open and manage this	rror port)	

4. Add the Modbue and Select the Function

Follow the steps to add the M-7055 module in the "ADD Modules" window.

- Enter the model number in the "**Srarch**" field to quickly locate the module.
- Select the desired module in the **"Device"** field.

Add Modules		>	<
Device: (none) (none) M-7055D M-7055D-NPN M-7055UD 2	Search:		
Search:			
Slave/Unit: 1	Add variables	Prefix:	
	OK Cancel		

After selecting the model, all supported I/O functions will be automatically displayed. In this example, select the "M-7055D – DI – Read all channels" and "M-7055D – DO – Write all channels".

Add Modules	×
Device: M-7055D	Search: 55
M-7055D - DI - Read all channels M-7055D - DI - Read counter M-7055D - DI - Write clear counter M-7055D - DO - Write all channels	

Add Modules	X
Device:	Search:
M-7055D ~	55
✓M-7055D - DI - Read all channels M-7055D - DI - Read counter M-7055D - DI - Write clear counter	
M-7055D - DO - Write all channels	
When using two or more mod	ules.
Search: the Net-ID cannot be duplicate	ed.
Slave/Unit: 1	Add variables Prefix: M_7055_
(4)	(5) (6)
ОК	Cancel
(7)	

- Enter the module's Net-ID in the "Slave/Unit" field. Note that the Net-ID must be unique and cannot be duplicated.
- Select "Add variables" to automatically add variables. If unchecked, the user will need to add new variables manually.
- Enter the variable prefix in the "Prefix" field (e.g., M_7055_, where the variable name can be M_7055_DI_R_00).
- Click "**OK**".

The **M-7000** series offers a wide range of modules. Users can quickly locate the desired model using the search function.

Add Modules		×
Device:	Search:	
M-7003	~	
M-7003		
M-7005 M-7013PD M-7015 M-7015P M-7016D M-70177 M-7017C-16 M-7017R-A5 M-7017R-A5 M-7017R-C M-7017R-RMS M-7017R-RMS M-7017Z M-7018 M-70182 M-7019R M-7019R M-70192 M-7022		

The selected items have automatically created two data blocks: one for reading 8 DI data and one for writing 8 DO data.

5. Configure the DI MODBUS Request Address

Double-click the first data block (i.e., <2> Read Input Bits), which is used to read 8 DI with Modbus addresses 1 to 8 (Base1). Therefore, the **Offset** address should be set from 0 to 7.



6. Configure the DO MODBUS Request Address

Double-click the second data block (i.e., <15> Write Coil Bits), which is used to write 8 DO with Modbus addresses 1 to 8 (Base 1). Therefore, the Offset address should be set from 0 to 7. If the Operation field is set to "Error report", the Offset address should be set to "0", and the variable type should be set to "DINT".



7. Download the Demo Program and Test the I/O Module

Click the "**Online**" button to connect to the PAC and download the demo program. Afterward, users can view the M-7055's I/O status.



To add other module settings with the same communication settings (COM3:115200,N,8,1), follow these steps:

1. Select the "ADD Modules"

Right-click the "RTU: COM3:115200,N,8,1" and select the "ADD Modules".

File Edit View Insert Project Tools Window Help							
- 🖬 🖻 🖶 X 🖬 - X 💌 -	🤊 🕾 🏭 🏯 🙆 🖪 🗞 🖻 🐂 🌌						
Workspace	I/O Drivers						
▲ lemo_M_7055	🖉 🔺 🐜 MODBUS Master	Properties	Name 🔺 Type				
Exception programs	🚔 🔺 🏯 RTU: COM3:115200,N,8,1 🕎	View Information	Global variables				
🕨 🗎 Programs	💾 👘 👌 📲 <2> Read Input Bits (1) [18		I,8,1 M_7055_DI_R_00 BOC				
🛛 🖻 Watch (for debugging)	▶ 📲 <15> Write Coil Bits (1) [18] -	Disable Configuration	M_7055_DI_R_01 BOC				
🎟 Initial values	· · · · · · · · · · · · · · · · · · ·		M_7055_DI_R_02 BOC				
🗘 Variables	Č	× <u>C</u> lear	M_7055_DI_R_03 BOC				
Types		₩ Cut	M_7055_DI_R_04 BOC				
🗎 (All Projects)		En Conv	M_7055_DI_R_05 BOC				
		u c <u>o</u> py	M_7055_DI_R_06 BOC				
		Paste	M 7055 DI D 07 DOC				
	~						
		Find					
	Request Slave/Unit	Find Next	sriod				
	<2> Read Input Bits 1						
	<15> Write Coil Bits 1	Go to variable Definition					
		MODBUS Master Addresses					
		Renumber addresses					
		Add modules					
		Add modules					
		Library of Devices					

2. Add the Modbue and Select the Function

Select the desired model (e.g., M-7017) and I/O function in the "ADD Modules" window.

Add Modules		×
Device: M-7017	Search: 17 17 1 17 1 1 1 1 1 1 1 1 1 1 1 1 1	
Search: When us the Net -	ing two or more modules, D cannot be duplicated.	
Slave/Unit: 2	OK 7	Prefix: M_7017_ 6

3. The Module Settings are Complete

Users can verify that the M-7017 Data Block has been successfully added to the MODBUS-RTU communication settings.

File Edit View Insert Proj	ect lools Window Help	
- 💾 🖻 🖶 🐰 🖸 ə 🗙 🟹 😓	◎ ◇ 緇 細 品 ① ⋿ §₀ 邱 № ┛	
Workspace	I/O Drivers *	
🔺 🖻 demo_M_7055	🖉 🔺 🐜 MODBUS Master Name Value	Name 🔺 Type
Exception programs	🚆 🔺 # RTU: COM3:115200,N,8,1 Request <4> Re	ad Input Regist 🔺 🖻 Global variables
Programs	** ** <2> Read Input Bits (1) [18] - M-7055D - DI - Re Slave/Unit	M_7017_AI_R_Engr_00 INT
Watch (for debugging)		M_7017_AI_R_Engr_01 INT
Initial values	Image: Second secon	M_7017_AI_R_Engr_02 INT
🖸 Variables	Activation Periodi	M_7017_AI_R_Engr_03 INT
🖻 🗖 Types	Period (ms) 0	M_7017_AI_R_Engr_04 INT
🗎 (All Projects)	on err 0	M_7017_AI_R_Engr_05 INT
	The added M-7017 module. ut(ms) 3000	M_7017_AI_R_Engr_06 INT
	er of tria 1	M 7017 AI R Engr 07 INT
	C Description M-7017	7 - Al - Read all 💽 M 7017 status DINT
	Symbol Operation Offect Mack Storage	Dapas (Lau) M 7055 DI R 00 BOOL
	Symbol Operation Offset Mask Storage	M 7055 DI R 01 BOOL
	M_7017_AI_R_Engr_00 Data exchange 0 FFFF Default	M 7055 DL R 02 BOOL
	M_/01/_AI_R_Engr_01 Data exchange 1 FFFF Default	M 7055 DL R 03 BOOL
	M_7017_AI_R_Engr_02 Data exchange 2 FFFF Default	
	M_7017_AI_R_Engr_03 Data exchange 3 FFFF Default	
	M_7017_AI_R_Engr_04 Data exchange 4 FFFF Default	
	M_7017_AI_R_Engr_05 Data exchange 5 FFFF Default	 Variables
	M_7017_AI_R_Engr_06 Data exchange 6 FFFF Default	Name Value Type [
	M 7017 AL R Engr 07 Data exchange 7 FFFF Default	
	M_7017_status Data exchange 0 FEE - Default	

6.6 AVEVA Edge



Before using the module, download the **DCON Utility Pro** software to configure the basic parameters of the **M-7000**.



6.6.1 Example1: M-7018 Configuration Setup

This section explains how to use AVEVA Edge to read from and write to the M-7018-G module via the Modbus RTU protocol. In this example, a simple screen will be created to display the thermocouple temperature readings, along with a button of the Symbols function.

> The M-7018 Webpage and Download Files

The **M-7018-G** is an 8-channel thermocouple input module developed by **ICP DAS**. Click the **Download Center** button on the **M-7018-G** webpage to download the user manual and Tools. (https://www.icpdas.com/en/product/M-7018-G)



> Configure M-7018 Parameters (DCON Utility Pro)

Once the software is launched, click the **Connection Options** button in the toolbar, select the PC's COM port, verify the search parameters, and click **Start Search**. When the module is detected, double-click on **7018** to access the **Configuration** page.

B DCON Utility Pro V 4.3.0.6						X
	CMD 🕎 📢	5	FAQ			
	ID Address Baud Ra	te Checksum Format	Status	Description Comments		
	Connection Search	Options 2.		×		
PC COM Port	COM5	~	Start	0 End 255		
	Baud Rate Pro	tocol Checksum	Format	3.		
	2 115200	57600	38400	19200		
	9600	□ 4800	2400	□ 1200		
	Time suit 20	0	The	e default communica	ation format	for
	Timeout 30	u ms		DAS products is " 96	00 N 8 1"	
	Search RU-	87PN Addr. Mode	e			
Clear	Search and	Get I/O Configu	rations			
	Start Searc	:h		Exit		
	4.					
5.						
ID Address Bau	ud Rate Checksum	Format Stat	tus Des	scription		Comments
7018 1[01h] 960	0 Disabled	N,8,1 Ren	note I/O [Mo	odbus RTU]8*AI (mA,mV,V,	Thermocouple)	Supported

Set the analog format to **Engineering Format**, the type code to **Thermocouple K-type**, and then click the **Set Module Configurations** button.

19 7018 Firmware[B405]			
Configuration I (Commands Log	Summary	
Protocol Address Baud Rate Data Format (INIT*) Checksum	Modbus RTU 1 9600 N,8,1 Disabled	 ✓ O1H ✓ ✓ ✓ ✓ ✓ ✓ 	The following sections will explain how
Analog Format	Engineering For	rm ~	to convert values with 2's complement.
60/50 Hz	60Hz	~	Go back to this page and modify the
Type Code	[0F] T/C K-type	~	setting to 2's complement format.
Response Delay	0 [Max	k.30ms]	? Set Module Configurations

> Engineering or 2's Complement Al Values

On the **AI** tab, channels that are checked are enabled, and real-time AI values will be displayed. The table below shows the values in different formats, and the following sections will guide you on how to convert the software readings into actual temperature values.

Analog Format	AI0 value	The temperature detected on the channel
Engineering Format	00302	30.200°C
2's Complement Format	02DB	30.608°C

Configuration	Al Commands L	.og Sun	nmary	
[0F] T/C K-	type			
	Al Value	CJC O	ffset	
CH:00	00233 [+023.300]	0.00	+ -	Analog Format = 2's Complement Format
CH:01		0.00	+ -	shown in the figure.
CH:02		0.00	+ -	[0F] T/C K-type
CH:03		0.00	+ -	Al Value CJC Offset
CH:04		0.00	+ -	CH:00 023A [+023.867] 0.00 + -
CH:05		0.00	+ -	
CH:06		0.00	+ -	
CH:07		0.00	+ -	
CJC Tempe	erature 23.470		🗹 Ena	ble CJC Module CJC Offset 00.00 + -

6.6.2 Example1: AVEVA Edge and the M-7018 Module

Create the Project and Tags

Click the "**New**" shortcut icon, name the project "**M-7018**", choose the platform and the number of tags, then click "**OK**".



Set the resolution to **1920 × 1080** in the project wizard, then click "**OK**".

Project Wizard					×	
Display Resolution: Custom	• 19	idth: 920		Height: 1080		
			OK		Cancel	

The **Overview** window displays the current security settings. Simply click the **Next** button to proceed through the setup. In Steps 2 to 6, the user can set the primary password, configure security settings, and create user groups.

Overview			×
\leftarrow		Step 1/6	
This wizard will help you to configure the new Security	y System.		
These are the current security settings:	Users:	Groups:	
Security System is enabled.	Guest	Guest	
[Local Mode]			
[Local Mode]: GOOD			
☑ Do not automaticaly show this wizard next time you	ı open Security.		
		Next > Ca	ancel

This example uses the default settings. Once done, click the **Finish** button to complete the setup.

Finish			×
~		Step 6/6	
Configuration Wizard results:			
	Users:	Groups:	
Security System is enabled.	Guest	Guest	
[Local Mode]			
[Local Mode]: GOOD			
		Finish	Cancel

Click the **Global** tab in the **Project Explorer** panel. Right-click on **Datasheet View** and select **Open** to display the **Project Tags** page. Then, follow the table to add tags.

Name	Array Size	Туре	Description
AI	0	Real	AI Value of M-7018
Temperature	0	Real	Thermocouple temperature

		AVEVA Edge - Project	Tags		- 🗆 ×
File Home View Insert Pro	oject Help	ement G	Verify 🚆 Archiv	re Global Replace Q Tags	Style Y
Project Explorer + × Project Tags Project: M-7018.APP Name Array Size Type Description Scope H-Historian U.A.External Availabilit Project: Tags Datasheet View V					
	Name Q. Filter text	Array Size	Type	Description	n
1		0	Real	Al Value of M-7018	
2	∽ Temperature	0	Real	Thermocouple tem	perature

Add the Screen

Click the **Graphics** tab in the **Project Explorer** panel. Right-click on **Screens** and select the **Insert** to display the **Screen Attributes** window.



The user can adjust the resolution (e.g., 1920 x 1080) in this window. Click **OK** to add the screen.

Description: Main				
Background Picture Enable Background Shared image:	BMP v	Size Width: Height:	1920 1080	Location Top: 0 Left: 0
Runtime Properties				Security Level: 0
 System Menu Maximize Box Minimize Box Don't redraw: Disable Commands: 	Style: Border:	Replace(Partial) •	Screen Logic On Open While Open On Close
Focus Receive focus on open Share tab order with other scr Background screen	eens	Tab Order:	Performat Hide : Keep	Multi Touch Settings nce Optimization screen instead of closing it screen file in memory

> Add the Text Object

The **Draw** ribbon appears only after creating a screen. To add a text object from the **Active Objects** group, click on the screen to input the text, then double-click the object to open the **Objects Properties** Window and adjust the font.

	Draw Tools	Object Tools		AV/EV/A Edge - Screen?	
	Diaw roois	Object roois		AVEVA Luge - Screenz	= _ ^
File Home View Insert Project	Draw	Format	Help		Style `
🕥 📘 Selection 🗸 🚍 🗖 🗍 🗍 T	Text 🖪 🗐	\odot		🖯 Command T. Text Data	a Link 🛛 🔐 Resize
🔆 Disable Drag 🏢 🗸 🗲 🖬	ext Text 🗹 💷	~		🔗 HyperLink 🔳 Color	🔊 Rotation
v k Replace v v	Button 💿 🖭	m	Symbols	📠 Bargraph 🛛 💿 Visibility,	/Position
Editing	ctive Objects	Data Objects	Libraries	Animati	ons
Project Explorer 👻 🖛 🗴 🗎 Project	Tags 📮 Screen	2 ×			-
✓					
Screen Group	Λ 7	N1			
> Thin Clients				· · · · · · · · · · · · · · · · · · ·	
Project Symbols					×
Graphics Script Native Symbols	Object Proper	ties			
I Layout	Repla	ace	Hint:	Text	-
Global Graphics Tasks Comm					
	Captio	on: M-7018			Text data link
Click the "Font" button	t o Alig	gn: Left		~	Fonts
set the font color and size	ze.				
		Bor	der:		
				Backgro	ound:
	 Enable trans 	slation			

Add two text objects to the screen. Set their captions as "Thermocouple Temp. Status" and "Channel 1: #####". The number of "#" indicates the length of the displayed data, including the decimal point. Double-click "Channel 1: #####" to open the Object Properties Window, then click the Text Data Link button and input "AI" in the Tags/Expression field.



Add a System Symbol

In this example, an **Exit** button is added from the system symbols to terminate the run-time task. Clicking the **Symbols** object on the **Draw** ribbon brings up the **Symbols** window. <u>Note:</u> Users can save the screen as "**Main.SCC**" by clicking the "**Save All**" button in the upper-left corner of the window.



Expand the **System Symbols** folder and navigate to the **Buttons** sub-folder. Double-click the **button_exit** object to automatically close the Symbols page. Then, click on the Screen page to position the object.



Then, click on the "Main.SCC" page to position the object. Once completed, the screen will appear as shown below.



> Add the MODBU (Modbus RTU) Communication Driver

Adding a driver sheet is simple. AVEVA Edge supports various drivers, and this project uses the MODBUS Driver (Modbus RTU) along with the ICP DAS M-7018-G module for testing.

