Industrial Fieldbus Product

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1. Introduction

Fieldbus is known as family of industrial network protocols for real-time distributed control. An automated industrial system usually requires Fieldbus solutions in order to overcome connectivity issues between the various, such as controllers, sensors and actuators.

In order to provide a variety of Fieldbus solutions, ICP DAS has devoted signification resources for many years into developing Fieldbus products based on different protocols. In additional to Modbus TCP, Modbus RTU and Modbus ASCII, these products comprehensively cover the majority of industrial communication protocols,such as CAN Bus, CANopen, DeviceNet, J1939, PROFIBUS, HART, EtherCAT, Ethernet/IP, BACnet/IP, and PROFINET, for process and factory automation, as illustrated.

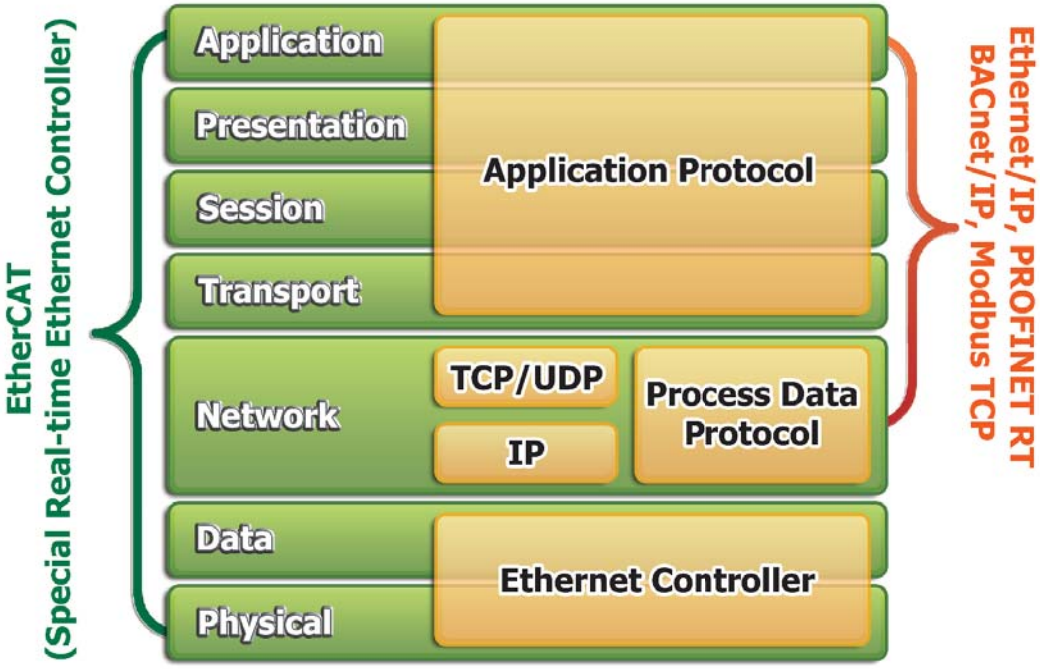
ICP DAS also offers a diverse range of PACs incorporating different sizes and features. These powerful PACs provide a method of assembling private protocols based on RS-232, RS-485, industrial Ethernet, CAN bus, Wi-Fi, 2.5G and 3G interfaces. By using a PAC, it is possible to integrate various communication protocols into a single controller, meaning that constructing a multi-function automation system becomes quicker and easier.

2. Industrial Ethernet Products

2.1 Overview

Industrial Ethernet is a kind of technology, which uses the Ethernet family of computer network technologies in an industrial environment, for automation and process control. By using standard Ethernet interface, the automation units from different manufacturers can be easy to interconnect with each other throughout an application system. Industrial Ethernet takes advantage of the relatively larger marketplace because the comprehensive usage of the Ethernet interconnections could reduce cost and improve performance of communications between industrial controllers.

ICP DAS foresees the market trend and have announced several Industrial Ethernet products. In addition to the Modbus TCP series, ICP DAS also offers different product lines of the EtherCAT, EtherNet/IP, PROFINET and BACnet/IP application protocols. Through them, to construct a multi-function automation system can be more flexible and be easy to integrate the computers and the Industrial Ethernet products from different manufactures.

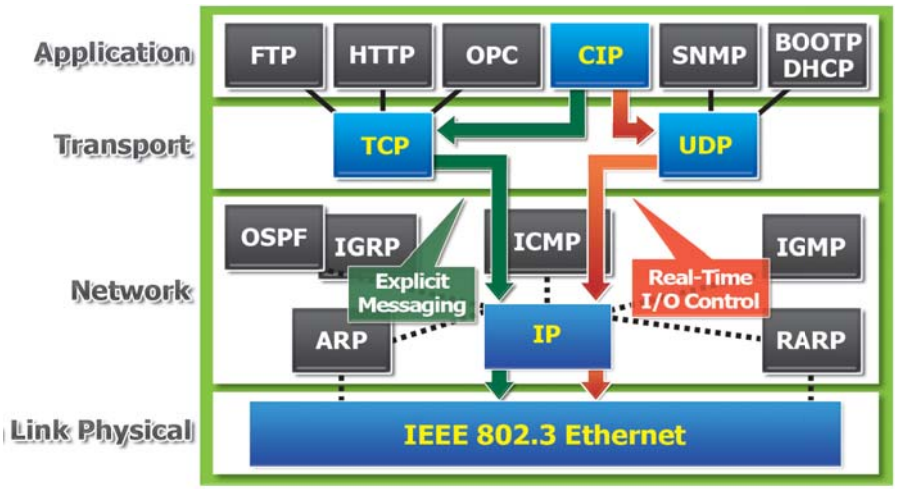


Protocol	Modbus TCP	EtherCAT	EtherNet/IP	PROFINET RT	BACnet/IP
Trademark	Modbus	EtherCAT	EtherNet/IP	PROFINET	BACnet
Organization	Modbus	ETG	ODVA	PI	SSPC
Special Hardware	No	Yes	No	No	No
Ethernet Switch	Yes	No	Yes	Yes	Yes
Cycle Time	Normal	Fast	Normal	Good	Normal
Topology Flexibility	Normal	Good	Normal	Normal	Normal
Data Integration	Easy	Normal	Easy	Easy	Easy

2.2 EtherNet/IP Products

EtherNet/IP is one of the open network standards, like DeviceNet and ControlNet. It is an industrial application layer protocol for industrial automation applications. Building on standard Ethernet technologies means that EtherNet/IP will work transparently with all the standard Ethernet devices found today. EtherNet/IP application layer is based on the "Common Industrial Protocol" (CIP) which is used in both DeviceNet and ControlNet. Based on these protocols, EtherNet/IP provides a seam-less integrated system from the Industrial floor to the enterprise network.

EtherNet/IP uses all the transport and control protocols of standard Ethernet including the Transport Control Protocol (TCP), the User Datagram Protocol (UDP), the Internet Protocol (IP). Building on these standard communication technologies means that EtherNet/IP works transparently with all the standard Ethernet devices found in today's market-place.



Features:

- Offer Producer-consumer service that enable users to control, configure and collect data
- Provide robust physical layer options for industrial environments and includes the use of sealed RJ45 and M12 D-coding connector
- Compatible with general communication standards, including OPC, TCP/IP, HTTP, FTP, SNMP, DHCP
- Use TCP port number 44818 for explicit messaging and UDP port number 2222 for implicit messaging
- Transfer of basic I/O data via UDP-based implicit messaging
- Uploading and downloading of parameters, programs and recipes via TCP
- Polled, cyclic and change-of-state monitoring via UDP
- One-to-one (unicast), one-to-many (multicast), and one-to-all (broadcast) communication via TCP

Selection Guide

Model Name		Description
EtherNet/IP Gateways	GW-7472	Ethernet/IP Adapter to Modbus TCP/RTU Master Gateway
	GW-7473	Modbus TCP/RTU Slave to EtherNet/IP Scanner Gateway
EtherNet/IP I/O Modules	EIP-2017	EtherNet/IP I/O Module with Isolated 8-Ch Voltage/Current Inputs
	EIP-2019	Ethernet/IP I/O Module with 8-Ch Thermocouple Inputs
	EIP-2042	Ethernet/IP I/O Module with 16-Ch DO
	EIP-2051	Ethernet/IP I/O Module with 16-Ch DI
	EIP-2055	Ethernet/IP I/O Module with 8-Ch DI, 8-Ch DO
	EIP-2060	Ethernet/IP I/O Module with 6-Ch DI, 6-Ch Relay

GW-7472 EtherNet/IP Adapter to Modbus TCP/RTU Master Gateway

The GW-7472 (EtherNet/IP adapter to Modbus TCP/RTU Master Gateway) is helpful for data-exchanging between the Modbus RTU Network, Modbus TCP Network, and the EtherNet/IP Network. It reads the register data from the Modbus RTU slaves as well as Modbus TCP servers and publishes these data to the input register data of the EtherNet/IP scanner. The output data transmitted by the EtherNet/IP scanner are updated to the register data of Modbus TCP/RTU slaves via the GW-7472.

General Features

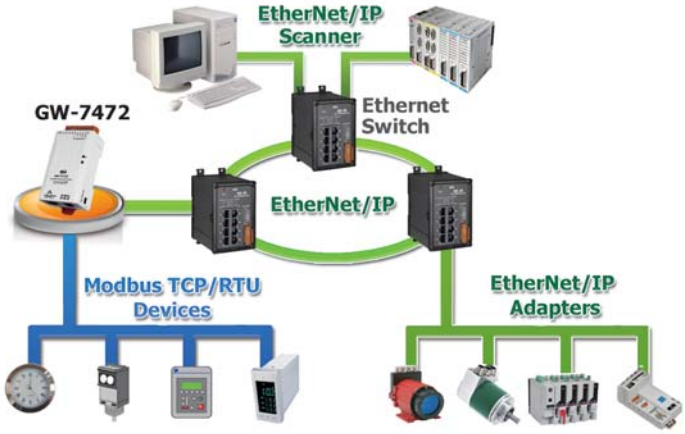
- 10/100 Base-TX Ethernet, RJ-45 x1
- Redundant power inputs: PoE (IEEE 802.3af, Class 1) and DC jack
- Automatically RS-485 direction control
- Tiny form-factor and low power consumption

EtherNet/IP Features

- Ethernet Protocol: EtherNet/IP adapter
- Maximum number of connections for Explicit Messages: 6
- Maximum number of connections for Implicit Messages: 1
- EtherNet/IP Input/Output command data size: maximum 500 bytes
- Supported I/O connection methods:
  - Transport and trigger: Exclusive-Owner, Cyclic
  - Originator to Target Type: POINT2POINT
  - Target to Originator Type: POINT2POINT, MULTICAST

Modbus Features

- Maximum support 8 Modbus commands for each one Modbus TCP server
- Modbus Input/Output command data size: maximum 500 bytes
- Supported Modbus Function Code 01, 02, 03, 04, 05, 06, 15, and 16
- Modbus Protocol: Modbus TCP/RTU master protocols
- Maximum support 30 Modbus RTU commands
- Maximum support 10 Modbus TCP servers



GW-7473 Modbus TCP/RTU Slave to EtherNet/IP Scanner Gateway

The GW-7473 (Modbus TCP/RTU Slave to EtherNet/IP Scanner Gateway) is helpful for data-exchanging between Modbus Master and EtherNet/IP adapter. It reads the register data from the EtherNet/IP adapter and publishes these data to the input register data of the Modbus TCP client as well as Modbus RTU Master. The output data transmitted by the Modbus TCP/RTU Master are updated to the register data of EtherNet/IP adapter.

General Features

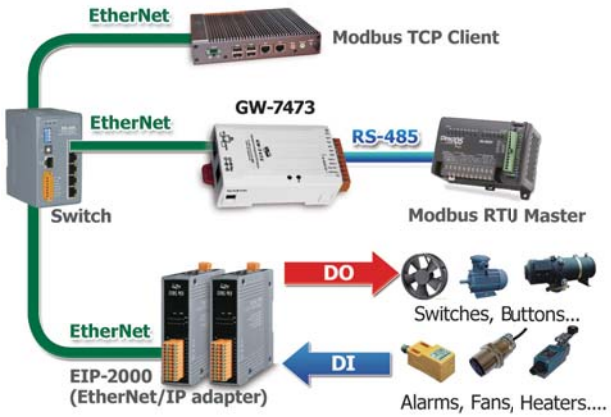
- 10/100 Base-TX Ethernet, RJ-45 x1
- Redundant power inputs: PoE (IEEE 802.3af, Class 1) and DC jack
- Automatically RS-485 direction control
- Tiny form-factor and low power consumption

EtherNet/IP Features

- Supported Objects according to CIP Standard
  - Assembly Object
  - Connection Manager Object
  - Ethernet Link Object
  - Message Router Object
  - TCP/IP Interface Object
- Ethernet Protocol: EtherNet/IP Scanner
  - Scanner Class Functionality
  - Class 1 (connected) I/O Server and Client

Modbus Features

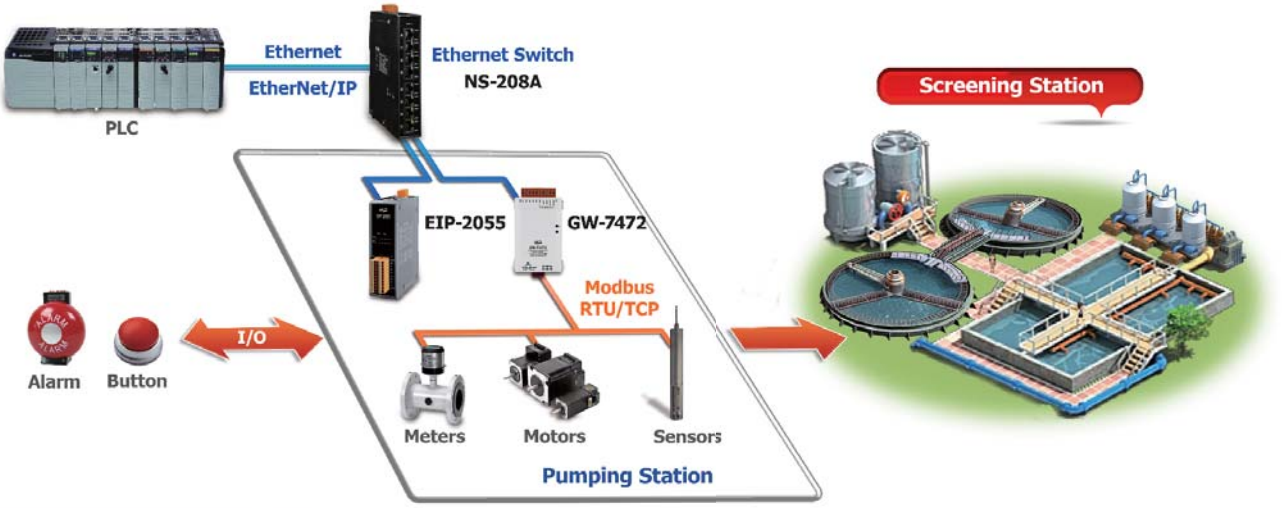
- Modbus Protocol: Modbus TCP Server/RTU Slave protocols
- Supported Modbus Function Code 01, 02, 03, 04, 05, 06, 15, and 16



