Industrial I/O Modules for 8000 Series PAC and ViewPAC

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5.1. I/O Modules Overview

• Overview

There are two types of I/O modules, parallel and serial. Both type of the modules can be plugged into the slots of PAC series. But only the serial module can be used in remote I/O units, such as RU-87Pn and ET-87Pn. Up to now, over 100 I/O, communication and motion control modules are available. For the new generation PACs, only the high profile I-8KW and I-87KW I/O modules can be used.

1. Parallel I/O Modules (I-8KW Series) Includes

- High speed A/D: 100 k samples/second
- High speed D/A: 30 k (-10 ~ +10 V)
- High speed DI & DO: All Digital I/O modules provide visual indication of status via LED indicators
- High speed stepping/Servo motion control modules
- High speed encoder modules
- High performance Counter/Frequency modules
- High speed multi-channel RS-232/422/485 modules
- CAN bus communication modules
- FRnet communication modules

2. Serial I/O modules (I-87KW Series) Includes

- RTD Input modules
- Thermocouple Input modules
- Strain Gauge Input modules
- VW Input modules
- High resolution multi-channel Analog Input modules
- Isolated multi-channel D/A modules
- Digital Input and Digital Output modules with Latch and counter function
- Counter/Frequency modules

3. Comparison Table of I-8KW Series and I-87KW Series

Item	I-8KW Series	I-8KRW Series	I-87KW Series
Communication Interface	Parallel bus	Parallel bus	Serial bus
Protocol	-	-	DCON
DI with latched function	-	-	Y
DI with counter input	-	-	Y (100 Hz)
Power on value	-	Y	Y
Safe value	-	Y	Y
Programmable slew-rate for AO module	-	-	Y

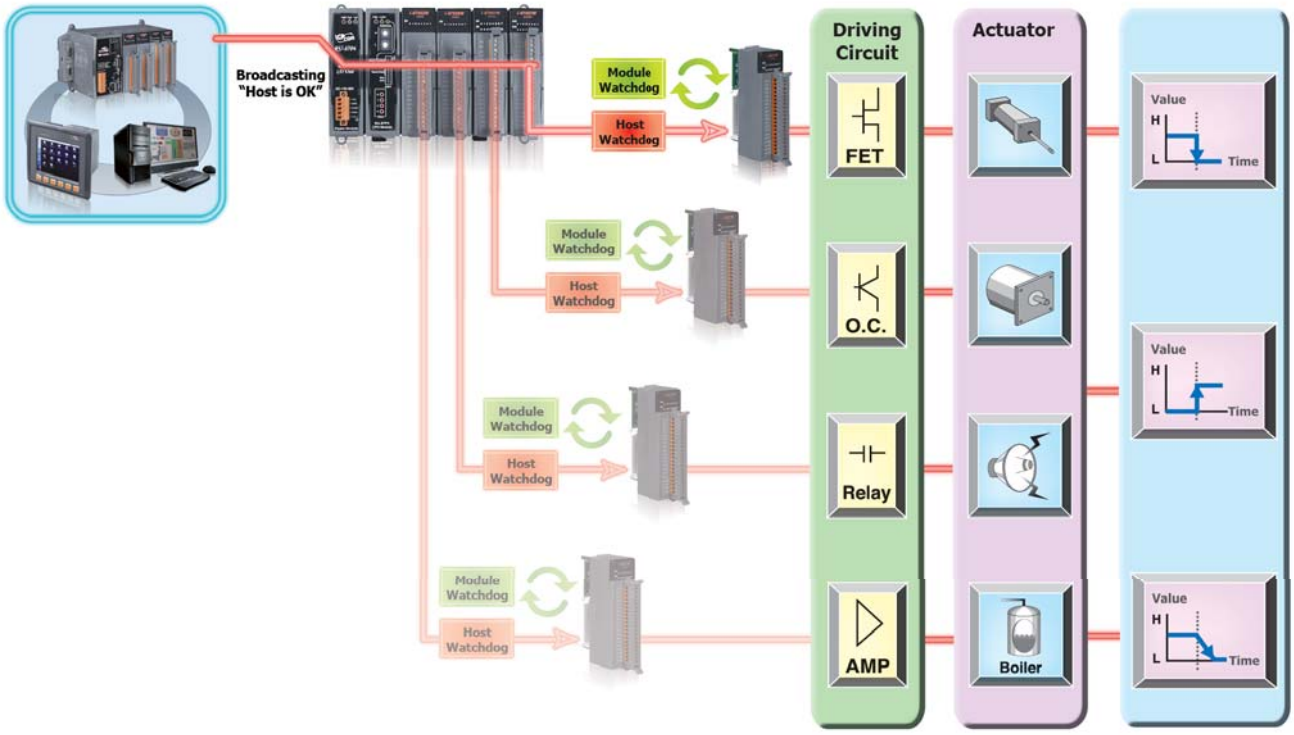
4. Supporting I/O Module list of MCU (Main Control Unit) and I/O expansion unit:

Item	I-8K Series		I-87K Series	
	High Profile	Low Profile	High Profile	Low Profile
XPAC	Y	-	Y	-
WinPAC	Y	-	Y	-
LinPAC	Y	-	Y	-
iPAC	Y	-	Y	-
ViewPAC	Y	-	Y	-
RU-87P1/2/4/8	-	-	Y	-
USB-87P1/2/4/8	-	-	Y	-
ET-87P4/8	-	-	Y	-
I-8KE4/8	Y	Y	Y	Y
I-8KE4/8-MTCP	Y	Y	Y	Y
I-87K4/5/8/9	-	-	Y	Y

5. Hot features

Dual Watchdog Operation

The I-87K I/O modules include an internal Dual Watchdog. It is the combination of module watchdog and host watchdog. The module watchdog is a hardware watchdog designed to reset the micro-controller of the module when the module fails. This mechanism can keep the module work continuously without disruption. The host watchdog is a software watchdog that monitors the operating status of the PAC. When the PAC fails, the outputs of the module will be set to the safe values to prevent any erroneous operations. With Dual Watchdog, the control system is more reliable and stable.



Power On Value and Safe Value of Digital / Analog Output

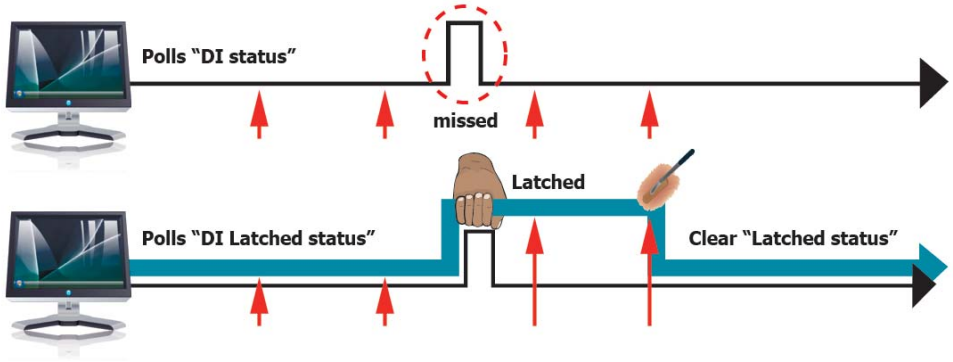
Besides setting by the set digital/analog output commands, the digital/analog outputs can be set under two other conditions. When the host watchdog is enabled and a host watchdog timeout occurs, the "safe value" is loaded into the digital/analog output ports. The set digital/analog output commands have no effect on the digital/analog output ports until the host watchdog timeout status is cleared. The host watchdog timeout status is saved in the EEPROM. The status is not changed even after power-on reset. It can be cleared only by the reset host watchdog timeout status command ~AA1. See Section A.2 for host watchdog details.
When the module is powered on and the host watchdog timeout status is cleared, the "power-on value" is loaded into the digital/analog output ports. If the host watchdog timeout status is not cleared on power-on, then the safe value is loaded into the digital/analog output ports. Both the safe value and power-on value are set by the ~AA5V command.

Advanced DI Functions of I-87K Series I/O Modules

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 (>=5ms) signal will not be lost any more.

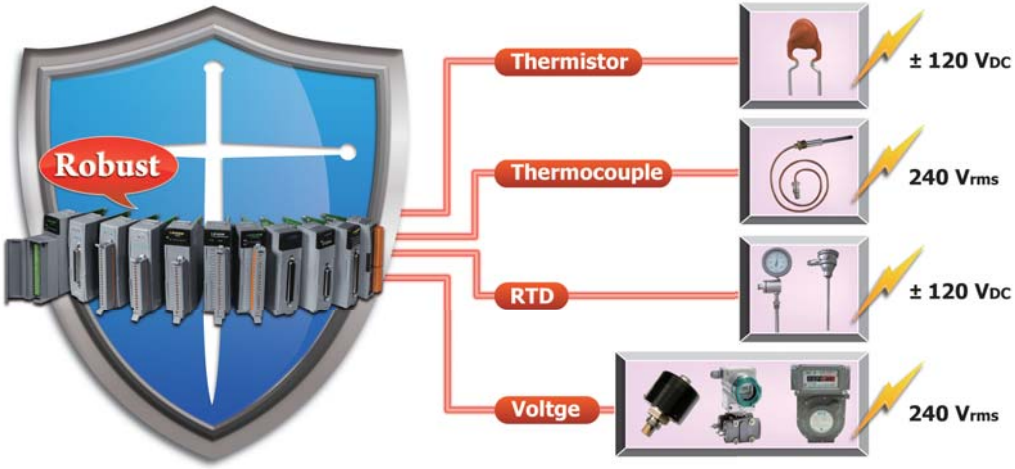


• Low Speed Counter

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

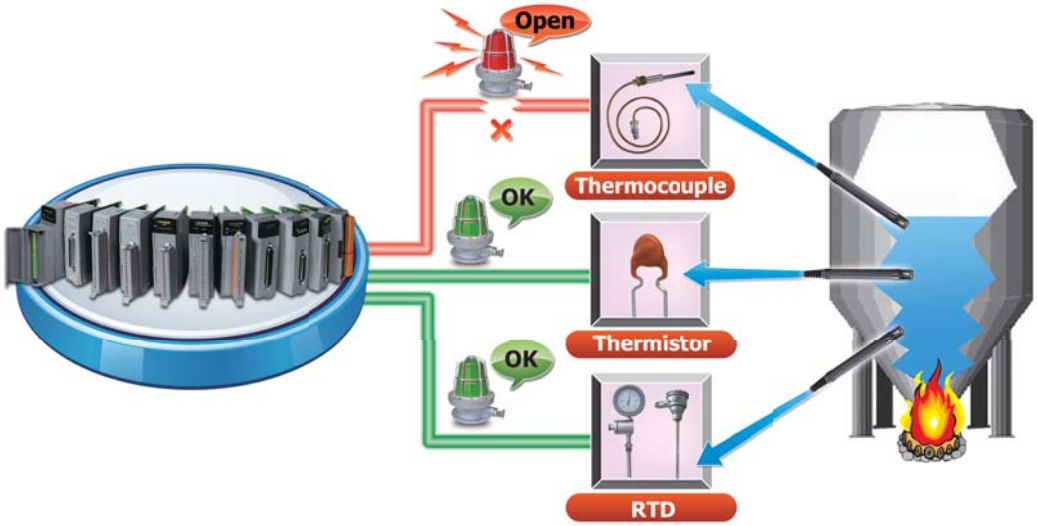
Overvoltage Protection

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.



