

# Remote I/O Module and Unit 3



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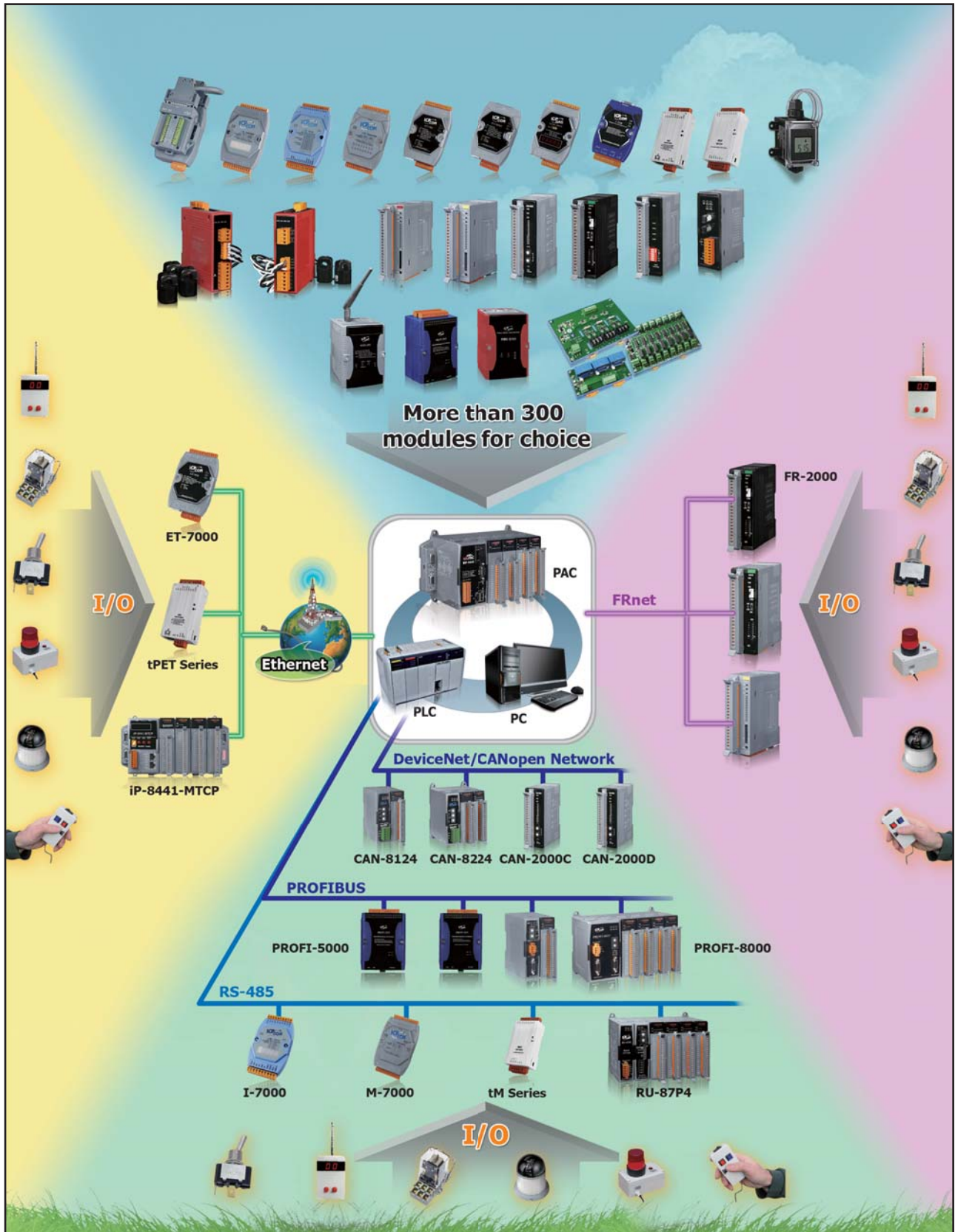
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# Overview






ICP DAS launches a series of remote I/O modules and I/O expansion units for industrial monitoring and controlling applications. The I/O modules are highly flexible and compatible, thus reduce your I/O modules inventory. Furthermore, various communication interfaces, such as **RS-485, Ethernet, EtherCAT, EtherNet/IP, Profinet, FRnet, CAN bus, Profibus and Hart** are available for PAC, PC and PLC.



# 1. RS-485 I/O Products

Although RS-485 is a very old technology, it is still a good choice to establish a cost-effective remote I/O system. Our RS-485 remote I/O module supports DCON protocol, Modbus RTU/ASCII protocol. According to different application, we have developed various RS-485 I/O modules, such as palm-size I-7000/M-7000 series (Ch 2-1.) and tiny-size tM series (Ch 2-2.). The module has diversified I/O interface, such as overvoltage-protection analog input module, relay output, digital input/output, counter, timer...etc.

The brief comparison is as the following table. Besides those regular RS-485 I/O modules, we can also provide some ODM modules.

Model Name	tM series	I-7000	M-7000	DL-100	LC Series	
Pictures						
<b>Communication</b>						
Protocol	DCON, Modbus RTU, Modbus ASCII	DCON	DCON, Modbus RTU			
Data Format	(N, 8, 1), (N, 8, 2), (O, 8, 1), (E, 8, 1)	(N,8,1)		(N, 8, 1), (N, 8, 2), (O, 8, 1), (E, 8, 1)		
Max. Nodes	32	256				
Bias resistor	Yes, 10 K $\Omega$	No ( <b>Note1</b> )				
Dual Watchdog	Yes, Module (2.3 second), Communication (Programmable)	Yes, Module (1.6 second), Communication (Programmable)		Module (1.6 second),	Yes, Module (2.3 second), Communication (Programmable)	
<b>I/O</b>						
DIO max. channel	8	16		0	4	
AIO	Resolution	12/14 bits	12/16 bits		12/14 bits	12 bits
	Max. channel	8 (tM-AD8)	20 (I-7017Z, M-7017Z)		1	1
	Individual Channel Configuration	-	Yes		-	-
<b>Display</b>						
Power and Communication LED	Yes					
I/O Status LED	-	Yes (for D version only)		-	-	
7-Segment LED	-	Yes (for D version only)		-	-	
<b>Mechanical</b>						
Dimensions (W x L x D)	52 x 98 x 27 mm	72 x 123 x 35 mm		82 x 126 x 55 mm	52 x 98 x 27 mm	
<b>Note1:</b> The RS-485 master is required to provide the bias. Otherwise, the tM-SG4 or SG-785 should be added to provide the bias. All ICP DAS controllers and converters provide the bias.						