Application

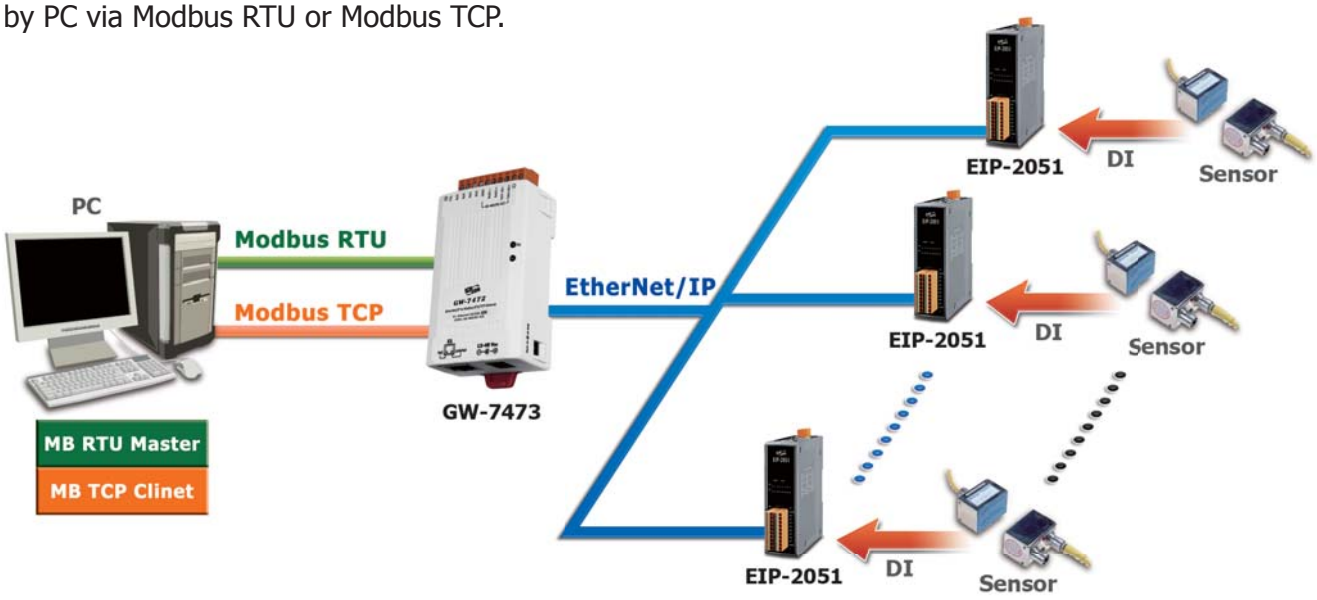
The application of sewage treatment plant is getting more and more important. The sewage treatment plant needs to reconstruct the control system. We provide a GW-7472 solution with AB PLC (Allen-Bradley ControlLogix 5563 via 1756-ENBT). Users can convert the data between EtherNet/IP and Modbus Protocol.

In the control room, GW-7472 gets the motors, meters and sensors information and publishes these data to PLC. PLC can also transmit data to the Modbus device via GW-7472.



In the screw factory, the screw and the other elements need to be counted at the same time. We provide a detective solution with GW-7473 and EIP-2000 module. Users do not need the PLC to be a scanner.

EIP-2000 module receives the I/O status and publishes these data to GW-7473. Users can read data by PC via Modbus RTU or Modbus TCP.



2.2.1 EtherNet/IP Remote I/O Modules

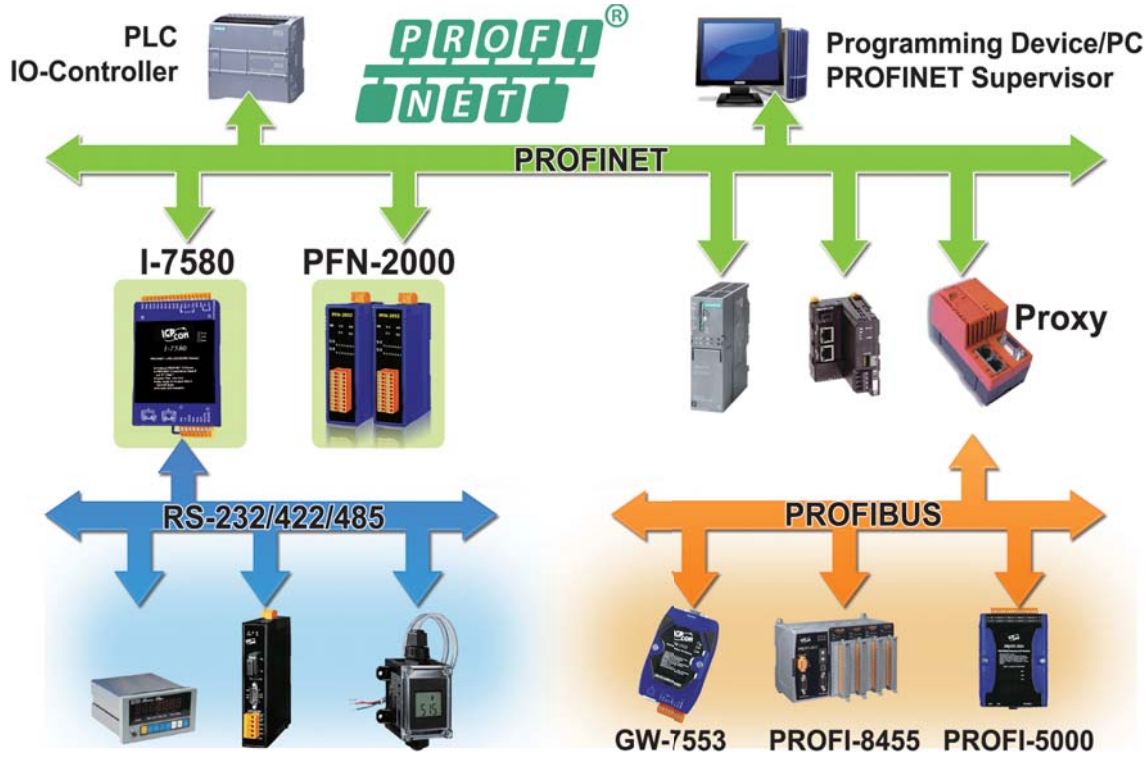
Analog Input & Output Module			
Model Name		**EIP-2017**	**EIP-2019**
Pictures		8-ch(DIFF.)/16-ch(S.E.) analog inputs module	8-Ch Thermocouple Input Module
			
Analog Input			
Channels	Differential	8 (Differential)	8 (Differential)
	Single-Ended	16	-
Sensor Type		-	Thermocouple (J, K, T, E, R, S, B, N, C)
Voltage Input Range		±15 mV, ±50 mV, ±100 mV, ±500 mV, ±1 V, ±2.5 V, ±5 mV, ±10 mV	±15 mV, ±50 mV, ±100 mV, ±500 mV, ±1 V, ±2.5 V, ±5 V, ±10 V
Current Input Range (Jumper)		±20 mA, 0~+20 mA, +4 mA~+20 mA	±20 mA, 0~+20 mA, +4 mA~+20 mA
Resolution		16-bit	16-bit
Sampling Rate		10 Hz	10 Hz
Accuracy		±0.1% of FSR	±0.1% of FSR
Overvoltage Protection		240 Vrms	240 Vrms
Input Impedance		400 kΩ	400 kΩ
EDS Protection		4 kV Contact for each channel	4 kV Contact for each channel
Intra-Module Isolation		3000 VDC	3000 VDC

Digital Input & Output Module					
Model Name		**EIP-2042**	**EIP-2051**	**EIP-2055**	**EIP-2060**
Pictures		16-Ch DO Module	16-Ch DI Module	8-Ch DI, 8-Ch DO Module	6-Ch DI, 6-Ch Relay Module
					
Digital Input					
Channels		-	16	8	6
Sink/Source (NPN/PNP)			Sink/Source	Sink/Source	Sink/Source
Wet Contact	On Voltage Level		+10 ~ 50 VDC	+10 ~ 50 VDC	+10 ~ 50 VDC
	Off Voltage Level		+4 VDC Max.	+4 VDC Max.	+4 VDC Max.
Dry Contact	On Voltage Level		Close to GND	Close to GND	Close to GND
	Off Voltage Level		Open	Open	Open
Input Impedance			10 kΩ, 0.5W	10 kΩ, 0.5W	10 kΩ, 0.5W
Digital Output					
Channels		16	-	8	6
Sink/Source (NPN/PNP)		Sink (NPN)		Sink (NPN)	Form A
Load Voltage		+3.5 ~ +50 VDC		+3.5 ~ +50 VDC	30 VDC/125 VAC
Max. Load Current		650 mA/Channel		650 mA/Channel	5 A @ 30 VDC, 5 A @ 125 VAC
Overvoltage Protection		60 VDC		60 VDC	-
Overload Protection		Yes		Yes	-
Power-on Value		Yes		Yes	Yes
Safe Value		Yes		Yes	Yes

2.3 PROFINET Products

Introduction:

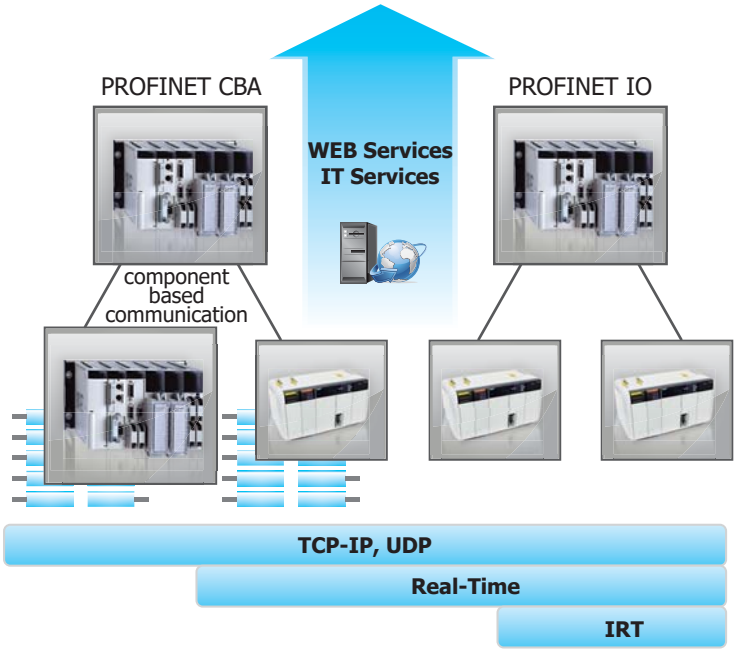
PROFINET is the Ethernet based standard for real-time automation that specified and published by PI (PROFIBUS & PROFINET International – http://www.profibus.com). PROFINET uses Ethernet standard as well as TCP, UDP and IP as protocols for communication, configuration and diagnosis in the network. Therefore, it is easy to be integrated to existing fieldbus systems, like PROFIBUS DP, PROFIBUS PA, Interbus, DeviceNet and other technologies to an open Ethernet based network without changes to existing field devices.



PROFINET contains 2 different solutions. They are PROFINET IO and PROFINET CBA (Component Based Automation).

PROFINET CBA is a communication solution for autonomously acting partial units of machines or plants. PROFINET IO is used for communication with decentral periphery like IOs, drives, etc. PROFINET products of ICP DAS are PROFINET IO devices.

The PROFINET standard defines three different performance levels which cover the various requirements from different applications.



PROFINET NRT (Non Real Time)

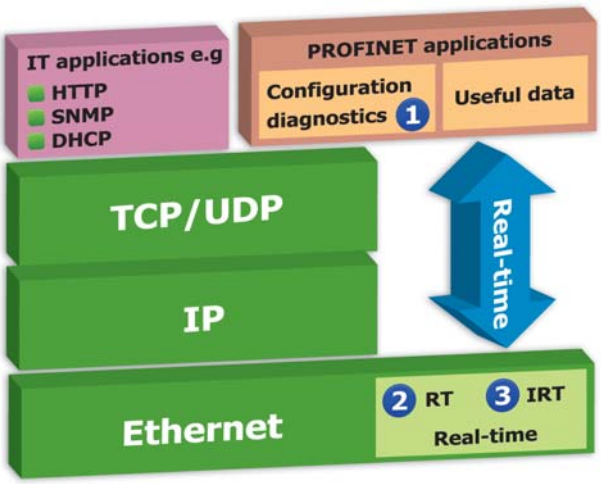
It uses standard protocols as UDP/IP. With response time approx. 100 ms PROFINET NRT targets for applications in process automation.

PROFINET RT (Real Time)

For applications with higher requirements on cycle time like factory automation, it directly uses the Ethernet protocol to exchange I/O data, while diagnosis and configuration uses standard UDP/IP. PROFINET RT enables applications With response time approx. > 10 ms.

PROFINET IRT (Isochronous Real Time)

The highest requirements come from the control of complex industrial drive systems, like packaging machines or robotics. With applications with cycle time < 1 ms and jitter < 1 µs are possible. The PFN-2000 series provides various I/O modules that meet PROFINET RT for process automation, factory automation.