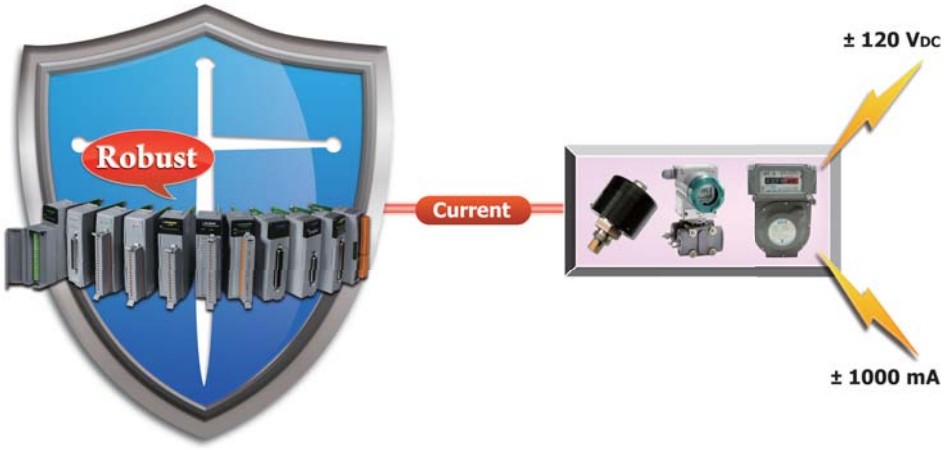
Open Wire Detection

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.



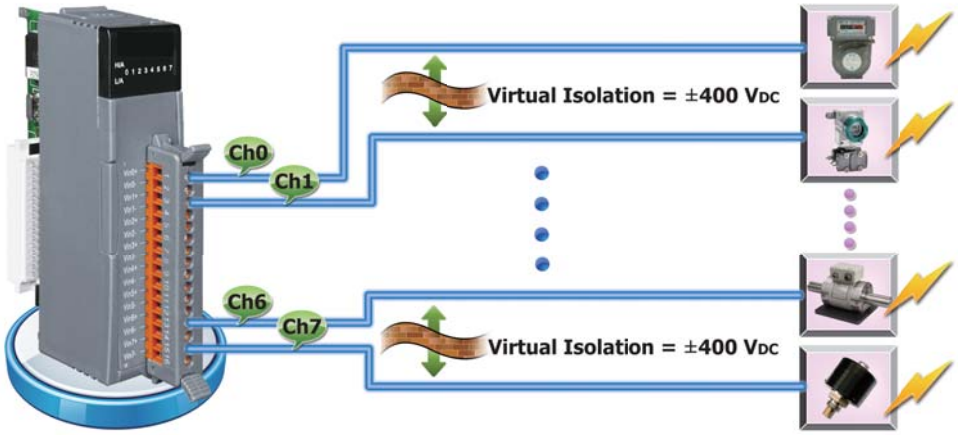
Over-current Protection

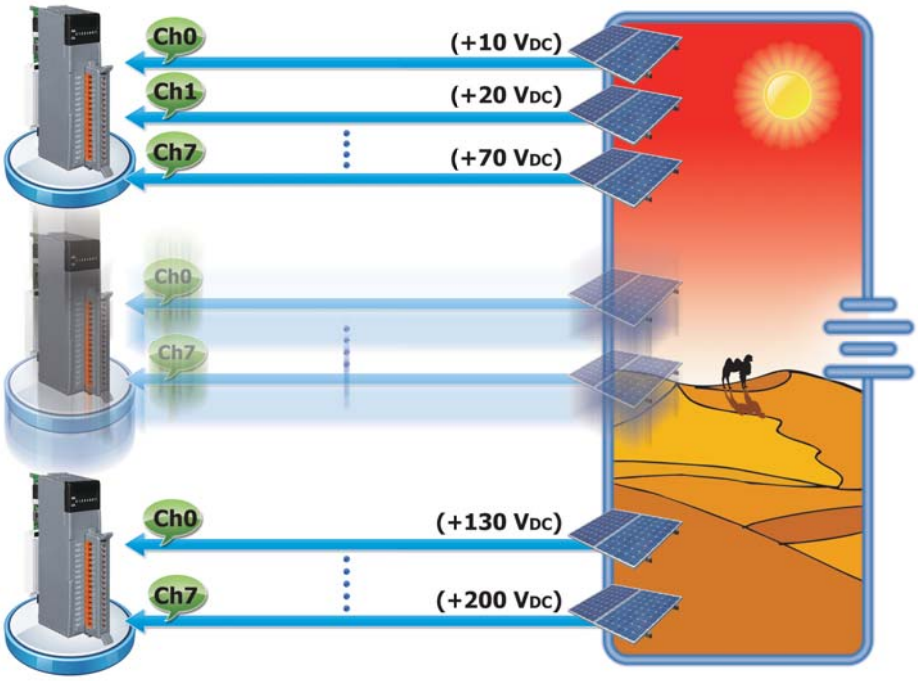
For the current measurement module, it may be damaged when there is high current or voltage introduced into the current loop. The protection for current measurement is improved to +/-120 VDC and +/-1000 mA.. A high current or voltage in the current loop will not damage the current measurement, so the 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-87017RW, I-87017ZW, I-87018RW, I-87018ZW, I-87019RW, and I-87019ZW. 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.



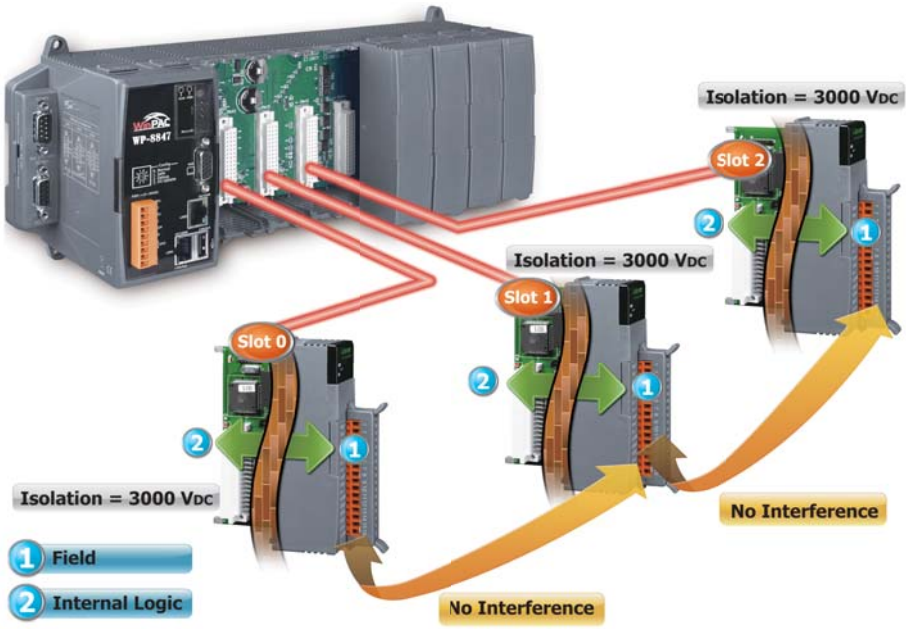


Common Voltage Protection

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-8KW and I-87KW 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-8K and I-87K 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 plugged into controller. There will be no interference from the adjacent slot because the noise from the adjacent slot is isolated.

5.2. Analog Modules

• Selection Guide

Thermistor Introduction

A thermistor is a type of resistor whose resistance varies significantly with temperature, more so than in standard resistors. The word is a portmanteau of *thermal* and *resistor.* Thermistors are widely used as inrush current limiters, temperature sensors, self-resetting overcurrent protectors, and self-regulating heating elements.

Thermistors differ from resistance temperature detectors (RTD) in that the material used in a thermistor is generally a ceramic or polymer, while RTDs use pure metals. The temperature response is also different; RTDs are useful over larger temperature ranges, while thermistors typically achieve a higher precision within a limited temperature range (usually -90 ~ 130°C).

Applications

Thermister Input Module (Serial Bus) — Table 5-2-1

Models	I-87005W
Pictures	
Analog Input	
Sensor Type	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
Channels	8
Wiring	2 Wires
Resolution	16-bit
Accuracy	±0.1% of FSR
Sampling Rate	8 Hz (Total)
Individual Channel Configurable	Yes
3-wire RTD lead resistance elimination	-
Resistance Measurement	200 kΩ
Open Wire Detection	Yes
Overvoltage Protection	±120 V_{DC} /110 V_{AC}
4 KV ESD Protection	Yes
Digital Output	
Channels	8
Type	Open Collector
Sink /Source (NPN /PNP)	Sink
Load Voltage	5 ~ 50 V_{DC}
Over Load Protection	Yes
Short Circuit Protection	Yes
System	
Dual Watchdog	Yes
Isolation	3000 V_{DC}
Power Consumption	1 W
Connector	Terminal Block
Optional Accessories	-

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RTD Introduction

Resistance Temperature Detectors (RTD), as the name implies, are sensors used to measure temperature by correlating the resistance of the RTD element with temperature. Most RTD elements consist of a length of fine coiled wire wrapped around a ceramic or glass core. The element is usually quite fragile, so it is often placed inside a sheathed probe to protect it. The RTD element is made from a pure material whose resistance at various temperatures has been documented. RTDs are also relatively immune to electrical noise and therefore well suited for temperature measurement in industrial environments, especially around motors, generators and other high voltage equipment.

Applications

RTD Input Module (Serial Bus) Table 5-2-2

Models	I-87013W	I-87015W	I-87015PW
Pictures			
Analog Input			
Sensor Type	Pt100, Pt1000, Cu50, Ni120	Pt100, Pt1000, Ni120, Cu50, Cu100, Cu1000	
Channels	4	7	
Wiring	2/3/4 Wires	2/3 Wire	
Resolution	16-bit	16-bit	
Accuracy	±0.1% of FSR	±0.05% of FSR	
Sampling Rate	10 Hz (Total)	12 Hz (Total)	
Individual Channel Configurable	Yes	Yes	
3-wire RTD lead resistance elimination	Yes	-	Yes
Resistance Measurement	3.2 kΩ	3.2 kΩ	
Open Wire Detection	Yes	Yes	
Overvoltage Protection	±20 V_{DC}	±20 V_{DC}	±120 V_{DC}
4 KV ESD Protection	Yes	Yes	
System			
Dual Watchdog	Yes	Yes	
Isolation	3000 V_{DC}	3000 V_{DC}	
Power Consumption	0.8 W	1 W	
Connector	Terminal Block	Terminal Block	
Optional Accessories	-	-	

■ **3-wire RTD lead resistance elimination**
With the feature, the line resistance of the RTD cable is eliminated regardless the length of the RTD cable for 3-wire RTD measurement.