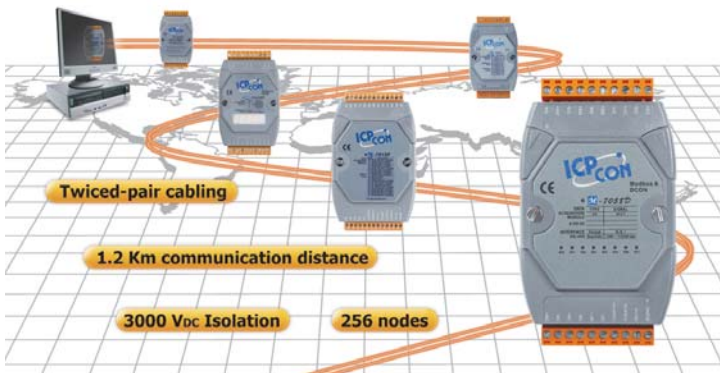
Furthermore, we also developed RU-87Pn, a series of RS-485 remote I/O unit for compact and modular I/O expansion. It comprises a CPU, a power module and a backplane with a number of I/O slots for flexible I/O configuration. With its patented technology, namely auto configuration and hot swap, it saves lots of labor on the set up and maintenance of the automation systems. Reliable 3-piece construction enables users to hot swap modules during operation, without rewiring. All I/O module data are backed up in the non-volatile memory of the RU-87Pn. After hot-swapping a module, all settings are automatically loaded to recover.



## Features ▶▶▶▶▶

- Hot Swap
- Auto Configuration
- Easy Duplicate System
- Easy Maintenance and Diagnosis
- DCON Protocol

## 1.1 I-7000 and M-7000 Series



I-7000 and M-7000 remote I/O modules 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. I-7000 supports DCON protocol, and M-7000 modules support Modbus RTU and DCON protocols. Many SCADA/HMI software and PLCs support Modbus RTU protocol. It is easy for them to integrate with M-7000 modules.

### Applications

Factory automation, machine automation, testing equipment, building automation, solar energy system, pollution monitoring system, heating chamber...etc

### Features

#### ■ RS-485 Industrial Multi-Drop Network

I-7000/M-7000 series modules use the industrial EIA RS-485 communication interface to transmit and receive data at high speed over long distance. All modules are easy to integrate to the regular computer and controller. Internal surge protection circuitry is used on data lines to protect the modules from spikes.

#### ■ I/O type and Range Programmable

The analog modules support several types and ranges which can be selected remotely by issuing command from the host.

#### ■ Easy Mounting and Connection

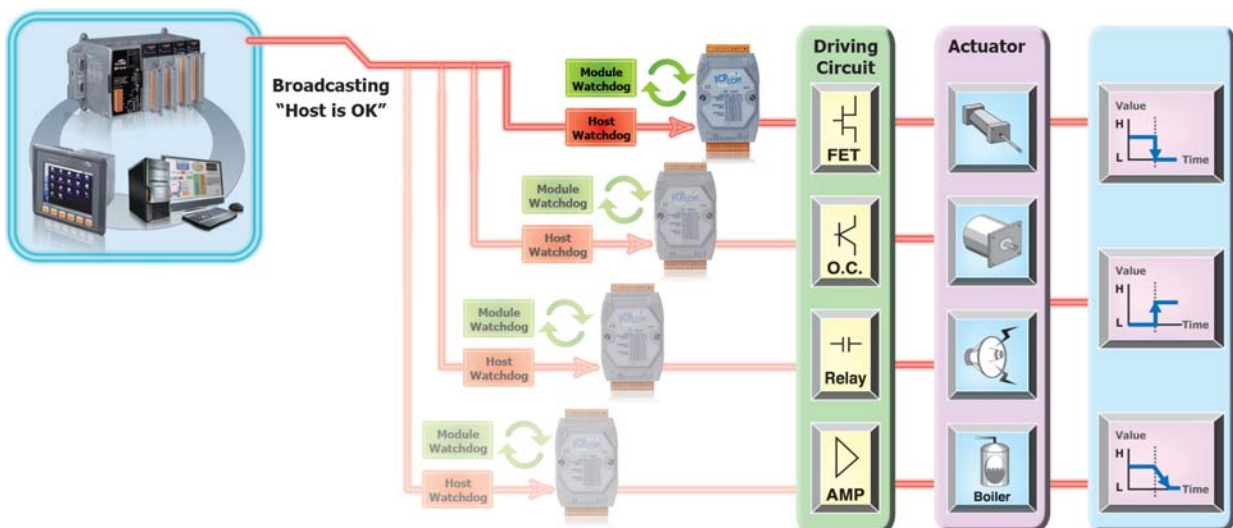
The user may mount the modules on a DIN rail or piggyback.

#### ■ Rugged Industrial Environment

I-7000 and M-7000 modules provide module watchdog and host watchdog. The module watchdog is a hardware watchdog designed to automatically reset the micro-processor when the module hangs. The host watchdog is a software watchdog that monitors the communication status of the host controller, such as PC, PLC and PAC. The output of module will go to the safe value state when the host fails to prevent any erroneous operations. The Dual Watchdog design ensures higher reliability and stability.

#### ● Programmable Power-on Value and Safe Value

The DO and AO I/O modules provide programmable power-on value and safe value. When the host watchdog is active, the DO and AO output go to the pre-configured safe value.

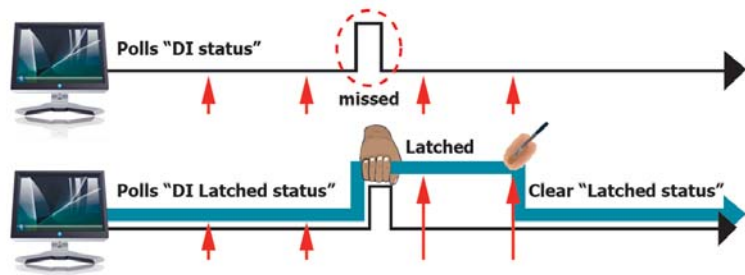


## Advanced DI Functions

DI channel is not only for reading digital input status but also provides several advanced functions in the meanwhile.

### DI Latch Function

All DI channels provide Latch function to keep the high/low events in the internal registers of the module. In general, the host controller polls modules one by one to get all DI status. Because RS-485 is a low speed field bus, the polling will take time and probably miss a short duration signal. With the DI latch function, the short duration (>=5 ms) signal will not be lost any more.



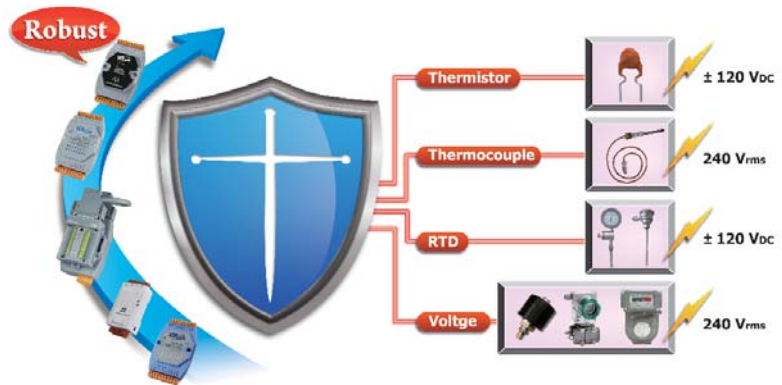
### Low Speed Counter

The DI module automatically counts the DI signal in the background. The signal under 100 Hz can be detected and counted.