1 TCP/IP
- Device parameterization and configuring
- Reading of diagnostic data
- Negotiating the useful data channel

2 Real-time RT
- Effective cyclic transmission of useful data
- Event-driven messages/alarms

3 Isochronous real-time IRT
- Useful data transfer in isochronous mode
- Hardware support through ERTEC
- Jitter < 1 µs

Features:

- Transfer protocol: PROFINET IO
- Supported Ethernet services: ICMP, IGMP, ARP, DHCP, TELNET, TFTP, SNMP, VLAN Priority Tagging
- Supported PROFINET services: RTC, RTA, CL-RPC, DCP, LLDP, I&M
- PROFINET Conformance Class B and RT Class 1
- Cyclic Time: 1 ms (min)
- Generic GSDML File Provided
- Automatic MDI / MDI-X Crossover for Plug-and-play

Selection Guide

Model Name		Description
PROFINET Converter	I-7580	PROFINET to RS-232/422/485 Converter
PROFINET Gateway	GW-7662	PROFINET to Modbus RTU/ASCII Gateway
	GW-7663	PROFINET to Modbus TCP Gateway
PROFINET I/O Module	PFN-2019	PROFINET I/O Module with 8-Ch universal AI
	PFN-2024	PROFINET I/O Module with 4-Ch AO
	PFN-2042	PROFINET I/O Module with 16-Ch DO
	PFN-2051	PROFINET I/O Module with 16-Ch DI
	PFN-2052	PROFINET I/O Module with 8-Ch DI
	PFN-2053	PROFINET I/O Module with 16-Ch DI
	PFN-2055	PROFINET I/O Module with 8-Ch DI, 8-Ch DO
	PFN-2060	PROFINET I/O Module with 6-Ch DI, 6-Ch Relay

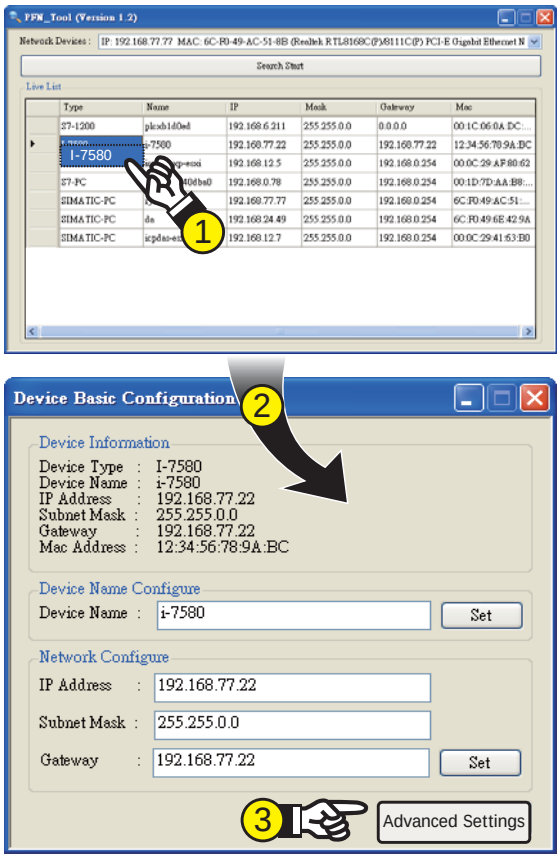
2.3.1 PROFINET Converters

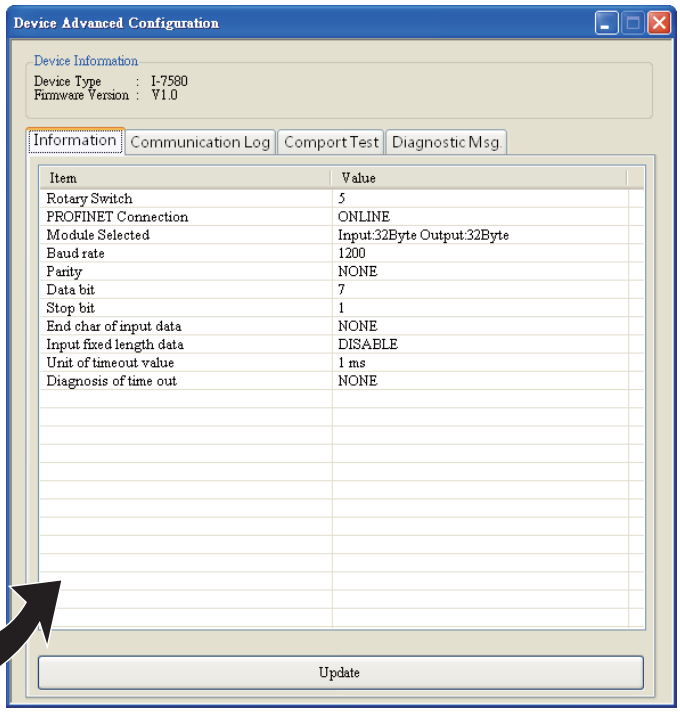
I-7580 PROFINET to RS-232/422/485 Converter

The I-7580 is specially designed for PROFINET IO device. It offers RS-232, RS-422, and RS-485 three kinds of communication way. With the Hybrid COM 1 design, users can readily choose one type of com port to use. Through the GSDML file, it is easy to communicate with any standard PROFINET IO controller.

- Protocol: PROFINET IO Device
- PROFINET Conformance Class B and RT Class 1
- Cyclic Time: 1 ms (min)
- Generic GSDML File Provided (Version 2.25)
- Max length of in/output data is 512/384 Bytes
- Provide LED indicators
- 4 kV Contact ESD protection for any terminal
- Wide range of power input (+10 VDC ~ +30 VDC) and operating temperature (-25°C ~ +75°C)

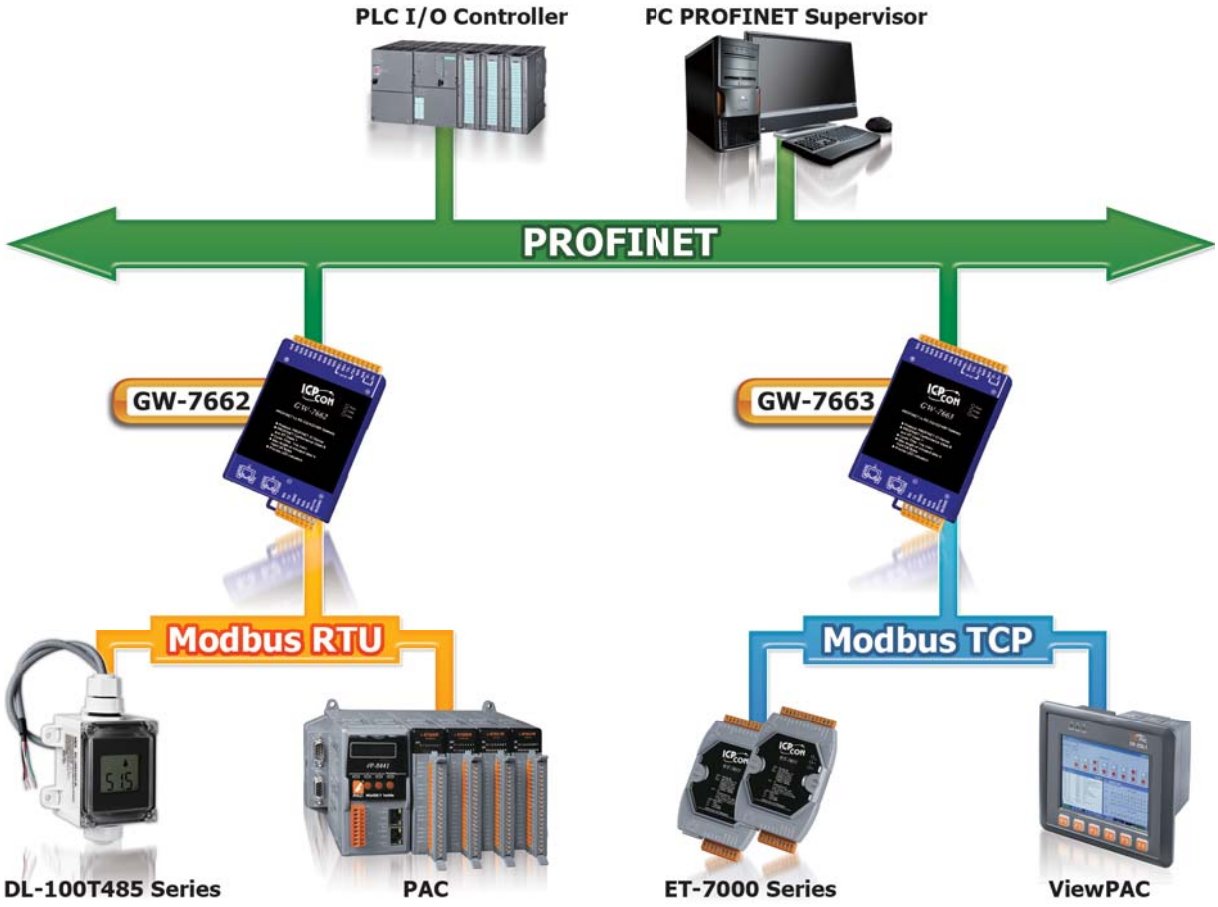
- Show PROFINET user parameters of the I-7580
- Show diagnostic messages of the I-7580
- Provide comport test function
- Provide Communication Log of comport





2.3.2 PROFINET Gateways

The PROFINET gateway is used to solve data-exchanging between different communication network and PROFINET network. If it is necessary to integrate different communication protocols to PROFINET, the PROFINET gateway is helpful. The application architectures as following figures provide the examples to show when and how to apply these products.



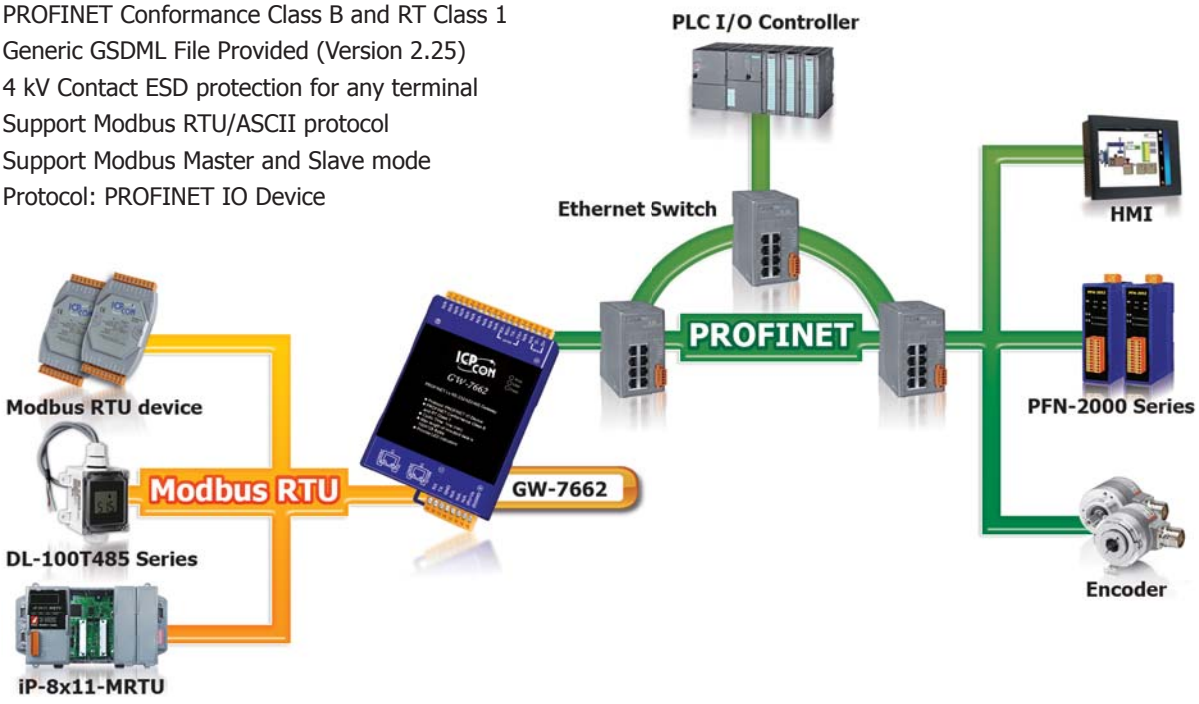
Specifications

Models		GW-7662	GW-7663
Pictures			
		PROFINET to Modbus RTU/ASCII Gateway	PROFINET to Modbus TCP Gateway
PROFINET	Protocol	IO device	
	Conformance Classes	Class B	
	RT Classes	Class 1	
	Cyclic Time	1 ms	
COM port	Type	1 x RS-232/422/485	N/A
	Baud Rate (bps)	2.4 k ~ 115.2 k	N/A
	Protocol	Modbus RTU/ASCII, Master/Slave	N/A
Ethernet Port	Speed	10/100M	
	Protocol	PROFINET IO device	Modbus TCP Server/ Client & PROFINET IO device

GW-7662 PROFINET to Modbus RTU Master Gateway

The GW-7662 gateway is a PROFINET IO device that allows the PROFINET controller to access the Modbus RTU devices. In the Modbus network, the GW-7662 can be a Modbus master to access the Modbus slaves, can be a Modbus slave provide the data from the PROFINET controller. The flexible design lets the GW-7662 widely applying in the many applications.