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Analog I/O Modules (Parallel Bus) Table 5-2-3

Models	I-8014W	I-8017HW	I-8017DW	I-8017HCW	I-8024W	I-8024DW
Pictures	NEW 		NEW 	NEW 		Available soon 
Analog Input						
Channels	8/16	8/16			-	
Wiring	Differential/ Single-ended	Differential/ Single-ended				
Range	±10 VDC, ±5 VDC, ±2.5 VDC, ±1.25 VDC -20 ~ +20 mA (Requires Optional External 125 Ω Resistor)	±10 VDC, ±5 VDC, ±2.5 VDC, ±-1.25 VDC ±20 mA (Requires Optional External 125 Ω Resistor)	±10 VDC, ±5 VDC, ±2.5 VDC, ±-1.25 VDC ±20 mA (Jumper Select)			
Resolution	16-bit	14-bit				
Accuracy	0.05% of FSR	±0.1% of FSR				
Sampling Rate	Single Channel Polling Mode: 250 k S/s	Single Channel Polling Mode: 100 k S/s Single Channel Interrupt Mode: 50 k S/s 8 channel Scan Mode : 16 k S/s				
Input Impedance	20 k, 200 k, 20 M (Jumper Select)	20 k, 200 k, 20 M (Jumper Select)				
Overvoltage Protection	-45 ~ +60 VDC	±35 VDC				
Analog Output						
Channels	-	-			4	
Range					±10 VDC, 0 ~ +20 mA	
Resolution					14-bit	
Accuracy					±0.1% of FSR for voltage output ; ±0.2% of FSR for current output	
Throughput					External +24 VDC @ 1050 Ω	
Output Capacity					20 mA @ 10 VDC	
Power on Value					-	
Safe Value					-	
System						
Watchdog	-	-			-	
Isolation	2500 Vrms	2500 Vrms			3000 VDC	
Power Consumption	2.5 W	2 W			2 W	
Connector	Terminal Block	Terminal Block	D-Sub 37	Terminal Block	Terminal Block	D-Sub 37
Optional Accessories	-	-	DN-37-381-A	-	-	DN-37-381-A

I/O module with DN-37-381-A

• Selection Guide

Analog Input Modules (Serial Bus) Table 5-2-4

Models	I-87017W	I-87017DW	I-87017RW	I-87017ZW	I-87017W-A5	I-87017RCW	I-87017RCDW	I-87017RCDW-AI
Pictures		NEW 		NEW 			Available soon 	Available soon 
Analog Input								
Channels	8	8/16	8	10/20	8	8	16	16
Wiring	Differential	Differential/ Single-ended	Differential	Differential/ Single-ended	Differential	Differential	Differential	Differential
Range	±150 mV, ±500 mV, ±1 VDC, ±5 VDC, ±10 VDC ±20 mA ,0 ~ +20 mA, +4 ~ +20 mA (Requires Optional External 125 Ω Resistor)			±150 mV, ±500 mV, ±1 VDC, ±5 VDC, ±10 VDC, ±20 mA, 0 ~ +20 mA, +4 ~ +20 mA (Jumper Selectable)	±50 VDC, ±150 VDC	0 ~ +20 mA, +4 ~ +20 mA, ±20 mA (No External Resistor Required)	0 ~ +20 mA, +4 ~ +20 mA, ±20 mA (No External Resistor Required)	0 ~ +100 mA
Resolution	Normal Mode: 16-bit Fast Mode: 12-bit				Normal Mode: 16-bit Fast Mode: 12-bit	Normal Mode: 16-bit Fast Mode: 12-bit		
Accuracy	Normal Mode :±0.1% of FSR Fast Mode :±0.5% of FSR				Normal Mode: ±0.1% of FSR Fast Mode: ±0.25% of FSR	Normal Mode: ±.1% of FSR Fast Mode: ±0.5% of FSR		
Sampling Rate	Normal Mode: 10 Hz (Total) Fast Mode: 60 Hz (Total)			Normal Mode: 10 Hz (Total) Fast Mode: 50 Hz (Total)	Normal Mode: 10 Hz (Total) Fast Mode: 50 Hz (Total)	Normal Mode: 10 Hz (Total) Fast Mode: 60 Hz (Total)		
Input Impedance	20 MΩ	DF: 2 MΩ SE: 1 MΩ	> 2 MΩ	DF: 2 MΩ SE: 1 MΩ	290 KΩ	125 Ω		
Common Voltage Protection	±15 VDC	±200 VDC			±200 VDC	±200 VDC		
Individual Channel Configurable	-	Yes	-	Yes	-		Yes	
Open Daughter Board Detection	-	Yes	-	-	-		Yes	
Overvoltage Protection	±35 VDC	DF: 240 Vrms SE: 120 Vrms	240 Vrms	DF: 240 Vrms SE: 150 Vrms	±200 VDC	±120 VDC	-	
Overcurrent Protection	-			Yes	-	Yes	-	
4 KV ESD Protection	Yes				Yes			
Virtual Channel to Channel Isolation	±30 VDC	±400 VDC			±400 VDC	±150 VDC		
System								
Dual Watchdog	Yes							
Isolation	3000 VDC							
Power Consumption	1.3 W			2.0 W	1.3 W			
Connector	Terminal Block	D-Sub 37	Terminal Block		Terminal Block		D-Sub 37	
Optional Accessories	-	DN-37-381-A	-		-		DN-37-381-A	

I/O module with DN-37-381-A

Introduction

A thermocouple is a temperature sensor which consists of two wires of different conductors.

Based on the Seebeck effect in thermoelectricity, the temperature difference results voltage difference on the two wires.

Thermocouples are widely used in scientific and industrial applications because they're generally accurate and can operate over wide range of temperature.

Thermocouple Type

Type	Range (°C)
J	-210 ~ +760
K	-270 ~ +1372
T	-270 ~ +400
E	-270 ~ +1000
R	0 ~ +1768
S	0 ~ +1768

Type	Range (°C)
B	0 ~ +1820
N	-270 ~ 1300
C	0 ~ 2320
L	-200 ~ +800
M	-200 ~ +100
$L_{DIN43710}$	-200 ~ +900

Thermocouple input module (Serial Bus) — Table 5-2-5

Models	I-87018W	I-87018PW	I-87018RW	I-87018ZW
Pictures		NEW 		
Analog Input				
Sensor Type	±15 mV, ±50 mV, ±100 mV ±500 mV, ±1 V_{DC}, ±2.5 V_{DC}			±15 mV, ±50 mV, ±100 mV, ±500 mV, ±1 V_{DC}, ±2.5 V_{DC}
	±20 mA (Requires Optional External 125 Ω Resistor)	0 ~ +20 mA, + 4 ~ +20 mA, ±20 mA (Requires Optional External 125 Ω Resistor)	±20 mA (Requires Optional External 125 Ω Resistor)	±0 mA, 0 ~ +20 mA, +4 ~ +20 mA (Requires Optional External 125 Ω Resistor)
	Thermocouple (J, K, T, E. R. S, B, N, C, L, M, $L_{DIN43710}$)			Thermocouple (J, K, T, E, R, S, B, N, C, L, M, $L_{DIN43710}$)
Channels	8			10
Wiring	Differential			Differential
Resolution	16-bit			16-bit
Accuracy	±0.1% of FSR			±0.1% of FSR
Temperature outputs consistency	-	Yes	-	Yes
Stable temperature output in the field	-	Yes	-	Yes
Sampling Rate	10 Hz (Total)			10 Hz (Total)
Input Impedance	>400 kΩ			>400 kΩ
Individual Channel Configurable	-	Yes	-	Yes
Open Wire Detection	-	Yes	Yes	Yes
Overvoltage Protection	±35 V_{DC}	240 V_{rms}	240 V_{rms}	240 V_{rms}
4 KV ESD Protection	Yes	Yes	Yes	Yes
Virtual Channel to Channel Isolation	±30 V_{DC}	±400 V_{DC}	±400 V_{DC}	±400 V_{DC}
System				
Dual Watchdog	Yes			Yes
Isolation	3000 V_{DC}			3000 V_{DC}
Power Consumption	0.8 W	0.7 W	0.6 W	1.3 W
Connector	Terminal Block			DB25
Optional Accessories	-	CN-1824	-	DB-1820/DN-1822

- We suggest to choose I-87018PW anbd I-87018ZW for accurate thermocouple measurement
- Special daughter board for thermocouple inputs features two benefits
  - Temperature outputs consistency
  - Stable temperature output in the field

I-87018PW-G/S CR=
I-87018PW connects CN-1824 directly

I-87018ZW-G/S CR=
I-87018ZW connects DB-1820 directly

I-87018ZW-G/S2 CR=
I-87018ZW connects DN-1822 with CD-2518D kit

• Selection Guide

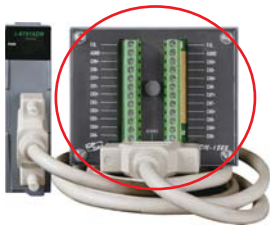
Analog Input Modules (Serial Bus) Table 5-2-6

Models	I-87019PW	I-87019RW	I-87019ZW
Pictures	NEW 		NEW 
Analog Input			
Sensor Type	±15 mV, ±50 mV, ±100 mV, ±150 mV, ±500 mV, ±1 V_{DC} , ±2.5 V_{DC} , ±5 V_{DC} ,±10 V_{DC}		
	±20 mA, 0 ~ +20 mA, +4 ~ +20 mA (Jumper Selectable)		
	Thermocouple Type: (J, K, T, E. R. S, B, N, C, L, M, and $L_{DIN43710}$)		
Channels	8	8	10
Wiring	Differential		
Resolution	16-bit		
Accuracy	±0.1% of FSR		
Temperature outputs consistency	Yes	-	Yes
Stable temperature output in the field	Yes	-	Yes
Sampling Rate	10 Hz (Total)	8 Hz (Total)	10 Hz (Total)
Input Impedance	Voltage Input: >400 kΩ Current Input: 125 Ω		
Individual Channel Configurable	Yes		
Open Wire Detection	Yes, (Software Selectable)	Yes	Yes, (Software Selectable)
Overvoltage Protection	240 V_{rms}		
4 KV ESD Protection	Yes		
Virtual Channel to Channel Isolation	±400 V_{DC}		
System			
Dual Watchdog	Yes		
Isolation	3000 V_{DC}		
Power Consumption	1.3 W	1.1 W	1.4 W
Connector	Terminal Block		DB25
Optional Accessories	CN-1824	-	DB-1820/DN-1822

- We suggest to choose I-87019PW anbd I-87019ZW for accurate thermocouple measurement
- Special daughter board for thermocouple inputs features two benefits
  - Temperature outputs consistency
  - Stable temperature output in the field

I-87019PW-G/S CR=
I-87019PW connects CN-1824 directly

I-87019ZW-G/S CR=
I-87019ZW connects DB-1820 directly



I-87019ZW-G/S2 CR=
I-87019ZW connects DN-1822 with CD-2518D kit

• Selection Guide

Analog Output Modules (Serial Bus) Table 5-2-7

Models	I-87024W	I-87024RW	I-87024DW	I-87024CW	I-87028CW	I-87028UW
Pictures		NEW 	NEW 	Available soon 		Available soon 
Analog Output						
Channels	4			4	8	
Wiring of Current Output	Sink			Sink		Source
Range	0 ~ +5 VDC, ±5 VDC, 0 ~ +10 VDC, ±10 VDC, 0 ~ +20 mA, +4 ~ +20 mA			0 ~ +20 mA, +4 ~ +20 mA		0 ~ +5 VDC, ±5 VDC, 0 ~ +10 VDC, ±10 VDC, 0 ~ +20 mA, +4 ~ +20 mA
Resolution	14-bit			12-bit		16-bit
Accuracy	±0.1% of FSR			±0.1% of FSR		±0.02% of FSR
DA Output Response Time	10 ms per channel			10 ms per channel		10 ms per channel
Output Capacity	Voltage: 10 VDC @ 5 mA Current: External + 24 VDC @ 1050 Ω	Voltage: 10 VDC @ 20 mA Current: External +24 VDC @ 1050 Ω		External +24 VDC @ 1050 Ω		Voltage: 10 VDC @ 20 mA Current: External +24 VDC @ 1050 Ω
Channel to channel isolation	-			Yes, 1 kV		-
Open Current Detection	-		Yes	Yes		
Short Circuit Protection	Yes			Yes		
4 KV ESD Protection	Yes			Yes		
RS Immunity (IEC 61000-4-2)	-	5 V/m, 80 MHz ~ 1 GHz		-		5 V/m, 80 MHz ~ 1 GHz
Power on Value	Yes			Yes		
Safe Value	Yes			Yes		
System						
Dual Watchdog	Yes			Yes		
Isolation	3000 VDC			1000 VDC		2500 VDC
Power Consumption	2.8 W	3.2 W	3.1 W	0.9 W	1.4 W	0.9 W
Connector	Terminal Block		D-Sub 37	Terminal Block		
Optional Accessories	-		DN-37-381-A	-		

