M-2004 and M-7004 User Manual

Version 1.0.2/ April 2020



M-2004 & M-7004 User Manual, v 1.0.2, Apr. 2020

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If you have any problems, please feel free to contact us.

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Chapter 1. Hardware

1.1. Introduction

The M-2004/M-7004 is a digital temperature sensor module that provides four ports for 2- or 3 wire DS18B20 digital temperature sensor input. The DS18B20 temperature sensor has a high accuracy of ± 0.5 °C when measuring temperatures between -10 and + 85°C, with a total measurement range of between -55 and +125°C. Up to 20 DS18B20 sensors can be connected to each port on the M-2004/M-7004 module in a daisy-chain arrangement with a maximum wiring distance of 100 meters. The M-2004/M-7004 module is fully RoHS compliant, and features 4 kV ESD protection as well as 3000 VDC intra-module isolation.

Applications

- Temperature Measurement
- Environment Monitoring
- Tunnel Monitoring
- Building Monitoring



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1.2. Features

- 4-Port DS18B20 Sensor Input Module
- 2/3-wire DS18B20 Wire Connection
- Max 20 Ssensors per Port
- Max. Distance of 100 m per Port when using Daisy-Chain Wiring
- Measures Temperatures from -55 to +125°C
- ±0.5°C Accuracy from -10 to +85°C
- 4 kV ESD Protection
- 3000 VDC Intra-module Isolation, Field to Logic
- RoHS Compliant
- Wide Operating Temperature Range: -25 to +75°C

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1.3. Specifications

I/O Specifications

Temperature Measurement						
Port	4					
Wiring	2-wire or 3-wire					
Sensor Type	DS18B20					
Temperature Measurement Range	-55°C to +125°C					
Resolution	12-bit					
Accuracy	±0.5°C (See Note 1)					
Sampling Rate	1 Hz					
Number of Sensors per Port	20					
Sensor Wiring Length	Max. 100 m per Port					
Note to 10 500 common only contine for	an annual state between 1990 and 19590					

Note 1: $\pm 0.5^{\circ}$ C accuracy only applies for measurements between -10°C and +85°C

System Specifications

M-2004

Communication Interface				
Interface	RS-485			
Bias Resistor	Yes, $1k \Omega$ bias resistor by switch selectable			
Format	N81, N82, E81, O81			
Baud Rate	1200 to 115200 bps			
Protocol	Modbus RTU, DCON			
Dual Watchdog	Yes, Module (1.6 Seconds), Communication (Programmable)			
LED Indicators/Display				
System LED Indicator	Yes, 1 as Power/Communication Indicator			
I/O LED Indicators				
Isolation				
Intra-module Isolated, Field-to-Logic	3000 VDC			
EMS Protection				
FCD //FC (1000 4 3)	±4 kV Contact for each Terminal			
ESD (IEC 61000-4-2)	±8 kV Air for Random Point			
EFT (IEC 61000-4-4)	±4 kV for Power			
Surge (IEC 61000-4-5)	±2 kV for power liner			
Power				
Reverse Polarity Protection	Yes			
Input Voltage Range	+10 ~ +48 VDC			
Power Consumption	0,5 W			
Mechanica				
Dimensions (L x W x H)	110 x 33 x 96 mm			
Installation	DIN-Rail			
Environment				
Operating Temperature	-25°C to +75°C			
Storage Temperature	-30°C to +80°C			
Relative Humidity	10 ~ 95% RH, Non-condensing			

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M-7004

Communication						
Interface	RS-485					
Bias Resistor	Yes, 1k $\boldsymbol{\Omega}$ bias resistor by Jumper selectable					
Format	N81, N82, E81, O81					
Baud Rate	1200 to 115200 bps					
Protocol	DCON Modbus/RTU					
Dual Watchdog	Yes, Module (1.6 Seconds), Communication (Programmable)					
LED Indicators/Display						
System LED Indicator	Yes, 1 as Power/Communication Indicator					
I/O LED Indicators						
Isolation						
Intra-module Isolation, Field-to-Logic	3000 VDC					
EMS Protection						
ESD (IEC 61000-4-2)	±4 kV Contact for each Terminal					
LSD (IEC 01000-7-2)	±8 kV Air for Random Point					
EFT (IEC 61000-4-4)	±4 kV for Power					
Surge (IEC 61000-4-5)	±2 kV for power liner					
Power						
Reverse Polarity Protection	Yes					
Input Range	+10 ~ +48 VDC					
Consumption	0.5 W					
Mechanical						
Dimensions (L x W x H)	123 mm x 72 mm x 35 mm					
Installation	DIN-Rail					
Environment						
Operating Temperature	-25 to +75°C					
Storage Temperature	-30 to +80°C					
Humidity	10 to 90% RH, Non-condensing					

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1.4. Pin Assignment

M-2004



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1.5. Wiring



1.6. Block Diagram



1.7. Dimensions

Dimensions (Units: mm)

M-2004



M-7004



1.8. Jumper Settings

For the M-7004 modules, the JP1 jumper can be used to enable providing the RS-485 bias. The position of the JP1 jumper is shown in the figure below.