1

Click the Comn	n tab in the Project Explorer panel.	Project Explorer	▼ ₽ ×	
Right-click on C	Drivers and select Add/Remove drivers.	 Project: M-7018.APP Drivers OPC Add/Remove drivers OPC UA 		
	BU ariver is round, click the Select >>	> DOPC XML/DA		
click the OK bu	t to the Selected Drivers list. Afterward, tton to close the window.			
Communio	cation Drivers	🕲 Global 🔒 Graphics 🖻 Tas	ks 🖵 Comm	
Available d	lrivers:			
DLL	Description 1.	I I I I I I I I I I I I I I I I I I I	Ielp	
MELSE MITSU MODSL MOTCP MQTT OMDIR OMETH Selected dr DLL MODBU	MELSE: Mitsubishi - MELSEC Protocol (v10.16) MITSUBISHI Protocol, FX Series (v10.10) Protocol ModBus Slave(ASCII and RTU)(Serial and TCP/IP) [3. MODBUS Protocol RTU via TCP/IP (v10.26.0) MQTT (v1.18] OMRON - Ethernet (v1.1.0) OMRON, OMPLC Protocol - FINS communication / CS1, CV an OMPON - Fine Cotours Protocol (v1.04.0) ivers: Description MODBUS Protocol RTU/ASCII (v10.14.0) 3.	4.0] d C Sela	2. ect >> Remove	
		ОК Са	ncel	

Next, right-click the added **MODBU** driver and select "**Settings**" to open the settings window.

If the user has any questions about the settings, click "Help" to access the relevant driver manual.

Project Expl	orer 👻 🖣 🗙
✓ ■ Project: M-70 ⁻ ✓ ■ Drivers	18.APP
> MODBU OPC DA > OPC UA > OPC XM TCP/IP	Insert Settings Help
	ics 🛯 Tasks 🖵 Comm

In the **MODBU** window, select the correct COM port (which can be entered manually, e.g., COM5) and the predefined parameters (e.g., Baud Rate: 9600, Data Bits: 8, Stop Bits: 1, Parity: None). Make sure **RTU** is selected in the Protocol field, then click **OK**.

	📟 MODBU:					×
	Serial Encapsulation:	None	*			
COM1 COM2	– Serial Port – – – COM:	COM5		Stop Bits:	1	·
COM3 COM4 /dev/ttyS0	Baud Rate:	9600	•	Parity:	None	•
/dev/ttyS1 /dev/ttyS2 /dev/ttyS3 /dev/ttyUSB0	Data Bits:	8	*			
/dev/ttyUSB1 /dev/ttyUSB2 /dev/ttyUSB3	It allows the use	er to enter the	e PC's COM p	ort manua	ally.	
COM5	Signed/Unsigned:		Prot	ocol(ASCII	or RTU):	
	Unsigned (legacy)		▼ RTU			-
	Swap - Write Type	:	Bloc	k Size /		
	No Swap / Write Ite	em	• 64			
	Advanced				OK	Cancel

Note:

After the **MODBU** driver is added, the **MAIN DRIVER SHEET** will be automatically created. Generally, the user can add tags in this sheet. However, if the system becomes large and there are many tags to add, which could overload the communication. It is recommended that the user add tags in a separate sheet to ensure the stability of data communication, as will be explained later.

Project Explorer 🚽 👻	MODBU - MAIN DRIVER SHEET X							•
 Project: M-7018.APP Drivers MODBU MAIN DRIVER SHEET OPC DA Client (legacy) OPC UA 	Description: MAIN DRIVER SHEET Disable: Read Completed: Read Status:							
> 🖿 OPC XML/DA 🖿 TCP/IP	Write Completed: Write Status:	Min: Max:						
	Tag Name 🗸 🗸	Station	I/O Address	Action	Scan	Div	Add	_
	Q Filter text	Q Filter text C	C Filter text	Q (All)	Q (All)	Q Filter text	Q Filter text	
				Read+Write	Always			
				Read+write	Always			

> Add a Driver Worksheet for Analog Inputs (Engineering)

Click the **Comm** tab in the **Project Explorer** panel. Right-click on the **MODBU** driver and select **Insert** to add a standard Modbus RTU worksheet.

In this example, the type code of the M-7018 module is set to Thermocouple K-type, with a data range of -2700 to 13720, representing -270°C to 1372°C. For more details, refer to Appendix B.

Input the following settings in the MODBU worksheet.

Field Name	Settings
Description	M-7018
Enable Read when Idle	1
Station	1
Header	3X:0

No.	Tag Name	Address	Div	Add
1	AI	1	10	-

10	MODBU001.DRV	×				•
	Description:					
	M-7018			Increase prior	rity	
	Read Trigger:	Enable Read wh	en Idle: Rea	ad Completed:	Read Status:	
		1				
	Write Trigger:	Enable Write on	Tag Change: Wr	rite Completed:	Write Status:	
	Station:	Header:				
	1	3X:0]	
					111111	
Г	Tag Name	Address		Div	Add	
	Q Filter text	Q Filter text	Q Filter text		Q Filter text	
1	AI	1		10.00000		
*						

The table below outlines the fields to be configured in Example 1:

Description	Enter a brief description to identify the worksheet
Enable Read when Idle	Enter a tag name (Boolean) or a constant value. If the value exceeds 0, the module data will be read automatically and continuously. In this example, the value is set to 1.



Station	Enter the Net-ID (ranging from 0 to 255) assigned to the module on the Modbus network. In this example, the ID is set to 1.
Header	In this example, the header is set to "3X:0" to read the analog input values from the module.

The following are commonly used examples. Users can also click on "**Help**" to view the Driver's Manual.

Example	Description
0X:0	Coil status
1X:0	Input status
STA:0	Exception Status
3X:0	Input register
4X:0	Holding register
FP3:0	Input register (Floating-point value)
FP:0	Holding Register (Floating-point value)
DW3:0	Input register (Dword value)
DW:0	Holding Register (Dword value)
ST:0	Holding Register (String value)

Project Explo	rer	→ ₽ ×
 ✓ ■ Project: M-7018. ✓ ■ Drivers 	APP	
> 🖿 MODBI 🖿 OPC DA (Insert	
> 🖿 OPC UA	Settings	
> COPC XML	Help	
	🕒 Tasks 🖵 🗘	Comm

Tag Name	Enter the tag name for reading or writing data. In this example, the tag name is set to "AI" (Real).
Address	Enter the Modbus address (or offset address). For this example, the address is set to "1".

Click the link to view the M-7018's Modbus address (Base1) mapping table.

https://www.icpdas.com/web/product/download/io_and_unit/rs-485/document/manual/7000/ M-7000_address_mapping_table.pdf

	Modbus	function	Modbus Address	Notes (M-7018)	
	3X		30001 to 30008 To read AI0 to AI7		
Div Div Div Div		he user can livisor is set re enabled.	set a divisor to scale t to 10. <u>Note:</u> Do not use	he displayed value. In this e this field if the " Min " and	example, th d " Max " field
Users can refe	r to Append	ix B for the r	nodule's type code. This	s module is set to K-type, a	nd its value

range can be adjusted to display from -270°C to 1372°C after dividing by 10.

Type Code	Input Range	Data Format	Min.	Max.
0x0F	K-type Thermocouple -270 to 1372°C	Engineering unit	-2700	13720

Click the "Save All" button in the upper-left corner. A "Save As" dialog box will appear; click "OK." Then, click "Run" on the Home ribbon to start the run-time task.

	AVEVA Edge - MODBU001.DR	۲V	- 🗆 ×
File Home View Insert Paste Cut Copy Find/Replace Clipboard Local Manag	Project Help Run Stop Debug Connect Remote Manage OK OK OK OK	Cancel	Style ~
 ✓ E Project: M-7018.APP ✓ E Drivers ✓ MODBU I MAIN DRIVER SHEET II M-7018 II OPC DA Client (legacy) > II OPC UA > OPC XML/DA II TCP/IP 	Description: M-7018 Read Trigger: Enable Read when Idle: 1 Write Trigger: Enable Write on Tag Change:	Read Completed: Write Completed:	rity Read Status: Write Status:
	Station: Header: 1 3X:0 Tag Name Address Q. Filter text Q. Filter text 1 Al	Div 10.000000	Min: Max:

The user can see that the current temperature is 25.60°C. Click the "**Exit**" button to exit the runtime screen.



The run-time screen

> Add a Driver Worksheet for Analog Inputs (2's Complement)

If the module's analog format is set to **2's Complement** using DCON Utility Pro, the data will be in hexadecimal. The K-type thermocouple's data range is from E6D0 to 7FFF (see Appendix B). In this example, a formula is used to convert the reading to the actual temperature. A simpler conversion method is shown in Example 2.

Input the following settings in the MODBU worksheet.

Field Name	Settings		No.	Tag Name	Address	Div	Add
Description	M-7018		1	AI	1	_	_
Read Trigger	1						
Station	1						
Header	3X:0	1					

MODBU001.DRV	/ ×			
Description:				
M-7018			Increase prior	ity
Read Trigger:	Enable Read whe	en Idle: Re	ad Completed:	Read Status:
Write Trigger:	Enable Write on	Tag Change: Wi	rite Completed:	Write Status:
Station:	Header:			Min: Max:
Tag Name Q. Filter text	Address	R Filter text	Div	Add Q Filter text
Al	1		0.000000	

Click the **Tasks** tab in the **Project Explorer** panel. Right-click on **Math** and select **Insert** to add a sheet for performing the 2's complement conversion.

Project Explorer 💿 👻 🖛 🛪	(x) MATH001.MAT	[Language: Built-in] ×		•
 Project: M-7018.APP Alarms Trend Logger Recipes 	Description: 2's complement conversion Execution:			
> Beports A math Seri Insert	1	Emeration	Þ	•
 Scheduler Database/ERP Internet of Things 	G Filter text Temperature *	Q Filter text if (AI > 32767, AI / 32768 * 1372, AI / 32767 * 1372)		
			•	

The settings are listed in the table below.

Field Name	Settings
Description	2's complement conversion
Execution	1
Tag Name	Temperature
Expression	if (Al > 32767, Al / 32768 * 1372, Al / 32767 * 1372)

Users can refer to Appendix B for the module's type code. The M-7018 module is set to K-type with temperature range of -270 to 1372 (°C).

Type Code	Input Range	Data Format	Min.	Max.
0x0F	Type K	Engineering unit	-2700	13720
	-270 ~ 1372°C	2's complement HEX	E6D0	7FFF

The data range for a 16-bit signed value spans from -32,768 to 32,767. In this example, the module's data is represented in 2's complement format in hexadecimal. To obtain the corresponding temperature value, we need to convert this data accordingly.



If the data exceeds the maximum range of a signed 16-bit value (32,767), it is treated as a negative value. Therefore, the expression is defined as:

if (AI > 32767, AI / 32768 * 1372, AI / 32767 * 1372)

	Tag Name	Expression	
	Q Filter text	Q Filter text	
1	Temperature	if (AI > 32767, AI / 32768 * 1372, AI / 32767 * 1372)	
*			
*			

Double-click on **Channel 1 : #####** to open the **Object Properties** window. Then, click the **Text data link** button and enter **Temperature** in the **Tag/Expression** field.

Project Exp	lorer	▼ ‡	× 🖳 Main	.SCC × (x) MATH	001.MAT [Language: Built	-in]		
 Project: M-70 Screens Main Thin Clients Project Sym Graphics Sc Native Sym Layout 	and the second s		N Ch	I-7018 annel 1	3 Thermo	ocoup	le Temp. S	Status 🎵 (#label:"Edi
Global & Graph	nics 🔒 Ta	ısks 및 Com	Object [Proportion		· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	×
				Replace	Hint:		Text	~
				Caption: Cha	nnel 1 : ######			Text data link
	Obje	ct Proper	ties				×	Fonts
	×	Repla	ace	Hint:		Text Data	a Link 👻	
		Tag/I	Expression:	Temperature)			
			Format:	Auto	- Input En	abled	Back to text	
		Minim	num Value:					
		Maxin	num Value:					
			Disable:					
	Pas	ssword	A	uto Size	F	RTL	Security: 0	
	E-5	Sign	R	equire confirma	tion Virt	al keyboard:	<use default=""></use>	

Click **Save All** to save the project. Then, click **Run** on the **Home** ribbon to start the run-time task and view the current temperature value.

	□ @ =	Dra	aw Tools	Object Tools	
File Home V	'iew Insert Proje	ct [Draw	Format	Help
Paste & Cut Paste @ Find/Replace	Runtime Tasks Debug V	- C Connect	✤ Downloa▶ Run■ Stop	d Runtime Wa Tasks	tch LogWin
Clipboard	Local Management 🕞		Remote N	lanagement	Г _Ч



6.6.3 Example 2: M-7026 Configuration Setup

This section provides a brief overview of using AVEVA Edge to read from and write to the M-7026-G module through the Modbus RTU protocol. A PC can be connected to the M-7026-G using the I-7561 (USB to RS-485) converter.

The M-7026 Webpage and Download Files

The M-7026-G, developed by ICP DAS, is a module featuring 6 analog inputs, 2 analog outputs, 3 digital inputs, and 3 digital outputs.

Webpage: M-7026-G (https://www.icpdas.com/en/product/M-7026-G). Download files: https://www.icpdas.com/en/download/index.php?model=M-7026-G



<u>Note:</u>

Before using the module, download the **DCON Utility Pro** software to configure the basic parameters of the M-7026-G.

Configure M-7026 Parameters (DCON Utility Pro)

Once the software is launched, click the **Connection Options** button in the toolbar, select the PC's COM port, check the search parameters (e.g., Baud Rate, Protocol, and so on), and click **Start Search**.

DCON Utility Pro V 4.3.0.6	
(I) II 🗄 🕒 🤄	MD 🔄 📢 🔚 🗊 🖶 FAQ
COM3:*	Address Baud Rate Checksum Format Status Description Comments
	Connection Search Options ×
	COM5 Start 0 End 255
	Baud Rate Protocol Checksum Format
	☑ 115200 □ 57600 □ 38400 □ 19200
	☑ 9600 □ 4800 □ 2400 □ 1200
	Timeout 300 ms
	Search RU-87PN Addr. Mode
Clear	Search and Get I/O Configurations
	Start Search Exit

When the module is detected, double-click on **7026** to access the **Configuration** page.

ID	Address	Baud Rate	Checksum	Format	Status	Description	Comments
7026	1[01h]	9600	Disabled	N,8,1	Remote I/O	[Modbus RTU]2*AO + 6*AI + 3*DO + 3*DI (mA,V)	Supported
	•						

The analog format of the M-7026 module can be configured as either **Engineering Format** or **2's Complement Format**. After setting the type code to ±5V on both the AO and AI pages, click the Set **Module Configurations** button.

8 7026 Firmware[0B01]										
Configuration AO	Configuration AO AI/DO Alarm DI Host WDT Commands Log Summary									
Protocol	Modbus RTU ~									
Address	1 ÷ 01H	Refer to A	pendix B for the type co	ode and da	ata range					
Baud Rate	9600 ~	details.								
Data Format (INIT*)	N,8,1 ~									
Checksum	Disabled 🗸	Туре	Data Format	Min.	Max.					
Analog Format	Engineering Form ~	[05]	Engineering	-5000	+5000					
Fast Mode	Normal Mode ~	+/- 5 V	2's complement HEX	8000h	7FFFh					
60/50 Hz	60 Hz ~									
Response Delay	0 [Max.30ms]	?								
			Set Moo	dule Config	urations					

🛢 7026 Firmware[0B01] Configuration AO AI/DO Alarm DI Host WDT Commands Log Summary Set AO Value with Engineering Format Read Back Range Type Code Slew Rate AO Value Output AO:00 [05] +/- 5 V 0 0 -5000~5000 immediate 0 ~ Set Write \sim 0 0 -5000~5000 AO:01 [05] +/- 5 V ~ immediate 0 Set Write \sim Set Channel Type Code As AO:00 Set [Power-on Value] Set [Safe Value] Read AO O Read Power-on Value O Read Safe Value

18 7026 Firmwar	re[0B01]							
Configuration	AO AI/DO Alarm	DI Host WDT	Commands Log	Summary				
	Al Value	Type Code		Alarm Mode	High Alar	m Limit	Low Alarn	n Limit
CH:00	00000 [+00.0000]	[09] +/- 5 V		Disable 🗸	5		-5	
		[09] +/- 5 V	\mathbf{R}	Disable 🗸	5		-5	
				Disable ~	10		-10	
U CH:02		[08] +/- 10 V	<u> </u>	Set Alarm				
CH:03		[08] +/- 10 V	~					
CH:04		[08] +/- 10 V	~	DO Bit Status	High Alari	m Status	Low Alarn	n Status
CH:05		[08] +/- 10 V	~	DO:00	AI:00	Clear	AI:00	Clear
				DO:01	Al:01	Clear	AI:01	Clear
		Set all channels	as Al:00	DO:02	AI:02	Clear	AI:02	Clear
				Set [Power-on	Value]	Set [S	afe Value]	
				Read DO				
○ Read Power-on Value								
				O Read Safe Val	ue			

6.6.4 Example2: AVEVA Edge and the M-7026 Module

Create the Project and Tags

Create a project named M-7026, select "Windows AVEVA Edge 150 tags", and click OK.

lew	×
Project File	⊲ ⊳
Create new Project with the specified settings	
M-7026	
Location:	
C:\Users\Janice\Documents\AVEVA Edge 2023 Projects\ Browse	
Configuration file: C:\Users\Janice\Documents\AVEVA Edge 2023 Projects\M-7026\M-7026.app	
Target platform*: (All)	
Windows AVEVA Edge Unlimited Embedded AVEVA Edge Unlimited Windows AVEVA Edge Unlimited Windows AVEVA Edge 12K tagsWindows AVEVA Edge 150 tagsWindows AVEVA Edge 512K tags 	
AVEVA Edge 150 tags for Windows	ī.
*Select Windows target platform for Windows Server or Desktop projects. Select Embedded target platform for Windows Embedded or IoT View (Linux) projects. *You can modify the target platform and product type after creating the project by using the Project tab.	
OK Cancel	

(Set the resolution to 1920 × 1080.)