I/O module with DN-37-381-A

5.3. Digital Modules

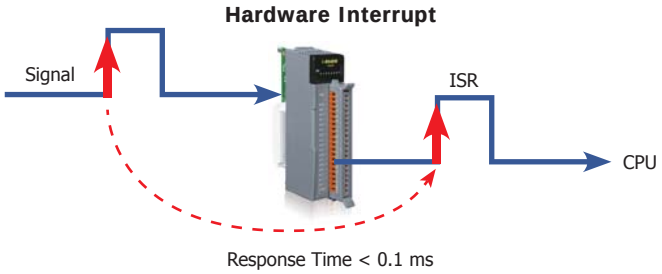
• Selection Guide

Digital Input Modules (Parallel Bus) Table 5-3-1

Models	I-8040W	I-8040PW	I-8046W	I-8048W	I-8051W	I-8052W	I-8053W	I-8053PW	I-8058W
Pictures				Note1 					
Digital Input									
Channels	32		16	8	16	8	16		8
Contact	Wet		Dry	Dry + Wet	Dry	Wet	Wet		Wet
Sink /Source (NPN /PNP)	Sink, Source		Source	Sink, Source	Source	Sink, Source	Sink, Source		Sink, Source
on Voltage Level	10 ~ 30 V_{DC}	19 ~ 30 V_{DC}	Close to GND.	Isolated: 4 ~ 30 V Non-Isolated TTL: 0.8 V Max.	Close to GND.	10 ~ 30 V_{DC}	10 ~ 30 V_{DC}	19 ~ 30 V_{DC}	80 ~ 250 V_{AC}
off Voltage Level	4 V_{DC} Max.	11 V_{DC} Max.	Open	Isolated: 1 V_{DC} Max. Non-Isolated TTL: 2 ~ 5 V_{DC}	Open	4 V_{DC} Max.	4 V_{DC} Max.	11 V_{DC} Max.	30 V_{AC} Max.
Low Pass Filter	-	Yes	-	-	-	-	-	Yes	-
Effective Distance for Dry Contact	-		500 m	100 m	100 m	-			
System									
Watchdog	-		-						
Isolation	3750 V_{rms}		3750 V_{rms}	1500 V_{rms}	-	5000 V_{rms}	3750 V_{rms}		5000 V_{rms}
Power Consumption	0.65 W	1 W	1.3 W	1.75 W	1.1 W	0.3 W	0.4 W	0.45 W	0.6 W
Connector	D-Sub 37		Terminal Block						
Optional Accessories	DN-37-381-A		-						

I/O module with DN-37-381-A

Note1. I-8048W supports hardware interrupt capturing. Each channel can be configured to capture either of rising edge or falling edge signal.

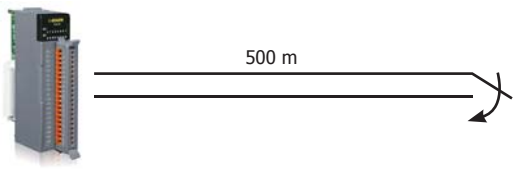


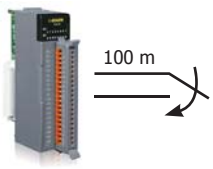
Response Time < 0.1 ms

■ **We suggest to choose "P" version of digital input module for industrial use, example : I-8040PW, I-8053PW ... etc.**

■ **Effective distance for dry contact of DI/DIO module**

In general, the effective distance for dry contact of DI module is 100 m. With the enhanced circuit design, the distance can be extended up to 500 m.





• Selection Guide

Digital Input Modules (Serial Bus) Table 5-3-2

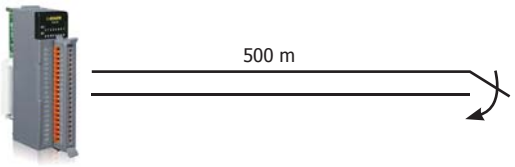
Models		I-87040W	I-87040PW	I-87046W	I-87051W	I-87052W	I-87058W	I-87059W
Pictures								
Digital Input								
Channels		32		16	16	8	8	8
Type		Wet		Dry	Dry	Wet	Differential	Differential
Sink /Source (NPN /PNP)		Sink, Source		Source	Source	Sink, Source	-	-
on	Voltage Level	3.5 ~ 30 V_{DC}	19 ~ 30 V_{DC}	Close to GND.	Close to GND.	3.5 ~ 30 V_{DC}	80 ~ 250 V_{AC}	10 ~ 80 V_{AC}
off	Voltage Level	1 V_{DC} Max.	11 V_{DC} Max.	Open	Open	1 V_{DC} Max.	30 V_{AC} Max.	3 V_{AC} Max.
Counter (100 Hz, 16-bit)		Yes		Yes				
Effective Distance for Dry Contact		-		500 m	100 m	-		
4 KV ESD Protection		Yes		Yes				
Low Pass Filter		Yes		Yes				
System								
Dual Watchdog		Yes		Yes				
Isolation		3750 V_{rms}		-	-	5000 V_{rms}	5000 V_{rms}	3750 V_{rms}
Power Consumption		1.6 W		1 W	0.5 W	0.3 W	0.3 W	0.3 W
Connector		D-Sub 37		Terminal Block				
Optional Accessories		DN-37-381-A		-				

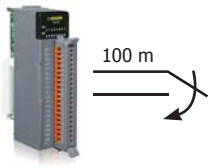
I/O module with DN-37-381-A

■ **We suggest to choose "P" version of digital input module for industrial use, example : I-87040PW ... etc.**

■ **Effective distance for dry contact of DI/DIO module**

In general, the effective distance for dry contact of DI module is 100 m. With the enhanced circuit design, the distance can be extended up to 500 m.





• Selection Guide

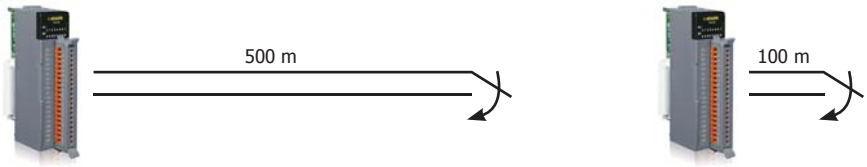
Digital Input Modules (Serial Bus) Table 5-3-3

Models		I-87053W	I-87053PW	I-87053W-A5	I-87053W-AC1	I-87053W-E5
Pictures						
Digital Input						
Channels		16				
Type		Dry+Wet			Wet	Wet
Sink /Source (NPN /PNP)		Sink, Source			AC Voltage	Sink
on	Voltage Level	Dry Contact: Close to GND.	Dry Contact: Close to GND.	Dry Contact: Close to GND.	-	-
		Wet contact: 3.5 ~ 30 V_{DC}	Wet contact: 19 ~ 30 V_{DC}	Wet contact: 68 ~ 150 V_{DC}	Wet contact: 10 ~ 80 V_{AC}	Wet contact: 68 ~ 150 V_{DC}
off	Voltage Level	Dry Contact: Open	Dry Contact: Open	Dry Contact: Open	-	-
		Wet contact: 1 V_{DC} Max.	Wet contact: 11 V_{DC} Max.	Wet contact: 48 V_{DC} Max.	Wet contact: 3 V_{AC} Max.	Wet contact: 48 V_{DC} Max.
Counter (100 Hz, 16-bit)		Yes				
Effective Distance for Dry Contact		500 m			-	500 m
4 KV ESD Protection		Yes				
Low Pass Filter		Yes				
Fuse Protection		-				Yes
System						
Dual Watchdog		Yes				
Isolation		3750 V_{rms}				
Power Consumption		0.8 W	0.8 W	0.9 W	1.5 W	0.8 W
Connector		Terminal Block				
Optional Accessories		-	-	-	-	-

■ **We suggest to choose "P" version of digital input module for industrial use, example : I-8053PW, I-87053PW ... etc.**

■ **Effective distance for dry contact of DI/DIO module**

In general, the effective distance for dry contact of DI module is 100 m. With the enhanced circuit design, the distance can be extended up to 500 m.



• Selection Guide

Digital Output Modules (Parallel Bus) Table 5-3-4

Models	I-8037W	I-8041W	I-8041RW	I-8041AW	I-8056W	I-8057W	I-8057RW	I-8057PW	I-8060W	I-8064W	I-8068W	I-8069W	I-8069RW
Pictures			Available soon 				Available soon 	Available soon 					Available soon 
Digital Output													
Channels	16	32			16				6	8	8	8	
Type	Open Collector	Open Collector			Open Collector				Power Relay			PhotoMOS Relay	
Sink /Source (NPN /PNP)	Source	Sink	Sink	Source	Sink				Form C	Form A	Form A x 4 Form C x 4	Form A	
Load Voltage	5~30 V_{DC}	5~30 V_{DC}			5~30 V_{DC}		5~50 V_{DC}						
Max. Load Current	100 mA/ channel	100 mA/channel			100 mA/channel		700 mA/channel		0.5 A @125 V_{AC} 0.25 A @250 V_{AC} 2A @30 V_{DC}	5 A @250 V_{AC} 5 A @30 V_{DC}	Form A : 5 A @250 V_{AC} 5 A @28 V_{DC} Form C : 5 A (NO) /3A (NC) @30 V_{DC} 5 A (NO) /3A (NC) @ 277 V_{AC}	60 V_{DC} /1.0 A	
Electrical Endurance	-								5 × 10^5 ops.			No arcing, no bounce and no switching	
Power on Value	-	-	Yes	-	-		Yes	-	-	-	-	-	Yes
Safe Value	-	-	Yes	-	-		Yes	-	-	-	-	-	Yes
System													
Watchdog	-	-	Yes	-	-								
Isolation	3750 V_{rms}	3750 V_{rms}			-	3750 V_{rms}	3750 V_{rms}		1500 V_{rms}	2000 V_{rms}	1500 V_{rms}	1500 V_{rms}	
Power Consumption	0.9 W	1.5 W			0.9 W	0.9 W	1.5 W		1 W	1.1 W	2.5 W	0.6 W	
Connector	Terminal Block	D-Sub 37			Terminal Block								
Optional Accessories	-	DN-8K32R, DN-37-381-A		DN-37-381-A	-								