- Support Modbus RTU baud rate from 2.4~115.2 kbps
- Max length of in/output data is 512/512 Bytes
- PROFINET Conformance Class B and RT Class 1
- Generic GSDML File Provided (Version 2.25)
- 4 kV Contact ESD protection for any terminal
- Support Modbus RTU/ASCII protocol
- Support Modbus Master and Slave mode
- Protocol: PROFINET IO Device
- Cyclic Time: 1 ms (min)
- Provide LED indicators



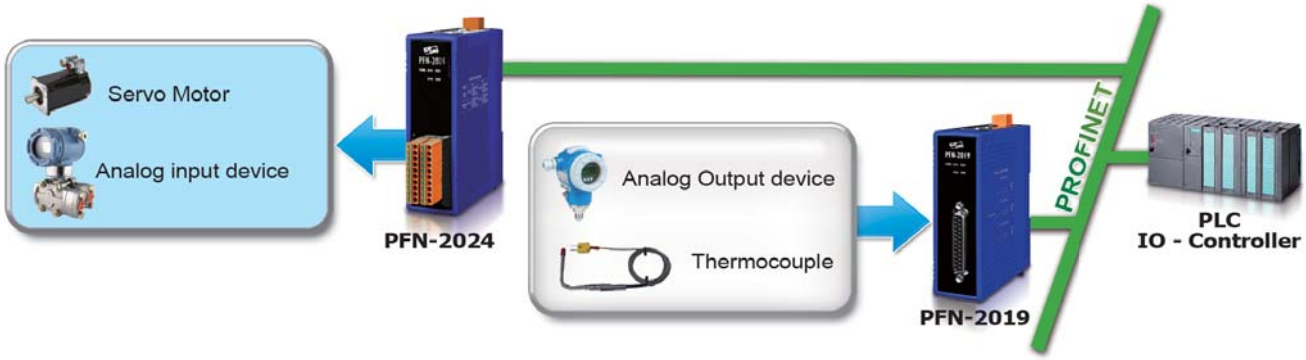
GW-7663 PROFINET to Modbus TCP Master Gateway

The GW-7663 is used for data-exchange between the Modbus TCP network and the PROFINET network. It provides the Modbus TCP client and server functions. Therefore, the GW-7663 can satisfy most of the applications of the data transfer between Modbus and PROFINET.

- Max length of in/output data is 512/512 Bytes
- PROFINET Conformance Class B and RT Class 1
- 4 kV Contact ESD protection for any terminal
- Generic GSDML File Provided (Version 2.25)
- Protocol: PROFINET IO Device
- Support Modbus TCP protocol
- Support Modbus Master and Slave mode
- Cyclic Time: 1 ms (min)

2.3.3 Analog Input & Output Modules

Model Name		PFN-2019	PFN-2024
Pictures			
		10-Ch AI Module	4-Ch AO Module
Analog Input			
Channels		10 (Differential)	-
Sensor Type		Thermocouple (J, K, T, E, R, S, B, N, C)	
Voltage Input Range		±15 mV, ±50 mV, ±100 mV, ±500 mV, ±1 V, ±2.5 V, ±5 V, ±10 V	
Current Input Range		±20 mA, 0 ~ +20 mA, +4 mA ~ +20 mA (Jumper Selectable)	
Resolution		16-bit	
Sampling Rate		10 Hz	
Accuracy		±0.1% of FSR	
Analog Output			
Channels		-	4
Voltage Output Range			0 ~ 5 V, ±5 V, 0 ~ 10 V, ±10 V
Current Output Range			0 ~ 20 mA, 4 ~ 20 mA
Resolution			16-bit
Accuracy	Voltage Output		±0.1% of FSR
	Current Output		±0.2% of FSR
PROFINET			
Connector		2 x RJ-45, 10/100 BaseTX	
Protocol		PROFINET IO	
Service		RTC, RTA, CL-RPC, DCP, LLDP	
Conformance		Class B	
RT		Class 1	
Cycle Time		1 ms (min.)	
Generic GSDML File		Ver. 2.25	
System			
ESD (IEC 61000-4-2)		4 kV	
EFT (IEC 61000-4-4)		1 kV	
Surge (IEC 61000-4-5)		1 kV	
Intra-Module Isolation, Field-to-Logic		3750 Vrms	
Power Input		+10 ~ +30 VDC	

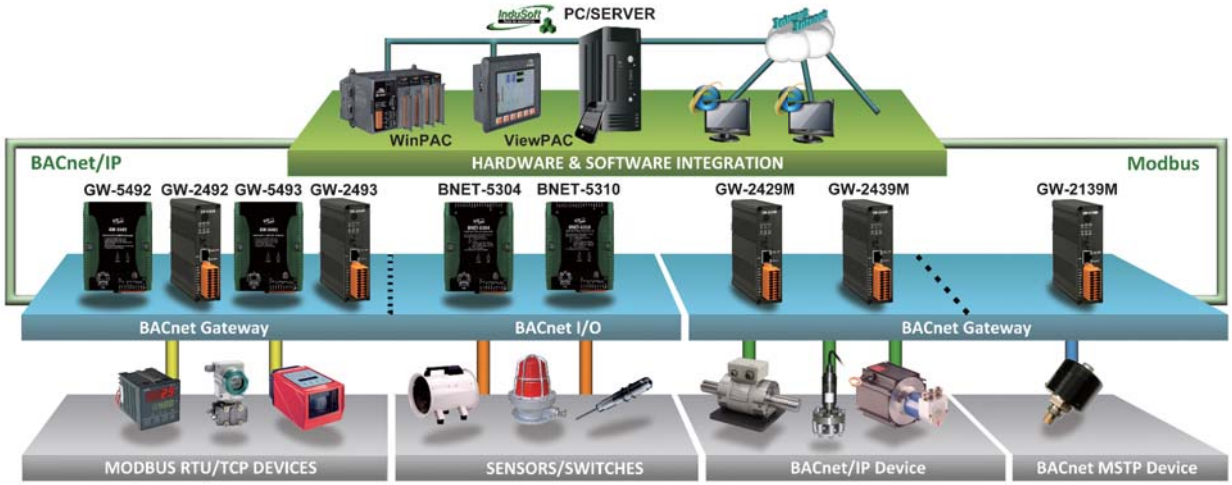


2.3.4 Digital Input & Output Modules

Digital Input & Output Module							
Model Name		**PFN-2042**	**PFN-2051**	**PFN-2052**	**PFN-2053**	**PFN-2055**	**PFN-2060**
Pictures		16-Ch DO Module	16-Ch DI Module	8-Ch DI Module	16-Ch DI Module	8-Ch DI, 8-Ch DO Module	6-Ch DI, 6-Ch Relay Module
							
Digital Input							
Channels		-	16	8	16	8	6
Contact			Dry + Wet	Wet	Dry	Dry + Wet	Dry + Wet
Sink/Source (NPN/PNP)			Sink/Source	Sink/Source	Source	Sink/Source	Sink/Source
Wet Contact	On Voltage Level		+10 ~ 50 VDC	+4 ~ 30 VDC	-	+10 ~ 50 VDC	+10 ~ 50 VDC
	Off Voltage Level		+4 VDC Max.	+1 VDC Max.	-	+4 VDC Max.	+4 VDC Max.
Dry Contact	On Voltage Level		Close to GND	-	Close to GND	Close to GND	Close to GND
	Off Voltage Level		Open	-	Open	Open	Open
Input Impedance			10 kΩ, 0.5 W	3 KΩ, 0.3 W	-	10 kΩ, 0.5 W	10 kΩ, 0.5 W
Digital Output							
Channels		16	-	-	-	8	6
Type		Open Collector				Open Collector	Power Relay
Sink/Source (NPN/PNP)		Sink				Sink	Form A
Load Voltage		+3.5 ~ +50 VDC				+3.5 ~ +50 VDC	30 VDC/125 VAC
Max. Load Current		700 mA/Channel				700 mA/Channel	2 A @ 30 VDC, 0.6 A @ 125 VAC
Overvoltage Protection		60 VDC				60 VDC	-
Overload Protection		Yes				Yes	-
Power-on Value		Yes				Yes	Yes
Safe Value		Yes				Yes	Yes
PROFINET							
Connector		2 × RJ-45, 10/100 BaseTX					
Protocol		PROFINET IO					
Service		RTC, RTA, CL-RPC, DCP, LLDP					
Conformance		Class B					
RT		Class 1					
Cycle Time		1 ms (min.)					
Generic GSDML File		Ver. 2.25					
System							
ESD (IEC 61000-4-2)		4 kV					
EFT (IEC 61000-4-4)		1 kV					
Surge (IEC 61000-4-5)		1 kV					
Intra-Module Isolation, Field-to-Logic		3750 V					
Power Input		+10 ~ +30 VDC					

2.4 BACnet Products

BACnet, a data communication protocol for building automation and control networks, is developed under the auspices of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). This protocol is comprehensive applied in vastly different applications such as heating, ventilating, and air-conditioning control, and fire detection systems. The BACnet protocol also provides mechanisms for computerized building automation devices to exchange information, regardless of the particular building service they perform.



Features:

- Designed specifically for building automation control
- Conformance to ANSI/ASHRAE standard 135-2008 or ISO 16484-5
- A completely non-proprietary open communication software standard
- Support several different physical and link layers (BACnet/IP, Ethernet, ARCNET, MS/TP, PTP and LonTalk)
- All data in a BACnet system is represented in terms of "objects", "properties" and "services"

BACnet Stack Layers

BACnet Defined

<table>
<tr><td colspan="5">BACnet Application Layer</td></tr>
<tr><td colspan="5">BACnet Network Layer</td></tr>
<tr><td colspan="2" rowspan="2">ISO 8802-2
(IEEE 8802.3) Type 1</td><td rowspan="2">MS/TP</td><td rowspan="2">PTP</td><td rowspan="2">LonTalk</td><td>BVLL</td></tr>
<tr><td>UDP/IP</td></tr>
<tr><td>ISO 8802-3
Ethernet</td><td>ARCNET</td><td>EIA 485</td><td>EIA 232</td><td>IP Supporting
Data link</td></tr>
</table>

OSI Layer

Application (7)	Handles the actual interface with the user's application program
Network (3)	Establishes logical circuits and routing between two machines
Data-Link (2)	Controls orderly access to the physical medium
Physical (1)	Transmits and receives individual bits on the physical medium

Selection Guide

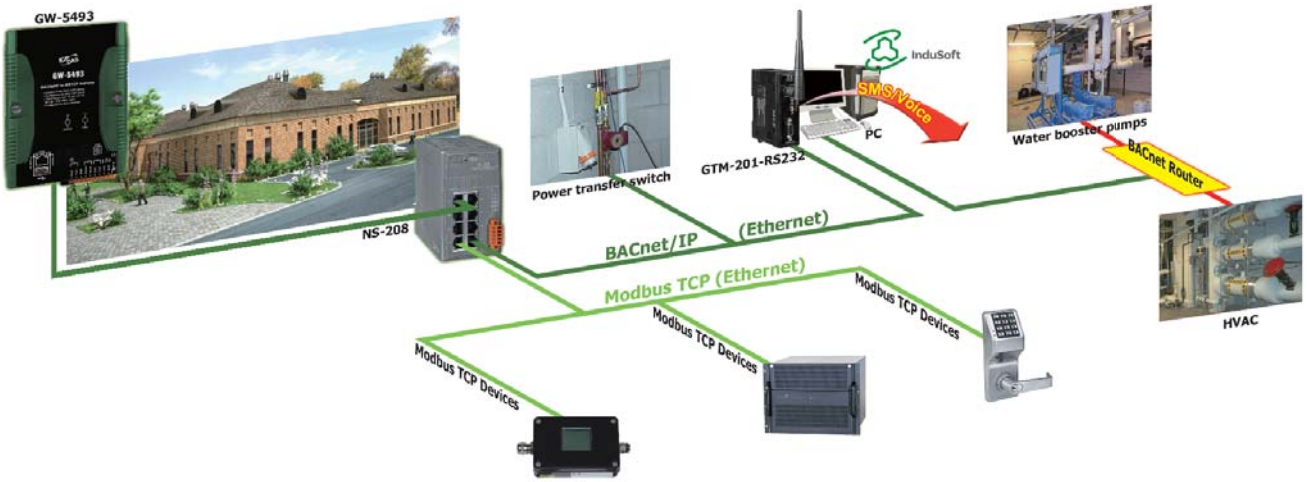
Model Name		Description
BACnet/IP Gateway	GW-5492	BACnet/IP Server to Modbus RTU Master Gateway
	GW-2492M	BACnet/IP Server and Modbus RTU Master Gateway with Metal case
	GW-5493	BACnet/IP Server to Modbus TCP Client Gateway
	GW-2493M	BACnet/IP Server and Modbus TCP Client Gateway with Metal case
	GW-2429M	BACnet/IP Client and Modbus RTU Slave Gateway
	GW-2439M	BACnet/IP Client and Modbus TCP Server Gateway
BACnet/IP I/O Modules	BNET-5304	BACnet/IP I/O Module with 6-Ch AI, 1-Ch AO, 4-Ch DI, 4-Ch DO
	BNET-5310	BACnet/IP I/O Module with 4-Ch AI, 2-Ch AO, 3-Ch DI, 3-Ch DO
BACnet MS/TP Gateway	GW-2139M	Modbus TCP Server and BACnet MS/TP Master Gateway

Case Studies

Building Automation of a Medical Center

Product: GW-5493

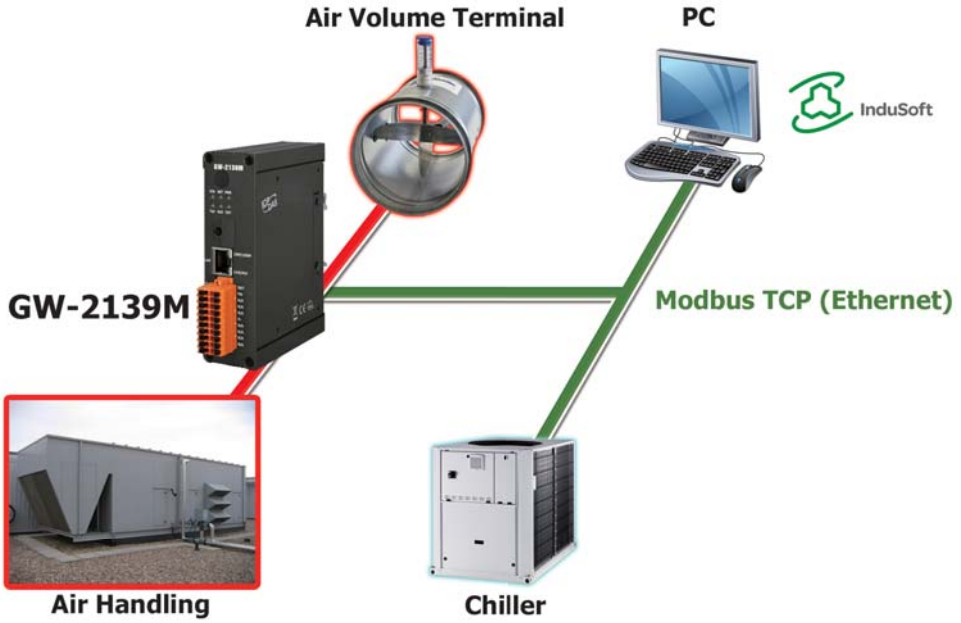
The user form a medical center used the SCADA, InduSoft Web Studio, to integrate numerous third party devices using BACnet/IP protocol – including the hospital emergency power transfer switches, water booster pumps, and HVAC system. For those existing Modbus TCP devices, the user added the GW-5493 BACnet/IP to Modbus gateway in order to make the devices accessible. The system integration provides the information necessary to make complex decisions driving energy savings and properly monitor the equipment. With GTM-201, the system allows the operator to receive alarms via SMS messages. The building automation system also trends data regularly so that the client can use the information to track costs and troubleshoot equipment from historical data.