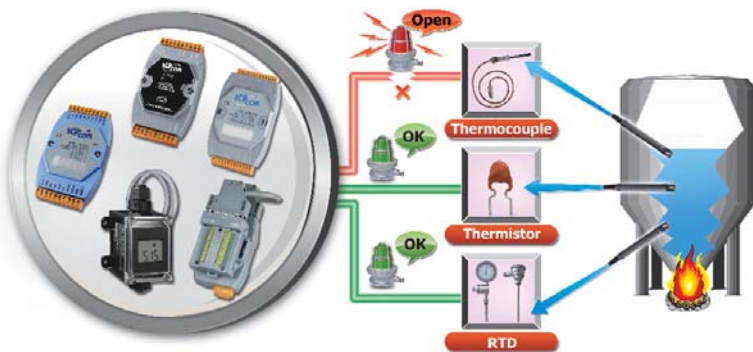
## Overvoltage Protection

Many of our analog input modules provide high overvoltage protection for the analog input channels. When user picks wrong line accidentally or high voltage spike is applied to the analog input terminals, the module will not be broken and can still get the correct readings. This feature improves the reliability, reduces maintenance frequency, and makes the whole system more robust.



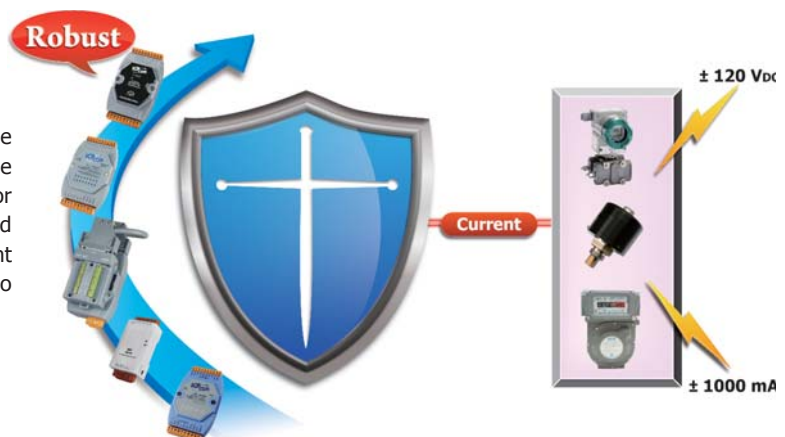
## Open Wire Detection

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.



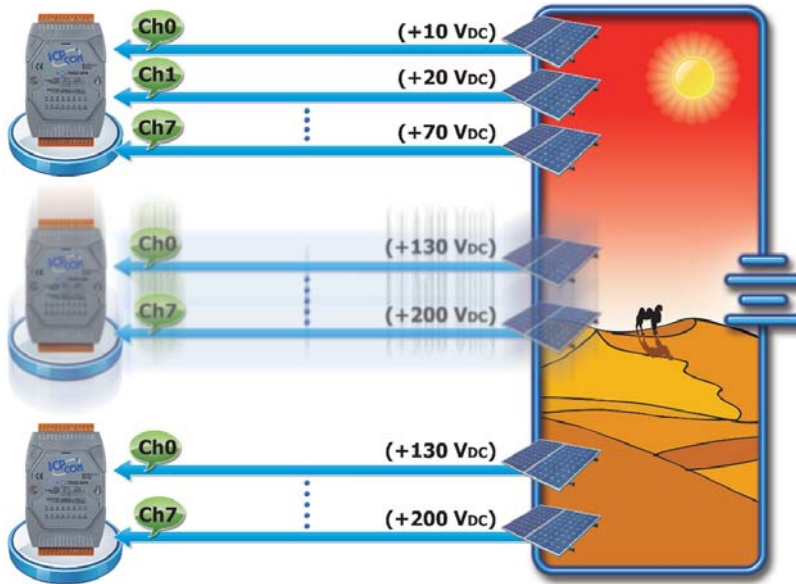
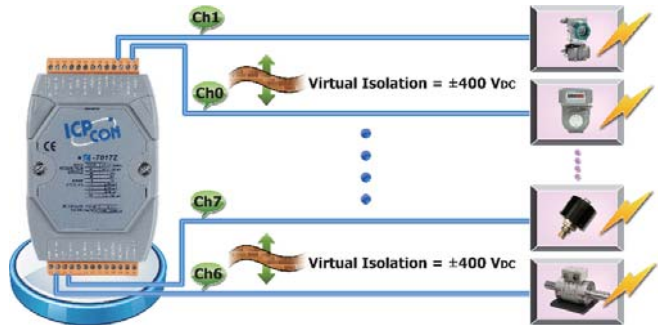
## Over-current Protection

For the current measurement module, it may be damaged when there is high current or voltage introduced into the current loop. The protection for current measurement is improved to +/-120 VDC and +/-1000 mA. A high current or voltage in the current loop will not damage the current measurement, so the whole system can work normally.



### Virtual Channel to Channel Isolation

The "R" and "Z" version of analog input modules provide +/-400 VDC virtual channel to channel isolation to avoid the noise interference from adjacent channel in the industrial environment. To name a few of the modules, they are I-7017R, I-7017Z, I-7018R, I-7018Z, I-7019R, and I-7019Z. Though it is not real channel to channel isolation, there is only 1uA leakage current between two adjacent channels and the interference is very small and can be negligible.

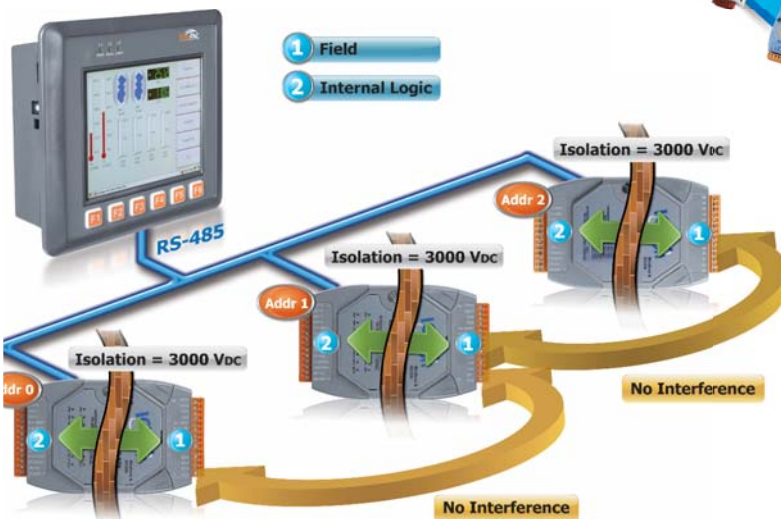


### Common Voltage Protection

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 between vin+ and vin- terminal, while the common voltage is up to 200 VDC. If the common voltage of the analog input module is not large enough, then it can not measure the correct voltage of the battery in charging. ICP DAS analog input modules provide +/-200 VDC high common voltage for industrial applications.