The settings for the JP1 jumper is as follows.

Enable RS-485 bias.
Disable RS-485 bias. (factory default)

Chapter 2. Quick start

M-2004/M-7004 is a digital temperature sensor module that supports the DCON and Modbus RTU protocols. The host needs to use some DCON or Modbus RTU commands to configure and communicate with the M-2004/M-7004. ICP DAS provides the DCON Utility Pro program that can configure and test M-2004/M-7004 without understanding any DCON and Modbus RTU command. Users can follow below steps to configure M-2004/M-7004 and read temperature readings from M-2004/M-7004.

Step 1: Install DCON Utility Pro on the host.

Note: DCON Utility pro supports M-2004/M-7004 for version 2.0.0.7 and later.

ICP DAS provides different versions of DCON Utility Pro for different platforms that can be used to configure and test I/O modules. The installation file locations for different platforms are as follows:

For Windows 98,NT,2000,XP,Vista,Win 7 and Win 8 on PC, laptop and etc computer				
CD	CD:\ 8000\NAPDOS\Driver\DCON_Utility			
FTP	http://ftp.icpdas.com/pub/cd/8000cd/napdos/driver/dcon_utility/			
For ICI	P DAS CE5 platform PAC			
CD	CD:\ napdos\wp-8x4x_ce50\Micro_SD\DCON_Utility_Pro			
FTP	http://ftp.icpdas.com.tw/pub/cd/winpac/napdos/wp-8x4x_ce50/ micro_sd/dcon_utility_pro/			
For ICI	P DAS CE6 platform PAC			
CD	CD:\ XPAC\XPAC-ATOM-CE6\PC_Tools\DCON_Utility_Pro			
FTP	http://ftp.icpdas.com.tw/pub/cd/xpac-atom-ce6/pc_tools/dcon_ut ility_pro/			
For ICF	P DAS CE7 platform and ARM CPU PAC			
CD	CD:\WinPAC_AM335x\Wp-5231\System_Disk\Tools \DCON_Utility_Pro			
FTP	http://ftp.icpdas.com.tw/pub/cd/winpac_am335x/wp-5231/syste m_disk/tools/dcon_utility_pro			
For ICI	P DAS WES platform PAC			
CD	CD:\ XPAC\XPAC-Atom\tools\DCON_Utility_pro			
FTP	http://ftp.icpdas.com.tw/pub/cd/xpac-atom/tools/dcon_utility_pro/			

Step 2: Search and find the M-2004/M-7004 module

DCON Utility Pro V 2.0.0.7	:
Start Address 255	
ID Address Baud Rate Checksum Format Status Description	
Comport Option × COM Port Timeout	
Baud tate Protocol Checksum Format	
☑ 11520 □ 57600 □ 38400 □ 19200	
☑ 9600	:
OK Cancel	

Select the correct COM Port and search:

Find the M-2004/M-7004 module, click the module name to enter configuration form

BCON Utility Pro V 2.0.0.7	
Start Address 0 End Address 255	
Address Baud Rate Checksum Format Status Description	
7004 I[II] 9000 Disable N,8,1 Remote I/O [DCON]4-AL I-wire digital thermometer	X
Configuration Temperature About	
Protocol(INIT*)	
Address 1 01H	
Baud Rate(INIT*) 9600	
Parity(INIT*) N.8,1-None Parity	
Checksum(INIT*) Disable	
Set Module Configurations	
	i
Exit	1
	1.

Step 3: Configure M-2004/M-7004 using DCON Utility Pro To read temperature, each sensor must be assigned a channel index. The easiest way is to select Temperature tab and select "Assign all new sensor as default". Then, you can read the temperature for all sensors.

For the sensor which is not installed or not assigned, its temperature reading is -999.99 for DCON protocol and -32768 for Modbus RTU protocol as shown below.

004 Firmware[A107]					
Configuration Temperature About					
Port 0 Se	elect P	ort 0			
Port_1 Ser	ensor:0	-999.99	Sensor:1	-999.99	
Port_ 2	ensor:0	-999.99	Sensor:1	-999.99	
Port_ 3	ensor:0	-999.99	Sensor:1	-999.99	
Ser	ensor:0	-999.99	Sensor:1	-999.99	
Ser	ensor:0	-999.99	Sensor:1	-999.99	
Ser	ensor:0	-999.99	Sensor:1	-999.99	
Ser	ensor:0	-999.99	Sensor:1	-999.99	
Ser	ensor:0	-999.99	Sensor:1	-999.99	
Ser	ensor:0	-999.99	Sensor:1	-999.99	
Ser	ensor:0	-999.99	Sensor:1	-999.99	
Update Selection Update assigned sensor		Export Assigned Sensor			
Update new sensor	-		-		
Assign all new sensors as default					
Exit					