Airconditioning Data Acquisition System

Product: GW-2139M

The user used the SCADA, InduSoft Web Studio, with Modbus driver to integrate with BACnet MS/TP devices and controllers in a factory including 16 air volume terminals, 3 air handling units… etc. Using GW-2139M, the user was able to integrate those Modbus MS/TP devices to Modbus TCP network to implement simple data acquire system.



2.4.1 BACnet/IP Gateways

GW-549x GW-249xM BACnet/IP Server to Modbus Master Gateway

GW-5492, GW-5493, GW-2492M and GW-2493M is a fully configurable universal BACnet/IP to Modbus RTU/TCP gateway. The GW-549x and GW-249xM include BACnet/IP Server and Modbus RTU Master (GW-5492/2492M) or TCP Client (GW-5493/2493M) which is used to make Modbus devices accessible on a BACnet network.

BACnet (Building Automation and Control Networking) protocol has been designed specifically to meet the communication needs of building automation and control systems for applications such as heating, ventilating. The modules contains a large number of BACnet objects gives you flexibility in mapping Modbus registers to any combination of BACnet objects. Multiple BIBBs are supported. All the data transfer is configurable using a standard Web browser.

Features

- No Programming Required
- Fully compliant with BACnet/IP and Modbus
- Quickly and cost effectively integrate networks

Modbus TCP Support

Function Code	0x01, 0x02, 0x03, 0x04, 0x05, 0x06, 0x10, 0x0F

BACnet/IP Support

Object	Binary Input, Binary Output, Binary Value, Analog Input, Analog Output, Analog Value, Multi-State Input, Multi-State Output, Multi-State Value, Device
BIBB	DS-RP-B, DS-RPM-B, DS-WP-B, DS-WPM-B, DS-COV-B, DM-DDB-B, DM-DOB-B, DM-DCC-B, DM-TS-B, DM-UTC-B, DM-RD-B

GW-2429M GW-2439M Modbus Slave to BACnet/IP Client Gateway

GW-2429M and GW-2439M are network gateways allowing Modbus slave devices, Modbus RTU (GW-2429M) or Modbus TCP (GW-2439M) , to be accessed BACnet/IP network as a BACnet/IP client. The BACnet/IP protocol is used to relay and exchange information between building devices. GW-2429M and GW-2439M contains a large number of BACnet objects (AI, AO, AV, BI, BO, BV, MSI, MSO, MSV) gives you flexibility in mapping Modbus TCP registers to any combination of BACnet objects. BACnet interoperability building blocks (DS-RP-A, DS-RPM-A, DS-WP-A, DS-WPM-A, DM-DDB-A, DM-DOB-A, DM-DCC-A, DM-RD-A) are Supported. All the data transfer is configurable using ICPDAS Utility

Features

- Read/Write standard BACnet objects via modbus
- Configurable BACnet/IP client
- Configurable Modbus TCP server
- Simple data translation allows you to manipulate data
- Supports BACnet AI, AO, AV, BI, BO, BV, MSI, MSO, MSV Object Types

Modbus TCP Support

Function Code	0x01, 0x02, 0x03, 0x04, 0x05, 0x06, 0x10, 0x0F

Utility Features

- Provide Modbus TCP network configuration interface
- Provide BACnet/IP configuration interface

BACnet/IP Support

Objects	Binary Input / Binary Output / Binary Value / Analog Input / Analog Output Analog Value / Multi-state Input Multi-state Output / Multi-state Value
BIBBs	DS-RP-A, DS-RPM-A, DS-WP-A, DS-WPM-A, DM-DDB-A, DM-DOB-A, DM-DCC-A, DM-RD-A

2.4.2 BACnet/IP I/O Modules

Model Name		BNET-5304	BNET-5310
Pictures		Multi-function BACnet/IP Module 	Multi-function BACnet/IP Module 
System			
Ethernet		10/100 Base-TX	
Security		ID and Password	
Built-in Watchdog		Yes	
BACnet		BACnet/IP	
BACnet Objects		1 Device, 6 AI, 1 AO, 4 BI, 4 BO	1 Device, 4 AI, 2 AO, 3 BI, 3 BO
BIBB		DS-RP-B, DS-RPM-B, DS-WP-B, DS-WPM-B, DS-COV-B, DM-DDB-B, DM-DOB-B, DM-DCC-B, DM-TS-B, DM-UTC-B, DM-RD-B	
Analog Input			
Channel		6	4
Wiring		Single-Ended	Differential
Range		±5 V, 0 ~ +5 V	±10 V
Resolution		12-bit	
Sampling Rate		4 KHz	
Input Impedance		1 MΩ	
Overvoltage Protection		±30 VDC	
Isolation		Non-isolated	
Analog Output			
Channel		1	2
Range		±5 V	±10 V
Resolution		12-bit	
Output Capacity		20 mA	
Isolation		Non-isolated	
Digital Input			
Channels		4	3
Contact		Dry	
Dry Contact	On Voltage Level	Close to GND	
	Off Voltage Level	Open	
Overvoltage Protection		30 VDC	
Digital Output			
Channels		4	3
Type		Open Collector	
Sink/Source (NPN/PNP)		Sink	
Load Voltage		+10 VDC ~ 40 VDC	
Max. Load Current		200 mA/channel at 25°C	
Overload Protection		1.4 A	
Environmental			
Operating Temp		-25 ~ +75°C	
Storage Temp.		-30 ~ +85°C	
Humidity		5 ~ 90% PH, Non-condensing	
Power Input Range		+10 V to +30 VDC	
Power Consumption		4.8 W (0.2 A @ 24 VDC)	

2.4.3 BACnet MS/TP Gateway

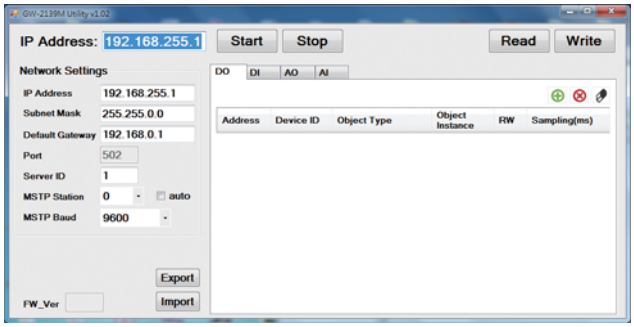
GW-2139M Modbus TCP to BACnet MS/TP Gateway

GW-2139M is a network gateway allowing Modbus TCP client devices to be accessed BACnet MS/TP network as a BACnet MS/TP master. The BACnet Master Slave Token Passing (MS/TP) protocol is used to relay and exchange information between building devices. GW-2139M contains a large number of BACnet objects (AI, AO, AV, BI, BO, BV, MSI, MSO, MSV) gives you flexibility in mapping Modbus TCP registers to any combination of BACnet objects. BACnet interoperability building blocks (DS-RP-A, DS-RPM-A, DS-WP-A, DS-WPM-A, DM-DDB-A, DM-DOB-A, DM-DCC-A, DM-RD-A) are Supported. All the data transfer is configurable using ICPDAS Utility.

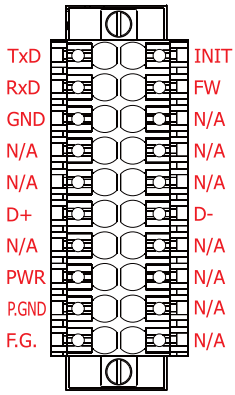
- Read/Write standard BACnet objects via modbus
- Configurable BACnet MS/TP master
- Configurable Modbus TCP server
- Simple data translation allows you to manipulate data
- Supports BACnet AI, AO, AV, BI, BO, BV, MSI, MSO, MSV Object Types
- Supports Modbus DI, DO, AO, AI Types
- BACnet object properties mapping configured via Modbus register
- Isolated COM : RS-485
- Built-in Watchdog
- 4KV ESD Protection

Utiltity

- Provide Modbus TCP network configuration interface
- Provide BACnet MS/TP configuration interface



Pin Assignments



Pin Name	Description
F.G.	Power +10 ~ +30 VDC
GND	
PWR	
D+	RS-485
D-	
GND	RS-232
RxD	
TxD	
INIT	Connect to GND, Change to Initial Mode
FW	Connect to GND, Change to Bootloader Mode

BACnet MSTP Support

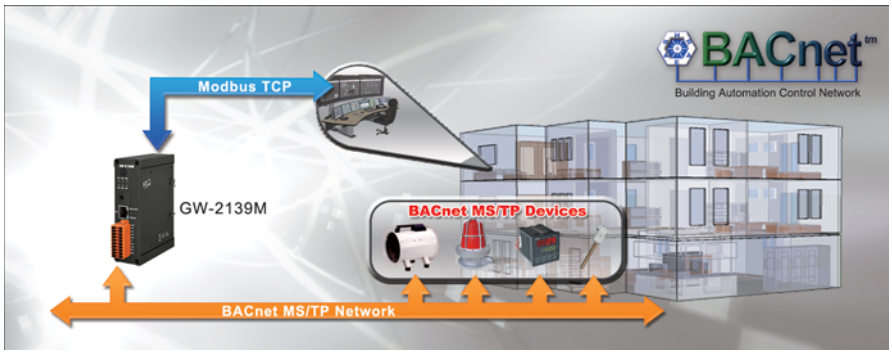
Objects	Binary Input / Binary Output / Binary Value / Analog Input / Analog Output Analog Value / Multi-state Input Multi-state Output / Multi-state Value
BIBBs	DS-RP-A, DS-RPM-A, DS-WP-A, DS-WPM-A, DM-DDB-A, DM-DOB-A, DM-DCC-A, DM-RD-A

Modbus TCP Support

Function Code	0x01, 0x02, 0x03, 0x04, 0x05, 0x06, 0x10, 0x0F

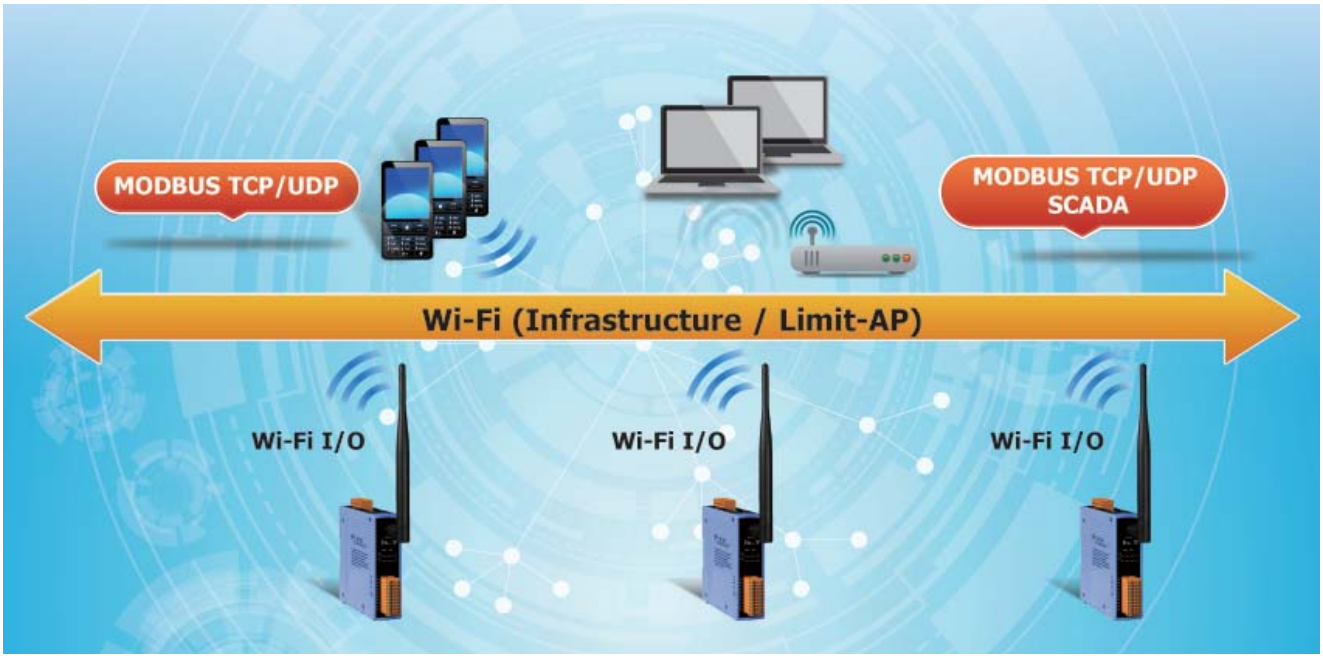
Application

- Building Automation
- Heating, Ventilating, and Air-conditioning Control
- Lighting Control
- Access Control
- Fire Detection Systems



2.5 Wi-Fi Products

WLAN (Wireless Local Area Network) links devices by wireless distribution method (spread-spectrum or OFDM radio), and generally provides a connection through an access point to the Internet. WLAN allows users to move device within a local coverage area, and still be connected to the network. High-bandwidth allocation for wireless will make a relatively low-cost wiring possible. Nowadays, Wireless LAN applications are very popular. They're not only faster than traditional industrial transmissions, i.e. RS-232, RS-485, RS-422 etc, but are also able to minimize the need for troublesome wiring tasks and have a higher mobility than an Ethernet network. ICP DAS provides a great variety of WLAN products, which are all compliant with standard of IEEE 802.11.