### ESD Protection

In the industrial environment there are many noise, 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. Our modules are immunity to the electrostatic discharges by using components that can clamp and resist to the high voltages defined by IEC 61000-4-2 standard.



### 3000 Vdc Isolation

The I-7K and M-7K series have 3000 VDC isolation between the field and the internal logic. This isolation prevents the noise from the field to the internal logic that can damage the module. It is recommended to choose isolated modules that will be connected on RS-485 network. There will be no interference from the neighbor module because the noise from the neighbor module is isolated.

## ■ Dual Communication Protocols

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, TRACE MODE, EZ data logger, EZ Prog..etc.

**I-7000:** supports DCON protocol

**M-7000:** supports 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.

## ■ Expandable Network

I-7510 repeater is more than a pure isolated repeater. "Self-Tuner" ASIC is built-in. It has some outstanding features, such as 3000V isolation, 115K max. speed, variable baud rate and data format. Each I-7510 repeater can let you extend the network to another 4,000 ft long. Actually the user should consider the network length and the hardware loading effect and use I-7510 to isolate different groups to avoid high voltage hitting the whole system through a single communication network.

## Hardware

### 1. Installation

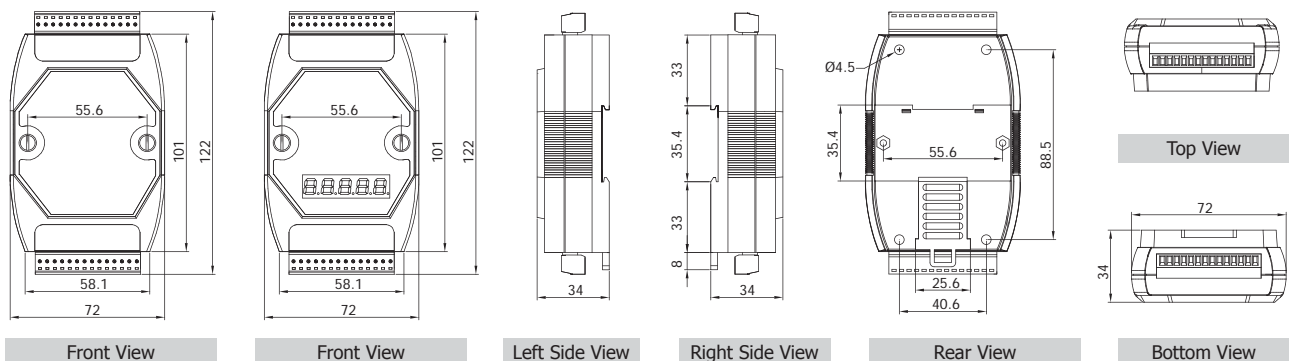


DIN-Rail Mounting



Stack Mounting

### 2. Dimensions (Units: mm)

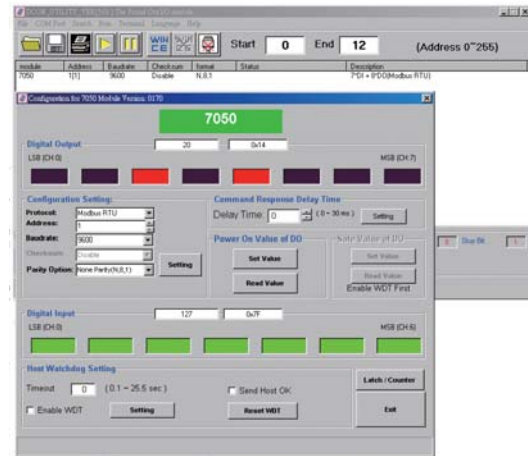


## Software Support

Our free charge software utility and development kit include

### 1. DCON Utility

DCON Utility is used to search, configure and test simply the I-7000 and M-7000 modules via the serial port (RS-232/485).



### 2. OPC Server

**NAPOPC\_ST DA Server** is a free OPC DA Server ("OPC" stands for "OLE for Process Control" and "DA" stands for "Data Access") for ICP DAS products. Based on Microsoft's OLE COM (component object model) and DCOM (distributed component object model) technologies, NAPOPC\_ST DA Server defines a standard set of objects, interfaces and methods for use in process control and manufacturing automation applications to facilitate the interoperability.

Using NAPOPC\_ST DA Server, system integrates data with SCADA/HMI/Database software on the same computer and others. SCADA/HMI/Database sends a request and NAPOPC DA Server fulfills the request by gathering the data of ICP DAS modules (**License Free**) and third-party devices (**License Charge**) to SCADA/HMI/Database.

For different OS of PAC products, ICP DAS provides several professional DA Servers:

Version	NAPOPC_ST	NAPOPC_XPE	NAPOPC_CE5	NAPOPC_CE6
Platform	Desktop Windows	Windows XP Embedded	Windows CE5	Windows CE6
Price	Free/\$	Free	Free	Free

For more Information please visit <http://opc.icpdas.com>



### 3. EZ Data Logger

EZ Data Logger is the software that ICP DAS provides for users to easily build a small SCADA system on Windows 2000/XP/Vista. It comes with two versions, "Lite" & "Professional". The Lite version is not only full-functioned but free to all ICP DAS users!

EZ Data Logger is a small data logger software. It can be applied to small remote I/O system. With its user-friendly interface, users can quickly and easily build a data logger software without any programming skill.