I/O module with DN-8K32R

I/O module with DN-37-381-A

• Selection Guide

Digital Output Modules (Serial Bus) Table 5-3-5

Models	I-87037W	I-87041W	I-87057W	I-87057PW	I-87061W	I-87064W	I-87065W	I-87066W	I-87068W	I-87069W	I-87069PW
Pictures	NEW 			NEW 							NEW 
Digital Output											
Channels	16	32	16		16	8	8	8	8	8	8
Type	Open Emitter	Open Collector			Power Relay		AC SSR	DC SSR	Power Relays	PhotoMOS Relay	
Sink /Source (NPN /PNP)	Source	Sink	Sink		Form A				Form A × 4 Form C × 4	Form A	
Load Voltage	10 ~ 40 V_{DC}	5 ~ 30 V_{DC}	5 ~ 30 V_{DC}	5 ~ 50 V_{DC}	Relay Contact: 0 ~ 250 V_{AC} 0 ~ 30 V_{DC}		24 ~ 265 V_{rms}	3 ~ 30 V_{DC}	Form A: 0 ~ 250 V_{AC} 0 ~ 28 V_{DC} Form C: 0 ~ 277 V_{AC} 0 ~ 30 V_{DC}	350 V Max. at DC/AC	80 V Max. at DC/AC
Max. Load Current	700 mA/ channel	100 mA/ channel	100 mA/ channel	700 mA/ channel	5.0 A_{rms}		1.0 A_{rms}	1.0 A_{rms}	Form A: 8 A Form C: 3 A (NC) 5 A (NO)	0.13 A_{rms}	1.0 A_{rms}
Over Load Protection	Yes	-	-	Yes	-		-	-	-	-	-
Short Circuit Protection	Yes	-	-	Yes	-		-	-	-	-	-
4 KV ESD Protection	Yes	Yes	Yes		Yes		Yes	Yes	Yes	Yes	Yes
Electrical Endurance	-				5×10^5 ops		No arcing, no bounce and no switching		10^5 ops	No arcing, no bounce and no switching	
Power on Value	Yes	Yes	Yes		Yes		Yes	Yes	Yes	Yes	Yes
Safe Value	Yes	Yes	Yes		Yes		Yes	Yes	Yes	Yes	Yes
System											
Dual Watchdog	Yes	Yes	Yes		Yes		Yes	Yes	Yes	Yes	Yes
Isolation	3750 V_{DC}	3750 V_{rms}	3750 V_{rms}		3000 V_{rms}	2000 V_{rms}	2500 V_{rms}	2500 V_{rms}	4000 V_{rms}	5000 V_{rms}	1500 V_{rms}
Power Consumption	0.41 W	0.7 W	1 W		1.8 W	1.5 W	0.6 W	0.6 W	2.5 W	0.5 W	0.5 W
Connector	Terminal Block	D-Sub 37	Terminal Block		Terminal Block		Terminal Block	Terminal Block	Terminal Block	Terminal Block	Terminal Block
Optional Accessories	-	DN-8K32R, DN-37-381-A	-								

I/O module with DN-8K32R

I/O module with DN-37-381-A

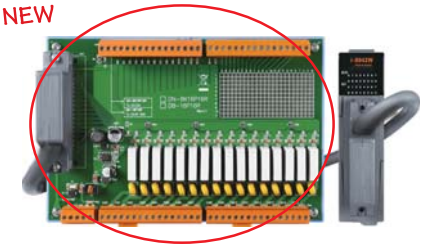
• Selection Guide

Digital Input & Output Modules (Parallel Bus) Table 5-3-6

Models	I-8042W	I-8050W	I-8054W	I-8054RW	I-8055W	I-8063W
Pictures		Note1 		Available soon 		
Digital Input						
Channels	16	16	8		8	4
Type	Wet	Wet	Wet		Dry	Wet
Sink /Source (NPN /PNP)	Sink, Source	Sink	Sink, Source		Source	Sink, Source
on Voltage Level	10 ~ 30 V_{DC}	10 ~ 30 V_{DC}	10 ~ 50 V_{DC}		Close to GND.	10 ~ 30 V_{DC}
off Voltage Level	4 V_{DC} Max.	4 V_{DC} Max.	4 V_{DC} Max.		Open	4 V_{DC} Max.
Low Pass Filter	-	-	-	Yes	-	-
Effective Distance for Dry Contact	-	-	-	-	100 m	-
Digital Output						
Channels	16	16	8		8	4
Type	Open Collector	Open Collector	Open Collector		Open Collector	Power Relay
Sink /Source (NPN /PNP)	Sink	Sink	Sink		Sink	Form C
Load Voltage	5 ~ 30 V_{DC}	5 ~ 30 V_{DC}	5 ~ 50 V_{DC}		5 ~ 30 V_{DC}	5 A (NO)/3 A (NC) @ 30 V_{DC} 5 A (NO)/3 A (NC) @ 277 V_{AC} 5 A (NO)/3 A (NC) at 65°C
Max. Load Current	100 mA/channel	100 mA/channel	700 mA/channel		100 mA/channel	
Power on Value	-	-	-	Yes	-	-
Safe Value	-	-	-	Yes	-	-
System						
Watchdog	-	-	-		-	-
Isolation	3750 V_{rms}	3750 V_{rms}	3750 V_{rms}		-	3750 V_{rms}
Power Consumption	1.5 W	1 W	0.55 W		1 W	2 W
Connector	D-Sub 37	Terminal Block	Terminal Block		Terminal Block	Terminal Block
Optional Accessories	DN-37-381-A, DN-8K16P16R	-	-		-	-

I/O module with DN-37-381-A

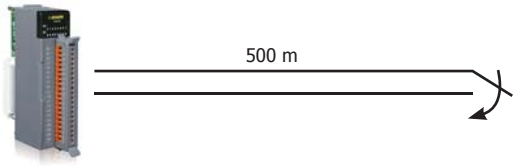
NEW

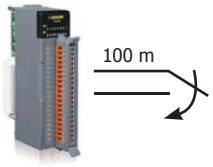


I/O module with DN-8K16P16R

■ **Effective distance for dry contact of DI/DIO module**

In general, the effective distance for dry contact of DI module is 100 m. With the enhanced circuit design, the distance can be extended up to 500 m.





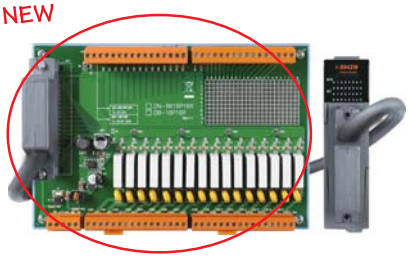
Note1. I-8050W is 16-ch universal digital I/O module. Each channel can be independently configured to be an input or an output channel by software setting.

• Selection Guide

Digital Input & Output Modules (Serial Bus) Table 5-3-7

Models	I-87042W	I-87054W	I-87055W	I-87063W
Pictures	NEW 			
Digital Input				
Channels	16	8	8	4
Contact	Wet	Wet	Dry	Wet
Sink /Source (NPN /PNP)	Sink, Source	Sink, Source	Sink	Sink, Source
on Voltage Level	+3.5 ~ +30 VDC	+3.5 ~ +50 VDC	Close to GND.	+3.5 ~ +30 VDC
off Voltage Level	1 VDC Max.	1 VDC Max.	Open	1 VDC Max.
Counter (100 Hz, 16-bit)	Yes	Yes	Yes	Yes
Low Pass Filter	Yes	Yes	Yes	Yes
Effective Distance for Dry Contact	-	-	100 m	-
Digital Output				
Channels	16	8	8	4
Type	Open Collector	Open Collector	Open Collector	Power Relay
Sink /Source (NPN /PNP)	Sink	Sink	Sink	Form C
Load Voltage	+5 ~ +30 VDC	+5 ~ +50 VDC	+5 ~ +30 VDC	+5 ~ +24 VDC 0 ~ +250 VAC
Max. Load Current	100 mA/channel	700 mA/channel	100 mA/channel	5 A (NO)/3 A (NC) @ 30 VDC 5 A (NO)/3 A (NC) @ 277 VAC
Short Circuit Protection	-	Yes	-	-
4 KV ESD Protection	Yes	Yes	Yes	Yes
Power on Value	Yes	Yes	Yes	Yes
Safe Value	Yes	Yes	Yes	Yes
System				
Dual Watchdog	Yes	Yes	Yes	Yes
Isolation	3750 Vrms	3750 Vrms	-	4000 Vrms
Power Consumption	1.5 W	0.7 W	0.6 W	1.5 W
Connector	D-Sub 37	Terminal Block	Terminal Block	Terminal Block
Optional Accessories	DN-37-381-A, DN-8K16P16R	-	-	-

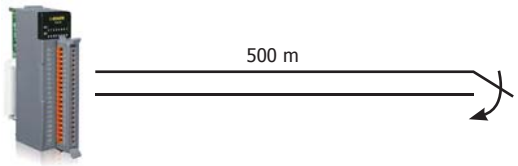
I/O module with DN-37-381-A

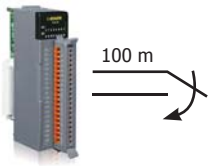
NEW 

I/O module with DN-8K16P16R

■ **Effective distance for dry contact of DI/DIO module**

In general, the effective distance for dry contact of DI module is 100 m. With the enhanced circuit design, the distance can be extended up to 500 m.





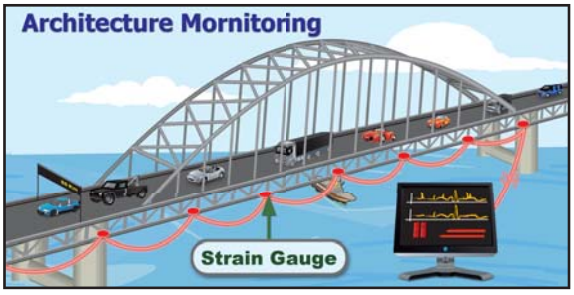
5.4. Multi-Function/Strain Gauge Modules

• Selection Guide

Strain Gauge Introduction

A strain gauge is a resistive sensor. The measurement of strain is usually made using a Wheatstone bridge circuit with excitation voltage. The variation in strain can be calculated based on the measured voltage. The resistance of the gauge varies when the gauge is compressed or stretched. With the characteristic, it can be applied to measure stress or the growth of the crack or movement in buildings, foundations, and other structures to ensure the safety.