Step 4: Manual update, assign and remove sensor

Select "Update new sensor" to manually assign sensor

7004 Firmware[A107]					×
Configuration Temperature About					
Port_ 0	Select	Port_0			
-Port_ 1	Sensor:0	-999.99	Sensor:1	-999.99	
-Port_ 2	Sensor:0	-999.99	Sensor:1	-999.99	
Port_ 3	Sensor:0	-999.99	Sensor:1	-999.99	
	Sensor:0	-999.99	Sensor:1	-999.99	
	Sensor:0	-999.99	Sensor:1	-999.99	
	Sensor:0	-999.99	Sensor:1	-999.99	
	Sensor:0	-999.99	Sensor:1	-999.99	
	Sensor:0	-999.99	Sensor:1	-999.99	
	Sensor:0	-999.99	Sensor:1	-999.99	
	Sensor:0	-999.99	Sensor:1	-999.99	
Update Selection Update assigned sensor		Export Assigned Sensor	1		
Update new sensor		•			
Assign all new sensors as default					
Exit Kemove all assigned sensors					
					1.

Select "Update assigned sensor" then you can read temperature reported by the sensor:

Port_ 0	Select	Port_ 0			
Assigned_Sensor_0_370008025B0C7010	Sensor:0	026.62	Sensor:1	026.50	
Assigned_Sensor_1_690008025AC57010	Sensor:0	026.68	Sensor:1	026.75	
Assigned_Sensor_2_E30008025AD35410	Sensor:0	026.62	Sensor:1	026.43	
Assigned_Sensor_3_4F0008025B2A8210	Sensor:0	026.62	Sensor:1	026.50	
Assigned_Sensor_4_4E0008025AC6C210	Sensor:0	026.62	Sensor:1	026.50	
Assigned_Sensor_5_060008025B38A210	Sensort	026.68	Sensor:1	026.56	
Assigned_Sensor_6_890008025B0A4A10	Sensort	026.18	Sensor:1	026.43	
Assigned_Sensor_/_EF0008025B23DE10	Sensorio	026.12	Concord	026.45	
Assigned_Sensor_8_930008025633DE10	G O	020.12	Jensor.1	020.02	
Assigned_Sensor_9_4A0008025ADRATI0	Sensor:0	020.37	Sensor:1	020.50	
Assigned_Sensor_10_900008025ADBE910	Sensor:0	026.68	Sensor:1	-999.99	
Assigned_Sensor_12_50000025AD64510					
Assigned_Sensor_12_SD0008025AD04510					
Assigned Sensor 14 D30008025B17E310					
Assigned Sensor 15 080008025B294B10	•				
ate Selection Undate assigned sensor		Export Assigned Sensor	1		
Update new concor	j —	Inport Houghou Bonior			
Update assigned sensor					
Remove all assigned sensors					

Select "Remove all assigned sensor" to remove all assigned sensor, the temperature readings of all sensors will be changed to "-999.99"

7004 Firmware[A107]		×
Configuration Temperature About	^	
Port_ 0	Select Port_0	\wedge
Port_ 1	Sensor:0 999.99	Sensor:1 -999.99
Port_ 2	Sensor:0 -999.99	Sensor:1 -999.99
Port_ 3	Sensor:0 -999.99	Sensor:1 -999.99
	Sensor:0 999.99	Sensor:1 999.99
	\mathbf{V}	
		-
Update Selection Update new sensor	Export Un-Assigned Sensor	
Update new sensor Update assigned sensor		
Remove all assigned sensors		
Exit		
上午 09:42 :: READ_CH8_SENSOR_AI[#01008]; []; [2355 ms] => (FimeOut)	

Step 5: Save the Assigned Sensor to a .csv file.

To ease checking, comparing and re-assigning sensors, DCON Utility Pro provides the "Export Assigned Sensor" function, as shown below, to save sensor data to a Excel .csv file. Then use can have more convenience to check, compare or re-assign sensor in many sensors conditions. Use DCON Utility Pro to save assigned sensors to a file.