## EZ Data Logger

DCON  
Modbus TCP  
Modbus Serial

★Virtual Channel Definition

★Control Logic (VB Script)

★Alarm Notifier

High/Low Alarm

★IP Camera Viewer

Layout

Data Trend

Database and Report

### 4. Various Software Development Toolkits

Plenty of library functions and demo programs are provided to let user develop programs easily under Windows, Linux and DOS operating systems. We also provide LabVIEW driver, DASyLab driver and InduSoft driver for all I-7000 and M-7000 modules. The SDK includes:

DLL, ActiveX, LabVIEW driver, InduSoft driver, DASyLab driver, Linux driver



 **Selection Guide**

 **Voltage & Current Input**



Model Name		Analog Input							Digital I/O	
		Channels	Resolution	Sampling Rate (total)	Voltage and Current Input	Common Voltage Protection	Individual Channel Configurable	Overvoltage Protection		
<b>I-7012</b> <b>I-7012D</b>		1 diff.		10 Hz	±150 mV ±500 mV ±1 V ±5 V ±10 V ±20 mA (Note1)	±100 Vdc		±100 Vdc	DI x 1 (Note3)	
<b>I-7012F</b> <b>I-7012FD</b>				10/100 Hz	±150 mV ±500 mV ±1 V ±5 V ±10 V ±20 mA (Note1)				DO x 2 (Note4)	
<b>I-7017</b>	<b>M-7017</b>	8 diff.	16-bit	10 Hz	±150 mV ±500 mV ±1 V ±5 V ±10 V ±20 mA (Note1)	±35 VDC	-	±120 Vdc	-	
<b>I-7017C</b>	<b>M-7017C</b>				0 ~ 20 mA 4 ~ 20 mA ±20 mA (Note2)					±100 Vdc
<b>I-7017F</b>					±150 mV ±500 mV ±1 V ±5 V ±10 V ±20 mA (Note1)					±120 Vdc
<b>I-7017FC</b>				10/60 Hz	0 ~ 20 mA 4 ~ 20 mA ±20 mA (Note2)			±100 Vdc		
<b>I-7017R</b>	<b>M-7017R</b>				±150 mV ±500 mV ±1 V ±5 V ±10 V ±20 mA (Note1)			Yes (Note6)		±240 Vrms
<b>I-7017R-A5</b>	<b>M-7017R-A5</b>				10/50 Hz			±50 V ±150 V		200 Vdc
<b>I-7017RC</b>	<b>M-7017RC</b>			10 Hz	0 ~ 20 mA 4 ~ 20 mA ±20 mA (Note2)			±100 Vdc		
	<b>M-7017RMS</b>				0 ~ +10 Vrms, 0 ~ +5 Vrms, 0 ~ 1 Vrms, 0 ~ 500 mVrms, 0 ~ 150 mVrms			±35 Vdc		
<b>I-7017Z</b>	<b>M-7017Z</b>			10 diff. or 20 SE				10/60 Hz		±150 mV ±500 mV ±1 V ±5 V ±10 V 0 ~ 20 mA 4 ~ 20 mA ±20 mA (Note5)

- Note1:** Need external 125 Ω resistors.  
**Note2:** Doesn't need external 125 Ω resistors.  
**Note3:** Can be used as DI or low speed (50 Hz) counter.  
**Note4:** Can be used as DO or High/Low Alarm.  
**Note5:** Jumper selectable.  
**Note6:** Only available with the firmware version of 7017R series is B3.9 and later.

PAC Products  
 Panel Products  
 Remote I/O Module and Unit  
 Industrial Communication  
 Wireless Solution  
 Motion Automation  
 Energy Management Solution  
 DAQ Card  
 Accessories



Model Name		Analog Input							Digital I/O	
		Channels	Resolution	Sampling Rate (total)	Voltage and Current Input	Sensor Input	Open Wire Detection	Individual Channel Configurable		Overvoltage Protection
<b>I-7011</b> <b>I-7011D</b>		1 diff.			±15 mV ±50 mV ±100 mV ±500 mV ±1 V ±2.5 V ±20 mA (Note1)	J.K.T.E. R. S. B. N.C Thermocouple	Yes		±5 Vdc	DI x 1 (Note2) DO x 2 (Note3)
<b>I-7011P</b> <b>I-7011PD</b>					±15 mV ±50 mV ±100 mV ±500 mV ±1 V ±2.5 V ±20 mA (Note1)	J.K.T.E.R.S. B.N.C.L.M Thermocouple				
	<b>M-7018-16</b>	16 diff.			±15 mV ±50 mV ±100 mV ±500 mV ±1 V ±2.5 V ±20 mA (Note1)	J.K.T.E. R. S.B.N.C Thermocouple				
<b>I-7018</b>	<b>M-7018</b>						-	-	±120 Vdc	
<b>I-7018P</b>		8 diff.	16-bit	10 Hz	±15 mV ±50 mV ±100 mV ±500 mV ±1 V ±2.5 V ±20 mA (Note1)	J.K.T.E.R.S. B.N.C.L.M Thermocouple			±35 V	
<b>I-7018BL</b>										
<b>I-7018R</b>	<b>M-7018R</b>				±50 mV ±100 mV ±500 mV ±1 V ±2.5 V ±20 mA (Note1)	J.K.T.E.R.S. B.N.C.L.M Thermocouple				
<b>I-7018Z</b>	<b>M-7018Z</b>	10 diff.			±50 mV ±100 mV ±500 mV ±1 V ±2.5 V ±20 mA (Note1)	J.K.T.E.R.S. B.N.C.L.M, DIN43710 Thermocouple	Yes			
<b>I-7019R</b>	<b>M-7019R</b>	8 diff.			±15 mV ±50 mV ±100 mV ±150 mV ±500 mV ±1 V ±2.5 V ±5 V ±10 V ±20 mA (Note4)	J.K.T.E.R.S. B.N.C.L.M, DIN43710 Thermocouple		Yes		±240 Vrms
	<b>M-7019Z</b>	10 diff.								

**Note1:** Need external 125 Ω resistors.  
**Note2:** Can be used as DI or low speed (50 Hz) counter.  
**Note3:** Can be used as DO or Alarm.  
**Note4:** Jumper selectable.

 RTD Input



Model Name		Analog Input							Overvoltage Protection
		Channels	Resolution	Sampling Rate (total)	Sensor Input	Open Wire Detection	Individual Channel Configurable	3 Wire RTD long distance measurement	
I-7013	I-7013D	1	16-bit	10 Hz	Pt100, Pt1000, Ni120	Yes	-	Yes	±5 V
	M-7013P	1 (Note1)		10 Hz	Pt100				±30 V
I-7015	M-7015	6 diff.		12 Hz	Pt100, Pt1000, Ni120, Cu100, CU1000		-	-	±110 V
I-7015P	M-7015P			12 Hz	Pt100, Pt1000, Ni120, Cu100, CU1000				
I-7033	M-7033	3 diff.		15 Hz	Pt100, Pt1000, Ni120		-	Yes	±5 V

Note1: M-7013P also includes 1x DI (Dry contact, Source), 2x DO (Open Collector, MOSFET, Sink, 700mA)

 Thermistor Input



Model Name		Analog Input							Digital I/O
		Channels	Resolution	Sampling Rate	Sensor Input	Open Wire Detection	Individual Channel Configurable	Overvoltage Protection	
I-7005	M-7005	8 diff.	16-bit	8 Hz	Precon ST-A3, Fenwell U, YSI L100, YSI L300, YSI L1000, YSI B2252, YSI B3000, YSI B5000, YSI B6000, YSI B10000, YSI H10000, YSI H30000, User-defined	Yes	Yes	±110 V	DO x 6 (Note1)

Note1: Can be used as DO or High/Low Alarm.