Selection Guide

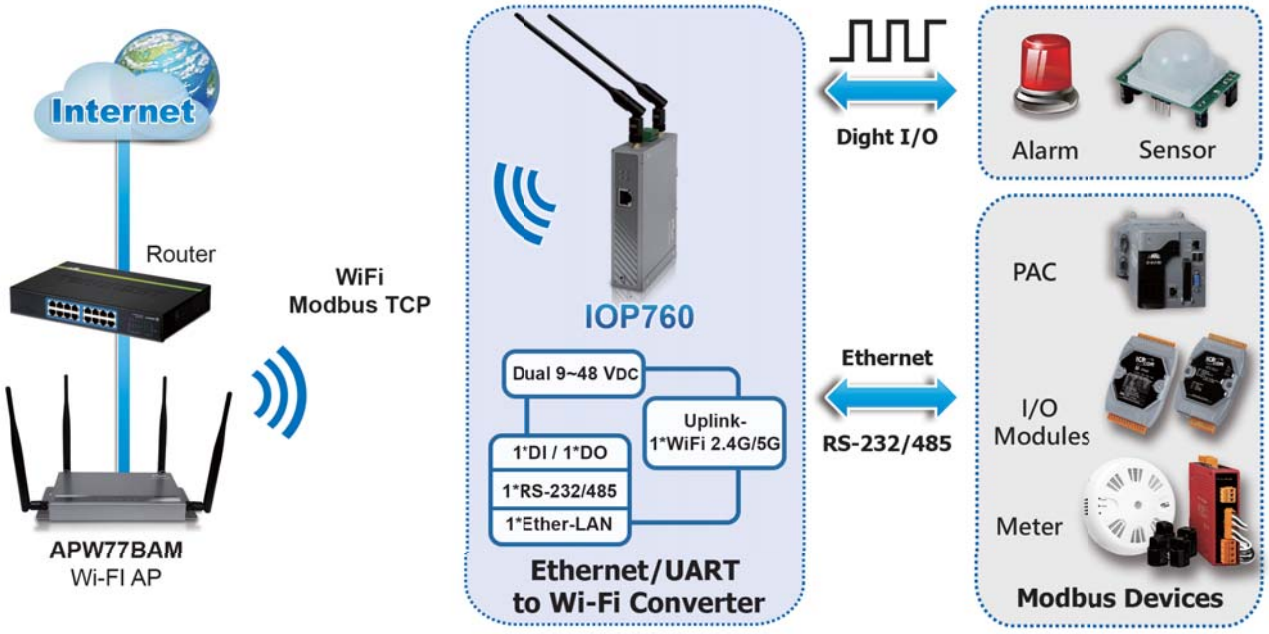
Module Name		Description
Remote Maintenance	M2M-711D	Remote Maintenance Wi-Fi Device Terminal Unit
Wi-Fi Converter	IOP760	Ethernet/Serial to Wi-Fi Converter
Wi-Fi Bridge	WF-2572	Ethernet to Wi-Fi Bridge
Wi-Fi Gateway	RMV-762D-MTCP	Modbus TCP/RTU Data-Exchange with Wi-Fi Interface Gateway
Wi-Fi Concentrator	MDC-211-WF	Wi-Fi Modbus Data Concentrator
Wi-Fi I/O Module	WF-2015	Wi-Fi I/O Module (6-ch RTD Input)
	WF-2017	Wi-Fi I/O Module (8-ch Differential/16-ch Single-Ended AI)
	WF-2019	Wi-Fi I/O Module (10-ch Universal AI)
	WF-2026	Wi-Fi I/O Module (5-ch AI / 2-ch AO / 2-ch DI / 3-ch DO)
	WF-2042	Wi-Fi I/O Module (16-ch DO)
	WF-2051	Wi-Fi I/O Module (16-ch DI)
	WF-2055	Wi-Fi I/O Module (8-ch DI / 8-ch DO)
	WF-2060	Wi-Fi I/O Module (6-ch DI / 6-ch Relay)
	WFM-R14	Wi-Fi I/O Module with Metal Case (14-ch Relay)

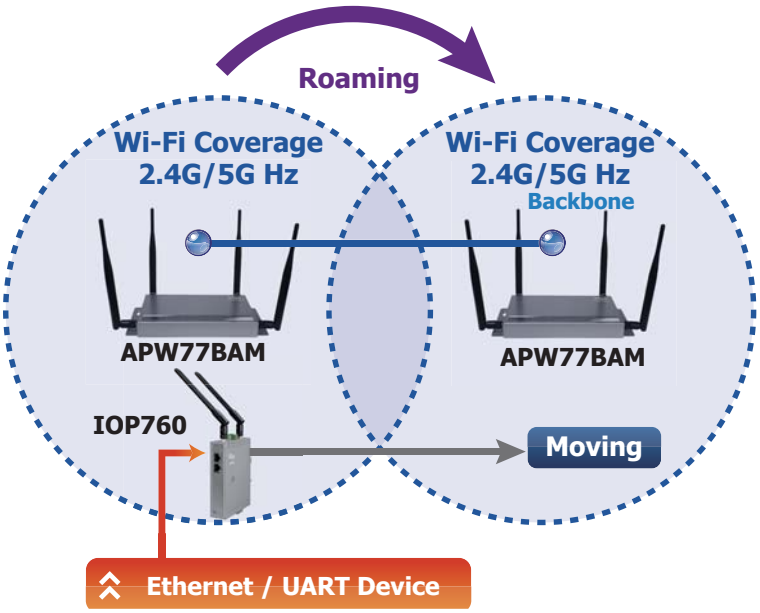
2.5.1 Wi-Fi Converter

IOP760 Ethernet/Serial to Wi-Fi Converter

The IOP760 is absolutely the right choice for wireless M2M (Machine-to-Machine) applications. With built-in high performance IEEE802.11a/b/g/n/ac compliant Wi-Fi uplink or multi-mode access point function. The data can be exchanged via the three different interfaces Wi-Fi, Ethernet and UART. Users can select 2.4GHz connections or 5GHz connections. When the Wi-Fi strength is lower than the threshold setting, IOP760 can connect to another stronger one via the roaming function. The IOP760 has two Ethernet interfaces that can connect to two Ethernet devices. All the Ethernet devices exchange data via the IOP760. In the UART communication, data can be sent directly or formed by Modbus protocol.

- Wi-Fi Uplink or Ethernet WAN Connection
- One RS-232/485 for Modbus RTU Connection
- IEEE 802.11a/b/g/n/ac Wi-Fi Compliance
- Support Wi-Fi dual bands 2.4/5 GHz
- Two LAN Port for Linking Local Ethernet Devices
- One DI/One DO For Device Triggering or Event Reporting
- Designed by solid and easy-to-mount metal body



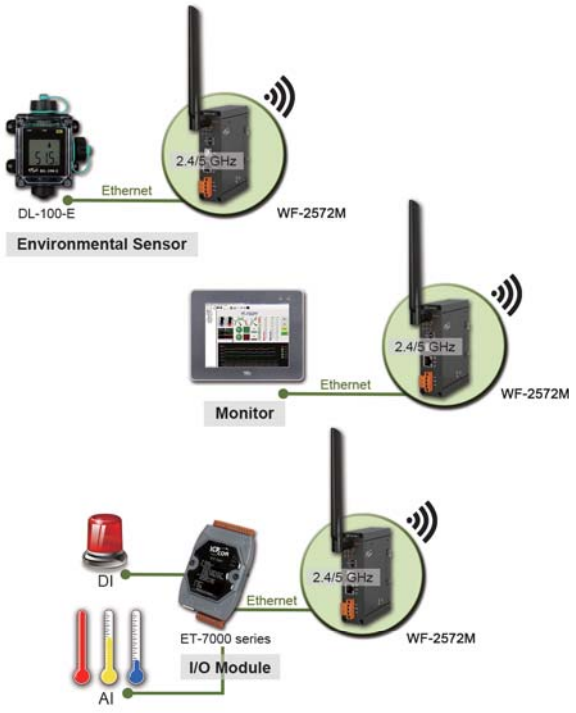


2.5.2 Wi-Fi Bridge

Model Ethernet to Wi-Fi Bridge

The WF-2572/WF-2572M is an Industrial Ethernet to Wi-Fi Bridge that creates a connection between an 802.11a/b/g wireless LAN and a device with a standard Ethernet port. The Bridge transparently conveys data between devices with a 100Base-TX Ethernet interface and a wireless LAN without drivers or complicated addressing schemes. This significantly reduces the complexity of network connectivity and wireless system deployment and also provides wireless LAN and Internet connectivity to industrial, scientific and automotive applications.

- Compatible with IEEE 802.11a/b/g standards
- Supports both Infrastructure and Limit-AP mode
- Plug-and-Play Ethernet to Wi-Fi connectivity
- USB-based configuration
- No driver installation required
- Supports WEP, WPA and WPA2 Wi-Fi encryption
- Metal Case: WF-2572M

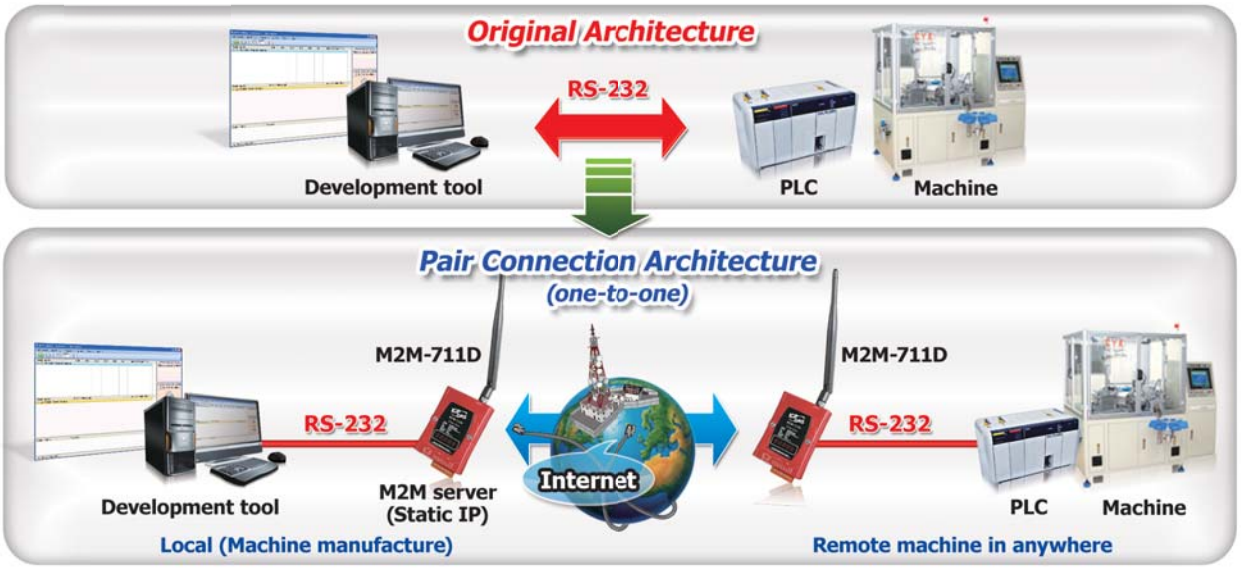


2.5.3 WLAN Remote Maintenance Device

M2M-711D Remote maintenance Wi-Fi Device Terminal Unit

The M2M-711D module is specially designed for the remote maintenance and upgrading the serial to network application solution. It is suitable for the harsh industrial field. M2M-711D provides 2 major technologies on networking: VxServer and Pair-connection. This solution can transfer the site condition of equipment accurately. The maintenance engineer can directly check and diagnose the device/PLC like on-site. This can reduce the huge maintenance cost to increase the competition of enterprises.

- IEEE 802.11b/g compliant
- Support VxServer software
- 5-Digit 7 Segment LED Display
- Web-based administration
- Supports both Infrastructure and Ad-hoc mode
- Provide pair connection (RS-232,RS-485) on network
- Support Server and Client communication mode
- Supports WEP-64,WEP-128, WPA-TKIP and WPA2-AES encryption



2.5.4 Wi-Fi Gateway

RMV-762D-MTCP Modbus TCP/RTU Gateway With Wi-Fi Interface

RMV-762D-MTCP is a wireless Modbus TCP/RTU gateway. The IEEE 802.11 a/b/g 2.4GHz and 5GHz are available on the Wi-Fi interface. It exchanges Modbus command from Modbus TCP/RTU master to Modbus RTU/TCP slave. Modbus TCP command can be transceived not only Ethernet port but also Wi-Fi interface. It supports VxComm and Pair-Connection functions. Users can choose Ethernet mode or Wi-Fi mode to do the pair connection, which provides TCP data tunneling between two serial devices.

- Full compatible with IEEE 802.11 a/b/g
- Supports Virtual COM applications
- Internal 7-Seg LED indicator
- Support Wi-Fi Limit-AP and Infrastructure mode.
- Supports pair-connection applications
- Application Modes: Virtual COM, MB TCP Server/Client, MB RTU Master/Slave
- Support WPA-PSK, WPA2-PSK for Wi-Fi encryption

2.5.5 Wi-Fi Concentrator

MDC-211-WF Wi-Fi Modbus Data Concentrator

MDC-211-WF Modbus data concentrator developed by ICP DAS, with Ethernet, WiFi Wireless, RS-232 and RS-485 communication interfaces, can link the Modbus RTU devices to the Ethernet network. MDC-211-WF can read the data of Modbus RTU device according to the user-defined command table, and integrate the data of different Modbus RTU devices into the format of the continuous address so that the remote monitor host can connect to MDC-211-WF from Ethernet to access the data of multiple Modbus RTU devices at once.