Project Wizard			×
Display Resolution:	Width:	Height:	
Custom -	1920	1080	
		OK Cancel	

<u>Note</u>: In the following "**Overview**" window, keep the default settings. Users can directly click the **Next** button to complete the setup. In this example, the Tags listed in the table below need to be added.

Click the **Global** tab in the Project Explorer, right-click on **Datasheet View**, and select **Open** to display the **Project Tags** window.

Tag Name	Array Size	Туре	Description
AIO	0	Real	AI value of M-7026
AO0	0	Real	AO value of M-7026
DIO	0	Boolean	DI value of M-7026
DO0	0	Boolean	DO value of M-7026
Counter1	0	Integer	DI Counter
Clear_Counter1	0	Integer	Clear DI Counter



Add the Screen

Click the **Graphics** tab in the **Project Explorer** panel • Right-click on the **Screens** and select **Insert**.



Add the Text Object and Assign the Tag

The **Draw** ribbon appears only after creating a screen. Click the **Text** object in the **Active Objects** group to create the objects listed in the table below. The number of "#" symbols represents the length of the data to be displayed (including the decimal point).

Caption	Tag/Expression	Caption	Tag/Expression	Input Enabled
M-7026	-	Real-time I/O Status	-	-
AI: #####	AIO	AO: #####	AO0	V
DI: ####	DIO	DO: ####	DO0	V
Counter: ##	Counter1	Clear_Counter: ##	Clear_Counter1	V

Double-click on the **Text** object to open the **Object Properties** window, and configure the settings as specified in the table.



For AO0, DO0, and Clear_Counter1 tags, check the **Input Enabled** item.

Object Prop	perties					×
Re	eplace	Hint:		Text Data I	Link	•
Τa	ag/Expression:	Clear_Counter1				
	Format:	Auto	Input Enab	led	Back to text	
Mi	nimum Value:					
Ma	ximum Value:					
	Disable:					
Password	A	ito Size	RT	L	Security: 0	
E-Sign	Re	equire confirmation	Virtual	keyboard: <	Use Default>	-

Once completed, the screen will appear as shown below.

M-7026 Real	-time I/O Status
AI: #####	AO: #####
DI: ####	DO: ####
Counter: ##	Clear Counter: ##

Note: Refer to Example 1 - Add a System Symbol to add an "Exit" button, which is used to exit the run-time task.

> Add the MODBU (Modbus RTU) Communication Driver

Right-click on **Drivers** and select **Add/Remove drivers** in the Comm tab. After the **MODBU** is selected, click OK.

Project Explorer 🔹 📲	Communication Drivers	×
 Project: M-7026.APP Drivers C Add/Remove drivers D OPC UA OPC XML/DA TCP/IP 	Available drivers: 2. DLL Description 2. MELSE MELSE, Mitsubishi - MELSEC Protocol [v10.18] 2. MISU MITSUBISHI Photocol, PX-3ehes [v10.10] 2. MODEL Protocol moubus Stave(ASCIT and RTU)(Senar and TCP/IF)(3.4.0] MOTCP MODBUS Protocol RTU via TCP/IP [v10.26.0] MQTT MQTT [v1.18] OMDIR OMRON - Ethernet [v1.1.0] OMETH OMRON, OMPLC Protocol - FINS communication / CS1, CV and C OMRON OMRON - Fins Gateway Protocol [v1.24.0] DOC Extensor DOC/DOC Dive/std 111 Selected drivers: DLL DLL Description	 ▲ Help 3. Select >> >> Remove
 ♥ Global A Graphics ■ Tasks ■ Comm Watch Taq/Expression Value Qualit ontinue 	4.	
		OK Cancel

Right-click on the **MODBU** driver and select "**Settings**" to open the window. Then, configure the parameters according to the M-7026 module's configurations.

				Project Expl	orer	▼ ₽ ×
📼 MODBU:			(■ Project: M-70 1. と ■ Drivers	26.APP	
Serial Encapsulation:	None	Select the PC's CC	OM port		Insert	
Serial Port – 2.		or input it main		> DOPC OA	Settings	
COM:	COM5	 Stop Bit 	ts: 1	TCP/IP	Theip	
Baud Rate:	9600	• Parity:	None		ics 🖻 Tasks	₽ Comm
Data Bits:	8	•		Click " Help " to o driver manual. En the Protocol is set	pen the sure that t to RTU .	
Signed/Unsigned:		Protocol(AS	SCII or RTU):			
Unsigned (legacy)		+ RTU		*		
Swap - Write Type:		Block Size /	1			
No Swap / Write Iter	m	→ 04				
Advanced			OK	Cancel		

> Add a Driver Worksheet for I/O (Engineering)

Click the **Comm** tab in the **Project Explorer** panel. Right-click on the **MODBU** driver and select **Insert** to add a standard Modbus RTU worksheet.



Note:

After adding the **MODBU** driver, the **MAIN DRIVER SHEET** is automatically created. Users can typically add tags there, but if the system becomes large with too many tags, it could overload communication. **To ensure stable data communication, it's recommended to add tags in a separate sheet**, as will be explained later.

In this example, 6 new Modbus RTU worksheet will be added. Please input the data for the first "M-7026_AI" worksheet first.

Field Name	AI		NO.	Tag Name	Address	Div	Add
Description	M-7026_AI		1	AIO	S1	1000	-
Read Trigger	second			•	•	•	
Station	1		Note:	s" hoforo tha	addross for (Signad or	
Header	3X:0	it out for Unsigned. See the explanation below.					

MODBU001.DRV ×				•
Description:			Increase pri	ority
Read Trigger:	Enable Read whe	en Idle:	Read Completed:	Read Status:
second				
Write Trigger:	Enable Write on	Tag Change:	Write Completed:	Write Status:
Station:	Header:			Min:
				Max:
Tag Name Q. Filter text Q. Filter	Address	Q Filter text	Div	Add Add
1 Alo S1			1000.000000	

Read Trigger Enter a tag name. The module's data will be read once when the value changes. In this example, this field in the AI, AO, DI, and DO worksheet will be set to the system variable "Second" to read data every second. Users can double-click "Datasheet View" under System Tags on the **Global** page to view all system variables. System Tags X **Project Explorer** -**▼** ₽ × Name Array Size Description Scope Туре Project: M-7026.APP ۸ Q Q Filter text Project Tags 1 Ab Date 0 String Local date: mm-dd-vvvv Classes AD Time 2 0 String time: hh:mm:ss Local > 🖿 Shared database 3 📲 Hour 0 Integer hour (0 - 24) Local E System Tags 4 💞 Minute 0 minute (0 - 59) Local Integer 5 Second Datasheet View 0 Integer second (0 - 59) Local 0 Local 6 Integer day (0 - 31) 🖿 Tag List (46) • 7 • Month 0 Local Integer month(1-12) 8 🐶 Year 0 Integer vear (1994 -) Local Users can insert a schedule on the "Tasks" tab and set the tag status to change every 0.5 seconds to trigger a read action (Time: 00:00 :00.5, Tag: B 500MS, Expression: NOT B 500MS). SCHED001.SCH × Project Explorer ▼ ₽ × Project: M-7026.APP Description:

Enable Read when Idle

Insert

Alarms

Reports
Math

🖿 Script

Datapase/EKr

> 🖿 Internet of Thing

🕑 Global 🛛 🔒 Graphics 🕻 🖻 Tasks

SCITE

Trend Logger
 Recipes

Enter a tag name (Boolean) or "1". If the value is greater than **0**, data will be automatically read continuously. In this example, enter "1" in this field for both the **DI_Counter** and **Clear_Counter** worksheet.

Time-triggered tag

Trigger

Time

00:00:00.5

00:00:00.2

Date

Tag

B_500MS

Expression

Set to "1" to disable it.

NOT B 500MS

NOT DO0

Event

1 Clock

2 Clock

Clock

Clock

* Clock * Clock

Comm

Note:

To read **AI**, **DI**, or **Counter** tags, configure the "**Read Trigger**" or "**Enable Read When Idle**" field. For **AO**, **DO**, and **Clear Counter** tags, configure the "**Write on Tag Change**" field as well.
Enable Write on Tag Change

Enter a tag name or a constant value (greater than 0). When the tag data in the worksheet changes, it will automatically be written to the on-site equipment. In this example, enter " $\mathbf{1}$ " in this field for the AO, DO, and Clear Counter worksheets.

Header

Specify the data type and start address to read/write the module data. Users can click "**Help**" to view the driver manual. Commonly used examples are listed in the table.

Example	Description	
0X:0	Coil status	
1X:0	Input status	
STA:0	Exception Status	
3X:0	Input register	
4X:0	Holding register	
FP3:0	Input register (Floating-point value)	
FP:0	Holding Register (Floating-point value)	
DW3:0	Input register (Dword value)	
DW:0	Holding Register (Dword value)	
ST:0	Holding Register (String value)	



Min/Max

This function will be used for the 2's complement conversion, as explained in the next section. After selecting the checkbox, the entered values will apply to all tags in the table, and the column names "Div" and "Add" will change to "Min" and "Max". It is recommended to enter values individually for each tag.

	Station:	Header: 3X:0		Min: Max:			
	Tag Name	Address	Min	Max			
1	Al0	S1	-32768.000000	 Filter text 32 	2767.000000		
Та	Tag Name						
Er	Enter a tag name to read/write data.						

Address

Enter the Modbus address of the unit.

Example	Description
S1, S <mark>33</mark>	"S" indicates that the data is a signed value
1, U33, 33	"U" (or no symbol) indicates that the data is an unsigned value

Click the link to view the M-7026's Modbus address (Base1) mapping table.

https://www.icpdas.com/web/product/download/io_and_unit/rs-485/document/manual/7000/ M-7000_address_mapping_table.pdf

Modbus Function	Modbus Register	Notes (M-7026)
3X	30001 ~ 30006	Read the AI 0 to 5
4X	40033 ~ 40034	Read/Write the AO 0 to 1
1X	10033 ~ 10035	Read the DI 0 to 2
OX	00001 ~ 00003	Read/Write the DO 0 to 3
3X	30129 ~ 30131	Read the DI Counter 0 to 2
OX	00513 ~ 00515	Clear the Counter 0 to 2

<u>Note:</u> In the "Header" field, the sum of the start address and the address must be greater than 0. For example,

Modbus Register	Header (Data Type: start Address)	Address
0 1020	0x: 1000	20
1000 1	1x: 1	0
3 1020	3x: 1000	20
3000 1	3x: 1	0
300 10	3x: 0	10
40001	4x: 1	0
400 10 (bit 2)	4x: 0	10.2
4000 1 and 40002	DW:1	0
400 13 and 40014	DW: 0	13

Div

The user can set a divisor to scale the displayed value. Do not use this field if the 'Min' and 'Max' fields are enabled. In this example, the data range of M-7026 is as follows (refer to Appendix B.5): divide the reading value by 1000 to display a range of -5 to +5 V.

Type Code	Input Range	Data Format	Min.	Max.
0x05	+/-5 V	Engineering	-5000	+5000

Refer to the table below to add other worksheets.

Field Name	AO	DI	DO	Counter	Clear_Counter
Description	M-7026_AO	M-7026_DI	M-7026_DO	M-7026_DI_Counter	M-7026_Clear_Counter
Read Trigger	second	second	second	-	-
Enable Read when Idle	-	-	-	1	1
Enable Write on Tag Change	1	-	1	-	1
Station	1	1	1	1	1
Header	4X:0	1X:0	0X:0	3X:0	0X:0
Tag Name	AO0	DI0	DO0	Counter1	Clear_Counter1
Address	S33	33	1	130	514
Div	1000	-	-	-	-

M-7026_AO:

Read Trig	ger	Enable Write on Tag Change	Station	Header	Tag Name	Address	Div
secon	I	1	1	4X:0	AO0	S33	1000

MODBU002.DRV	/ ×			•
Description: M-7026_AO			Increase prie	Drity
Read Trigger:	Enable Read wh	en Idle:	Read Completed:	Read Status:
second				
Write Trigger:	Enable Write on	Tag Change:	Write Completed:	Write Status:
Station:	Header:			Min
1	4X:0			Max:
		1		
Rag Name	Address Q Filter text	Q Filter text	Div	Add Rilter text
1 AO0	\$33		1000.000000	

M-7026_DI:

Read Trigger	Station	Header	Tag Name	Address
second	1	1X:0	D10	33

MODBU003.DRV	×			
Description:			Increase mi	
Read Trigger:	Enable Read wh	en Idle:	Read Completed:	Read Status:
Write Trigger:	Enable Write on	Tag Change:	Write Completed:	Write Status:
Station:	Header:			
1	1X:0			Max:
Tag Name Q. Filter text 1	Address Q. Filter text 33	S Eilter text	Div	Add Q Filter text

M-7026_DO:

Read Trigger	Enable Write on Tag Change	Station	Header	Tag Name	Address
second	1	1	0X:0	DO0	1

MODBU004.DRV	×			~
Description: M-7026_DO			Increase pri	ority
Read Trigger:	Enable Read wh	en Idle:	Read Completed:	Read Status:
second				
Write Trigger:	Enable Write or	a Tag Change:	Write Completed:	Write Status:
Station:	Header:			Min:
	0X:0			Max:
Tag Name	Address Q. Filter text	Q Filter text	Div	Add .
	1			

M-7026_DI_Counter:

Enable Read when Idle	Station	Header	Tag Name	Address
1	1	3X:0	Counter1	130

MODBU005.DRV	/ ×			•
Description:				
M-7026_DI_Counter]		Increase pri	ority
Read Trigger:	Enable Read wh	en Idle:	Read Completed:	Read Status:
Write Trigger:	Enable Write or	n Tag Change:	Write Completed:	Write Status:
Station:	Header:			Min:
	3X:0			Max:
Tag Name	Address		Div	Add
C Filter text	Q Filter text	۹ Filter text		Q Filter text
1 Counter1	130			

M-7026_Clear_Counter:

	Enable Read when Idle	Enable Write on Tag Change	Station	Header	Tag Name	Address	
	1	1	1	0X:0	Clear_Counter1	514	
	MODBU006.DRV	×					-
Ι	Description:	_					
	M-7026_Clear_Counter	r		Inc	rease priority		
R	Read Trigger:	Enable Read whe	n Idle:	Read Comple	eted: Read	Status:	
		1					
V	Vrite Trigger:	Enable Write on	Tag Change:	Write Compl	eted: Write	e Status:	
S	tation:	Header:					
6	1	0X:0			M	in:	
					M	ax:	
	Tag Name	Address	2	Div	A	dd	
1 C	Filter text Counter1 5	Filter text	K Filter text		C Filter text		
<u> </u>			J				

1-7000/101-7000 comprehensive manual v1.0

After clicking "**Save All**" in the upper-left corner, the "**Save As**" dialog box appears. Simply click **OK** several times to save worksheet 1 to 6.

	AVEVA Edge - MODBU001.DRV	- 🗆 ×
File Home View Insert	Project Help	Style 💙
Save As	× 🖞 🔀 👁 🗉 🐼 🖉 🖬 🦕	e Second Q
Paste Kind/Re	t Runtime Watch LogWin Verify Archive Globa Tasks	
Clipboard	Remote Management 🕞 Tools 🕞	Tags
Project Expl	ancel 6.DRV IIII MODBU001.DRV × IIII MODBU002.DRV IIII MOE	DBU003.DRV ₹
 ✓ E Project: M-702 ✓ E Drivers ✓ MODBU ■ MAIN DRIVER SHFET ■ 1: M-7026_AI ■ 2: M-7026_AO ■ 3: M-7026_DI ■ 4: M-7026_DO ■ 5: M-7026_DI_Counter 	Description: M-7026_AI Increase priority Read Trigger: Enable Read when Idle: Read Completed: second Increase priority Write Trigger: Enable Write on Tag Change: Write Completed:	Read Status: Write Status:
 iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii	Station: Header: 1 3X:0	Min: Max:
Global Graphics □ Tasks Comm	Tag Name Address Div Q Filter text Q Filter text Q Filter text Q Filter text 1 Al0 S1 1000.000000	Add er text

Click Run on the Home ribbon.



The hardware wiring of the M-7026 module in this example.

- 1. The Vin0+ is connected to the Vout0+
- 2. The VinO- is connected to the VoutO-
- 3. The DI0 is connected to the DO0
- 4. If the DI1 is connected to the COM, the counter value will increase by 1.



Testing steps:

- 1. If the analog format is set to Engineering, set the AO value to 2.35 and press Enter; the AI value will display 2.350.
- 2. Set the DO to "1", and the DI will change to "1".
- 3. If the DI1 pin is connected to the COM pin, the counter value will increase by 1. If the Clear_Counter is set to "1", the counter value will reset to "0".



<u>Note:</u> Click the "Exit" button or press Alt + Tab to return to the software interface, then click "Stop" on the Home ribbon.

> Add a Driver Worksheet for I/O (2's Complement)

If the M-7026 module's analog format is set to **2's Complement** using DCON Utility Pro, the data will be in hexadecimal as shown in the table (see Appendix B.5). Therefore, it is necessary to convert the readings to actual values by means of engineering unit conversion.