 Transmitter Input



Model Name		Analog Input							Digital I/O	
		Channels	Resolution	Sampling Rate	Voltage and Current Input	Input Linear Scaling	Open Wire Detection	Individual Channel Configurable		Overvoltage Protection
I-7014D		1 diff.	16-bit	10 Hz	±150 mV, ±500 mV, ±1 V, ±5 V, ±10 V, ±20 mA (Note1)	Yes	-	-	±15 V	DI x 1 (Note2) DO x 2 (Note3)

Note1: Need external 125 Ω resistors.  
 Note2: Can be used as DI or low speed (100 Hz) counter.  
 Note3: Can be used as DO or High/Low Alarm.

 Strain Gauge



Model Name		Analog Input							Digital I/O
		Resolution	Channels	Sampling Rate	Voltage and Current Input	Sensor Input	Input Linear Scaling	Overvoltage Protection	
I-7016	M-7016	16-bit	2 diff.	10 Hz for 1-channel mode, 2 Hz for 2-channel mode	±15 mV, ±50 mV, ±100 mV, ±500 mV, ±1 V, ±2.5 V, ±20 mA	4 Wire Strain Gauge	Yes	±5 V	DI x 1 (Note1)
I-7016P	M-7016PD		1 diff.	10 Hz		6 Wire Strain Gauge			DO x 4 (Note2)

Note1: Can be used as DI or low speed (50 Hz) counter.  
 Note2: Can be used as DO or Alarm.

Analog Output



Model Name		Analog Output					
		Resolution	Channels	Voltage Output	Current Output	Safe Value	Power-on Value
I-7021		12-bit	1	0 ~ 10 V			
I-7021P		16-bit					
I-7022	M-7022	12-bit	2 (Note1)	±10 V, 0 ~ 10 V, ±5 V, 0-5 V	0 ~ 20 mA 4 ~ 20 mA	Yes	Yes
I-7024	M-7024	14-bit	4				
	M-7024R		4 (Note2)				
	M-7024U M-7024UD (Note3)	16-bit	4 (Note4)				
	M-7028	12-bit	8				

Note1: Channel-to-channel isolation.  
 Note2: M-7024R also includes 5 channel DI (Dry Contact).  
 Note3: M-7024UD includes LED for DI and DO status.  
 Note4: M-7024U and M-7024UD also include 4x DI(Dry and Wet contact)

Multi-function



Model Name	Analog Input		Analog Output		DC Input		DC Output	
	Channels	Voltage and Current Input	Channels	Voltage and Current Output	Channels	ON Voltage Level	Output type	Max Load Current
M-7002	4	±150 mV, ±500 mV ±1 V, ±5 V, ±10 V 0 ~ 20 mA, 4 ~ 20 mA, ±20 mA (Note1)	-	-	5	10 ~ 50 VDC	Power Relay (Form A)	5 A @ 250 VAC/30 Vdc
M-7003	8		-	-	-	-		
M-7026	6		2	±10 V, 0 ~ 10 V, ±5 V, 0 ~ 5 V, 0 ~ 20 mA, 4 ~ 20 mA (Note1)	3	Connect to GND	Open Collector x 3	Sink, 700 mA

Note1: Jumper selectable.

DC Input



Model Name		DC Input				
		Channels (Note1)	Type	ON Voltage Level	OFF Voltage Level	Isolation Voltage
I-7041 I-7041D	M-7041 M-7041D	14 (Sink/Source)	Common Source	+4 ~ +30 V	+1 V Max.	3750 Vrms
I-7041P I-7041PD	M-7041P M-7041PD			+19 Vdc ~ +30 Vdc	+11 Vdc Max.	
	M-7041-A5 M-7041D-A5			+68 Vdc ~ +150 Vdc	+11 Vdc Max.	
I-7051 I-7051D	M-7051 M-7051D	16 (Sink/Source)	Common Source or Common Ground	+10 ~ +50 V	+4 V Max.	5000 Vrms
I-7052 I-7052D	M-7052 M-7052D	8 (Sink/Source)	6 Differential and 2 Common Ground (Note2)	+4 ~ +30 V	+1 V Max.	
I-7053_FG I-7053D_FG	M-7053 M-7053D	16 (Sink/Source)	Dry Contact	Open		

Note1: DI channel can be used as DI or low speed (100Hz) counter.  
 Note2: 6 differential inputs provide 2 KV channel to channel isolation.

DC Output



Model Name		DC Output					
		Channels	Output type	Load Voltage	Max Load Current	Short Circuit Protection	Isolation Voltage
I-7042 I-7042D		13 (Sink)	Open Collector (NPN)	+3.5 ~ +30 V	100 mA	-	3750 Vrms
I-7043 I-7043D		16 (Sink)					-
I-7045 I-7045D	M-7045 M-7045D	16 (Source)	Open Source (N-MOSFET)	+10 ~ +40 V	650 mA	Yes	3750 Vrms
I-7045-NPN I-7045D-NPN	M-7045-NPN M-7045D-NPN	16 (Sink)	Open Collector (NPN)	+3.5 ~ +50 V	700 mA		3750 Vdc

 DC Input/Output



Model Name		DC Output				DC Input		
		Channels	Load Voltage	Max Load Current	Short Circuit Protection	Channels (Note1)	ON Voltage Level	OFF Voltage Level
I-7044 I-7044D		8 (Sink) Open Collector (3750 Vrms)	+3.5 ~ +30 V	375 mA	-	4 (Sink/Source, 3750 Vrms)	+4 ~ +30 V	+1 V Max.
I-7050 I-7050D	M-7050 M-7050D	8 (Sink) Open Collector (3750 Vrms)		30 mA		7 (Sink, Non-Isolation)		
I-7050A I-7050AD		8 (Source) Open Collector (3750 Vrms)		50 mA		7 (Source, Non-Isolation)		
I-7055 I-7055D	M-7055 M-7055D	8 (Source) Open Source (3750 Vrms)	+10 ~ +40 V	650 mA	Yes	8 (Sink/Source, 3750 Vrms)	+10 ~ +50 V	+4 V Max.
I-7055-NPN I-7055D-NPN	M-7055-NPN M-7055D-NPN	8 (Sink) Open Collector (NPN) (3750 Vrms)	+3.5 ~ +50 V	700 mA		8 (Sink/Source, 3750 Vrms)		

Note1: DI channel can be used as DI or low speed (100 Hz) counter.

 AC Digital Input



Model Name		AC Digital Input					
		Channels (Note1)	ON Voltage Level	OFF Voltage Level	Max. Input Voltage	Operating AC Frequency	Isolation Voltage
I-7058 I-7058D	M-7058 M-7058D	8 Differential	250 ~ 80 VAC	< 30 VAC Max.	250 VAC	50/60 Hz	5000 Vrms
I-7059 I-7059D	M-7059 M-7059D		80 ~ 10 VAC	< 3 VAC	80 VAC		

Note1: DI channel can be used as DI or low speed (100 Hz) counter.