Applications

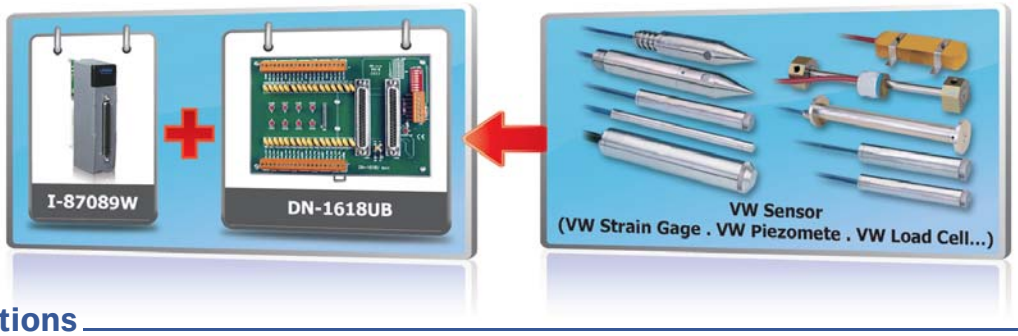


Multi-function Module (Parallel/Serial Bus)				
Models		**I-87016W**	**I-87026PW**	**I-8026PW**
Pictures		NEW 	NEW 	Available soon 
Analog Input				
Channels		2	6	
Range		±15 mV, ±50 mV, ±100 mV, ±500 mV, ±1 V_{DC}, ±2.5 V_{DC}, ±20 mA	±150 mV, ±500 mV, ±1 V, ±5 V, ±10 V, ±20 mA	±10 V_{DC}, ±5 V_{DC}, ±20 mA (Jumper Select)
Strain Gauge Type		Full-Bridge, Half-Bridge, Quarter-Bridge	-	
Resolution		16-bit	16-bit	12-bit
Accuracy		±0.05% of FSR (Voltage), ±0.1% of FSR (Current)	±0.1% of FSR	±0.2% of FSR
Sampling Rate		2 Hz (Total) or 10 Hz (Total)	10 Hz (Total)	35 kHz
Input Impedance		> 400 kΩ (Voltage), 125 Ω (Current)	2 MΩ (Voltage), 125 Ω (Current)	2M Ω
Overvoltage Protection		30 V_{DC}	240 V_{rms}	
Long Distance Strain Gauge Measurement		Yes	-	-
Individual Channel Configurable		Yes	Yes	
Analog Output				
Channels		1	2	
Range		0 ~ +10 V_{DC}	±10 V, ±5 V, 0 ~ 10 V, 0 ~ 5 V, 0 ~ 20 mA, 4 ~ 20 mA	±10 V, ±5 V, 0 ~ 10 V, 0 ~ 5 V, 0 ~ 20 mA
Resolution		16-bit	12-bit	
Accuracy		±0.05% of FSR	±0.1% of FSR	±0.2% of FSR
Output Capacity		10 V @ 80 mA	10 V @ 20 mA	
Digital Input				
Channels		2	2	
Contact		Wet	Wet	
Sink /Source (NPN /PNP)		Sink	Sink	
on	Voltage Level	3.5 ~ 50 V_{DC}	3.5 ~ 50 V_{DC}	
off	Voltage Level	1 V_{DC} Max.	1 V_{DC} Max.	
Low Pass Filter		Yes	Yes	-
Digital Output				
Channels		2	2	
Type		Open Collector	Open Collector	
Sink /Source (NPN /PNP)		Sink	Sink	
Load Voltage		3.5 ~ 50 V_{DC}	3.5 ~ 50 V_{DC}	
Max. Load Current		700 mA/channel	700 mA/channel	
System				
Dual Watchdog		Yes	Yes	-
Data Bus		Serial	Serial	Parallel
Isolation		3000 V_{DC}	2500 V_{DC}	
Power Consumption		2.5 W	1.8 W	3 W
Connector		Terminal Block	Terminal Block	Terminal Block
Optional Accessories		-	-	-

5.5. Vibrating Wire Input Modules

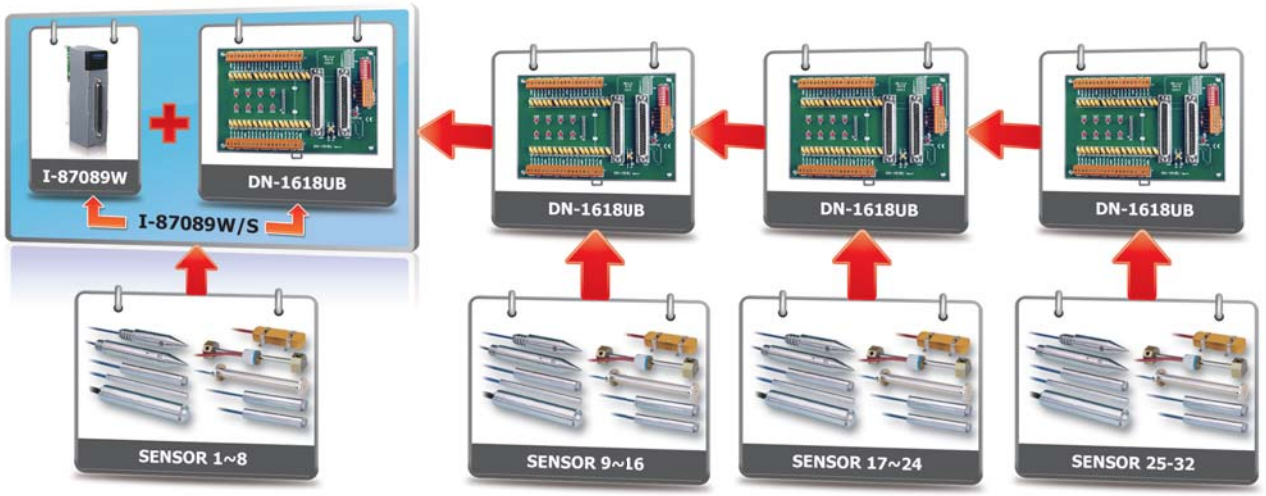
Introduction

The vibrating wire sensor has a wire which is initially plucked by a series of electrical magnetic forces from a coil. The conductive wire after plucking is vibrating in a magnetic field. The wire will disturb the field, and then the coil can pick up the induced voltage change. The signal is amplified and detected by a VW readout device, or called VW reader. After plucking, there is no other force acting on this wire. When the transient response dies out, the reader can read a stable resonant frequency. The resonant frequency is function of the tension of this wire.



Applications

The I-87089W/S can be extended to 32 channels by connecting 3 extra DN-1618UB.



VW Input Module	
Models	**I-87089W/S**
Pictures	Available soon 
Vibrating Wire Input	
Channels	8
Input Type	Vibrating Wire Sensor (2 VW wire + 2 Temperature wire +1 shield wire)
Measurement Range	Wire: 450 ~ 6000 Hz
Excitation mode	Enhanced square wave
Resolution	Wire: 0.01Hz / Temperature: 0.01°C
Accuracy	Wire: ±0.01% of FSR / Temperature: ±0.1% of FSR
Channel to channel isolation	Yes, 1 kV
System	
Dual Watchdog	Yes
Isolation	3000 V_{DC}
Power Consumption	3.6 W
Connector	D-Sub 37
Optional Accessories	DN-1618UB

5.6. Counter/Frequency/PWM Modules

• Selection Guide

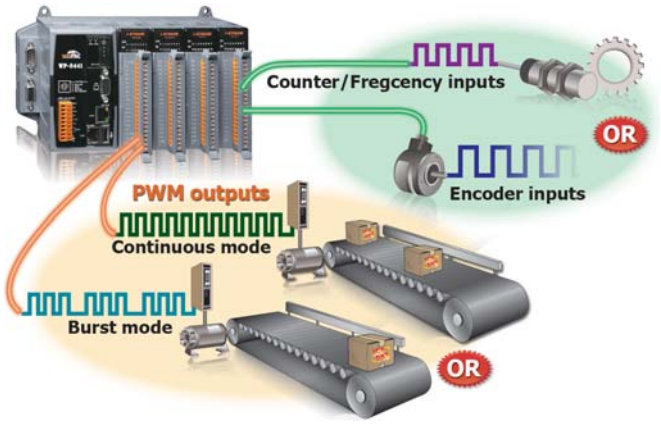
PWM Introduction

PWM (Pulse width modulation) is a powerful technique for controlling analog circuits. It uses digital outputs to generate a waveform with variant duty cycle and frequency to control analog circuits. I-8088W and I-87088W have 8 PWM output channels and 8 digital inputs. It can be used to develop powerful and cost effective analog control system.

PWM Features

- Automatic generation of PWM outputs by hardware, without software intervention.
- Software and hardware trigger mode for PWM output
- Individual and synchronous PWM output
- Burst mode PWM operation for standby
- DI channel can be configured as simple digital input channel or hardware trigger source of the PWM output.

Applications



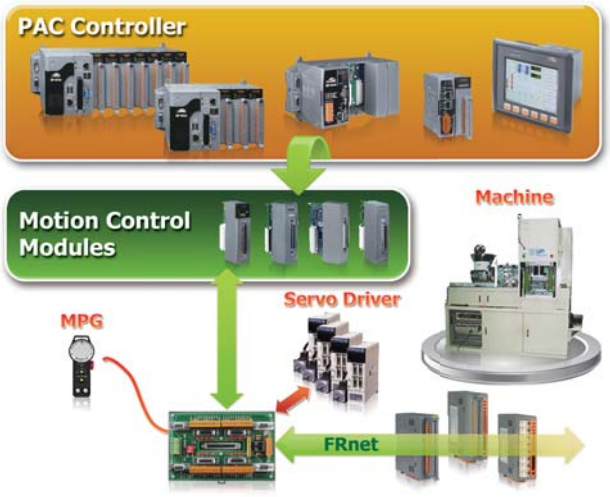
Counter/Frequency/PWM Module (Parallel/Serial Bus)						
Models		**I-87082W**	**I-8084W**	**I-87084W**	**I-8088W**	**I-87088W**
Pictures				NEW 		Available soon 
Digital Input						
Channels		2	8		8	8
Type		Isolated or Non-isolated	Isolated or Non-isolated (Jumper Selectable)		Isolated	Isolated
on	Voltage Level	3.5 ~ 30 VDC (isolated) 2.4 ~ 5 VDC (Non-isolated)	3.5 ~ 30 VDC (isolated) 2.4 ~ 5 VDC (Non-isolated)		5 ~ 30 VDC	2.4 ~ 5 VDC
off	Voltage Level	1 VDC Max. (isolated) 0~ 0.8 VDC (Non-isolated)	1 VDC Max. (isolated) 0 ~ 0.8 VDC (Non-isolated)		0.8 VDC Max.	0.8 VDC Max.
Threshold Voltage		Programmable	Fixed		Fixed	Fixed
Counter		Up	Up/Down		-	Up
Max.Counts		32-bits (4,294,967,295)	32-bits (4,294,967,295)		-	32-bits (4,294,967,295)
Max. Counter Speed		100 kHz	250 kHz (isolated) 1 MHz (Non-isolated)		-	1 MHz
Digital Filter		2 ~ 65000 µs	1 ~ 32767 µs		-	-
Virtual Battery Backup for Counter Value		-	-	Yes	-	Yes
Max. Frequency		100 kHz	250 kHz		-	-
Frequency Accuracy		1Hz or 10Hz	±0.4% of Input Frequency		-	
Encoder		-	CW/CCW, Dir/Pulse, AB Phase		-	-
Digital Output						
Channels		2	-		8	
Type		Sink, Open Collector	-		Source, PWM	
Output Voltage		5 ~ 30 VDC	-		5 VDC	
Output Current		30 mA	-		1 mA	
Alarm Output		Yes	-		-	
PWM Frequency		-	-		1 ~ 500 kHz	
PWM Duty Cycle		-	-		0.1 ~ 99.9%	
PWM Mode		-	-		Burst, Continuous	
Burst Count		-	-		1 ~ 65535	
Trigger Start		-	-		Hardware, Software	
System						
Dual Watchdog		Yes	-	Yes	-	Yes
Data Bus		Serial	Parallel	Serial	Parallel	Serial
Isolation		3750 Vrms	1000 Vrms	2000 VDC	3000 VDC	2500 Vrms
Power Consumption		0.5 W	0.6 W	0.6 W	1.8 W	1.8 W
Connector		Terminal Block			Terminal Block	
Optional Accessories		-			-	

5.7. Motion Control Modules

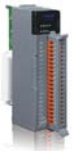
Introduction

The i-8092/4/F/A/H is a 2/4-axis stepping/pulse-type servo motor control module. This module contains a high-performance motion ASIC. Apart from a wide speed range, this intelligent motion controller also has a variety of motion control functions built in, such as 2/3 (4 axis only) - axis linear interpolation, 2-axis circular interpolation, T/S-curve acceleration/deceleration, various synchronous actions (4 axis only), automatic homing(4 axis only), and others. In addition, most of the motion control functions are performed with light load on the processor. While driving the motors, the motion status, and the other I/O status on the PAC modules, can still be monitored. As a result of the low CPU loading requirements, one or more motion modules may be used on a single PAC controller.