Type Code	Input Range	Data Format	Min.	Max.
0x05	+/-5 V	2's complement HEX	8000h	7FFFh

Double-click **Datasheet View** to display the **Project Tags** page. Right-click on **AIO** and select **Tag Properties** to open the window.



On the **Parameters** tab, enter a minimum value of **-5** and a maximum value of **5** in the **Engineering Units** area. Also, set the AO tag in the same way.

Tag Properties	×
Parameters Alarms - Integer/Real Type History - Integer/Real Type System Platform Integration Retentive Value Retentive Parameters Startup Value: 0 Engineering Units Unit: Unit: Image: Construction	
Max: 5 Signal Conditioning Dead Band: Smoothing OK Cance	

Refer to the table below to set the AI and AO worksheets. (The DI and DO worksheets are the same as described in the previous section.)

M-7026_AI:

Read Trigger	Station	Header	Min/Max
second	1	3X:0	Checked

Note:

If the Min/Max field is filled in, all tags in the MODBU001 worksheet will be converted based on that value. To convert each tag individually, leave the field empty. When the Min/Max option is selected, the field name will automatically change to Min/Max. Set the parameters as shown in the table below.

Tag Name	Address	Min	Max
AIO	S1	-32768	32767

Description:				
M-7026_AI			Increase prior	ity
Read Trigger:	Enable Read	l when Idle:	Read Completed:	Read Status:
second				
Write Trigger:	Enable Write	e on Tag Chang	e: Write Completed:	Write Status:
Station:	Header:			Min
	3X:0			Max:
Tag Name	Address	(Min	Max

M-7026_AO:

Set the parameters as shown in the table below.

Read Trigger	Enable Write on Tag Change	Station	Header	Min/Max
second	1	1	4X:0	Checked

Tag Name	Address	Min	Max
AO0	S33	-32768	32767

M-7026_AO			Increase prior	ity
Read Trigger:	Enable Read who	en Idle:	Read Completed:	Read Status:
Write Trigger:	Enable Write on	Tag Change:	Write Completed:	Write Status:
Station:	Header:			Min:

Click "Save All" in the upper-left corner, then click "Run" on the Home ribbon to start the runtime task.



The user can enter an AO value, set the DO to '1' (ON), or set the Clear_Counter to '1' to view the data change.

M-7026	Real-time I/O Status	
AI: 3.501	AO: <mark>3.500</mark>	
DI: 1	DO: 1	Exit
Counter: 7	77 Clear_Counter	r: 0

Note: Click the **"Exit**" button or press **Alt + Tab** to return to the software interface, then click **"Stop**" on the **Home** ribbon.

Chapter 7 Application Notes

7.1 Common Descriptions

7.1.1 Module Output Status

Index of the Manual (Ch4)

- 1: $I-7012(D)_I-7012F(D)_I-7014D_I-7017_I-7017F_en.pdf$
- 3: I-7011(D)_I-7011P(D)_I-7018_I-7018P_en.pdf
- 7: I-7016(D)_I-7016P(D)_en.pdf
- 8: I-7021_I-7021P(D)_I-7022_I-7024_I-7024R_M-7022_M-7024_M-7024L_ M-7024R_M-7024U(D)_M-7028_en.pdf

A "**power-on reboot**" or a "**module watchdog reboot**" will reset all outputs to their predefined **Power-on Values**. At this point, the module can receive commands from the host to change the output values. However, if a "**host watchdog timeout**" occurs, a flag will be set, and all outputs will be set to the Safe Values. In this state, the module will ignore output commands, and the LED on the module will blink.

Users can use the command **~AA0** to read the module status, where **04** indicates that the "host watchdog timeout" status has been set. The command **~AA1** can be used to clear the "host watchdog timeout" status, allowing the module to accept output commands again.

7.1.2 Reset Status

Ind	Index of the Manual (Ch4)		
8:	I-7021_I-7021P(D)_I-7022_I-7024_I-7024R_M-7022_M-7024_M-7024L		
	_M-7024R_M-7024U(D)_M-7028_en.pdf		
11:	M-7084_en.pdf		
12:	I-7088(D)_M-7088(D)_en.pdf		
13:	I-7000_M-7000_DIO_en.pdf (7041 ~ 7069)		

When the module powers on or reboots due to the module watchdog mechanism, the reset status flag will be set. This status will be cleared after responding to the **\$AA5** command (if it is the first time the reset status is detected). This can be used to check whether the module has rebooted. If the \$AA5 command response indicates that the reset status is cleared, it means the module has not rebooted since the last \$AA5 command was sent.

If the \$AA5 command response indicates that the reset status is set, and it is not the first time the \$AA5 command has been sent after power-on, this means the module has rebooted due to the "module watchdog mechanism," and the output values have been reset to the Power-on Values.

7.1.3 Dual Watchdog Operation

Index of the Manual (Ch4)

- 1: I-7012(D)_I-7012F(D)_I-7014D_I-7017_I-7017F_en.pdf
- 2: I-7017_I-7018_I-7019_M-7017_M-7018_M-7019_en.pdf
- 3: I-7011(D)_I-7011P(D)_I-7018_I-7018P_en.pdf
- 4: I-7005_M-7005_en.pdf
- 6: I-7013_I-7015_I-7033_M-7015_M-7033_en.pdf
- 7: I-7016(D)_I-7016P(D)_en.pdf
- 8: I-7021_I-7021P(D)_I-7022_I-7024_I-7024R_M-7022_M-7024_M-7024L_ M-7024R_M-7024U(D)_M-7028_en.pdf
- 11: M-7084_en.pdf
- 12: I-7088(D)_M-7088(D)_en.pdf
- 13: I-7000_M-7000_DIO_en.pdf (7041 ~ 7069)

Dual Watchdog = Module Watchdog + Host Watchdog

The module **watchdog** is a hardware reset circuit designed to monitor the module's operating status. In harsh or high-noise environments, the module may be affected by external signals and stop functioning. This circuit ensures that the module continues to operate without interruption.

The **host watchdog** is a software feature used to monitor the host's operating status. Its purpose is to prevent issues caused by network/communication errors or host failures. When a host watchdog timeout occurs, the module switches all outputs to Safe Values to prevent any unexpected conditions in the controlled devices.

The **I-7000/M-7000 series modules** are equipped with a dual watchdog mechanism, enhancing the stability and reliability of the control system.

7.1.4 Frame Ground (F.G.)

Index of the Manual (Ch4)

- 2: I-7017_I-7018_I-7019_M-7017_M-7018_M-7019_en.pdf
- 4: I-7005_M-7005_en.pdf
- 6: I-7013_I-7015_I-7033_M-7015_M-7033_en.pdf
- 8: I-7021_I-7021P(D)_I-7022_I-7024_I-7024R_M-7022_M-7024_M-7024L_ M-7024R_M-7024U(D)_M-7028_en.pdf
- 11: M-7084_en.pdf
- 12: I-7088(D)_M-7088(D)_en.pdf
- 13: I-7000_M-7000_DIO_en.pdf (7041~7069)

Electronic circuits are highly susceptible to electrostatic discharge (ESD), especially in continental climate regions where the impact is more severe. Some I-7000 modules and all M-7000 modules adopt a frame grounding design. This design provides a bypass path for electrostatic discharge, effectively enhancing ESD protection and improving the reliability of the modules.

Either of the following methods can enhance the protection of the module:

- If the module is installed on a DIN rail, ensure that the DIN rail is grounded, as it will be in contact with the upper frame ground (F.G.). (See the diagram on the right.)
- 2. Connect a wire to the lower frame ground (F.G.) terminal and ground the wire.



ICP DAS offers DIN rails that can be easily connected to a grounding terminal. Each model is made of stainless steel, which is more durable than aluminum. As shown in the diagram, one end features a screw and includes a ring terminal.



Visit the website for more information about the "DIN rail" product. https://www.icpdas.com/en/product/guide+Accessories+Others+DIN-Rail

Model	Description
DRS-125	125mm Length, Stainless 35mm DIN-Rail
DRS-240	240mm Length, Stainless 35mm DIN-Rail
DRS-360	360mm Length, Stainless 35mm DIN-Rail



7.2 Descriptions of AI and AO

7.2.1 Hexadecimal Data Conversion

Index of the Manual (Ch4)

2: I-7017_I-7018_I-7019_M-7017_M-7018_M-7019_en.pdf

There are two types of **hexadecimal conversions**: one for **4** ~ **20mA** and **0** ~ **20mA** data ranges, and another for other data ranges (e.g., **±10V**, **±20mA**).

1) 4 ~ 20mA and 0 ~ 20mA Data Ranges

0000h corresponds to the minimum value, and FFFFh corresponds to the maximum value.



2) Other Data Ranges

8000h (-32768) corresponds to **-Max**, **0000h (0)** corresponds to **0**, **7FFFh (32767)** corresponds to **+MAX**, where **Max** is the absolute value of the minimum or maximum range, whichever is greater.

The formula for data conversion is:

If Hex_Data >= 0 then Real_Data = Hex_Data * MAX / 32767 else Real_Data = Hex_Data * MAX / 32768

For example, for a thermocouple K Type of $-270 \approx 1372^{\circ}$ C, +1372MAX = 1372, the formula is: If Hex_Data >= 0 then Real_Data = Hex_Data * 1372.0 / 32767 else Real_Data = Hex_Data * 1372.0 / 32768 Real_Data = Hex_Data * 1372.0 / 32768 Real_Data = Hex_Data * 1372.0 / 32768 -32768 (8000h) -32768 (8000h) -32768 (7FFFh) -1372

7.2.2 High/Low Alarm

Index of the Manual (Ch4)

- 1: I-7012(D)_I-7012F(D)_I-7014D_I-7017_I-7017F_en.pdf
- 3: I-7011(D)_I-7011P(D)_I-7018_I-7018P_en.pdf
- 7: I-7016(D)_I-7016P(D)_en.pdf

Some analog input modules (e.g., I-7012) include an upper/lower limit alarm function. When this function is enabled, DO0 serves as the lower limit alarm, and DO1 as the upper limit alarm. As a result, DO commands to change the DO status will be ignored. The alarm function compares the AI value against the specified upper and lower alarm limits. The two types of alarms are described below.

Momentary Alarm :

When the AI value exceeds the alarm limit, the alarm is triggered. If the AI value returns within the specified range, the alarm is automatically deactivated.

If AI value > upper alarm value, DO1 (upper limit alarm) turns ON ; otherwise, DO1 remains OFF. If AI value < lower alarm value, DO0 (lower limit alarm) turns ON; otherwise, DO0 remains OFF.

Latch Alarm :

When the AI value exceeds the alarm limit, the alarm is triggered. The alarm remains latched even if the AI value returns to normal. A manual reset or command is required to deactivate the alarm.

If AI value > upper alarm value, (upper limit alarm) turns ON. If AI value < lower alarm value, DO0 (lower limit alarm) turns ON.

7.2.3 Thermocouple

Index of the Manual (Ch4)

- 2: I-7017_I-7018_I-7019_M-7017_M-7018_M-7019_en.pdf
- 3: I-7011(D)_I-7011P(D)_I-7018_I-7018P_en.pdf

When two wires composed of dissimilar homogeneous metals are joined at one end, a thermoelectric electromotive force (emf) appears that depends only on the metals and the junction temperature. This is called the Seebeck effect. A pair of different metals with a fixed junction at one end constitutes a **thermocouple**. For small changes in temperature, the emf is linearly proportional to the temperature. This implies that the temperature reading can be obtained by measuring the emf.

We cannot measure the emf, V_1 , directly because when a voltmeter is connected to the thermocouple, another emf, V_2 , is created at the (cold) junction of the thermocouple and the voltmeter. The cold junction compensation method is used to resolve the problem. Using another sensor, e.g. a thermistor, to measure the cold junction temperature, T_2 , we can calculate the emf, V_2 , which corresponds to T_2 . The thermocouple emf, V_1 , can be obtained by adding V_2 to that measured by the voltmeter and then the temperature.



7.2.4 Resistance Measurement

Index of the Manual (Ch4)

4: I-7005_M-7005_en.pdf

6: I-7013_I-7015_I-7033_M-7015_M-7033_en.pdf

The I-7005, M-7005, I-7013(D), M-7013(D), I-7015/15P, M-7015/15P, I-7033(D), and M-7033(D) modules support resistance measurement. Before measuring the resistance, check the thermistor wiring in the Data Sheet for these modules. Then, set the Analog Format to " Ω " on the "Configuration" page of the DCON Utility Pro, or send %AANNTTCCFF command to the module to change the data format. (refer to manuals No. 4 & 6).

For I-7005, M-7005:

For firmware version A2.3 (or older), the maximum resistance that can be measured is 180,000 Ω . For firmware version A3.7 (or later), the maximum resistance that can be measured is 204800 Ω .

When the Analog Format is set to " Ω ", the maximum measurable resistance for type codes 71 to 77 is as follows:

Type Code	Maximum Resistance
71	3200 Ω
72	6400 Ω

Type Code	Maximum Resistance
73	12800 Ω
74	25600 Ω
75	51200 Ω
76	102400 Ω
77	204800 Ω

For M-7015/15P and M-7033(D) modules with firmware version B2.9 or older, it has to be switched to DCON protocol for resistance measurement.

For I-7013(D), M-7013P(D):

Type Code	Maximum Resistance	Firmware Version
82	200 Ω	Only available for B1.5 (or later)
20 ~ 29	375 Ω	-
2A	3200 Ω	Only available for B1.3 (or later)

For I-7033(D), M-7033(D):

Type Code	Maximum Resistance	Firmware Version
82	200 Ω	Only available for B1.5 (or later)
20 ~ 29	375 Ω	-
2A	3200 Ω	-

For I-7015/15P ` M-7015/15P :

Type Code	Maximum Resistance	Firmware Version
2B, 2C	160 Ω	
20 ~ 29	320 Ω	Only available for A2.9 (or older)
2A, 2D	3000 Ω	

Type Code	Maximum Resistance	Firmware Version
2B, 2C	200 Ω	
20 ~ 29	375 Ω	Only available for B1.9 (or later)
2A, 2D	3200 Ω	

7.2.5 Transmitter

Index of the Manual (Ch4)
1: I-7012(D)_I-7012F(D)_I-7014D_I-7017_I-7017F_en.pdf

A **transmitter** is an instrument that converts a sensor signal into a **4** - **20mA** or **0** - **5V** output signal. Transmitters may include driving or compensation circuits for the sensor, with an output that has been linearized and amplified.

- **2-wire transmitter** Typically outputs a 4 20mA current signal. One wire is for power input, and the other is for signal output.
- **3-wire transmitter** Typically outputs a 0 5V voltage signal. One pair of wires is for power input and ground, while the third wire is for signal output.

7.2.6 Linear Mapping

Index of the Manual (Ch4)

- 1: I-7012(D)_I-7012F(D)_I-7014D_I-7017_I-7017F_en.pdf
- 7: I-7016(D)_I-7016P(D)_en.pdf

The linear mapping function converts an input value into a desired output value. It is a mechanism that transforms an analog input value into a physical quantity.

Linear mapping uses the following reference values:

- Source Low Value (SL) \rightarrow Target Low Value (TL)
- Source High Value (SH) → Target High Value (TH)

For an input value (AI), the output value is calculated as:

if AI < SL, output value = -19999. (under limit) else if AI > SH, output value = +19999. (over limit) else output value = (AI-SL)/(SH-SL) * (TH-TL) + TL

Suppose a **temperature sensor** is connected to an **I-7014D** module, where the sensor outputs 4mA at 0°C and 20mA at 100°C. To read the temperature directly, we have the source value **4 to 20 mA** and target value **0 to 100°C**. Additionally, assume the **I-7014D module** is configured to address = 01, baud rate = 9600 bps, and checksum disabled.

- Set the I-7014D to read ±20 mA type.
 See Chapter 4: Commands Manual %AANNTTCCFF Command: %01010D0600 Response: !01
- Set the Source Low Value (SL) to "4" and Source High Value (SH) to "20". See Chapter 4: Commands Manual - \$AA6(SL)(SH) Command: \$016+04.000+20.000 Response: !01
- Set the Target Low Value (TL) to "0" and Target High Value (TH) to "100".
 See Chapter 4: Commands Manual \$AA7(TL)(TH) Command: \$017+000.00+100.00 Response: !01
- 4. Enable the linear mapping function.
 See Chapter 4: Commands Manual \$AAAV Command: \$01A1 Response: !01
- Using the #01 command to read the temperature value of I-7014D directly.
 See Chapter 4: Commands Manual #AA

7.2.7 Analog Output

Index of the Manual (Ch4)

8: I-7021_I-7021P(D)_I-7022_I-7024_I-7024R_M-7022_M-7024_M-7024L_ M-7024R_M-7024U(D)_M-7028_en.pdf

Besides being set by analog output commands, the analog outputs can also be controlled under two additional conditions. When the host watchdog is enabled and a host watchdog timeout **(host WDT)** occurs, the system loads the **safe value** into the analog output ports. The **analog output commands** have no effect on the analog output ports until the **host WDT status** is cleared.

The host WDT status is stored in the EEPROM and remains unchanged even after a power-on reset. Users can clear this status through the Host **WDT** setting page in DCON Utility Pro or the **~AA1** command (see Chapter 4 of the command manual for details).