 Power Relay Output/DC Input



Model Name		Power Relay Output					DC Input		
		Channels	Contact Rating	Surge Strength	Operate Time	Release Time	Electrical Endurance	Channels	ON Voltage Level
I-7060 I-7060D	M-7060 M-7060D	RL1,RL2: Form A x 2 RL3,RL4: Form C x 2	0.6 A @ 125 VAC 2 A @ 30 VDC	1500 V	3 mS	2 mS	5 x 10 <sup>5</sup> ops.	4 (3750 Vrms)	+4 ~ 30 V
	M-7060P		16 A @ 250 VAC 10 A @ 30 VDC	2500 V	10 mS	5 mS	1 x 10 <sup>5</sup> ops.		+10 ~ 50 V
I-7061 I-7061D	M-7061 M-7061D	Form A x 12	5 A @ 250 VAC 5 A @ 30 VDC	3000 V	10 mS	5 mS	10 <sup>5</sup> ops.	-	-
I-7063 I-7063D		Form A x 3		4000 V	6 mS	3 mS		8 (3750 Vrms)	+4 ~ 30 V
I-7065 I-7065D		Form A x 5						4 (3750 Vrms)	
I-7067 I-7067D	M-7067 M-7067D	Form A x 7	0.5 A @ 120 VAC 1.0 A @ 24 VDC	1500 V	5 mS	2 mS	-	-	
	M-7068 M-7068D	Form A x 4 Form C x 4	0.25 A @ 250 VAC 2 A @ 30 VDC	2000 V	3 mS	4 mS			2 x 10 <sup>5</sup> ops.
	M-7069 M-7069D		6 A @ 250 VAC 6 A @ 30 VDC	4000 V	5 mS	1 mS			10 <sup>5</sup> ops.

✓ Solid-State Relay Output



Model Name		Solid-State Relay Output					DC Input		
		Channels	Load Voltage Range	Max Load Current	Min. Release Time	Min. Operate Time	Dielectric Strength	Digital Input Channels	ON Voltage Level
I-7063A	I-7063AD	3 AC-SSR	24 ~ 265 Vrms	1.0 Arms	1 mS	1/2 cycle +1 mS	2500 Vrms	8 Isolation with common Source (3750 Vrms)	+4 ~ 30 V
I-7063B	I-7063BD	3 DC-SSR	3 ~ 30 VDC	1.0 A		1 mS			
I-7065A	I-7065AD	5 AC-SSR	24 ~ 265 Vrms	1.0 Arms		1/2 cycle +1 mS			
I-7065B	M-7065B I-7065BD	3 DC-SSR	3 ~ 30 VDC	1.0 A		1 mS	4 Isolation with common Source (3750 Vrms)		

✓ PhotoMos Relay Output



Model Name		PhotoMos Relay Output					
		Channels	Load Current	Load Voltage	Isolation Voltage	Release Time	Operate Time
I-7066	I-7066D	7	0.13 A	350 V Max.	5000 Vdc	0.2 mS typical	0.05 mS typical
	M-7066P		1 A	80 V Max.	2000 Vdc	2 mS typical	0.06 mS typical

✓ Counter/Frequency



Model Name		Counter / Frequency						
		Channel	Signal	Maximum Count	Voltage Level	Speed	Frequency Accuracy	Virtual Battery Backup
I-7080	M-7080 I-7080D	2	Up	32-bit	3.5 ~ 30 VDC	100 kHz	1 Hz	-
I-7080B	M-7080B I-7080BD							Yes
	M-7084	4/8	Up, CW/CCW, A/B, Pulse/Dir			250 kHz	0.1 Hz	Yes

✓ Encoder Counter



Model Name		Encoder Counter						
		Input axis	Input Type	Encoder Mode	Isolated Input voltage	Maximum Count	Speed	Virtual Battery Backup
I-7083	I-7083D	3-axis	Isolated	Quadrant,cw/ccw, pulse/dir	> 12 V add external resistor	32-bit	1 MHz	-
I-7083B	I-7083BD							Yes

✓ PWM Output/Counter Input



Model Name		PWM Output				Counter Input					
		Channels	Voltage Level	Duty Cycle	Speed	Channels	Maximum Count	Signal	Voltage Level	Speed	Virtual Battery Backup
I-7088	M-7088 I-7088D	8	0 ~ 5 VDC	0.1 ~ 99.9%	1 ~ 500 KHz	8	32-bit	Up	0 ~ 5 VDC	1 MHz	-
I-7088/S	M-7088/S I-7088D/S		5 ~ 50 VDC						5 ~ 50 VDC		

## 1.2 RS-485 I/O Expansion Unit

### Patent



Taiwan	096134568
China	200710181138.6
USA	11/979,474

### Introduction

The RU-87Pn series, RS-485 remote I/O expansion unit, is designed to acquire and control remote I/O through RS-485 connections. It comprises

- A CPU module with non-volatile memory to backup/restore I/O module configurations; LED indicators to diagnose the I/O module; and a RS-485 port for 1.2 Km long distance communication.
- A power module
- A backplane with a number of I/O slots for flexible I/O configuration.

With its patented technologies, namely auto configuration and hot swap, it saves lots of labor on the set up and maintenance of the automation systems. Reliable 3-piece construction enables users to hot swap modules during operation, without rewiring. All I/O module data are backed up in the non-volatile memory of the RU-87Pn. After hot-swapping a module, all settings are automatically loaded to recover.

Furthermore, with the RS-485 network communication interface and more than 30 I/O modules for choice, users can apply the unit to nearly any automation system.



### Features

#### 1. Hot Swap

Reliable 3-piece construction enables users to hot swap modules during operation, without rewiring. All I/O module data are backed up in the non-volatile memory of the RU-87Pn. After hot-swapping a module, all settings are automatically loaded to recover.

#### 2. Auto Configuration

The I-87K I/O modules can be pre-configured and backed up in the non-volatile memory of the RU-87Pn. When the RU-87Pn is power on or plugged in, the RU-87Pn will automatically checks and restores these configurations to each I-87K I/O modules on it.

#### 3. Easy Duplicate System

Using the DCON Utility, you can easily make a backup of the I-87K module configurations and write to another RU-87Pn. This design can easily and quickly duplicate many RU-87Pn.