The i8092F/4F/4H modules have one port of FRnet. The FRnet port allows this module to expand its fast remote I/O easily. This two-wired FRnet can automatically scan its 128 DI and 128 DO with a period of 2.88 ms.



Selection Guide

Motion Control Modules (Parallel Bus)						
Model Name	**I-8092F**	**I-8093W**	**I-8094**	**I-8094F**	**I-8094A**	**I-8094H**
Pictures						
Encoder Input						
Axis	2	3	4			
Counter	32-bit	32-bit	32-bit			
Speed (pps)	1 M	1 M	1 M			
Signal	CW/CCW, A/B	CW/CCW, A/B, Pulse/Dir	CW/CCW, A/B			
Command Pulse Output						
Axis	2	-	4			
Counter	32-bit	-	32-bit			
Speed (pps)	4 M	-	4 M			
Signal	CW/CCW, Pulse/Dir	-	CW/CCW, Pulse/Dir			
System						
Programmable CPU (MiniOS7 inside)	-		-	-	Yes	Yes
FRnet	Yes	-	-	Yes	-	Yes
Isolation			2500 V_{rms}			
Power Consumption	1.9 W	2 W	2 W	2.5 W	3 W	3.5 W
Optional Accessories	DN-8237	-	DN-8468	DN-8468	DN-8468	DN-8468

Daughter-Board for two-axis motion controller	
DN-8237 Series  Dimensions: 110 mm X 107 mm	**DN-8237GB**: for general purpose usage
	DN-8237MB: for Mitsubishi servo J2 Amplifier
	DN-8237PB: for Panasonic servo minas A Amplifier
	DN-8237YB: for Yaskawa servo Amplifier
	DN-8237DB: for Delta ASDA A servo Amplifier

Daughter-Board for four-axis motion controller	
DN-8468 Series  Dimensions: 162 mm X 107 mm	**DN-8468GB**: for general purpose usage
	DN-8468MB: for Mitsubishi servo J2 Amplifier
	DN-8468PB: for Panasonic servo minas A Amplifier
	DN-8468YB: for Yaskawa servo Amplifier
	DN-8468DB: for Delta ASDA A servo Amplifier
	DN-8468FB: for FUJI FALDIC-W servo Amplifier

5.8. Serial Communication Modules (Parallel Bus)

• Selection Guide

RS-232/422/485 Communication Module (Parallel Bus)					
Model Name	**I-8112iW**	**I-8114W**	**I-8114iW**	**I-8142iW**	**I-8144iW**
Pictures					
Communication					
Interface	RS-232	RS-232	RS-232	RS-422/485	RS-422/485
Port	2	4	4	2	4
Max. Speed (K bps)	115.2				
Controller Chip	16C950				
System					
Hot Swap	-	-		-	
Isolation	2500 V_{rms}	-	2500 V_{rms}	2500 V_{rms}	
Power Consumption	1.5 W	1.25 W	1.75 W	1.5 W	1.75 W
Connector	D-Sub 9 x 2	D-Sub 37		Terminal Block	
Optional Accessories	CA-0915	CA-9-3705	CA-9-3705	-	-

CA-0915

CA-9-3705

Optional RS-232/422/485 Converter/Repeater

Model Name	tM-7520U	I-7520	I-7520R	I-7520A	I-7520AR	I-7551	tM-7510U	I-7510	I-7510A	I-7510AR
Pictures	NEW 						NEW 			
Function	Converter						Repeater			
Interface	RS-232 to RS-485			RS-232 to RS-422/485		RS-232 to RS-232	RS-485	RS-485	RS-422/485	
Isolation	2500 V_{DC} RS-232 side	3000 V_{DC} RS-232 side	3000 V_{DC} RS-485 side	3000 V_{DC} RS-232 side	3000 V_{DC} RS-422/485 side	3000 V_{DC} 3 ways	2500 V_{DC}	3000 V_{DC}		3000 V_{DC} 3 ways
Operating Temperature	-25 ~ +75°C									

Optional RS-232/485 to RS-485 Hub

Model Name	I-7513	I-7520U4	I-7514U
Pictures		NEW 	NEW 
Function	3-CH Hub/Splitter/Repeater	4-CH Hub/Splitter	4-CH Hub/Splitter/Repeater
Interface	RS-485 to 3-CH RS-485	RS-232 to 4-CH RS-485	RS-485 to 4-CH RS-485
Isolation	3000 V_{DC} 3 ways	2500 V_{DC} RS-232 side	2500 V_{DC} CH1-CH4 side
Operating Temperature	-25 ~ +75°C		

5.9. CAN/CANopen/DeviceNet Master Modules (Parallel/Serial Bus)

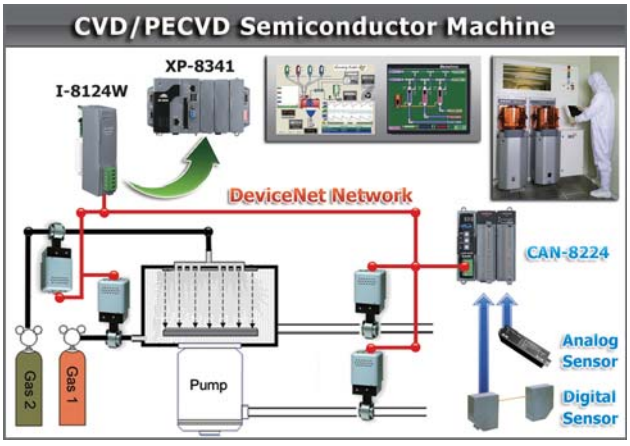
Introduction

These CAN bus communication modules are the solutions to the various CAN application requirements in PAC family with rich CAN bus protocols. The I-8123W, I-87123W, I-8124W, and I-87124W separately support CANopen and DeviceNet master protocols. Users can apply them in PAC to connect to CANopen and DeviceNet devices to reach various CANopen and DeviceNet systems easily.
For the especial CAN bus applications, the I-8120W and I-87120 are designed for users to apply in PAC series. The default firmware of I-8120W and I-87120 provides the transmission and reception of CAN bus messages in PAC. In addition, users can design the specific firmware in these modules to reduce the loading of the PAC in C language.

CAN Bus Applications

• CANopen/DeviceNet Application Stories

When the quality of motors is required to upgrade gradually, the precise and the fast motor equipment is more and more important. The high speed motor winding machine uses the I-8123W to monitor and control the distributed I/O data through the CANopen network. When the I-8123W gets these input data from tension sensors, pressure sensors, and so on, the WinPAC will trigger the CANopen DO modules and the motors to control relay, switch, pneumatic valve, and robot to do the winding. As the CANopen features, fast and safe, it can really improve the speed and quality.



This system utilizes XP-8341 and I-8124W as the controlling center of the remote I/O devices. I-8124W provides DeviceNet master engine to collect the remote I/O data, including pneumatic valve "MKS 683" and Beckhoff DeviceNet I/O. XP-8341 exists an operating program to control the situation in the chamber. It is important to control the reacting time of the wafer in the chamber which have some kind of gas inside. After tuning timing and pressure parameter, this series equipment has been developed successfully and works in some semiconductor factories.

• Selection Guide

CAN/CANopen/DeviceNet Master Module (Parallel/Serial Bus)					
Model Name	**I-8120W**	**I-8123W**	**I-87123**	**I-8124W**	**I-87124**
Pictures					
Communication					
Interface	ISO 11898-2 CAN				
Port	1				
Terminator	120 Ω Selected By Jumper				
Max. Speed (K bps)	1000	1000		500	
Controller Chip	SJA1000T				
Transceiver Chip	82C250				
Protocol	CAN 2.0 A/2.0 B	CANopen DS-301 ver 4.02, DS-401 ver 2.1		DeviceNet Volume I ver 2.0, Volumn II ver 2.0	
System					
Hot Swap	-	-	Yes	-	Yes
Data Communication	Parallel Interface	Parallel Interface	Serial Interface	Parallel Interface	Serial Interface
User-defined Firmware	Yes	-		-	
Isolation	2500 V_{rms}				
Power Consumption	2 W				
Connector	5-pin Terminal Block				
PAC Driver Support					
I-8000, iP-8000	-	-	BC, TC	-	BC, TC
VP-2111					
WP-8000	eVC++ 4.0, VB.Net 2005, C#.Net 2005				
VP-2000					
XP-8000-CE6, XP-8000-Atom-CE6	VB.Net 2005, C#.Net 2005, VC 2005				
XP-8000, XP-8000-Atom	VB.Net 2005, C#.Net 2005, VC 6				
LP-8000	-	-	GCC	-	GCC

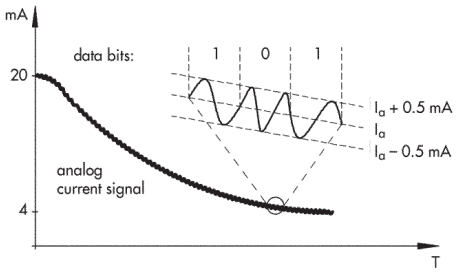
Model Name	I-2532	I-2533	I-7531	I-7532
Pictures				
Function	Converter	Bridge	Repeater	Bridge
Interface	CAN to Fiber Optics		2-port CAN	2-port CAN
Note.	ST type Fiber Optics Connector and Multi-mode		3000 V_{DC} Isolated on 3 Ways	
Operating Temperature	-25 ~ +75°C			

Model Name	I-7530	I-7530-FT	I-7530A	I-7530A-MR	I-7540D	I-7540D-MTCP	I-7540D-WF	I-7565	I-7565-H1	I-7565-H2
Pictures										
CPU	8-bit, 20 MHz		8-bit, 20 MHz	32-bit, 96 MHz	80186, 80 MHz		32-bit, 96 MHz	8-bit, 20 MHz	32-bit 72 MHz	
Interface	CAN ↔ RS-232		CAN ↔ RS-232/RS-422/ RS-485		CAN ↔ Ethernet		CAN ↔ Wi-Fi	CAN ↔ USB	CAN x 1 ↔ USB	CAN x 2 ↔ USB
Tools	VC6, VB6, VS.Net				VC6, VB6, VS.Net			VC6, VB6, VS.Net		
Description	CAN to RS-232 converter	Low-Speed/ Fault-Tolerance CAN to RS-232 converter	CAN to RS-232/ RS-422/ RS-485 converter	CAN to Modbus RTU slave converter	CAN to Ethernet converter	CAN to Modbus TCP server converter	CAN to Wi-Fi converter	USB to CAN converter	High performance 1-port USB to CAN converter	High performance 2-port USB to CAN converter

5.10. HART Communication Modules

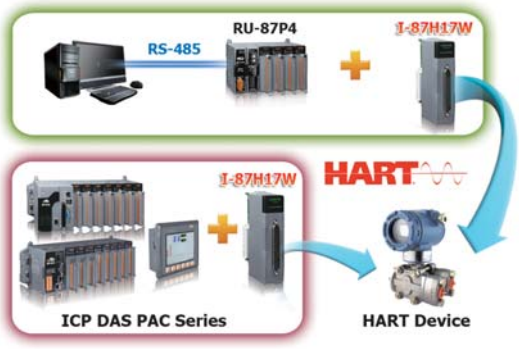
Introduction

The HART (Highway Addressable Remote Transducer) protocol uses the Bell 202 Frequency Shift Keying (FSK) standard to superimpose digital communication signals on the 4-20 mA loop current shown as below figure. HART communicates at 1200 bps without interrupting and interference with the 4-20mA signal and allows a host application (master) to send/receive digital information from a smart field device. The 4-20mA signal communicates the primary measured value - the fastest and most reliable industry standard. The digital signal can be used for additional device information including device status, diagnostics, additional measured or calculated values, etc. Therefore, the HART communication including analog and digital information provides a low-cost and very robust complete field communication solution that is easy to use and configure.