- Compatible with IEEE 802.11 a/b/g/n standards
- Support Infrastructure and Limit-AP mode
- Support WPA-PSK, WPA2-PSK for Wi-Fi encryption
- Support Ethernet, RS-232/485 and Wi-Fi interfaces
- Support Web-based UI Operations
- Support the Modbus TCP/RTU protocol
- Support 240 Modbus Polling Commands
- Supports 9600 Modbus Registers for DI/DO/AI/AO

2.5.6 Wi-Fi I/O Modules

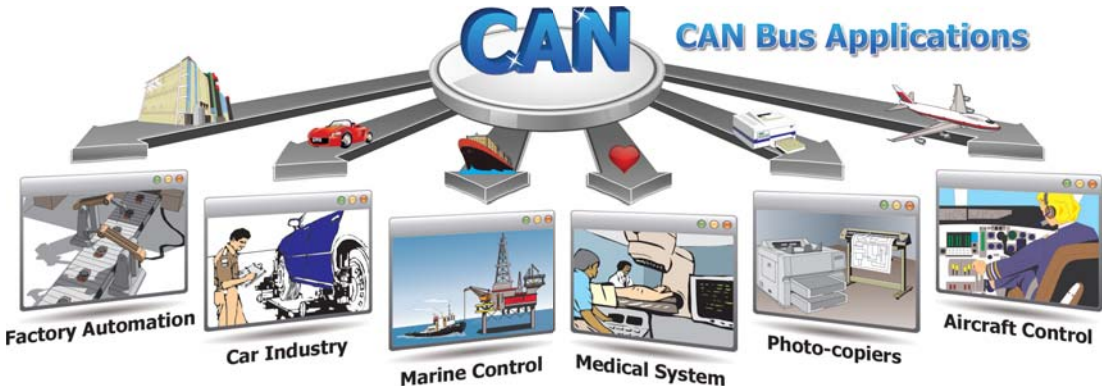
The WF-2000 series I/O modules in WLAN connection complies with the IEEE 802.11b/g standards. They make an easy way to incorporate wireless connectivity into monitoring and control systems. Wi-Fi I/O modules support Modbus TCP/UDP protocol and network encryption configuration, which makes perfect integration to SCADA software and offer easy and safe access for users from anytime and anywhere.

Model Name		WF-2026	WF-2042	WF-2055	WF-2060	WF-2051	WFM-R14
Digital Inputs							
Channels		2	-	8	6	16	-
Input Type		Dry Contact: Source		Dry Contact: Source Wet Contact: Sink / Source			
Counters	Channels	2		8	6	16	
	Max. Counts	32-bit		32-bit			
	Max. Input Freq.	10 KHz		8 KHz			
Photo-Isolation		3750 Vrms		3750 Vrms			
Digital Output							
Channels		3	16	8	6	-	14
Type		Sink (NPN)			Form A		2 Form A/ 12 Form C
Load Voltage		+3.5 VDC ~ +50 VDC			30 VDC/250 VAC		30 VDC/ 250 VAC
Load Current		700 mA/channel			5 A/channel		5 A (Form A)/ 6 A (Form C)
Intra-module Isolation		3750 VDC			-		-
Overvoltage Protection		60 VDC			-		-
Mechanical							
Casing		Plastic					Metal

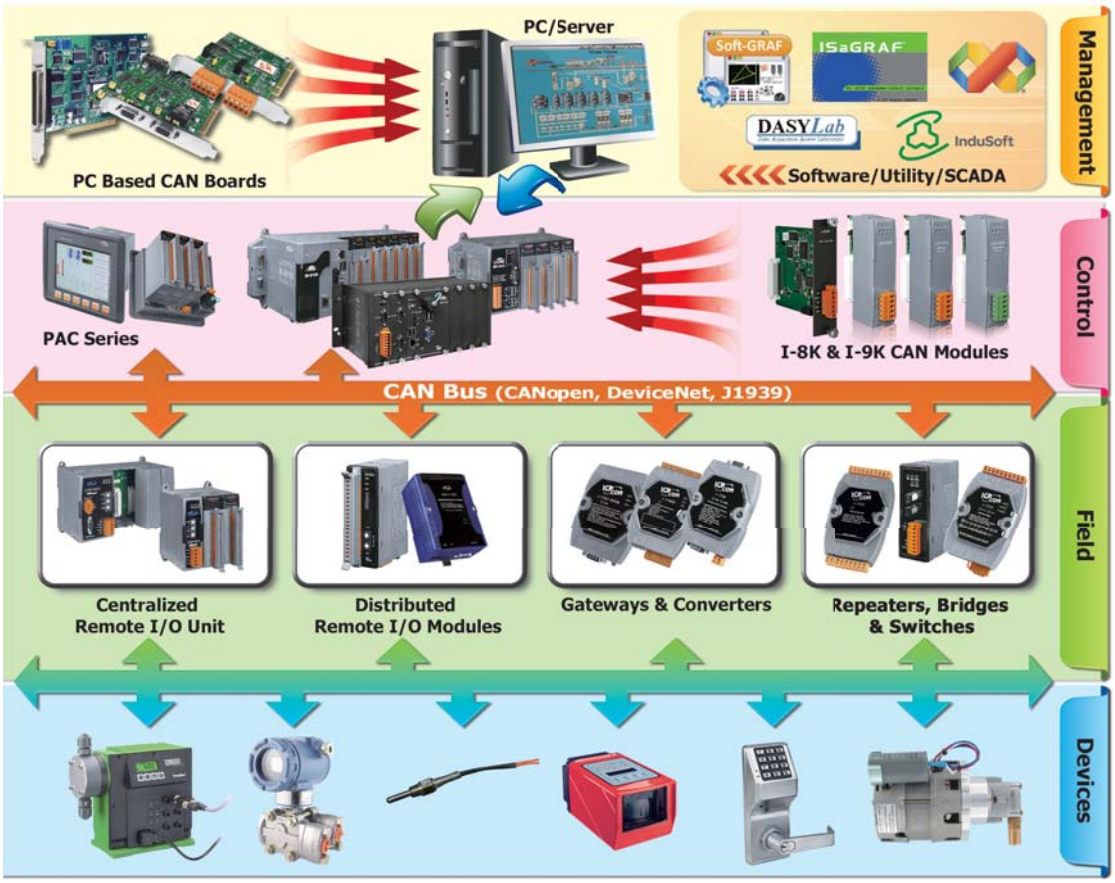
Model Name		WF-2026	WF-2017		WF-2019	WF-2015
Analog Input						
Channels		5 (Diff)	8 (Diff) / 16 (SE)		10 (Diff)	6
Input Type	Voltage	±150 mVDC, ±500 mVDC, ±1 VDC, ±5 VDC, ±10 VDC	±150 mV, ±500 mV, ±1 V, ±5 V, ±10 V		±15 mV, ±50 mV, ±100 mV, ±500 mV, ±1 V, ±2.5 V, ±5 V, ±10 V	-
	Current	0 ~ +20 mA, +4 ~ +20 mA, ±20 mA (Jumper Selectable)	0 ~ +20 mA, +4 ~ +20 mA, ±20 mA (Jumper Selectable)		±20 mA (External resistor required)	
	Thermocouple				J, K, T, E, R, S, B, N, C	
	2/3-wire RTD	-				Pt100, Pt1000, Ni120, Cu50, Cu100, Cu1000
Resolution		16 bit				
Accuracy		±0.1% FSR				±0.05% FSR
Sampling Rate		10 Hz (Total)				12 Hz (Total)
Overvoltage Protection		240 Vrms	Diff	240 Vrms	240 Vrms	120 VDC
			SE	150 Vrms		
Analog Output						
Channels		2	-			
Output Type	Voltage	+0 ~ +5 VDC, +0 ~ +10 VDC, ±5 VDC, ±10 VDC				
	Current	+0 ~ +20 mA, +4 ~ +20 mA (Jumper Selectable)				
Resolution		12 bit				
Accuracy		±0.1% FSR				
Output Capacity		10 VDC @ 20 mA				
Mechanical						
Casing		Plastic				
Wireless communication						
Wi-Fi Standard		2.4G Hz: IEEE 802.11 b/g 5GHz: IEEE 802.11 a				
Wireless mode		Infrastructure/Limit-AP/Ad-Hoc				
Wi-Fi Encryption		WEP, WPA, WPA2				

3. CAN Bus Products

3.1 Overview



ICP DAS has been developing rich **CAN-based/DeviceNet/CANopen/J1939** products for several years, including PCI interface cards, Fieldbus converters, PACs, gateways and remote I/O modules. We provide complete hardware solutions to satisfy a wide variety of CAN-based applications that can effectively solve issues related of data acquisition and calculation, transmission distance extension, network topology limitations, communication interface transformation, and noise resistance. In addition, ICP DAS supplies a large ranges of software resource, such as utility tools, APIs, demo programs, OPC, ActiveX and third-party drivers, which can help users to develop complex custom control and monitoring systems more easily and quickly. For certain special applications, we can offer flexible OEM/ODM projects to match the different requirements of our customers. Through ICP DAS's efficient and reliable service, you can easily complete your complex CAN-based projects.

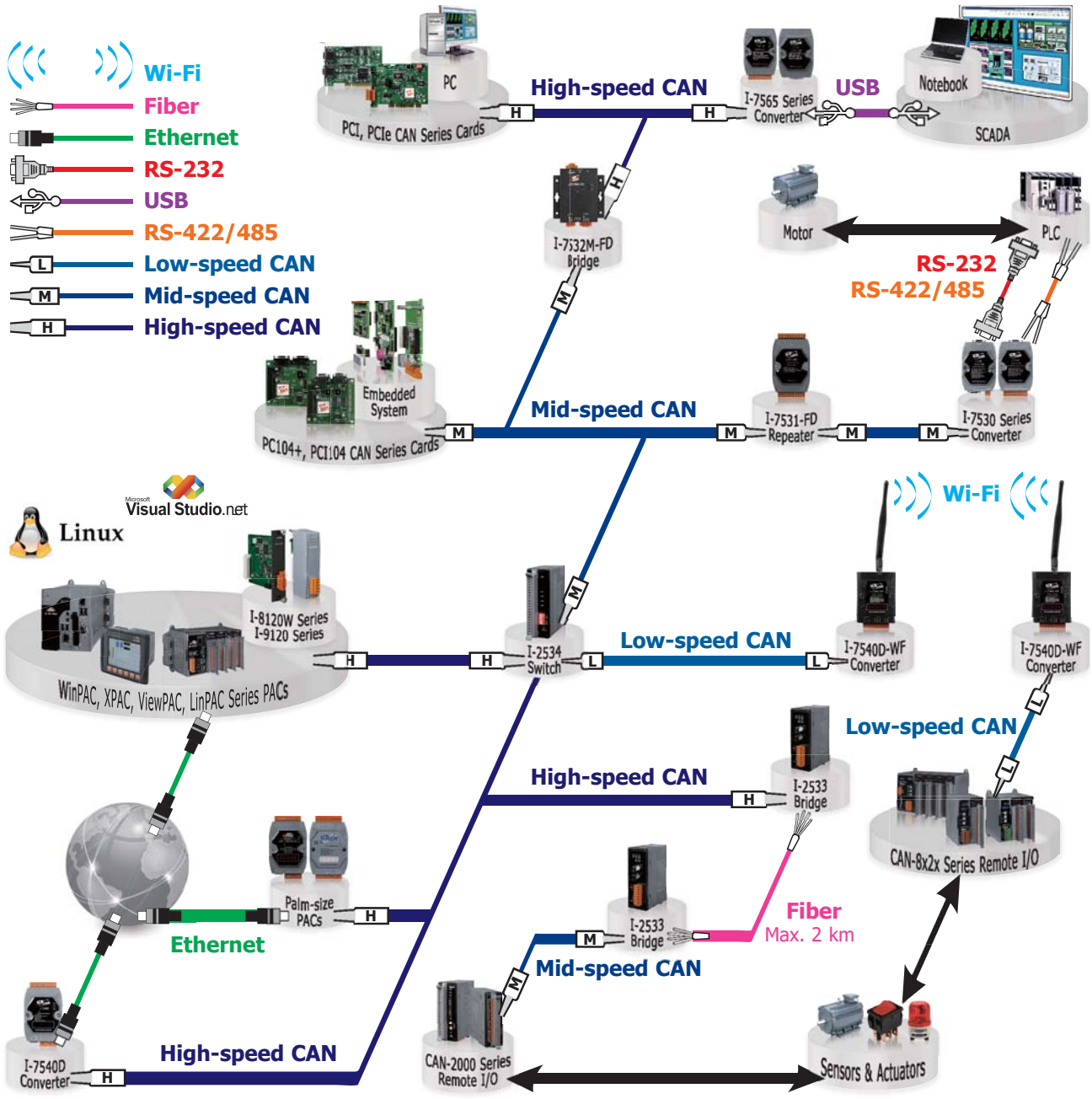


CAN Bus Introduction

The CAN bus is a serial communication bus system. Under the harsh and noisy environment, it still has high-level data integration capabilities. It also has a high degree of fault tolerance and error detecting capabilities. The bus itself has the electrical characteristics of multiple masters. The open frame structure is extremely flexible. The high security and excellent performance characteristics of CAN bus is commonly used in application systems that strictly require stability and safety, such as: avionics, vehicles, medical instruments, military industry, railway transportation, robots and important control systems, etc.

With the increasing advancement of industrial technology and the popularity of industrial automation, major industrial equipment manufacturers and system integrators have adopted the CAN bus as the core of the communication system. The CAN bus is

generally regarded as one of the important indicators of safety and stability in the industry.



CAN Bus Features

- **Multi-master**

  When the CAN Bus is idle, any unit which wants to send a CAN message may start to transmit a message at the same time. Therefore, the multi-master architecture can be realized easily without message conflict. The unit with the message of highest priority to be transmitted gains bus access.

- **Safety**

  In order to achieve the utmost safety of data transfer, powerful measures for error detection, signaling and self-checking are implemented in every CAN node.

- **Priorities**

  The CAN IDENTIFIER defines a static message priority during bus access.

- **Arbitration**

  If two or more nodes start transmitting messages at the same time, the arbitration mechanism is applied to guarantee that one of these messages can be sent successfully according to the priority.

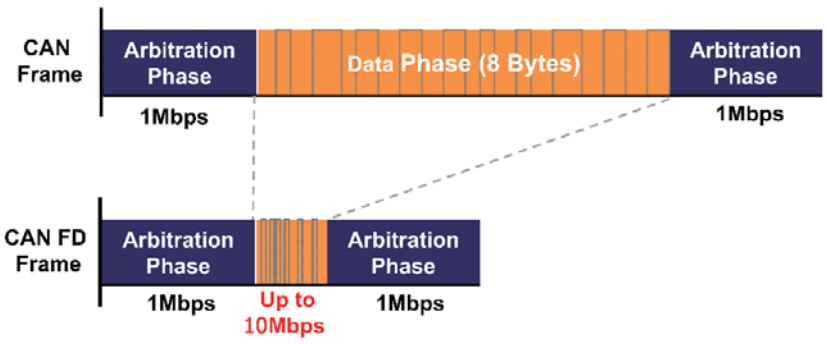
CAN FD Introduction

CAN FD (CAN with Flexible Data-Rate) is a newer extension version of the CAN 2.0 protocol. It was developed by Bosch and was released in 2012. It has been significantly improved during the standardization process and is nowadays in ISO 11898-1:2015. The CAN FD speeds up the data transmission and packs more data into each message.