When the module is powered on, If the host WDT status is cleared, the system loads the **power-on value** into the analog output ports. If It is not cleared, the **safe value** is loaded instead.

Users can configure the **power-on value** and **safe value** through the AO setting page in DCON Utility Pro or the following commands.

Model	Set "Safe Value" Command
I-7021, I-7021P	~AA5
I-7022, M-7022, I-7024, I-7024R, M-7024, M-7024L, M-7024R, M-7024U, M-7028	~AA5N

Model	Set "Power-on Value" Command		
I-7021, I-7021P	\$AA4		
I-7022, M-7022, I-7024, I-7024R, M-7024, M-7024L, M-7024R, M-7024U, M-7028	\$AA4N		

When the module receives the analog output command - #AA(data) or #AAN(data),

- If the Host WDT status is not cleared, the module will respond with "!", indicating that the command is ignored due to the WDT status.
- If the Host WDT status is cleared, the module will respond with ">", confirming that the command was successful and the analog output has been processed.
- If the specified output value exceeds the upper limit of the acceptable range, the module will respond with "?", indicating that the value is out of range. In this case, the analog output will be set to the lower limit as a safeguard.

7.2.8 Slew Rate Control

Index of the Manual (Ch4)

8: I-7021_I-7021P(D)_I-7022_I-7024_I-7024R_M-7022_M-7024_M-7024L_ M-7024R_M-7024U(D)_M-7028_en.pdf

Usually, the output of an analog output module changes instantaneously. That is, when the module receives an output command, its output changes to the specified value immediately. However, it may require that the output change to the specified value gradually in some applications. The slew rate control is to adjust the output change rate.

The I-7021, I-7021P, I-7022, M-7022, I-7024, M-7024, M-7024L, I-7024R, M-7024R, M-7024U, and M-7028 modules support programmable slew rate control. When an analog output command is received, the analog output will change to the new value in the specified slew rate automatically. These modules update the analog output every 10 ms. The analog output is updated smoothly until it reaches the specified output value.

7.2.9 Analog Output Read-back

Index of the Manual (Ch4)
8: I-7021_I-7021P(D)_I-7022_I-7024_I-7024R_M-7022_M-7024_M-7024L_
M-7024R_M-7024U(D)_M-7028_en.pdf

The I-7021/21P, I-7022, and M-7022 modules have the analog-to-digital converter that can be used to monitor the analog output signal and provide the analog output read- back. If the difference between the specified analog output value and the analog output read-back value is large, then it could be improper wire connection or load.

In contrast, the I-7024, M-7024, M-7024L, I-7024R, M-7024R, M-7024U, and M-7028 modules do not have the analog-to- digital converter to monitor the analog output signal. However, they can respond the value that is set to the digital-to-analog converter. This value cannot be used to check improper wire connection and load.

7.3 Descriptions of DI and DO

7.3.1 Digital Input and Event Counter

Index of the Manual (Ch4)

- 1: I-7012(D)_I-7012F(D)_I-7014D_I-7017_I-7017F_en.pdf
- 3: I-7011(D)_I-7011P(D)_I-7018_I-7018P_en.pdf
- 7: I-7016(D)_I-7016P(D)_en.pdf

The digital input DIO can function as an event counter. The counter increments when the input transitions from a high level to a low level. It is 16 bits wide, making it suitable for low-speed counting, with a frequency of less than 50 Hz.

7.3.2 Digital Output

Index of the Manual (Ch4)			
1:	I-7012(D)_I-7012F(D)_I-7014D_I-7017_I-7017F_en.pdf		
3:	I-7011(D)_I-7011P(D)_I-7018_I-7018P_en.pdf		
7:	I-7016(D)_I-7016P(D)_en.pdf		

When the module powers on, it first checks the **host watchdog timeout status**. If the status is set, the digital outputs (DO0 and DO1) are set to Safe Value. If the status is clear, the digital outputs are set to the **Power-On Value**. If the host watchdog timeout status is set, the module will ignore the digital output command @AADO(Data).

7.3.3 Safe Value and Power-on Value of Digital Output

Index of the Manual (Ch4)	
13: I-7000_M-7000_DIO_en.pdf (7	7041 ~ 7069)

Besides being set by DO commands, the digital outputs can also be controlled under two additional conditions. When the host watchdog is enabled and a host watchdog timeout **(host WDT)** occurs, the system loads the **safe value** into the DO ports. The **DO commands** have no effect on the DO ports until the **host WDT status** is cleared.

The host WDT status is stored in the EEPROM and remains unchanged even after a power-on reset. Users can clear this status through the Host **WDT** setting page in DCON Utility Pro or the **~AA1** command (see Chapter 4 of the command manual for details). When the module is powered on, if the host WDT status is cleared, the system loads the **power-on value** into the DO ports. If It is not cleared, the **safe value** is loaded instead. Users can configure the power-on value and safe value through the DO setting page in DCON Utility Pro or the **~AA5V** commands.

7.3.4 D/O Operation Principle

Index of the Manual (Ch4)

9: I-7080(D)_I-7080B(D)_en.pdf

1. Description of DO Usage

DO0 or DO1 can function as a digital output (DO) or alarm output as follows:

- In Frequency mode, it functions as a standard digital output.
- In Counter mode, when the alarm is disabled (using the @AADA or @AADAN command), it functions as a standard digital output.
- In Counter mode, when the alarm is enabled (using the @AAEAT or @AAEAN command), it functions as an alarm output.

Mode	DO 0	DO 1	
Frequency Mode	DO 0	DO 1	
Counter Mode & Alarm Disabled	DO 0 DO 1		
Counter Mode & Alarm Enabled (Alarm Mode 1 , ~AAA1)	High-alarm on Counter 0	High-High alarm on Counter 0	
Counter Mode & Alarm Enabled	Alarm	DO 1 or	
(Alarm Mode 0 , ~AAA0 ; Enable ch 0 @AAEA0)	on Counter 0	Alarm on Counter 1	
Counter Mode & Alarm Enabled	DO 0 or	Alarm	
(Alarm Mode 0 , ~AAA0;Enable ch 1 @AAEA1)	Alarm on Counter 0	on Counter 1	

- 2. The DO status of the I-7080 and I-7080D modules is off when powered on for the first time.
- 3. The DO will change to the desired status upon receiving the "@AADO" command. Once set, all the DOs will remain in the same state until the next "@AADO" command is received.
- 4. If the host watchdog is activated, the DOs will not change, and the module status will be set to '04'. In this case, the "@AADO" command sent from the host will be ignored, and the module will return '!' as a warning. The host can use the "~AA1" command to clear the module status to 0, after which the I-7080 and I-7080D modules will be able to accept the '@AADO' command again.
- 5. If the DO is configured as alarm output, the module will control the ON/OFF state automatically. Therefore, the "@AADO" command will be ignored in this condition.

7.4 Descriptions of Counter, Frequency, and Encoder

7.4.1 Counter/Frequency Input Mode Selection

Index of the Manual (Ch4)

9: I-7080(D)_I-7080B(D)_en.pdf

The counter/frequency input can be configured as either an isolated or non-isolated signal, and Channels 0 and 1 can be set independently. There are four different input modes available for both the I-7080 and I-7080D modules, as described below.

Input Mode	Command	Channel 0	Channel 1	
Input mode 0	\$AAB0	Non-isolated	Non-isolated	
Input mode 1 \$AAB1		Isolated	Isolated	
Input mode 2 \$AAB2		Non-isolated	Isolated	
Input mode 3	\$AAB3	Isolated	Non-isolated	

7.4.2 Frequency Measurement

Index of the Manual (Ch4)
11: M-7084_en.pdf

Frequency is usually measured in one of two ways:

1. by counting the number of signal pulses over a known time interval (gate time).

2. by counting the number of pulses in the reference clock over the signal period.

The M-7084 uses the second method for frequency measurement, which counts the number of reference clock pulses during one signal period. The drawback of this method is that its resolution decreases as the frequency increases. To improve resolution, the M-7084 offers a high-frequency measurement mode that counts 11 signal periods instead of just one. The high-frequency measurement mode can be enabled using the **@AAFHVV** command. Refer to the Ch4 commands manual or the Ch3 Settings Page - Counter Value.

The side effects of the high-frequency measurement mode are longer measurement times and the potential for counting overflow when the signal frequency is very low. The M-7084 can switch to automatic frequency measurement mode using the **@AAFAVV** command. (Refer to the Ch4 commands manual). In automatic frequency measurement mode, the channel automatically switches to the high-frequency measurement mode when the signal frequency is high, and to the low-frequency measurement mode when the signal frequency is low.

7.4.3 LED Display Format





The 5-digit 7-segment display will sequentially show the values of encoder 0/1/2, which are 8-byte hexadecimal values. The value will be displayed in two parts: the first display shows **0**. (decimal point on) **+ Bytes 8 to 5** of the value, and the second display shows **0** (decimal point off) **+ Bytes 4 to 1** of the value. As shown below:

Encoder 0	Step 1 : 0. + Byte 8 + Byte 7 + Byte 6 + Byte 5
	Step 2 : O + Byte 4 + Byte 3 + Byte 2 + Byte 1
Encoder 1	Step 3 : 1. + Byte 8 + Byte 7 + Byte 6 + Byte 5
	Step 4 : 1 + Byte 4 + Byte 3 + Byte 2 + Byte 1
Encodor 2	Step 5 : 2. + Byte 8 + Byte 7 + Byte 6 + Byte 5
	Step 6 : 2 + Byte 4 + Byte 3 + Byte 2 + Byte 1

The last 3-digit with the decimal point are used to represent the Hi/Lo status of Z, B, and A, respectively. For example: Ch0 = 1234ABCD, B = Hi.

Channel		Encoder Value					
Channel			-	Z	В	А	
Encoder 0	0.	Bytes 8 to 5	1	2	3.	4	
	0	Bytes 4 to 1	А	В	C.	D	

Index of the Manual (Ch4)

For the following subjects: 10: I-7083(D)_I-7083B(D)_en.pdf

7.4.4 Encoder & Synchronous Encoder

The encoder will continuously count until it receives the next **#**** command, at which point the synchronized encoder will latch the data. The user must read the encoder and synchronized encoder one by one. Therefore, there will be a time delay between each read operation. When the host computer sends the **#**** command to the RS-485 network, all 7083/7083B devices in the network will latch their synchronized encoders simultaneously. Then, the host computer can read these synchronized encoders one by one. Refer to the Ch4 commands manual or the Ch3 Settings Page - Encoder.

7.4.5 Preset Value of Encoder

The **@AAPN(data)** can be used to set the preset value of encoder. The value is saved in the EEPROM. When the power is turned on, the preset value will be loaded from the EEPROM and set as the encoder's starting value.

For the 7083**B** module, the current encoder value will be stored as the preset value in EEPROM when the power is turned OFF. When the next time the power is turned ON, the preset value will be reloaded from EEPROM. That is to say, the encoder value will not be lost (nonvolatile) even if the power is turned OFF. The 7083B can use the **\$AADNM** command to set the L-bit to 0 to disable the function of retaining data during a power failure. Refer to the Ch4 commands manual or the Ch3 Settings Page - Encoder.

For the 7083 module, this function is not supported, so the starting value of the encoder is always the same as the preset value in the EEPROM, and the L-bit has no effect.

7.4.6 Encoder Counting Sequence

The encoder is a 32-bit up/down counter with no overflow. If counting down (-), receiving 0x00000000 will change it to 0xffffffff. If counting up (+), receiving 0xffffffff will change it to 0x00000000. There is no overflow condition.

7.4.7 XOR Control Bit Setting

The module's internal logic is designed for active-high operation. Therefore, the XOR control bit should be set to "1" in most applications.

5V Differential Encoder



If the input signal is **single-ended and active-high**, the XOR control bit must be set to "**0**" for proper operation.

5V Single-ended Encoder



If the XOR bit is set incorrectly, the encoded value may exhibit the following errors.

- The counting direction will be **reversed**.
- The encoder value will have an **error count of 1**.
- The **Z signal** will be **inverted**.

The user can use **\$AASN** command to check the status of A, B, Z. All **A**, **B**, and **Z** signals are expected to be **Low** in the normal state and **High** in the active state. The check sequences are as follows:

Step	Command	Response
1	\$01S0	!01M0
2	\$01S1	!01M0
3	\$01S2	!01M0

M= Mode

For example,

Command	Response
\$01S0	!0150

01 (hex) indicates the module's Net-ID 50 (hex) can be represented as 0101 0000 (binary)

L	Х	С	С	0	Z	В	Α
0	1	0	1	0	0	0	0

L = 0: Do not update the preset value

1: Update the preset value

(Refer to Section 7.4.5 – Preset Value of Encoder)

X = XOR Control bit = 0 or 1

- **CC** = Counting mode
 - 00: Stop counting
 - 01: Up/Down (CW/CCW) Counting Mode
 - 10: Pulse/Direction Counting
 - 11: AB phase (Quadrant) counting mode

Z ` B ` A = 0: Low ; 1: High

Appendix A DCON Utility Pro – FAQ

Users can click the "FAQ" button in DCON Utility Pro to view descriptions of the functions.



Visit the ICP FAS website to view the latest FAQ:

https://www.icpdas.com/en/product/guide+Software+Utility_Driver+DCON_Utility_Pro#1243





DCON_01_005	How to query the commands used by the module through DCON Utility Pro?
DCON_01_006	How to use multi-language?
DCON_01_007	How to use DCON_Utility Pro to configure modules on Linux PAC platform?
DCON Utility	Pro Ethernet N-7000 I/O
DCON_02_001	How to establish a reliable and safety system by using Safe Value and Host Watchdog?
DCON_02_002	How to catch the DI module ON OFF signal of distributed system?
DCON_02_003	How to map GPS receiver module data to Google_Map?
DCON_02_004	How to configure the network settings for module with hardware configuration dip switch?
DCON_02_005	How to set the User define type for NTC thermistor thermometer?
DCON_02_006	What are the differences between I-87KN, RU-87PN, USB-87PN and ET-87PN settings?
DCON_02_007	How to upgrade from I-87KN to RU-87PN?
Troubleshooting	
DCON_03_001	How to solve the problem of NET Framework causing the PC fail to run DCON Utility Pro?
DCON_03_002	How to solve the problem that the RS-485 network cannot find the modules?

Appendix B Type Code for AI Values (Modbus Protocol)



When using the DCON or Modbus protocol, the data range for conversion may vary, even for the same type code. Refer to the table to determine the correct data range based on the selected protocol.

B.1 M-7013P, M-7013PD

Type Code	RTD Type	Data Format Min.		Max.
0.00	Platinum 100	Engineering unit	-10000	10000
0x20	α = 0.00385 -100 ~ 100°C	2's complement HEX	8000	7FFF
	Platinum 100	Engineering unit	0	10000
0x21	α = 0.00385 0 ~ 100°C	2's complement HEX	0000	7FFF
	Platinum 100	Engineering unit	0	20000
0x22	α = 0.00385 0 ~ 200°C	2's complement HEX	0000	7FFF
0.22	Platinum 100	Engineering unit	0	6000
0x23	$\alpha = 0.00385$ 0 ~ 600°C	2's complement HEX	0000	7FFF
	Platinum 100	Engineering unit	-10000	10000
0x24	α = 0.003916 -100 ~ 100°C	2's complement HEX	8000	7FFF
0.05	Platinum 100	Engineering unit	0	10000
0x25	α = 0.003916 0 ~ 100°C	2's complement HEX	0000	7FFF
0x26	Platinum 100	Engineering unit	0	20000
	α = 0.003916 0 ~ 200°C	2's complement HEX	0000	7FFF
0.07	Platinum 100	Engineering unit	0	6000
0x27	$\alpha = 0.003916$ 0 ~ 600°C	2's complement HEX	0000	7FFF
020	Nickel 120 -80 ~ 100°C	Engineering unit	-8000	10000
0x28		2's complement HEX	999A	7FFF
0.20	Nickel 120 0 ~ 100°C	Engineering unit	0	10000
UX29		2's complement HEX	0000	7FFF
0.24	Platinum 1000	Engineering unit	-2000	6000
Ux2A	$\alpha = 0.00385$ -200 ~ 600°C	2's complement HEX	D556	7FFF

Type Code	RTD Type	Data Format	Min.	Max.
025	Platinum 100	Engineering unit	-20000	20000
UX2E	$\alpha = 0.00385$ -200 ~ 200°C	2's complement HEX	8000	7FFF
0,25	Platinum 100	Engineering unit	-20000	20000
UX2F	-200 ~ 200°C	2's complement HEX	8000	7FFF
0.20	Platinum 100	Engineering unit	-2000	6000
0x80	$\alpha = 0.00385$ -200 ~ 600°C	2's complement HEX	D556	7FFF
	Platinum 100	Engineering unit	-2000	6000
0x81 α	-200 ~ 600°C	2's complement HEX	D556	7FFF

Under/Over Range Reading

Data Format	Under Range	Over Range	
Engineering Unit	-32768	+32767	
2's complement HEX	8000	7FFF	

B.2 M-7015, M-7015P

The Modbus protocol's Engineering data format is available for the M-7015/15P with firmware version B202 or later, as shown in the table below.