#### 4. Easy Maintenance and Diagnosis

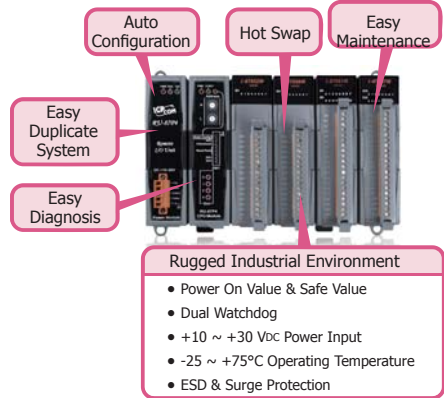
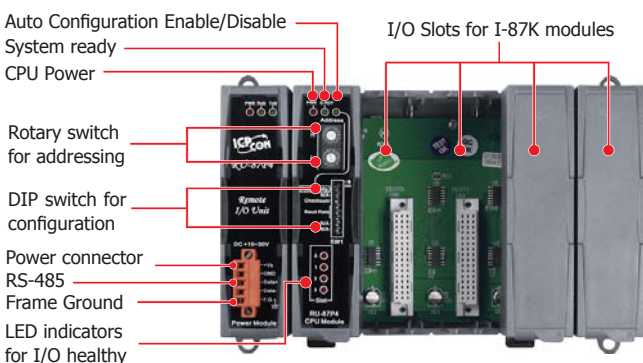
The basic configurations (includes station number, baudrate) are set by the rotary and DIP switches. The operator can use only one screwdriver to set the RU-87Pn. And there are several LED status indicators to show whether I-87K modules are configured and work properly.

If one I-87K module fails, the operator just needs to replace it with one good I-87K module with the same item number. And then checks the LED indicators to know whether the replacement is performed correctly. The switch and LED design makes it easy for maintenance. There is no PC and Notebook needed.

#### 5. Communication

- RS-485 industrial multi-drop network  
The RU-87Pn uses the industrial EIA RS-485 communication to transmit and receive data over long distance (1.2 Km).
- DCON protocol  
I-87K series I/O modules plugged in a RU-87Pn provides a simple command/response protocol (named DCON protocol) for communication. All command/response are in easy use ASCII format.

### Appearance



#### 6. Fully Software Support

The free charge software utility and development kits include

- A: DCON Utility: for configuration
- B: OPC Servers:  
OPC is an industrial standard interface based on OLE technology. With the OPC server, I/O modules can be easily integrated to any software that has OPC client capability.
- C: EZ Data Logger  
EZ Data Logger is a small data logger software. It can be applied to small remote I/O system. With its user-friendly interface, users can quickly and easily build a data logger software without any programming skill.
- D: Various Software Development Toolkits  
DLL, ActiveX, LabVIEW driver, InduSoft driver, DASyLab driver, Linux driver

### Ordering Information

<b>RU-87P1 CR</b>	1 slot I/O Expansion Unit (RoHS)
<b>RU-87P2 CR</b>	2 slots I/O Expansion Unit (RoHS)
<b>RU-87P4 CR</b>	4 slots I/O Expansion Unit (RoHS)
<b>RU-87P8 CR</b>	8 slots I/O Expansion Unit (RoHS)

## 1.3 tM Series Modules

### Introduction



The tM series is a family of network data acquisition and control modules with digital or analog I/O functions. The modules can be remotely controlled through an RS-485 serial bus by using DCON and Modbus RTU/ASCII protocols. The selectable transmission speed of the RS-485 port is up to 115,200 bps. Modbus has become a de facto standard communications protocol in industry, and is now the most commonly available means of connecting industrial electronic devices. This makes the tM series perfect integration with the HMI, SCADA, PLC and other software systems.

The tM series tiny RS-485 I/O modules support various I/O types, like photo-isolated digital input, power relay, photoMOS relay, open collector output, and analog input (voltage and current). Compared with the M-7000 series, the tM series is more cost-effective with low channel count design that is suitable for distributed I/O points applications.

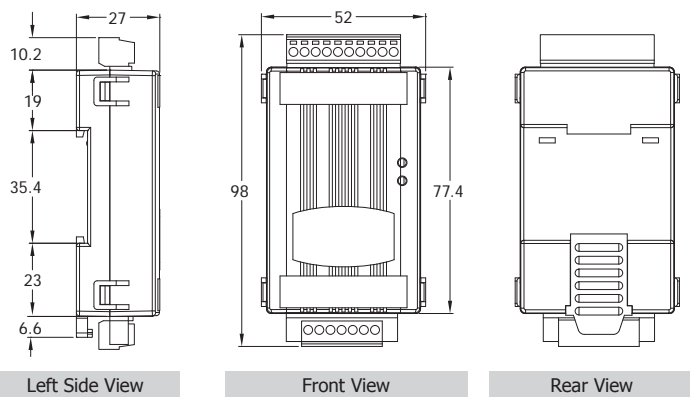
The tM series provides dual watchdog: module watchdog and host watchdog. The module watchdog is designed to automatically reset the microprocessor when the module hangs. The host watchdog monitors the host controller (PC or PLC), and the output of the module can go to predefined safe value state when the host fails.

For maximum space savings, the tM series is offered in an amazing tiny form-factor that makes it can be easily installed in anywhere, even directly embedded into a machine. It is equipped with two removable terminal block connectors for easy wiring.

### Features

- RS-485 Industrial Multi-Drop Network
- Programmable I/O Type and Range
- Easy Mounting and Connection
- Rugged Industrial Environment
- Dual Watchdog Design
- DI Latch Function
- Low Speed Counter
- Programmable Power-on Value and Safe Value
- Versatile Communication Protocols: DCON, Modbus RTU and Modbus ASCII
- Expandable Network
- Tiny Form Factor

### Dimensions (Units: mm)



### Selection Guide

tM Series Models							
Model Name	Bus	Protocols	AI	AO	DI	DO	
tM-AD5	RS-485	Modbus RTU Modbus ASCII DCON	5-ch (Differential, Voltage)	-	-	-	
tM-AD5C			5-ch (Differential, Current)	-	-	-	
tM-AD8			8-ch (Single-Ended, Voltage)	-	-	-	
tM-AD8C			8-ch (Single-Ended, Current)	-	-	-	
tM-AD4P2C2			2-ch (Single-Ended, Voltage) 2-ch (Single-Ended, Current)	-	-	2-ch (Source)	2-ch (NPN, Sink)
tM-DA1P1R1			-	1-ch (Single-Ended, Voltage)	1-ch (Sink/Source)	1-ch Form A Relay	
tM-TH8			8-ch (Thermistor)	-	-	-	
tM-P8			-	-	-	8-ch (Sink/Source)	-
tM-C8			-	-	-	-	8-ch (NPN, Sink)
tM-P4C4			-	-	-	4-ch (Source)	4-ch (NPN, Sink)
tM-P4A4			-	-	-	4-ch (Sink)	4-ch (PNP, Source)
tM-P3R3			-	-	-	3-ch (Sink/Source)	3-ch Form A Relay
tM-R5			-	-	-	-	5-ch Form A Relay