87004 Firmware[A106						×							
Configuration Temper	nature Event Log About												
Port_ 0		Select CH	1:0										
Port_1		Sensor:00	025.43	Sensor 1	0 025.06								
Port_2		Sensor:01	-999.99	Sensor 1	025.31								
		Sensor:02	025.37	Sensor 1	2 085.00	另存新檔							\times
		Sensor:03	025.50	Sensor 1	8 085.00	← → × ↑	DN_Utility_pro > pro > 20170322 > DCOM	N_Utility_Pro_PC > cr	nd_config	~ Ō	授尋 cmd_config		P
		Sensor:04	085.00	Sensor 1	4 025.37	组合管理 ▼ 新増資料共						800 -	0
		Sensor:05	025.43	Sensor 1	5 085.00	^	名稱	信改日期	湖리	大小			-
		Sensor:06	-999.99	Sensor 1	5 025.50	★ 快速存取	87004 AA 1 Assigned Sensor0801.csv	2017/8/1 下午 03	Microsoft Office	1.K	В		
		Sensor:07	025.50	Sensor 1	7 025.50	二 兵西 ・	2						
		Sensor:08	025.56	Sensor 1	8 025.37	◆ N町 メ ◎ 立作 →							
		Sensor:09	025.37	Sensor 1	9 025.43								
						hans							
Update Selection	Update assigned sensor $~~ \backsim$		Export Assigned Sensor			Hans 交接_2017							
						季冊							
Excit						交接							
						ConeDrive							
						- 本機							
						Suttem (F-)							
						橿案名稱(N): 87004	AA_1_Assigned_Sensor.csv						~
						存檔類型(T): CSV file	es (*.csv)						\sim
											and all set		
						▲ 陸藏資料英					存欄(S)	取消	

User can use the information saved in the file to check, compare and re-assign sensors between software and the sensors located in the field.

						_
	Α	В	С	D	Е	
1	Port	Sensor Index	Serial Num	ber		
2	Port_0	Sensor[0]	91000007	8D8C1028		
3	Port_ 0	Sensor[1]	A000007	8CFCE828		
4	Port_0	Sensor[2]	6E000007	8F1E8C28		
5	Port_0	Sensor[3]	FC000007	8DD39C28		
6	Port_0	Sensor[4]	82000007	8E383C28		
7	Port_ 0	Sensor[5]	FE000007	8D033C28		
8	Port_ 0	Sensor[6]	18000007	8E75FC28		
9	Port_ 0	Sensor[7]	0A00007	8F278228		
10	Port_ 0	Sensor[8]	CF000007	8EE49E28		
11	Port_ 0	Sensor[9]	FF000007	8CFCDE28		
12	Port_0	Sensor[10]	66000007	8D9B2128		
13	Port_0	Sensor[11]	4E000007	8CA41928		
14	Port_0	Sensor[12]	7000007	8F109928		
15	Port_0	Sensor[13]	17000007	8E535D28		
16	Port_0	Sensor[14]	5C000007	8E558328		
17	Port_ 0	Sensor[15]	9E000007	8EA0A328		
18	Port_ 0	Sensor[16]	FC000007	8C73E328		
19	Port_ 0	Sensor[17]	05000007	8C753B28		
20	Port_0	Sensor[18]	95000007	8C47B728		
21	Port_0	Sensor[19]	2C000007	8D607728		
22						
22	▶ ₩ 87004	1 AA 1 Assigned	Sensorti 4		► 1	۲
	0,00		and a state of the			

Chapter 3. Using DS18B20 Temperature Sensor

The M-2004/M-7004 provides four ports and up to 20 DS18B20 sensors can be connected to each port. Each DS18B20 has a unique 64-bit serial code, which can be represented by 16 characters in hexadecimal format. The user must know the serial code of each DS18B20 sensor and assign unique channel index to each DS18B20 when using the M-2004/M-7004 to read temperature data from DS18B20 sensors.

When the M-2004/M-7004 is powered on, it scans all the DS18B20 sensors connected for each port. Each scanned DS18B20 is checked to see whether a channel index is assigned. If it is not assigned, then the DS18B20 is added to the not assigned list. The user has to check the not assigned list and assign channel index for all members in the not assigned list. This needs to be done only once, since all of the data will be saved to the non-volatile memory.

When a DS18B20 sensor is broken and is replaced by a new one, its channel index should be removed first. Then, send command to M-2004/M-7004 to rescan DS18B20 on the port. The new DS18B20 will be found and put to the not assigned list. The user can reassign the previous channel index to the new DS18B20.

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Suppose that there are three DS18B20 sensors installed at location A, B, and C and they are connected to port 0 of an M-2004/M-7004. Followings are the procedure to configure the M-2004/M-7004.

- 1. Refer to Chapter 2 and go through steps 1 and 2.
- 2. Select Temperature tab.
- 3. Select Port_0.
- 4. Select "Update new sensor" and you will see the undefined sensor list.

7004 Firmware[A107]					×
Port_0	Select	Port_ 0			
Undefined_Sensor_0_370008025B0C7010	Sensor:0	-999.99	Sensor:1	-999.99	
Undefined_Sensor_1_EF0008025B23DE10	Sensor:0	-999.99	Sensor:1	-999.99	
Undefined_Sensor_2_460008025AC79710	Sensor:0	-999.99	Sensor:1	-999.99	
Port_1	Sensor:0	-999.99	Sensor:1	-999.99	
Port 3	Sensor:0	-999.99	Sensor:1	-999.99	
For S	Sensor:0	-999.99	Sensor:1	-999.99	
	Sensor:0	-999.99	Sensor:1	-999.99	
	Sensor:0	-999.99	Sensor:1	-999.99	
	Sensor:0	-999.99	Sensor:1	-999.99	
	Sensor:0	-999.99	Sensor:1	-999.99	
Update Selection Update new sensor Update new sensor Update new sensor Update new sensor		Export Un-Assigned Sensor			
Exit					

Index in undefined list	Serial Code	Location
0	370008025B0C7010	А
1	EF0008025B23DE10	С
2	460008025AC79710	В

- 5. Select Undefined_Sensor_X_YYYYYYYYYYYYYYYYY to assign channel index.
- 6. Set the new index and click on the Set button.