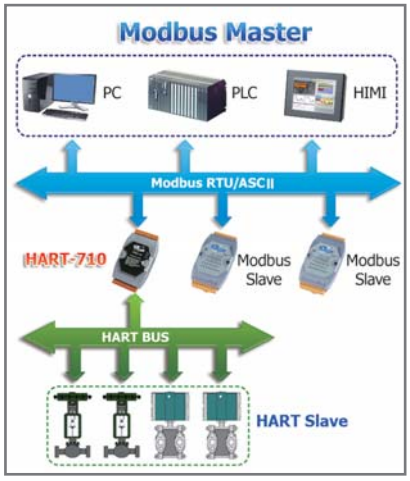
Communication Module for PAC

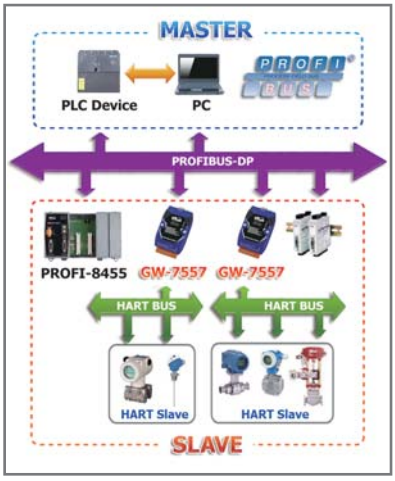
The HART communication is used in PAC to send/receive HART commands.		
Pictures	**Model**	**Description**
NEW 	**I-87H17W**	HART Module with 8-ch analog inputs for PAC
Available soon 	**I-87H24W**	HART Module with 4-ch analog outputs for PAC



Converter		
Pictures	**Model**	**Description**
Available soon 	**I-7547**	Ethernet to HART converter
NEW 	**I-7567**	USB to HART converter
NEW 	**I-7570**	RS-232/422/485 to HART converter

Gateway		
Pictures	**Model**	**Description**
	**HART-710**	Modbus RTU/ASCII to HART gateway
Available soon 	**GW-7437**	Modbus TCP to HART gateway
	**GW-7557**	PROFIBUS to HART gateway





5.11. FRnet Communication Modules (Parallel Bus)

Introduction

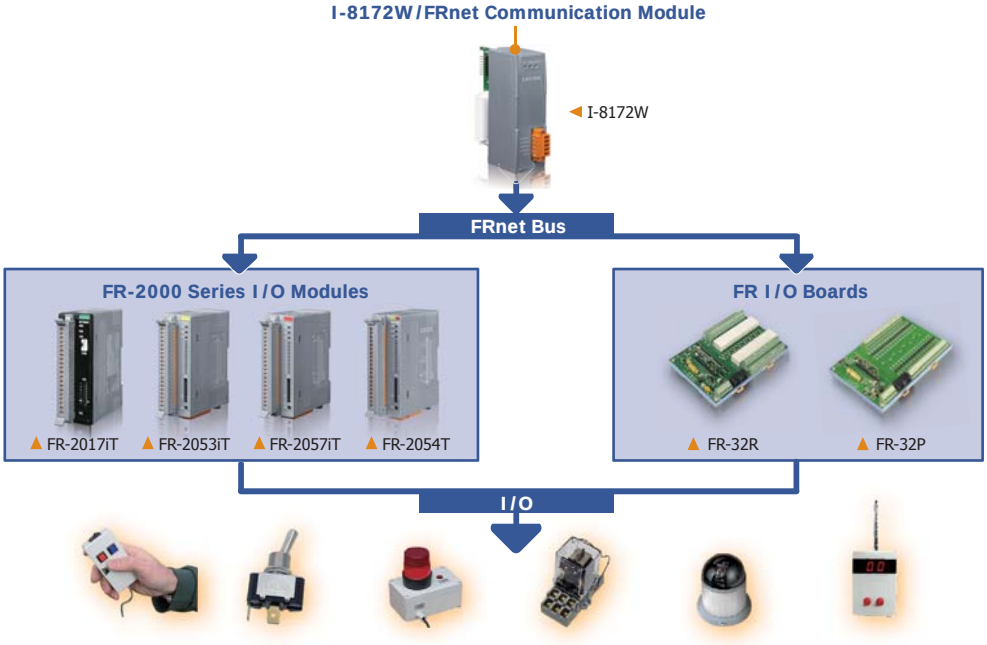
FRnet is an innovative industrial field bus. It uses twisted pair cable to be the transmission medium. Each FRnet port can link up to 128 DI and 128 DO channels. The whole I/O statuses are updated at a fixed cycle time (0.72 ms or 2.88 ms) no matter how many FRnet I/O modules are connected to the FRnet network. Further more, the update is done by hardware, there is no communication protocol is needed. Using FRnet, the user can easily and quickly implement high-speed distributed I/O control systems. Its key features are:

Features

- Easy connection: multi-drop networking with twisted pair cable
- Easy programming: memory mapping (no communication protocol needed)
- I/O expansion ability for each port: 8 SA nodes (for DI) and 8 RA nodes (for DO), each node addresses to 16 DI or DO channels
- Normally FRnet module provides two communication speeds. OEM customer can call manufacturer to design special FRnet module for long distance communication.

Speed	Baudrate	Max. Distance	Fixed Cycle Time
High Speed	1 Mbps	100 m	0.72 ms
Low Speed (Default)	250 kbps	400 m	2.88 ms

Applications



2-PORT FRnet module (Parallel Bus)	
Model Name	**I-8172W**
Pictures	
Communication	
Interface	FRnet
Port	2
Transfer distance	Max. 400 m for speed 250Kbps (Default); Max. 100 m for speed 1 Mbps
Transfer speed	2.88 ms for speed 250Kbps (Default) / 0.72 ms for speed 1 Mbps
Protocol	None (memory mapping)
I/O Expansion for Each Port	8 SA nodes (for DI) and 8 RA nodes (for DO); each node for DI or DO channels
networking	multi-drop networking with twisted pair cable
System	
Hot Swap	-
Intra-module Isolation, Field to Logic	3000 V_{DC}
Power Consumption	6 W
Optional Accessories	-

5.12. 2G/3G/GPS Modules

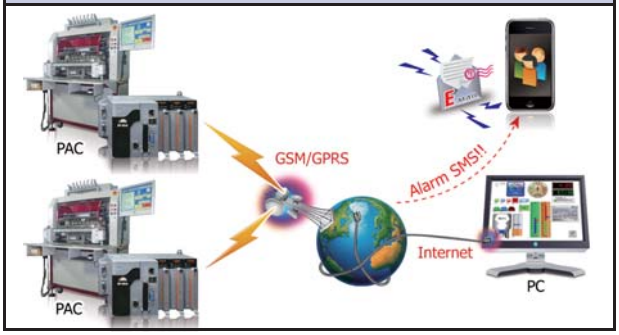
• Selection Guide

Introduction

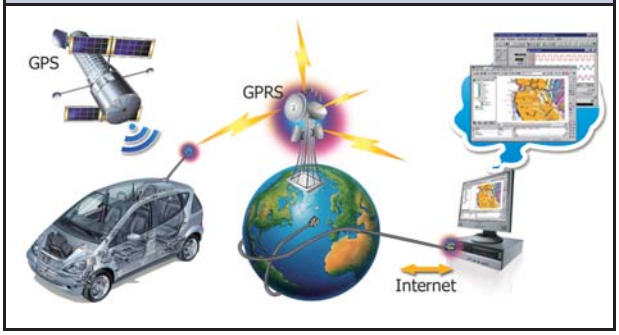
The I-87211W/I-8212W/I-8213W modules are specially designed for GPS, GSM and GPRS applications in PAC series. They expand the capability of PAC series into Machine to Machine, Mobile, Man communication applications. Also, there are rich demos including IsaGraf, InduSoft and C language for users to integrate these modules into M2M applications. By applying these modules in PAC series, the remote control or monitoring can be implemented easily from any location.

Applications

Remote Machine Management



GPS Vehicle Tracking



Model Name		I-87211W	I-8212W	I-8212W-3GWA	I-8213W	I-8213W-3GWA
Pictures						
Specifications						
3G	Band	-	-	WCDMA: 2100/1900/850 MHz	-	WCDMA: 2100/1900/850 MHz
	Data Transfer	-	-	WCDMA / HSDPA / HSUPA Upload: Max. 5.76 Mbps; Download: Max. 7.2 Mbps	-	WCDMA / HSDPA / HSUPA Upload: Max. 5.76 Mbps; Download: Max. 7.2 Mbps
2G	Band	-	850/900/1800/1900 MHz			
	GPRS Multi-slot	-	Class 10/8			
	GPRS Mobile Station	-	Class B			
	GPRS Class 10	-	Max. 85.6 kbps			
	CSD	-	Up to 14.4 kbps			
	Compliant to GSM phase 2/2+	-	Class 4 (2 W @ 850/900 MHz); Class 1(1 W @ 1800/1900 MHz)			
	Coding Schemes	-	CS 1, CS 2, CS 3, CS 4			
SMS	Mode	-	Text and PDU			
GPS Output	1 PPS	Pulse per second output (Default 100 ms pulse/sec)	-		-	
	RS-232 Interface	GPS information output	-		-	
GPS Receiver	Frequency	L1 1575.42 MHz, C/A code	-		L1 1575.42 MHz, C/A code	
	Support Channel	32	-		32	
	Position Accuracy	Capable of SBAS (WAAS, EGNOS, MSAS)	-		Capable of SBAS (WAAS, EGNOS, MSAS)	
	Max. Altitude	<18,000 m	-		<18,000 m	
	Max. Velocity	<515 m/s	-		<515 m/s	
	Acquisition Time	Cold Start (Open Sky)=36 s (typical)	-		Cold Start (Open Sky)=36 s (typical)	
	Sensitivity	Tracking=Up to -159 dBm	-		Tracking=Up to -159 dBm	
		Cold start=Up to -146 dBm	-		Cold start=Up to -146 dBm	
	Protocol Support	NMEA 0183 version 3.01	-		NMEA 0183 version 3.01	
Digital Output	Output Channels	2 (Sink)	-		-	
	Output Type	Non-isolated Open Collector	-		-	
	Output Current	100 mA/Channel	-		-	
	Load Voltage	Max. 30 V_{DC}	-		-	