Type Code	RTD Type	Data Format	Min.	Max.
	Platinum 100	Engineering unit	-10000	10000
0x20	α = 0.00385 -100 ~ 100°C	2's complement HEX	8000	7FFF
	Platinum 100	Engineering unit	0	10000
0x21	α = 0.00385 0 ~ 100°C	2's complement HEX	0000	7FFF
	Platinum 100	Engineering unit	0	20000
0x22	α = 0.00385 0 ~ 200°C	2's complement HEX	0000	7FFF
	Platinum 100	Engineering unit	0	6000
0x23	α = 0.00385 0 ~ 600°C	2's complement HEX	0000	7FFF
	Platinum 100	Engineering unit	-10000	10000
0x24	α = 0.003916 -100 ~ 100°C	2's complement HEX	8000	7FFF
	Platinum 100	Engineering unit	0	10000
0x25 α	α = 0.003916 0 ~ 100°C	2's complement HEX	0000	7FFF
	Platinum 100	Engineering unit	0	20000
0x26	α = 0.003916 0 ~ 200°C	2's complement HEX	0000	7FFF
	Platinum 100	Engineering unit	0	6000
0x27	α = 0.003916 0 ~ 600°C	2's complement HEX	0000	7FFF
0.00	Nickel 120 -80 ~ 100°C	Engineering unit	-8000	10000
0x28		2's complement HEX	999A	7FFF
020	Nickel 120 0 ~ 100°C	Engineering unit	0	10000
0x29		2's complement HEX	0000	7FFF
0.24	Platinum 1000	Engineering unit	-2000	6000
Ux2A	a = 0.00385 -200 ~ 600°C	2's complement HEX	D556	7FFF

Type Code	RTD Type	Data Format	Min.	Max.
020	Cu 100	Engineering unit	-2000	15000
UX2B	α = 0.00421 -20 ~ 150°C	2's complement HEX	EEEF	7FFF
020	Cu 100	Engineering unit	0	20000
UX2C	$\alpha = 0.00427$ 0 ~ 200°C	2's complement HEX	0000	7FFF
0.25	Cu 1000	Engineering unit	-2000	15000
UX2D	α = 0.00421 -20 ~ 150°C	2's complement HEX	EEEF	7FFF
0.25	Platinum 100	Engineering unit	-20000	20000
UX2E	$\alpha = 0.00385$ -200 ~ 200°C	2's complement HEX	8000	7FFF
0.05	Platinum 100 α = 0.003916 -200 ~ 200°C	Engineering unit	-20000	20000
UX2F		2's complement HEX	8000	7FFF
0.00	Platinum 100 α = 0.00385 -200 ~ 600°C	Engineering unit	-2000	6000
0x80		2's complement HEX	D556	7FFF
	Platinum 100 α = 0.003916 -200 ~ 600°C	Engineering unit	-2000	6000
0x81		2's complement HEX	D556	7FFF
0.02	Cu 50	Engineering unit	-5000	15000
0x82	-50 ~ 150°C	2's complement HEX	D556	7FFF
0.02	Nickel 100 -60 ~ 180°C	Engineering unit	-6000	18000
0x83		2's complement HEX	D556	7FFF
004	Nickel 120 -80 ~ 150°C	Engineering unit	-8000	15000
0x84		2's complement HEX	BBBC	7FFF
Over	Cu 100	Engineering unit	0	15000
0x85	α = 0.00428 0 ~ 150°C	2's complement HEX	0000	7FFF

Under/Over Range Reading

Data Format	Under Range	Over Range	
Engineering Unit	-32768	+32767	
2's complement HEX	8000	7FFF	

B.3 M-7017/18/19 Series

The table below allows users to quickly review the supported type codes for each model.

Туре	M-7017, M-7017R M-7017C, M-7017RC M-7017mC-16 M-7017RMS	M-7017R-A5	M-7018	M-7018R	M-7018Z	M-7019R M-7019Z
0x00 +/-15mV	-	-	•	•	•	٠
0x01 +/-50mV	-	-	•	•	•	٠
0x02 +/-100mV	-	-	•	•	•	•
0x03 +/-500mV	-	-	•	•	•	٠
0x04 +/-1V	-	-	•	•	•	٠
0x05 +/-2.5V	-	-	•	•	•	٠
0x06 +/-20mA	-	-	•	•	•	•
0x07 4~20mA	B2.2 (*)	-	-	-	•	B2.7(*)
0x08 +/-10V	•	-	-	-	-	•
0x09 +/-5V	•	-	-	-	-	•
0x0A +/-1V	•	-	-	-	-	•
0x0B +/-500mV	•	-	-	-	-	•
0x0C +/-150mV	•	-	-	-	-	•
0x0D +/-20mA	• (*)	-		-	-	•
OxOE Type J	-	-	•	•	•	•
OxOF Type K	-	-	•	•	•	•
0x10 Type T	-	-	•	•	•	•
Ox11 Type E	-	-	•	•	•	•
Ox12 Type R	-	-	•	•	•	٠
0x13 Type S	-	-	•	•	•	•
Ox14 Type B	-	-	•	•	•	٠
0x15 Type N	-	-	•	•	•	•
0x16 Type C	-	-	•	•	•	•
0x17 Type L	-	-	-	•	•	•
0x18 Type M	-	-	-	•	•	•
0x19 Type L2	-	-	-	•	•	•
0x1A 0~20mA	B2.2 (*)	-	-	-	•	B2.7 (*)
0x1B +/-150V	-	•	-	-	-	-
0x1C +/-50V	-	•	-	-	-	-
Note:						

1. "B2.x" indicates the firmware version required for the supported type.

2. Type codes 07, 0D, and 1A are not available for M-7017RMS.
| Type Code | Input Range | Data Format | Min. | Max. | |
|-----------|------------------------------|--------------------|--------|-------|--|
| 0×00 | $15 \sim \pm 15 mV$ | Engineering unit | -15000 | 15000 | |
| 0,00 | -13 +13 1110 | 2's complement HEX | 8000 | 7FFF | |
| 0.01 | $E0 \approx 1E0 \text{ mV}$ | Engineering unit | -5000 | 5000 | |
| 0,01 | -50 +50 1110 | 2's complement HEX | 8000 | 7FFF | |
| 0.02 | $100 \approx 100 \text{mV}$ | Engineering unit | -10000 | 10000 | |
| 0x02 | -100 +100 110 | 2's complement HEX | 8000 | 7FFF | |
| 002 | 500 m + 500 m / | Engineering unit | -5000 | 5000 | |
| UXU3 | -500 ^w +500 mv | 2's complement HEX | 8000 | 7FFF | |
| 0.04 | 1 ~ . 1 \/ | Engineering unit | -10000 | 10000 | |
| UXU4 | -1 +1 V | 2's complement HEX | 8000 | 7FFF | |
| 005 | | Engineering unit | -25000 | 25000 | |
| UXU5 | -2.5 ¹⁰ +2.5 V | 2's complement HEX | 8000 | 7FFF | |
| 0.00 | 20 01 1 20 11 1 | Engineering unit | -20000 | 20000 | |
| UXU6 | -20 [~] +20 mA | 2's complement HEX | 8000 | 7FFF | |
| 0.07 | 1 4 × 1 20 m 4 | Engineering unit | 4000 | 20000 | |
| UXU7 | +4 ¹⁰ +20 mA | 2's complement HEX | 0000 | FFFF | |
| 009 | 10~:10)/ | Engineering unit | -10000 | 10000 | |
| UXU8 | -10 ** +10 * | 2's complement HEX | 8000 | 7FFF | |
| 000 | | Engineering unit | -5000 | 5000 | |
| 0x09 | -5 * +5 V | 2's complement HEX | 8000 | 7FFF | |
| 00.4 | 1 01 - 1 1 | Engineering unit | -10000 | 10000 | |
| UXUA | -1 +1 V | 2's complement HEX | 8000 | 7FFF | |
| 0.05 | 500 at x 500 x 1/ | Engineering unit | -5000 | 5000 | |
| UXUB | -500 ¹⁰ +500 mV | 2's complement HEX | 8000 | 7FFF | |
| 0.00 | 150 00 (150 | Engineering unit | -15000 | 15000 | |
| UXUC | -150~+150 mV | 2's complement HEX | 8000 | 7FFF | |
| 0.05 | 20 20 20 1 | Engineering unit | -20000 | 20000 | |
| 0x0D | -20 ¹² +20 MA | 2's complement HEX | 8000 | 7FFF | |

Type Code	Input Range	Data Format	Min.	Max.
0.05	Type J	Engineering unit	-2100	7600
OXOE	l hermocouple -210 ~ 760°C	2's complement HEX	DCA2	7FFF
0x0F	Type K Thermocouple	Engineering unit	-2700	13720
	-270 ~ 1372°C	2's complement HEX	E6D0	7FFF
0x10	Type T Thermocouple	Engineering unit	-2700	4000
0,10	-270 ~ 400°C	2's complement HEX	A99A	7FFF
0v11	Type E	Engineering unit	-2700	10000
UXII	-270 ~ 1000°C	2's complement HEX	DD71	7FFF
0v12	Type R	Engineering unit	0	17680
UXIZ	0~1768°C	2's complement HEX	0000	7FFF
0,12	Type S	Engineering unit	0	17680
UX13	0~1768°C	2's complement HEX	0000	7FFF
0/14	Type B	Engineering unit	0	18200
0X14	0~1820°C	2's complement HEX	0000	7FFF
0/15	Type N	Engineering unit	-2700	13000
0X15	-270 ~ 1300°C	2's complement HEX	E56B	7FFF
0/16	Type C	Engineering unit	0	23200
0110	0~2320°C	2's complement HEX	0000	7FFF
0,17	Type L	Engineering unit	-2000	8000
UX17	-200 ~ 800°C	2's complement HEX	E000	7FFF
0v19	Type M	Engineering unit	-20000	10000
0110	-200 ~ 100°C	2's complement HEX	8000	4000
0/10	Type L DIN43710	Engineering unit	-2000	9000
0x19	-200 ~ 900°C	2's complement HEX	E38E	7FFF

Type Code	Input Range	Data Format	Min.	Max.
0x1A	0~+20 ~ 1	Engineering unit	0	20000
	0 +20 MA	2's complement HEX	0000	FFFF
0x1B	150~+150.)/	Engineering unit	-15000	FFFF 15000 7FFF
	-150 +150 V	2's complement HEX	8000	7FFF
0x1C	F0~+F0.\/	Engineering unit	-5000	5000
	-50 ⁻⁵ +50 V	2's complement HEX	8000	7FFF

Data Format	Under Range	Over Range
Engineering Unit	-32768	+32767
2's complement HEX	8000	7FFF

B.4 M-7024, M-7024R, M-7024L

Type Code	Output Range	Data Format	Min.	Max.	
020	0~20 mA	Engineering	0	20000	
0x30	0 20 MA	2's complement HEX	0000h	3FFFh	
0.21	$4 \approx 20 \text{ m}$	Engineering	4000	20000	
0X31	4 20 MA	2's complement HEX	0000h	3FFFh	
0x32	0~10.\/	Engineering	0	10000	
	0 10 V	2's complement HEX	0000h	3FFFh	
0x33	10 ~ 10 \/	Engineering	-10000	10000	
	-10 10 V	2's complement HEX	C000h	3FFFh	
0.24	0~5.1	Engineering	0	5000	
UX34	0 5 0	2's complement HEX	0000h	3FFFh	
0x35	E~EV	Engineering	-5000	5000	
	-5 5 V	2's complement HEX	C000h	3FFFh	

B.5 M-7024U, M-7026, M-7028

Type Code	Range	Data Format	Min.	Max.	
0.00	0 ~ 4 ~ + 20 ~ 4	Engineering	0	+20000	
0x00	0 MA +20 MA	2's complement HEX	0000h	FFFFh	
0.01	14 m A ~ 1 20 m A	Engineering	+4000	+20000	
UXUI	+4 MA +20 MA	2's complement HEX	0000h	FFFFh	
0x02	0\/~+10.\/	Engineering	0	+10000	
	00 +10 0	2's complement HEX	0000h	FFFFh	
0x03	. / 10.)/	Engineering	-10000	+10000	
	+/-10 V	2's complement HEX	8000h	7FFFh	
0×04		Engineering	0	+5000	
UXU4	0 0 + 5 0	2's complement HEX	0000h	FFFFh	
0x05	. / /	Engineering	-5000	+5000	
	+/-2 V	2's complement HEX	8000h	7FFFh	

B.6 M-7084

Type Code	Counter Type	Data Format	Min.	Max.
0x50	Up Counter	Hexadecimal	0000000	FFFFFFF
0x51	Frequency	The data format can be set by using a Modbus address - 00269. (0: Hex. 1: Float)		
0x54	Up/Down Counter	Hexadecimal 8000000		7FFFFFF
0x55	Pulse/Direction Counter	Hexadecimal	8000000	7FFFFFF
0x56	Quadrature Counter	Hexadecimal	8000000	7FFFFFF

Appendix C Type Code for AI Values (DCON Protocol)



When using the DCON or Modbus protocol, the data range for conversion may vary, even for the same type code. Refer to the table to determine the correct data range based on the selected protocol.

C.1 7005 (Thermistor)

I-7005, M-7005

Type Code	Thermistor Range	Data Format	-F.S.	+F.S.	
		Engineering unit	-030.00	+240.00	
0.00	PreCon Type III	% of FSR	-012.50	+100.00	
0x60	-30 ~ 240°F	2's complement HEX	F000	7FFF	
		Ohms	+173600.0	+000539.4	
		Engineering unit	-050.00	+150.00	
0	Fenwell U 2K @ 25°C	% of FSR	-033.33	+100.00	
UX61	-50 ~ 150°C	2's complement HEX	D556	7FFF	
		Ohms	+134020.0	+000037.2	
		Engineering unit	+000.00	+150.00	
0×63	Fenwell U 2K @ 25°C	% of FSR	+000.00	+100.00	
0x62	0 ~ 150°C	2's complement HEX	0000	7FFF	
		Ohms	+006530.0	+000037.2	
		Engineering unit	-080.00	+100.00	
0×62	YSI L Mix 100 @ 25°C -80 ~ 100°C	% of FSR	-080.00	+100.00	
0x05		2's complement HEX	999A	7FFF	
		Ohms	+014470.0	+000014.3	
		Engineering unit	-080.00	+100.00 +100.00 7FFF	
0×64	YSI L Mix 300 @ 25°C	% of FSR	-080.00		
0x04	-80 ~ 100°C	2's complement HEX	999A		
		Ohms	+067660.0	+000035.8	
		Engineering unit	-070.00	+100.00	
0.465	YSI L Mix 1000 @ 25°C	% of FSR	-070.00	+100.00	
0x03	-70 ~ 100°C	2's complement HEX	A667	7FFF	
		Ohms	+132600.0	+000106.4	
		Engineering unit	-050.00	+150.00	
0.466	YSI B Mix 2252 @ 25°C	% of FSR	-033.33	+100.00	
0,00	-50 ~ 150°C	2's complement HEX	D556	7FFF	
		Ohms	+151000.0	+000041.8	

Type Code	Thermistor Range	Data Format	-F.S.	+F.S.	
		Engineering unit	-040.00	+150.00	
0	YSI B Mix 3000 @ 25°C	% of FSR	-026.67	+100.00	
0x67	-40 ~ 150°C	2's complement HEX	DDDE	7FFF	
		Ohms	+101000.0	+000055.6	
		Engineering unit	-040.00	+150.00	
0768	YSI B Mix 5000 @ 25°C	% of FSR	-026.67	+100.00	
0x08	-40 ~ 150°C	2's complement HEX	DDDE	7FFF	
		Ohms	+168300.0	+000092.7	
		Engineering unit	-030.00	+150.00	
0×60	YSI B Mix 6000 @ 25°C	% of FSR	-020.00	+100.00	
0x09	-30 ~ 150°C	2's complement HEX	E667	7FFF	
		Ohms	+106200.0	+000111.5	
		Engineering unit	-030.00	+150.00	
0.46.4	YSI B Mix 10K @ 25°C	% of FSR	-020.00	+100.00	
UXBA	-30 ~ 150°C	2's complement HEX	E667	7FFF	
		Ohms	+177000.0	+000185.9	
		Engineering unit	-030.00	+150.00	
Over	YSI H Mix 10K @ 25°C	% of FSR -020.00		+100.00	
UXOB	-30 ~ 150°C	2's complement HEX	E667	7FFF	
		Ohms	+135200.0	+000237.0	
		Engineering unit -010		+200.00	
0.460	YSI H Mix 30K @ 25°C	% of FSR	-005.00	+100.00	
UXOC	-10 ~ 200°C	2's complement HEX	F99A	7FFF	
		Ohms	+158000.0	+000186.7	
		Engineering unit	-050.00	+150.00	
0,20 ~ 0,27	User-defined	% of FSR	-033.33	+100.00	
	-50 ~ 150°C	2's complement HEX	D556	7FFF	
		Ohms	+000000.0	+000000.0	

Note:

For the user-defined type, a resistance value greater than 180,000 Ω is considered out of the under-range. For firmware version A3.7 or later, this threshold is 204,800 Ω .