Assign New Sensor Inde	×
64-Bit Serial No.	370008025B0C7010
Current Index	0
New Index	Set

- Repeat steps 5 and 6 until all undefined sensors are assigned with new index.
- Select "Update assign sensor" and it will show the list of assigned sensors. We can use channel index 0 to read temperature at location A, channel index 1 to read temperature at location B, and channel index 2 to read temperature at location C.

Port_ 0	Select	Port_0		
Assigned_Sensor_0_370008025B0C7010	Sensor:0	025.06	Sensor:1	-999.99
Assigned_Sensor_1_460008025AC79710	Sensor:0	025.18	Sensor:1	-999.99
Assigned_Sensor_2_EF0008025B23DE10	Sensor:0	025.18	Sensor:1	-999.99
ort_1	Sensor:0	-999.99	Sensor:1	-999.99
Port 3	Sensor:0	-999.99	Sensor:1	-999.99
one_ o	Sensor:0	-999.99	Sensor:1	-999.99
	Sensor:0	-999.99	Sensor:1	-999.99
	Sensor:0	-999.99	Sensor:1	-999.99
	Sensor:0	-999.99	Sensor:1	-999.99
	Sensor:0	-999.99	Sensor:1	-999.99
ate Selection Update assigned sensor Indete systemed sensor Update systemed sensor		Export Assigned Sensor		

Assigned channel index	Serial Code	Location
0	370008025B0C7010	А
2	EF0008025B23DE10	С
1	460008025AC79710	В

If the sensor at location B is broken and to be replaced by a new sensor, then do the followings.

1. Select Assigned_Sensor_1_460008025AC79710.

Firmware[A107]					
figuration Temperature About					
Port_ 0	Select	Port_0			
Assigned Sensor 0 370008025B0C7010	Sensor:0	025.18	Sensor:1	-999.99	
Assigned_Sensor_1_460008025AC79710	Sensor:0	025.31	Sensor:1	-999.99	
Assigned_Sensor_2_EF0008025B23DE10	Sensor:0	025.25	Sensor:1	-999.99	
Port_1	Sensor:0	-999.99	Sensor:1	-999.99	
Port_2	Sensor:0	-999.99	Sensor:1	-999.99	
Port_ 3	Sensor:0	-999.99	Sensor:1	-999.99	
	Sensor:0	-999.99	Sensor:1	-999.99	
	Sensor:0	-999.99	Sensor:1	-999.99	
	Sensor:0	-999.99	Sensor:1	-999.99	
	Sensor:0	-999.99	Sensor:1	-999.99	
date Selection Update assigned sensor]	Export Assigned Sensor			

2. Select Remove.

Assign New Sensor Index		x
64-Bit Serial No.	460008025AC79710	
Current Index	1 Cancel	
		11.

- 3. Disconnect the broken sensor from the port.
- 4. Connect the new sensor to the port.
- 5. Select "Update new sensor" and you will see the new sensor as undefined sensor.

∋ Port_ 0	Select	Port_0		
Undefined_Sensor_0_4A0008025ABFA110>	Sensor:0	025.62	Sensor:1	-999.99
Port_1	Sensor:0	-999.99	Sensor:1	-999.99
Port_2	Sensor:0	025.81	Sensor:1	-999.99
Port_ 3	Sensor:0	-999.99	Sensor:1	-999,99
	Sensor:0	-999.99	Sensor:1	-999.99
	Sensor:0	-999.99	Sensor:1	-999.99
	Sensor:0	-999.99	Sensor:1	-999.99
	Sensor:0	-999.99	Sensor:1	-999.99
	Sensor:0	-999.99	Sensor:1	-999.99
	Sensor:0	-999.99	Sensor:1	-999.99
pdate Selection		Export Un-Assigned Sensor		
Assign all new sensors as default Remove all assigned sensors				

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E-mail: service@icpdas.com

- 6. Select Undefined_Sensor_0_4A0008025ABFA110 to assign channel index.
- 7. Set the new index and click on the Set button.

Assign New Sensor Inde	x	×
64-Bit Serial No.	4A0008025ABFA110	
Current Index	0	
New Index	Set	

8. Select "Update assign sensor" and it will show the updated list of assigned sensors.

Port_ 0	Select	Port_0			
Assigned_Sensor_0_370008025B0C7010	Sensor:0	025.06	Sensor:1	-999.99	
-Assigned_Sensor_1_460008025AC79710	Sensor:0	025.18	Sensor:1	-999.99	
Assigned_Sensor_2_EF0008025B23DE10	Sensor:0	025.18	Sensor:1	-999.99	
² ort_1	Sensor:0	-999.99	Sensor:1	-999.99	
Port_2	Sensor:0	-999.99	Sensor:1	-999.99	
-or_ 5	Sensor:0	-999.99	Sensor:1	-999.99	
	Sensor:0	-999.99	Sensor:1	-999.99	
	Sensor:0	-999.99	Sensor:1	-999.99	
	Sensor:0	-999.99	Sensor:1	-999.99	
	Sensor:0	-999.99	Sensor:1	-999.99	
Selection Update assigned sensor Update assigned sensor Update assigned sensor Assign of non-sensor Remove all assigned sensors		Export Assigned Sensor			

Assigned channel index	Serial Code	Location
0	370008025B0C7010	А
2	EF0008025B23DE10	С
1	4A0008025ABFA110	В

Chapter 4. DCON Command Sets

Command	Description
\$AAF	read firmware version
\$AAI	read INIT status
	response:
	!AA0 -> INIT short to GND
	!AA1 -> else
\$AAM	read module name
\$AAP	Read Modbus RTU/DCON protocol
	response:
	!AA0 -> DCON
	!AA1 -> Modbus RTU
\$AAPN	Set Modbus RTU/DCON protocol
	N-> 0: DCON, 1: Modbus RTU
\$AA2	read configuration
\$AA5	read reset status
	AA1 first after power on, AA0 others
#AAP	Read temperature readings of all connected sensors of a
	port
	P: port number, 0 ~ 3
	response
	> (sensor 0 reading in 0.01°C)(sensor 1 reading in
	0.01°C) (sensor last reading in 0.01°C)

Command	Description
#AAPNN	Read temperature reading of a sensor
	P: port number, 0 ~ 3
	NN: sensor channel index in hex, 00 ~ 13
	response
	> (sensor reading in 0.01°C)
%AANNTTCCFF	set configuration, NN: new address, TT = 00, CC: new
	baud rate
	FF: data format
@AAASPSSII	Assign channel index to a new sensor of a port
	P: port number, 0 ~ 3
	SS: index of the sensor in the new list in hex, $00 \sim 13$
	II: channel index of the sensor in a port to be assigned in
	hex, 00 ~ 13
@AACH	Clear all high latched temperature readings to the current
	values
@AACHP	Clear all high latched temperature readings of a port to the
	current values
	P: port number, 0 ~ 3
@AACHPII	Clear high latched temperature reading of a sensor to the
	current value
	P: port number, 0 ~ 3
	II: channel index of the sensor in a port in hex, 00 ~ 13
@AACL	Clear all low latched temperature readings to the current
	values
@AACLP	Clear all low latched temperature readings of a port to the
	current values
	P: port number, 0 ~ 3

Command	Description
@AACLPII	Clear low latched temperature reading of a sensor to the
	current value
	P: port number, 0 ~ 3
	II: channel index of the sensor in a port in hex, 00 ~ 13
@AANSP	Read number of assigned sensors of a port
	P: port number, 0 ~ 3
	response
	!AANN, NN in hex, 00 ~ 13
@AANSNP	Read number of not assigned sensors of a port
	P: port number, 0 ~ 3
	response
	!AANN, NN in hex, 00 ~ 13
@AANSRP	Read number of removed sensors of a port
	P: port number, 0 ~ 3
	response
	!AANN, NN in hex, 00 ~ 13
@AARHP	Read all high latched values of a port
	P: port number, 0 ~ 3
	response
	> (sensor 0 reading in 0.01°C)(sensor 1 reading in
	0.01°C) (sensor last reading in 0.01°C)
@AARHPNN	Read high latched value of a sensor of a port
	P: port number, 0 ~ 3
	NN: sensor channel index in hex, 00 ~ 13
	response
	> (sensor reading in 0.01°C)

Command	Description
@AARLP	Read all low latched values of a port
	P: port number, 0 ~ 3
	response
	> (sensor 0 reading in 0.01°C)(sensor 1 reading in
	0.01°C) (sensor last reading in 0.01°C)
@AARLPNN	Read low latched value of a sensor of a port
	P: port number, 0 ~ 3
	NN: sensor channel index in hex, 00 ~ 13
	response
	> (sensor reading in 0.01°C)
@AARMPII	Remove a sensor from a port
	P: port number, 0 ~ 3
	II: index of the sensor in a port to be removed in hex, 00 \sim
	13
@AARSP	Rescan sensors connected to a port
	P: port number, 0 ~ 3
@AASNPNN	Read serial code of an assigned sensor of a port
	P: port number, 0 ~ 3
	NN: sensor channel index in hex, 00 ~ 13
	response
	!AA (16-character serial code),
	FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
@AASNNPNN	Read serial code of a not assigned sensor of a port
	P: port number, 0 ~ 3
	NN: sensor index in the not assigned list in hex, $00 \sim 13$
	response
	!AA (16-character serial code),
	FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF

Command	Description
@AASNRPNN	Read serial code of a removed sensor of a port
	P: port number, 0 ~ 3
	NN: sensor index in the removed list in hex, $00 \sim 13$
	response
	!AA (16-character serial code),
	FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
~**	clear host watchdog timeout counter
~AA0	read host watchdog status
~AA1	clear host watchdog timeout status
~AA2	read host watchdog enable/disable status and timeout
	value
~AA3ETT	enable/disable host watchdog and set timeout value
	E-> 0: disable host watchdog, 1: enable host watchdog
	TT: host watchdog timeout in 0.1s in hex format
~AARD	read response delay time in ms in hex format
~AARDVV	set response delay time in ms, VV in hex format, 00 - 1E

Baud Rate Setting (CC)

Bits 5:0

Baud rate, 0x03 ~ 0x0A

Code	0x03	0x04	0x05	0x06
Baud	1200	2400	4800	9600
Code	0x07	0x08	0x09	0x0A
Baud	19200	38400	57600	115200

Bits 7:6

00: no parity, 1 stop bit

01: no parity, 2 stop bits

10: even parity, 1 stop bit

11: odd parity, 1 stop bit

Data Format Setting (FF)

Bit 6

- 0: checksum disabled
- 1: checksum enabled

Chapter 5. Modbus Address Mappings

M-20004/M-7004 Modbus Address Mappings (Base 1)

Address	Description	Attribute
30001 ~	Temperature readings of port 0 in 0.01°C	R
30020		
40001 ~		
40020		
30021 ~	Temperature readings of port 1 in 0.01°C	R
30040		
40021 ~		
40040		
30041 ~	Temperature readings of port 2 in 0.01°C	R
30060		
40041 ~		
40060		
30061 ~	Temperature readings of port 3 in 0.01°C	R
30080		
40061 ~		
40080		
30081 ~	Number of sensors of a port for port 0 to 3.	R
30084		
40081 ~		
40084		
30097 ~	Number of not assigned sensors of a port for	R
30100	port 0 to 3.	
40097 ~		
40100		

Address	Description	Attribute
30113 ~	Number of removed sensors of a port for port 0	R
30116	to 3.	
40113 ~		
40116		
30129 ~	Number of scanned sensors of a port for port 0	R
30132	to 3.	
40129 ~		
40132		
30145 ~	Number of error counts of a port for port 0 to 3.	R
30148		
40145 ~		
40148		
30161 ~	Serial number of sensors of port 0, 4 registers	R
30240	for a sensor	
40161 ~		
40240		
30241 ~	Serial number of sensors of port 1, 4 registers	R
30320	for a sensor	
40241 ~		
40320		
30321 ~	Serial number of sensors of port 2, 4 registers	R
30400	for a sensor	
40321 ~		
40400		
30401 ~	Serial number of sensors of port 3, 4 registers	R
30480	for a sensor	
40401 ~		
40480		

Address	Description	Attribute
40481	Firmware version (low word)	R
40482	Firmware version (high word)	R
40483	Module name (low word)	R
40484	Module name (high word)	R
40485	RS-485 module address, 1 to 247	R/W
	Only for Modbus RTU protocol	
40486	RS-485 baud rate and parity settings	R/W
	Bits 5:0	
	Baud rate, valid range: 3 ~ 10	
	Bits 7:6	
	00: no parity, 1 stop bit	
	01: no parity, 2 stop bit	
	10: even parity, 1 stop bit	
	11: odd parity , 1 stop bit	
40488	RS-485 response delay time in ms, valid	R/W
	range, 0 ~ 30	
40489	RS-485 host watchdog timeout value, 0 ~ 255,	R/W
	in 0.1s	
40492	RS-485 host watchdog timeout count, write 0	R/W
	to clear	
40513 ~	Assign channel index to a new sensor in the	W
40532	new list of port 0	
40533 ~	Assign channel index to a new sensor in the	W
40552	new list of port 1	
40553 ~	Assign channel index to a new sensor in the	W
40572	new list of port 2	
40573 ~	Assign channel index to a new sensor in the	W
40592	new list of port 3	

Address	Description	Attribute
30593 ~	High latched Temperature readings of port 0 in	R
30612	0.01°C	
40593 ~		
40612		
30613 ~	High latched Temperature readings of port 1 in	R
30632	0.01°C	
40613 ~		
40632		
30633 ~	High latched Temperature readings of port 2 in	R
30652	0.01°C	
40633 ~		
40652		
30653 ~	High latched Temperature readings of port 3 in	R
30672	0.01°C	
40653 ~		
40672		
30673 ~	Low latched Temperature readings of port 0 in	R
30692	0.01°C	
40673 ~		
40692		
30693 ~	Low latched Temperature readings of port 1 in	R
30712	0.01°C	
40693 ~		
40712		
30713 ~	Low latched Temperature readings of port 2 in	R
30732	0.01°C	
40713 ~		
40732		