<u>I-7005, M-7005</u>

Data Format	Under Range	Over Range
Engineering Unit	-9999.9	+9999.9
% of FSR	-999.99	+999.99
2's Complement HEX	8000	7FFF

M-7005: Using Modbus RTU Protocol

Under Range	Over Range
8000h	7FFFh

C.2 I-7011

7011(D), I-7011P(D)

Type Code	Input Range	Data Format	-F.S.	Zero	+F.S.
		Engineer Unit	-15.000	+00.000	+15.000
0x00	-15 ~ +15	% of FSR	-100.00	+000.00	+100.00
	IIIV	2's complement HEX	8000	0000	7FFF
	50 . 50	Engineer Unit	-50.000	+00.000	+50.000
0x01	-50 ~ +50	% of FSR	-100.00	+000.00	+100.00
	IIIV	2's complement HEX	8000	0000	7FFF
		Engineer Unit	-100.00	+000.00	+100.00
0x02	$-100 \approx +100$	% of FSR	-100.00	+000.00	+100.00
	IIIV	2's complement HEX	8000	0000	7FFF
	500 at 1 500	Engineer Unit	-500.00	+000.00	+500.00
0x03	-500 [~] +500	% of FSR	-100.00	+000.00	+100.00
	IIIV	2's complement HEX	8000	0000	7FFF
	-1 ~ +1 V	Engineer Unit	-1.0000	+0.0000	+1.0000
0x04		% of FSR	-100.00	+000.00	+100.00
		2's complement HEX	8000	0000	7FFF
		Engineer Unit	-2.5000	+0.0000	+2.5000
0x05	-2.5 ~ +2.5 V	% of FSR	-100.00	+000.00	+100.00
		2's complement HEX	8000	0000	7FFF
	20 01 1 20	Engineer Unit	-20.000	+00.000	+20.000
0x06	-20 ~ +20 mA	% of FSR	-100.00	+000.00	+100.00
		2's complement HEX	8000	0000	7FFF
	Ј Туре	Engineer Unit	-210.00	+00.000	+760.00
0x0E	-210 ~ 760	% of FSR	-027.63	+000.00	+100.00
	degree Celsius	2's complement HEX	DCA2	0000	7FFF
	К Туре	Engineer Unit	-0270.0	+00.000	+1372.0
0x0F	-270 ~ 1372	% of FSR	-019.68	+000.00	+100.00
	degree Celsius	2's complement HEX	E6D0	0000	7FFF
	Т Туре	Engineer Unit	-270.00	+000.00	+400.00
0x10	-270 ~ 400	% of FSR	-067.50	+000.00	+100.00
	degree Celsius	2's complement HEX	A99A	0000	7FFF

Type Code	Input Range	Data Format	-F.S.	Zero	+F.S.
	Е Туре	Engineer Unit	-0270.0	+000.00	+1000.0
0x11	-270 ~ 1000	% of FSR	-027.00	+000.00	+100.00
	degree Celsius	2's complement HEX	DD71	0000	7FFF
		Engineer Unit	+0000.0	+0000.0	+1768.0
0x12	R Type 0 ~ 1768	% of FSR	+0000.0	+0000.0	+100.00
	degree Cersius	2's complement HEX	0000	0000	7FFF
		Engineer Unit	+0000.0	+0.0000	+1786.0
0x13	S Type 0 ~ 1768	% of FSR	+0000.0	+000.00	+100.00
	degree Ceisius	2's complement HEX	0000	0000	7FFF
	B Type 0 ~ 1820 degree Celsius	Engineer Unit	+0000.0	+00.000	+1820.0
0x14		% of FSR	+0000.0	+000.00	+100.00
		2's complement HEX	0000	0000	7FFF
	N Type -270 ~ 1300 degree Celsius	Engineer Unit	-0270.0	+00.000	+1300.0
0x15		% of FSR	-20.77	+000.00	+100.00
		2's complement HEX	E56B	0000	7FFF
	0.7.00.0000	Engineer Unit	+00.000	+00.000	+2320.0
0x16	C Type 0 ~ 2320 degree Celsius	% of FSR	+000.00	+000.00	+100.00
		2's complement HEX	0000	0000	7FFF
	L Type	Engineer Unit	-200.00	+00.000	+800.00
0x17 ^{*1}	-200 ~ 800	% of FSR	-025.00	+000.00	+100.00
	degree Celsius	2's complement HEX	E000	0000	7FFF
	М Туре	Engineer Unit	-200.00	+000.00	+100.00
0x18 ^{*1}	-200 ~ 100	% of FSR	-100.00	+000.00	+050.00
	degree Celsius	2's complement HEX	8000	0000	4000
*1: Type coc	les '17, 18' are avail	able for the I-7011P and	I-7011PD.		

C.3 I-7012/14 Series (AI)

I-7012/12D/12F/12FD, I-7014D

Type Code	Input Range	Data Format	-F.S.	Zero	+F.S.
		Engineer Unit	-10.000	+00.000	+10.000
0x08	-10 ~ +10 V	% of FSR	-100.00	+000.00	+100.00
		2's complement HEX	8000	0000	7FFF
		Engineer Unit	-5.0000	+0.0000	+5.0000
0x09	-5 ~ +5 V	% of FSR	-100.00	+000.00	+100.00
		2's complement HEX	8000	0000	7FFF
0x0A	-1 ~ +1 V	Engineer Unit	-1.0000	+0.0000	+1.0000
		% of FSR	-100.00	+000.00	+100.00
		2's complement HEX	8000	0000	7FFF
	-500 ~ +500 mV	Engineer Unit	-500.00	+000.00	+500.00
0x0B		% of FSR	-100.00	+000.00	+100.00
		2's complement HEX	8000	0000	7FFF
		Engineer Unit	-150.00	+000.00	+150.00
0x0C	-150 ~ +150 mV	% of FSR	-100.00	+000.00	+100.00
		2's complement HEX	8000	0000	7FFF
		Engineer Unit	-20.000	+00.000	+20.000
0x0D	-20 ~ +20 mA	% of FSR	-100.00	+000.00	+100.00
	mA .	2's complement HEX	8000	0000	7FFF

C.4 7013/15/33 Series (RTD)

I-7013/13D, M-7013P/13PD ; I-7015/15P, M-7015/15P ; I-7033/33D, M-7033/33D

Type Code	RTD Range	Data Format	-F.S.	+F.S.
		Engineering unit	-100.00	+100.00
020		% of FSR	-100.00	+100.00
0x20	$\alpha = 0.00385$	2's complement HEX	8000	7FFF
	-100 100 C	Ohms	+060.25	+138.50
	Distinum 100	Engineering unit	+000.00	+100.00
0.21	Platinum 100 $\alpha = 0.00285$	% of FSR	+000.00	+100.00
UX21	$\alpha = 0.00385$	2's complement HEX	0000	7FFF
	0 100 C	Ohms	+100.00	+138.50
	Distinum 100	Engineering unit	+000.00	+200.00
0	Platinum 100 $\alpha = 0.00285$	% of FSR	+000.00	+100.00
UXZZ	$\alpha = 0.00385$	2's complement HEX	0000	7FFF
	0 200 C	Ohms	+100.00	+175.84
	Platinum 100 α = 0.00385 0 ~ 600°C	Engineering unit	+000.00	+600.00
0		% of FSR	+000.00	+100.00
0X23		2's complement HEX	0000	7FFF
		Ohms	+100.00	+313.59
		Engineering unit	-100.00	+100.00
024	Platinum 100 r = 0.002016	% of FSR	-100.00	+100.00
UX24	α = 0.003916 -100 ~ 100°C	2's complement HEX	8000	7FFF
		Ohms	+059.57	+139.16
		Engineering unit	+000.00	+100.00
025	Platinum 100 r = 0.002016	% of FSR	+000.00	+100.00
UX25	$\alpha = 0.003916$	2's complement HEX	0000	7FFF
	0 100 C	Ohms	+100.00	+139.16
		Engineering unit	+000.00	+200.00
026	Platinum 100	% of FSR	+000.00	+100.00
UX26	$\alpha = 0.003916$	2's complement HEX	0000	7FFF
	0 200 C	Ohms	+100.00	+177.14
		Engineering unit	+000.00	+600.00
0	Platinum 100 $\alpha = 0.00201$ C	% of FSR	+000.00	+100.00
UX27	$\alpha = 0.003916$	2's complement HEX	0000	7FFF
	U ~ 600°C	Ohms	+100.00	+317.28

Type Code	RTD Range	Data Format	-F.S.	+F.S.
		Engineering unit	-080.00	+100.00
0.28	Nickel 120	% of FSR	-080.00	+100.00
0x28	-80 ~ 100°C	2's complement HEX	999A	7FFF
		Ohms	+066.60	+200.64
		Engineering unit	+000.00	+100.00
0~29	Nickel 120	% of FSR	+000.00	+100.00
0,29	0 ~ 100°C	2's complement HEX	0000	7FFF
		Ohms	+120.00	+200.64
		Engineering unit	-200.00	+600.00
0,2,0,*	Platinum 1000	% of FSR	-033.33	+100.00
UXZA	-200 ~ 600°C	2's complement HEX	D556	7FFF
		Ohms	+0185.2	+3137.1
Type Codes '2A' is a	vailable for the I-7013/13	D with firmware B2.2 or late	er.	_
	Cu 100 α = 0.00421 -20 ~ 150°C	Engineering unit	-020.00	+150.00
0v2P*		% of FSR	-013.33	+100.00
UX2B		2's complement HEX	EEEF	7FFF
		Ohms	+091.56	+163.17
	Cu 100 α = 0.00427 0 ~ 200°C	Engineering unit	+000.00	+200.00
0,20*		% of FSR	+000.00	+100.00
UXZC		2's complement HEX	0000	7FFF
		Ohms	+090.34	+167.75
		Engineering unit	-020.00	+150.00
0v2D*	Cu 1000	% of FSR	-013.33	+100.00
UX2D	-20 ~ 150°C	2's complement HEX	EEEF	7FFF
		Ohms	+0915.6	+1631.7
Type Codes '2B, 2C,	2D' are available for the I	-7015/15P and M-7015/15P.		
		Engineering unit	-200.00	+200.00
0v2E*	Platinum 100	% of FSR	-100.00	+100.00
UXZE	-200 ~ 200°C	2's complement HEX	8000	7FFF
		Ohms	+018.49	+175.84
		Engineering unit	-200.00	+200.00
∩v2E*	Platinum 100 $\alpha = 0.002016$	% of FSR	-100.00	+100.00
UXZF	-200 ~ 200°C	2's complement HEX	8000	7FFF
		Ohms	+017.14	+177.14

Type Code	RTD Range	Data Format	-F.S.	+F.S.	
		Engineering unit	-200.00	+600.00	
0.480*	Platinum 100	% of FSR	-033.33	+100.00	
0x80	-200 ~ 600°C	2's complement HEX	D556	7FFF	
		Ohms	+018.49	+313.59	
		Engineering unit	-200.00	+600.00	
	Platinum 100	% of FSR	-033.33	+100.00	
0x81*	a = 0.003916 -200 ~ 600°C	2's complement HEX	D556	7FFF	
		Ohms	+017.14	+317.28	
Type Codes '2E, 2F, Type Codes '2E, 2F,	80, 81' are available for t 80, 81' are available for t	he I-7013/13D and I-7033, he I-7015 with firmware B1	/33D with firmwa .1 or later.	re B1.3 or later.	
		Engineering unit	-050.00	+150.00	
	Cu 50	% of FSR	-033.33	+100.00	
0x82*	-50 ~ 150°C	2's complement HEX	D556	7FFF	
		Ohms	+039.24	+082.13	
Type Code '82' is ava Type Code '82' is ava	ailable for the I-7013/13 ailable for the I-7015 and	D and I-7033/33D with firm I M-7015 with firmware A2.	ware B1.5 or later 3 or later.	:	
	Nickel 100 -60 ~ 180°C	Engineering unit	-060.00	+180.00	
		% of FSR	-033.33	+100.00	
0x83*		2's complement HEX	D556	7FFF	
		Ohms	+069.50	+223.10	
Type Code '83' is on Type Code '83' is ava	ly available for the I-7015 ailable for the I-7015 and	5/15P and M-7015/15P. I M-7015 with firmware A2.	9 or later.		
		Engineering unit	-080.00	+150.00	
0.04*	Nickel 120	% of FSR	-053.33	+100.00	
0x84	-80 ~ 150°C	2's complement HEX	BBBC	7FFF	
		Ohms	+066.60	+248.95	
		Engineering unit	+000.00	+150.00	
	Cu 100	% of FSR	+000.00	+100.00	
0x85*	α = 0.00428 0 ~ 150°C	2's complement HEX	0000	7FFF	
		Ohms	+100.00	+164.16	
Type Codes '84, 85' are only available for the I-7015/15P and M-7015/15P with firmware B2.9 or later.					

I-7013/13D, M-7013P/13PD, I-7033/33D, M-7033/33D (Firmware version: B1.2 or later)

Data Format	Under Range	Over Range
Engineering Unit	-0000	+9999
% of FSR	-0000	+9999
2's Complement HEX	8000	7FFF

I-7013, I-7033/33D (Firmware version: B1.3 or later),

I-7015/M-7015 (Firmware version: B2.1 or later),

M-7013P/13PD, I-7015P, M-7015P, M-7033/33D

<u>Note</u>: The under/over range readings can be set by using the ~AADVV command.

Data Format	Under Range	Over Range
Engineering Unit	-9999.9	+9999.9
% of FSR	-999.99	+999.99
2's Complement HEX	8000	7FFF

M-7013P/13PD, M-7015/15P, M-7033/33D: Using Modbus RTU Protocol

Under Range	Over Range
8000	7FFF

C.5 7016 Series

I-7016/16D/16P/16PD, M-7016/16D

Type Code	Input Range	Data Format	-F.S.	Zero	+F.S.
		Engineer Unit	-15.000	+00.000	+15.000
0x00	-15 ~ +15 mV	% of FSR	-100.00	+000.00	+100.00
		2's complement HEX	8000	0000	7FFF
		Engineer Unit	-50.000	+00.000	+50.000
0x01	-50 ~ +50 mV	% of FSR	-100.00	+000.00	+100.00
		2's complement HEX	8000	0000	7FFF
		Engineer Unit	-100.00	+000.00	+100.00
0x02	-100 ~ +100 mV	% of FSR	-100.00	+000.00	+100.00
		2's complement HEX	8000	0000	7FFF
	-500 ~ +500 mV	Engineer Unit	-500.00	+000.00	+500.00
0x03		% of FSR	-100.00	+000.00	+100.00
		2's complement HEX	8000	0000	7FFF
	-1 ~ +1 V	Engineer Unit	-1.0000	+0.0000	+1.0000
0x04		% of FSR	-100.00	+000.00	+100.00
		2's complement HEX	8000	0000	7FFF
		Engineer Unit	-2.5000	+0.0000	+2.5000
0x05	-2.5 ~ +2.5 V	% of FSR	-100.00	+000.00	+100.00
		2's complement HEX	8000	0000	7FFF
		Engineer Unit	-20.000	+00.000	+20.000
0x06	-20 ~ +20 mA	% of FSR	-100.00	+000.00	+100.00
		2's complement HEX	8000	0000	7FFF

I-7017/17C/17F/17FC/17R/17R-A5/17RC/17Z, M-7017/17C/17mC-16/17R/17R-A5/17RC/17RMS/17Z I-7018/18P/18R, M-7018/18P/18R, M-7018-16 I-7019R, M-7019R/19Z

The table below allows users to quickly review the supported type codes for each model.

Туре	I-7017, M-7017 I-7017F I-7017R, M-7017R M-7017RMS	I-7017C, M-7017C I-7017RC, M-7017RC M-7017mC-16	I-7017R-A5 M-7017R-A5	l-7018 M-7018
0x00 +/-15mV	-	-	-	•
0x01 +/-50mV	-	-	-	•
0x02 +/-100mV	-	-	-	•
0x03 +/-500mV	-	-	-	•
0x04 +/-1V	-	-	-	•
0x05 +/-2.5V	-	-	-	•
0x06 +/-20mA	-	-	-	•
0x07 4~20mA	B2.2 (*)	B2.2 (*)	-	-
0x08 +/-10V	•	-	-	-
0x09 +/-5V	•	-	-	-
0x0A +/-1V	•	-	-	-
0x0B +/-500mV	•	-	-	-
0x0C +/-150mV	•	-	-	-
0x0D +/-20mA	● (*)	•	-	-
0x0E Type J	-	-	-	•
0x0F Type K	-	-	-	•
0x10 Type T	-	-	-	•
0x11 Type E	-	-	-	•
Ox12 Type R	-	-	-	•
0x13 Type S	-	-	-	•
Ox14 Type B	-	-	-	•
0x15 Type N	-	-	-	•
0x16 Type C	-	-	-	•
0x17 Type L	-	-	-	-
0x18 Type M	-	-	-	-
0x19 Type L2	-	-	-	-
0x1A 0~20mA	B2.2 (*)	B2.2 (*)	-	-

0x1B +/-150V	-	-	•	-
0x1C +/-50V	-	-	•	-
Note:				

3. "B2.2" indicates the firmware version required for the supported type.

4. Type codes 07, 0D, and 1A are not available for the M-7017RMS.

Туре	I-7018P	I-7018R M-7018R	I-7018Z M-7018Z	I-7019R M-7019R M-7019Z		
0x00 +/-15mV	•	•	•	•		
0x01 +/-50mV	•	•	•	•		
0x02 +/-100mV	•	•	•	•		
0x03 +/-500mV	•	•	•	•		
0x04 +/-1V	•	•	•	•		
0x05 +/-2.5V	•	•	•	•		
0x06 +/-20mA	•	•	•	•		
0x07 4~20mA	-	-	•	B2.7 (*)		
0x08 +/-10V	-	-	-	•		
0x09 +/-5V	-	-	-	•		
0x0A +/-1V	-	-	-	•		
0x0B +/-500mV	-	-	-	•		
0x0C +/-150mV	-	-	-	•		
0x0D +/-20mA	-	-	-	•		
OxOE Type J	•	•	•	•		
0x0F Type K	•	•	•	•		
0x10 Type T	•	•	•	•		
Ox11 Type E	•	•	•	•		
Ox12 Type R	•	•	•	•		
Ox13 Type S	•	•	•	•		
Ox14 Type B	•	•	•	•		
0x15 Type N	•	•	•	•		
0x16 Type C	•	•	•	•		
0x17 Type L	•	•	•	•		
0x18 Type M	•	•	•	•		
0x19 Type L2	-	•	•	•		
0x1A 0~20mA	-	-	•	B2.7 (*)		
0x1B +/-150V	-	-	-	-		
0x1C +/-50V	-	-	-	-		
Note: "B2.7" indicates the firmware version required for the supported type.						

C.6.1 7017 Series

Type Code	Input Range	Data Format	-F.S.	+F.S
	. 4	Engineering unit	+04.000	+20.000
0x07*	+4 * +20	% of FSR	+000.00	+100.00
		2's complement HEX	0000	FFFF
Type Code '07' is or	nly available for I-7017 a	nd M-7017 with firmware	B2.2 or later, but n	ot on M-7017RMS.
		Engineering unit	-10.000	+10.000
0x08	-10 ~ +10 V	% of FSR	-100.00	+100.00
		2's complement HEX	8000	7FFF
		Engineering unit	-5.0000	+5.0000
0x09	-5 ~ +5 V	% of FSR	-100.00	+100.00
		2's complement HEX	8000	7FFF
		Engineering unit	-1.0000	+1.0000
0x0A	-1~+1V	% of FSR	-100.00	+100.00
		2's complement HEX	8000	7FFF
	500	Engineering unit	-500.00	+500.00
0x0B	-500 ~ +500 mV	% of FSR	-100.00	+100.00
		2's complement HEX	8000	7FFF
	-150~+150 mV	Engineering unit	-150.00	+150.00
0x0C		% of FSR	-100.00	+100.00
		2's complement HEX	8000	7FFF
	-20~+20 mA	Engineering unit	-20.000	+20.000
0x0D*		% of FSR	-100.00	+100.00
		2's complement HEX	8000	7FFF
Type Code '0D' is N	OT available for the M-7	017RMS.		
		Engineering unit	+00.000	+20.000
0x1A*	0~+20 mA	% of FSR	+000.00	+100.00
		2's complement HEX	0000	FFFF
Type Code '1A' is or	nly available for I-7017 a	nd M-7017 with firmware I	B2.2 or later, but n	ot on M-7017RMS.
		Engineering unit	-150.00	+150.00
0x1B*	-150~+150 V	% of FSR	-100.00	+100.00
		2's complement HEX	8000	7FFF
		Engineering unit	-50.000	+50.000
0x1C*	-50 ~ +50 V	% of FSR	-100.00	+100.00
		2's complement HEX	8000	7FFF
Type Codes '1B, 1C' are only available for the I-7017R-A5 and M-7017R-A5.				

C.6.2 7018 Series

Type Code	Input Range	Data Format	-F.S.	+F.S
		Engineering unit	-15.000	+15.000
0x00	-15 +15	% of FSR	-100.00	+100.00
		2's complement HEX	8000	7FFF
		Engineering unit	-50.000	+50.000
0x01	-50 +50	% of FSR	-100.00	+100.00
	1110	2's complement HEX	8000	7FFF
	100 ~ +100	Engineering unit	-100.00	+100.00
0x02	-100 +100	% of FSR	-100.00	+100.00
	1110	2's complement HEX	8000	7FFF
		Engineering unit	-500.00	+500.00
0x03	-500 +500 m\/	% of FSR	-100.00	+100.00
	1110	2's complement HEX	8000	7FFF
		Engineering unit	-1.0000	+1.0000
0x04	-1 ~ +1 V	% of FSR	-100.00	+100.00
		2's complement HEX	8000	7FFF
	-2.5 ~ +2.5 V	Engineering unit	-2.5000	+2.5000
0x05		% of FSR	-100.00	+100.00
		2's complement HEX	8000	7FFF
	20	Engineering unit	-20.000	+20.000
0x06	-20 +20	% of FSR	-100.00	+100.00
	IIIA	2's complement HEX	8000	7FFF
	. 4 ~ . 20	Engineering unit	+04.000	+20.000
0x07*	+4 ** +20	% of FSR	+000.00	+100.00
	IIIA	2's complement HEX	0000	FFFF
Type Code '07' is onl	y available for the I-7018	Z and M-7018Z.		
	Type J	Engineering unit	-210.00	+760.00
0x0E	Thermocouple	% of FSR	-027.63	+100.00
	-210 ~ 760°C	2's complement HEX	DCA2	7FFF
	Туре К	Engineering unit	-0270.0	+1372.0
0x0F	Thermocouple	% of FSR	-019.68	+100.00
	-270 ~ 1372°C	2's complement HEX	E6D0	7FFF
	Туре Т	Engineering unit	-270.00	+400.00
0x10	Thermocouple	% of FSR	-067.50	+100.00
	-270 ~ 400°C	2's complement HEX	A99A	7FFF

Type Code	Input Range	Data Format	-F.S.	+F.S
	Type E	Engineering unit	-0270.0	+1000.0
0x11	Thermocouple	% of FSR	-027.00	+100.00
	-270 ~ 1000°C	2's complement HEX	DD71	7FFF
	Type R	Engineering unit	+0000.0	+1768.0
0x12	Thermocouple	% of FSR	+000.00	+100.00
	0~1768°C	2's complement HEX	0000	7FFF
	Type S	Engineering unit	+0000.0	+1768.0
0x13	Thermocouple	% of FSR	+000.00	+100.00
	0~1768°C	2's complement HEX	0000	7FFF
	Type B	Engineering unit	+0000.0	+1820.0
0x14	Thermocouple	% of FSR	+000.00	+100.00
	0~1820°C	2's complement HEX	0000	7FFF
	Type N	Engineering unit	-0270.0	+1300.0
0x15	Thermocouple	% of FSR	-020.77	+100.00
	-270 ~ 1300°C	2's complement HEX	E56B	7FFF
	Type C	Engineering unit	+0000.0	+2320.0
0x16	Thermocouple	% of FSR	+000.00	+100.00
	0~2320°C	2's complement HEX	0000	7FFF
	Type L	Engineering unit	-200.00	+800.00
0x17*	Thermocouple	% of FSR	-025.00	+100.00
	-200 ~ 800°C	2's complement HEX	E000	7FFF
	Type M	Engineering unit	-200.00	+100.00
0x18*	Thermocouple	% of FSR	-100.00	+050.00
	-200 ~ 100°C	2's complement HEX	8000	4000
Type Codes '17, 18' a	are only available for the	I-7018P, I-7018R, M-7018R,	I-7018Z, and M-70	18Z.
	Type L DIN43710	Engineering unit	-200.00	+900.00
0x19*	Thermocouple	% of FSR	-022.22	+100.00
	-200 ~ 900°C	2's complement HEX	E38E	7FFF
Type Code '19' is on	ly available for the I-7018	R, M-7018R, I-7018Z, and M	-7018Z.	
		Engineering unit	+00.000	+20.000
0x1A*	0~+20 mA	% of FSR	+000.00	+100.00
		2's complement HEX	0000	FFFF
Type Code '1A' is only available for the I-7018Z and M-7018Z.				

C.6.3 7019 Series

Type Code	Input Range	Data Format	-F.S.	+F.S
		Engineering unit	-15.000	+15.000
0x00	-12 +12	% of FSR	-100.00	+100.00
	IIIV	2's complement HEX	8000	7FFF
	F0 ~ + F0	Engineering unit	-50.000	+50.000
0x01	-50 * +50	% of FSR	-100.00	+100.00
	IIIV	2's complement HEX	8000	7FFF
	100 ~ 100	Engineering unit	-100.00	+100.00
0x02	-100 **+100	% of FSR	-100.00	+100.00
	IIIV	2's complement HEX	8000	7FFF
	F00 ~ + F00	Engineering unit	-500.00	+500.00
0x03	-500 * +500	% of FSR	-100.00	+100.00
	mv	2's complement HEX	8000	7FFF
		Engineering unit	-1.0000	+1.0000
0x04	-1 ~ +1 V	% of FSR	-100.00	+100.00
		2's complement HEX	8000	7FFF
		Engineering unit	-2.5000	+2.5000
0x05	-2.5 ~ +2.5 V	% of FSR	-100.00	+100.00
		2's complement HEX	8000	7FFF
	20 ~ + 20	Engineering unit	-20.000	+20.000
0x06	-2010 +20	% of FSR	-100.00	+100.00
	IIIA	2's complement HEX	8000	7FFF
	. 4 ~ . 20	Engineering unit	+04.000	+20.000
0x07*	+4 +20	% of FSR	+000.00	+100.00
	IIIA	2's complement HEX	0000	FFFF
Type Code '07' is on	y available for the I-7019	R, M-7019R, and M-7019Z v	vith firmware B2.7	or later.
		Engineering unit	-10.000	+10.000
0x08	-10 ~ +10 V	% of FSR	-100.00	+100.00
		2's complement HEX	8000	7FFF
		Engineering unit	-5.0000	+5.0000
0x09	-5 ~ +5 V	% of FSR	-100.00	+100.00
		2's complement HEX	8000	7FFF
		Engineering unit	-1.0000	+1.0000
0x0A	-1 ~ +1 V	% of FSR	-100.00	+100.00
		2's complement HEX	8000	7FFF

Type Code	Input Range	Data Format	-F.S.	+F.S
		Engineering unit	-500.00	+500.00
0x0B	-500~+500	% of FSR	-100.00	+100.00
		2's complement HEX	8000	7FFF
	150 . 150	Engineering unit	-150.00	+150.00
0x0C	-150~+150 mV	% of FSR	-100.00	+100.00
	iiiv	2's complement HEX	8000	7FFF
		Engineering unit	-20.000	+20.000
0x0D	-20~+20 mΔ	% of FSR	-100.00	+100.00
		2's complement HEX	8000	7FFF
	Type J	Engineering unit	-210.00	+760.00
0x0E	Thermocouple	% of FSR	-027.63	+100.00
	-210 ~ 760°C	2's complement HEX	DCA2	7FFF
	Type K	Engineering unit	-0270.0	+1372.0
0x0F	Thermocouple	% of FSR	-019.68	+100.00
	-270~1372°C	2's complement HEX	E6D0	7FFF
	Type T Thermocouple -270 ~ 400°C	Engineering unit	-270.00	+400.00
0x10		% of FSR	-067.50	+100.00
		2's complement HEX	A99A	7FFF
	Type E Thermocouple	Engineering unit	-0270.0	+1000.0
0x11		% of FSR	-027.00	+100.00
	-270 ~ 1000°C	2's complement HEX	DD71	7FFF
	Type R	Engineering unit	+0000.0	+1768.0
0x12	Thermocouple	% of FSR	+000.00	+100.00
	0~1768°C	2's complement HEX	0000	7FFF
	Type S	Engineering unit	+0000.0	+1768.0
0x13	Thermocouple	% of FSR	+000.00	+100.00
	0~1768°C	2's complement HEX	0000	7FFF
	Type B	Engineering unit	+0000.0	+1820.0
0x14	Thermocouple	% of FSR	+000.00	+100.00
	0~1820°C	2's complement HEX	0000	7FFF
	Type N	Engineering unit	-0270.0	+1300.0
0x15	Thermocouple	% of FSR	-020.77	+100.00
	-270 ~ 1300°C	2's complement HEX	E56B	7FFF
	Type C	Engineering unit	+0000.0	+2320.0
0x16	Thermocouple	% of FSR	+000.00	+100.00
	0~2320°C	2's complement HEX	0000	7FFF

Type Code	Input Range	Data Format	-F.S.	+F.S	
	Type L	Engineering unit	-200.00	+800.00	
0x17*	Thermocouple	% of FSR	-025.00	+100.00	
	-200 ~ 800°C	2's complement HEX	E000	7FFF	
	Type M	Engineering unit	-200.00	+100.00	
0x18*	Thermocouple	% of FSR	-100.00	+050.00	
	-200 ~ 100°C	2's complement HEX	8000	4000	
	Type L DIN43710	Engineering unit	-200.00	+900.00	
0x19 [*]	Thermocouple	% of FSR	-022.22	+100.00	
	-200 ~ 900°C	2's complement HEX	E38E	7FFF	
Type Codes '17, 18, 2	19' are only available for t	he I-7019R, M-7019R, and N	И-7019Z.		
		Engineering unit	+00.000	+20.000	
0x1A*	0~+20 mA	% of FSR	+000.00	+100.00	
		2's complement HEX	0000	FFFF	
Type Code '1A' is on	Type Code '1A' is only available for the I-7019R, M-7019R, and M-7019Z with firmware B2.7 or later.				

I-7018 series (Firmware version: B1.4 or older)

Data Format	Under Range	Over Range
Engineering Unit		
% of FSR	-0000	+9999
2's Complement HEX		

I-7018 series (Firmware version: B1.5 or later), I-7019, M-7018, M-7019 series

Data Format	Under Range	Over Range
Engineering Unit	-9999.9	+9999.9
% of FSR	-999.99	+999.99
2's Complement HEX	8000	7FFF

M-7018, M-7019 series: Using Modbus RTU Protocol

Under Range	Over Range
8000	7FFF

4 ~ 20 mA Under Range Reading

Data Format	Modbus RTU	DCON
Engineering Unit	-32768	-9999.9
% of FSR	-	-999.99
2's Complement HEX	0000h	0000

C.7 7021/22/24/28 Series

I-7021/21P/22/24/24R, M-7022/24/24R/24L/24U(D)/28(D)

C.7.1 I-7021 and I-7021P

Type Code	Output Range	Data Format	Min.	Max.
	0 ~ +20 mA	Engineering unit	00.000	20.000
0x30		% of FSR	+000.00	+100.00
		2's complement HEX	000	FFF
0x31	+4 ~ +20 mA	Engineering unit	04.000	20.000
		% of FSR	+000.00	+100.00
		2's complement HEX	000	FFF
		Engineering unit	00.000	10.000
0x32	0 ~ 10 V	% of FSR	+000.00	+100.00
		2's complement HEX	000	FFF

C.7.2 I-7022 and M-7022

Type Code	Output Range	Data Format	Min.	Max.
		Engineering unit	00.000	20.000
0x00	0 ~ 20 mA	% of FSR	+000.00	+100.00
		2's complement HEX	000	FFF
		Engineering unit	04.000	20.000
0x01	4 ~ 20 mA	% of FSR	+000.00	+100.00
		2's complement HEX	000	FFF
		Engineering unit	00.000	10.000
0x02	0 ~ 10 V	% of FSR	+000.00	+100.00
		2's complement HEX	000	FFF
		Engineering unit	00.000	05.000
0x04*	0 ~ 5 V	% of FSR	+000.00	+100.00
		2's complement HEX	000	FFF
Note: Type Code 4 is supported on firmware version B1.2 or later.				

C.7.3 7024, 7024R, and M-7024L

Type Code	Output Range	Data Format	Min.	Max.
0x30	0 ~ +20 mA	Engineering unit	+00.000	+20.000
0x31	+4 ~ +20 mA	Engineering unit	+04.000	+20.000
0x32	0 ~ +10 V	Engineering unit	+00.000	+10.000
0x33	-10 ~ +10 V	Engineering unit	-10.000	+10.000
0x34	0 ~ +5 V	Engineering unit	+00.000	+05.000
0x35	-5 V ~ +5 V	Engineering unit	-05.000	+05.000

C.7.4 M-7024U and M-7028

Type Code	Output Range	Data Format	Min.	Max.
0x00	0 ~ +20 mA	Engineering unit	+00.000	+20.000
		% of FSR	+000.00	+100.00
		2's complement HEX	0000	FFFF
0x01	+4 ~ +20 mA	Engineering unit	+04.000	+20.000
		% of FSR	+000.00	+100.00
		2's complement HEX	0000	FFFF
0x02	0 ~ +10 V	Engineering unit	+00.000	+10.000
		% of FSR	+000.00	+100.00
		2's complement HEX	0000	FFFF
0x03	-10 ~ +10V	Engineering unit	-10.000	+10.000
		% of FSR	-100.00	+100.00
		2's complement HEX	8000	7FFF
0x04	0 ~ +5 V	Engineering unit	+00.000	+05.000
		% of FSR	+000.00	+100.00
		2's complement HEX	0000	FFFF
0x05	-5 ~ +5 V	Engineering unit	-05.000	+05.000
		% of FSR	-100.00	+100.00
		2's complement HEX	8000	7FFF