Address	Description	Attribute
30753 ~	Serial number of not assigned sensors of port	R
30832	0, 4 registers for a sensor	
40753 ~		
40832		
30833 ~	Serial number of not assigned sensors of port	R
30912	1, 4 registers for a sensor	
40833 ~		
40912		
30913 ~	Serial number of not assigned sensors of port	R
30992	2, 4 registers for a sensor	
40913 ~		
40992		
30993 ~	Serial number of not assigned sensors of port	R
31072	3, 4 registers for a sensor	
40993 ~		
41072		
31073 ~	Serial number of removed sensors of port 0, 4	R
31152	registers for a sensor	
41073 ~		
41152		
31153 ~	Serial number of removed sensors of port 0, 4	R
31232	registers for a sensor	
41153 ~		
41232		
31233 ~	Serial number of removed sensors of port 0, 4	R
31312	registers for a sensor	
41233 ~		
41312		

Address	Description	Attribute		
31313 ~	Serial number of removed sensors of port 0, 4	R		
31392	registers for a sensor			
41313 ~				
41392				
00001 ~	Write 1 to rescan sensors on a port for port 0 to W			
00004	3.			
00033 ~	Write 1 to remove the channel index of a W			
00052	sensor for port 0			
00053 ~	Write 1 to remove the channel index of a W			
00072	sensor for port 1			
00073 ~	Write 1 to remove the channel index of a W			
00092	sensor for port 2			
00093 ~	Write 1 to remove the channel index of a W			
00112	sensor for port 3			
00129 ~	Write 1 to clear all high latched temperature W			
00132	readings of a port for port 0 to 3			
00161 ~	Write 1 to clear all low latched temperature W			
00164	readings of a port for port 0 to 3			
00257	RS-485 Protocol, 0: DCON, 1: Modbus RTU	R/W		
	Only for Modbus RTU protocol			
00260	Modbus RTU host watchdog mode	R/W		
	0: same as I-7000			
	1: can use AO and DO command to clear host			
	watchdog timeout status			
	Only for Modbus RTU protocol			
00261	RS-485 host watchdog mode, 1: enable, 0:	R/W		
	disable.			
	Only for Modbus RTU protocol			
00270	Host watch dog timeout status, write 1 to clear	R/W		
	host watch dog timeout status			
	Only for Modbus RTU protocol			

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Address	Description	Attribute
00273	Reset status, 1: first read after powered on, 0:	R
	not the first read after powered on	
00280	Write 1 to clear all high latched temperature	W
	readings	
00281	Write 1 to clear all low latched temperature	W
	readings	
00385 ~	Write 1 to clear high latched temperature reading W	
00404	of a sensor of port 0	
00405 ~	Write 1 to clear high latched temperature reading W	
00424	of a sensor of port 1	
00425 ~	Write 1 to clear high latched temperature reading W	
00444	of a sensor of port 2	
00445 ~	Write 1 to clear high latched temperature reading W	
00464	of a sensor of port 3	
00465 ~	Write 1 to clear low latched temperature reading	W
00484	of a sensor of port 0	
00485 ~	Write 1 to clear low latched temperature reading	W
00504	of a sensor of port 1	
00505 ~	Write 1 to clear low latched temperature reading W	
00524	of a sensor of port 2	
00525 ~	Write 1 to clear low latched temperature reading	W
00544	of a sensor of port 3	

Chapter 6. Troubleshooting

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

- Ensure that the supplied power is within the range of +10 to +30 V DC. If the supplied power is OK, then the power LED should be on.
- Ensure that the RS-485 converter provides the bias. The RS-485 converters manufactured by ICP DAS all provide the bias. If the RS-485 converter does not provide the bias, then you can refer to section 1.8 to open the cover to adjust the jumper to enable the RS-485 bias for M-7004. For M-2004, you can turn on the two B.R. switches to provide the RS-485 bias.
- When the module receives a command, the power LED is set to "off". The power LED is shown as "on" after the module responds. This method can be used to check whether the module has received a command sent from the host.
- If possible, use another device to check whether the host can communicate with the device through the same RS-485 network.
- If the host is a PC installed with a Windows operating system, then execute the DCON Utility to determine whether the module can be found. The DCON Utility can be downloaded from the ICP DAS website <u>http://www.icpdas.com</u>. Please refer to Chapter 2 for details.
- Set the module to "INIT mode" and communicate with the module using the following settings: address 00, Baud Rate 9600bps and no checksum.

Revision History

Revision	Date	Changes Made
1.0.2	2020/4/1	Add section 1.8 and Chapter 6