The CAN FD offers four major benefits:

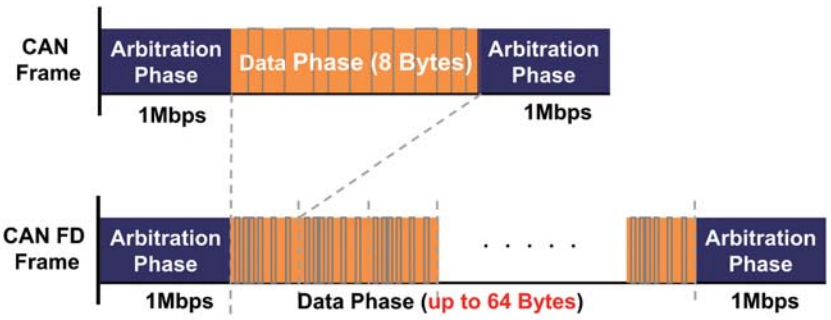
1. Increased Speed

The speed the CAN bus can operate at is determined by the need to complete the message arbitration. So the speed is dependent on the length and topology of the bus. For passenger vehicles the CAN speed is between 500 Kbit/s - 1Mbit/s, while in commercial vehicles, bus speeds of 250 kbit/s are more typical. With CAN FD, the speed of the arbitration remains the same. However at the end of arbitration when only one node is sending, the bus speed can be increased. The CAN FD supports dual bit rates: The nominal (arbitration) bit-rate limited to 1 Mbit/s as given in Classical CAN - and the data bit-rate, which depends on the network topology and transceivers. In practice, data bit-rates up to 10 Mbit/s are achievable.



2. Increased Data Length

The CAN FD provides a higher data bandwidth, but without modification of the cables, connectors, filters and CAN drivers, you should not expect more than 2 to 4 times an increase in bandwidth. To limit the time a CAN frame can occupy the CAN bus, you could expect some restrictions when using CAN frames above 16 bytes. If there is low real-time demand, it is possible to use any data length without any restrictions. A typical scenario is when the system is downloading a software update. The CAN FD supports up to 64 data bytes per data frame vs. 8 data bytes for Classical CAN. This reduces the protocol overhead and leads to an improved protocol efficiency.

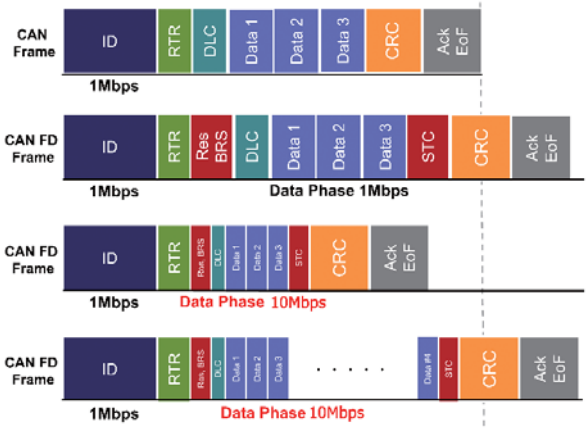


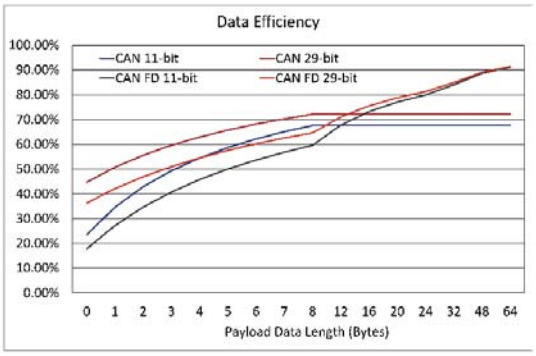
3. Improved Reliability

The CRC check sum is done in a different way in CAN FD and as a result, CAN FD has better protection against undetected errors in the data. To get undetected errors demands CAN communication with a high Error-Frame content. The best way to protect the communication is to improve the physical layer to remove any occurrence of Error-Frames. The CAN FD uses an improved cyclic redundancy check (CRC) and the "protected stuff-bit counter", which lower the risk of undetected errors. This is very important in safety-critical applications like vehicles and industrial automation.

4. Improved Data Efficiency

The added functionality of CAN FD adds a lot of extra bits vs. Classical CAN - how can this lead to less overhead? See the below visualization of Classical CAN vs. CAN FD for 3 data bytes. In fact, the efficiency of CAN FD does not exceed Classical CAN until crossing 8 data bytes. However, by moving towards 64 data bytes, the efficiency can go from about 50% up towards 90%.

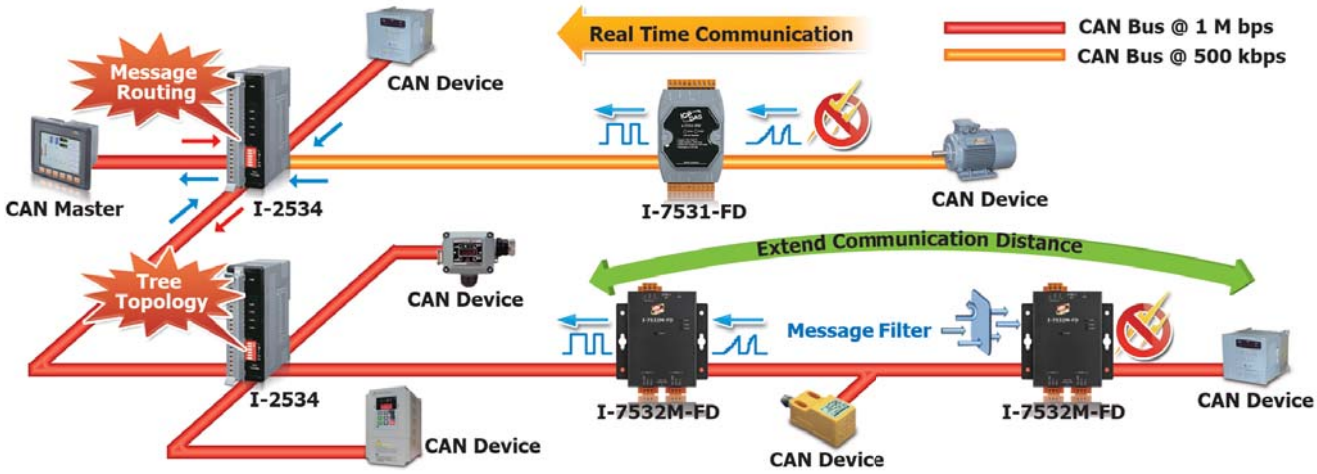




3.2 Repeater/Bridge/Switch

The CAN/CAN FD Repeater/Bridge/Switch is used to enhance the signal quality, extend the communication distance, isolate CAN Bus network. CAN FD (Controller Area Network Flexible Data-Rate) is a data-communication protocol typically used in the automotive industry. It supports up to 64 data bytes per data frame vs. 8 data bytes for Classical CAN. ICP DAS provides following products.

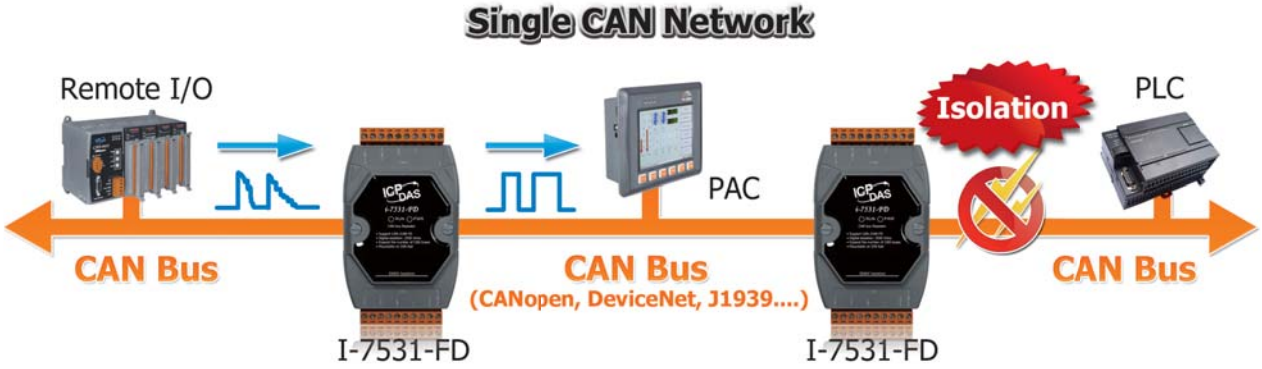
Model Name	I-7531-FD	I-7532M-FD	I-2534	I-5534-M
Pictures	Isolated CAN Bus Repeater	2-port CAN/CAN FD Bridge	4-Port CAN Bus Switch	4-Port CAN Bus Switch with Metal Casing
				
CAN Interface				
Channel number	2		4	
Transmission speed (bps)	5 k ~ 800 k with auto baud rate detection	CAN bit rates: 10 ~ 1000 kbps, CAN FD bit rates for data field: 100 ~ 10000 kbps	5 k ~ 1 M selected by rotary switch or utility tool	
Transmission Distance (m)	Depends on the CAN baud rate		Duplicates the transmission distance depended on the CAN baud rate	
Propagation Delay	Max. 175ns (shorters the transmission distance by ~35m)	Depends on the CAN baud rate (160 us @ 1Mbps)	Depends on the CAN baud rate (Max. 440 us @ 1 Mbps)	
Terminal Resistor	120 Ω(Jumper)	120 Ω(DIP Switch)		120 Ω(Jumper)
Isolation	3000 V for DC-DC, 2500 Vrms for digital isolation	3000 VDC for DC-to-DC, 2500 Vrms for photo-couple		
Specification	ISO-11898-2, CAN 2.0A/B and CAN FD (CAN FD support ISO and Non-ISO standards)		ISO 11898-2, CAN 2.0A and CAN 2.0B	
Power				
Power supply	+10 ~ +30 VDC			
Protection	Power reverse polarity protection, Over-voltage brown-out protection			
Power Consumption	1 W	1.2 W	3 W	
Mechanism				
Installation	DIN-Rail	Wall Mount or DIN-Rail	DIN-Rail	
Casing	Plastic	Metal	Plastic	Metal



I-7531-FD Two-channel Isolated CAN / CAN FD Signal Repeater

The I-7531-FD is a CAN/CAN FD signal repeater, which can connect two or more CAN networks with the same baud rate. Based on the signal repeat function of I-7531-FD, users can use different numbers of I-7531-FD to combine tree-shaped and star-shaped CAN network topology, and when there are too many devices on the CAN network, using I-7531-FD can increase the driving force of the CAN signal to drive more CAN devices. In addition, the CAN side of the I-7531-FD has a digital isolation of 2500 Vrms, and the CAN side and the power side also provide 3000 V DC-DC isolation protection, which can effectively isolate the noise interference between CAN networks ,and achieve protection the purpose of a specific CAN network.

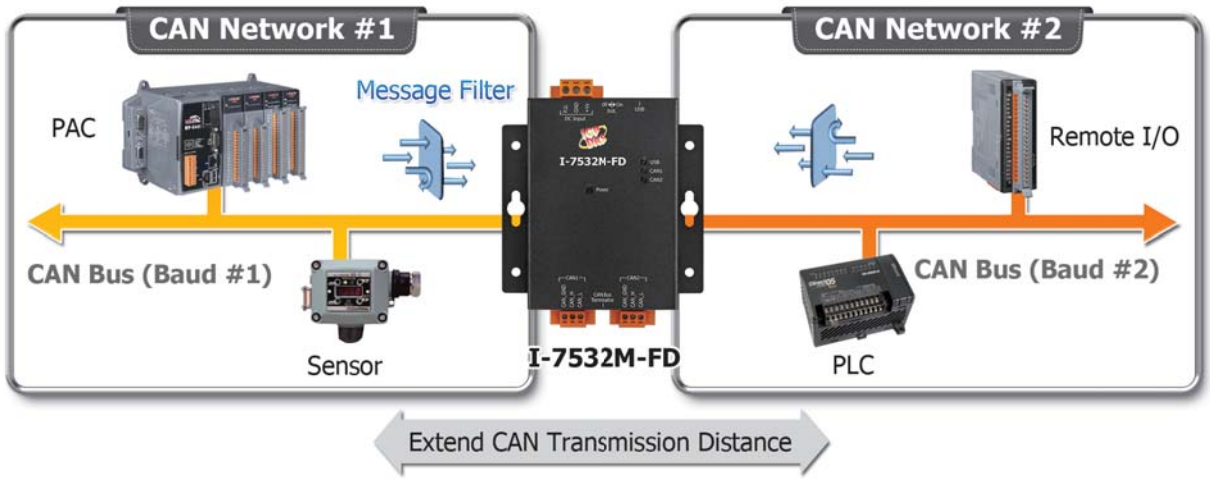
- Supported CAN specification 2.0A/B and CAN FD
- Fully compatible with the ISO 11898-2 standard
- Detected CAN bus baud rate automatically, maximum support 8000 kbps



I-7532M-FD Isolated two-channel CAN/CAN FD Bus Bridge

The I-7532M-FD is a CAN/CAN FD bridge that can be used to integrate two CAN/CAN FD networks even they implement different CAN/CAN FD baud rate. Compare with the CAN repeater series, the I-7532M-FD offers more than 3 useful features. First, the transmission distance limitation of the CAN Bus system on each side of the I-7532M-FD is independent. Second, when some errors (e.g. bit error) happened on one CAN port of the I-7532M-FD, the other CAN port of the I-7532M-FD will not be affected and can still work correctly. Last, the baud rate and CAN/CAN FD message filter configuration of these two CAN ports on the I-7532M-FD is able to be tuned following users' applications.

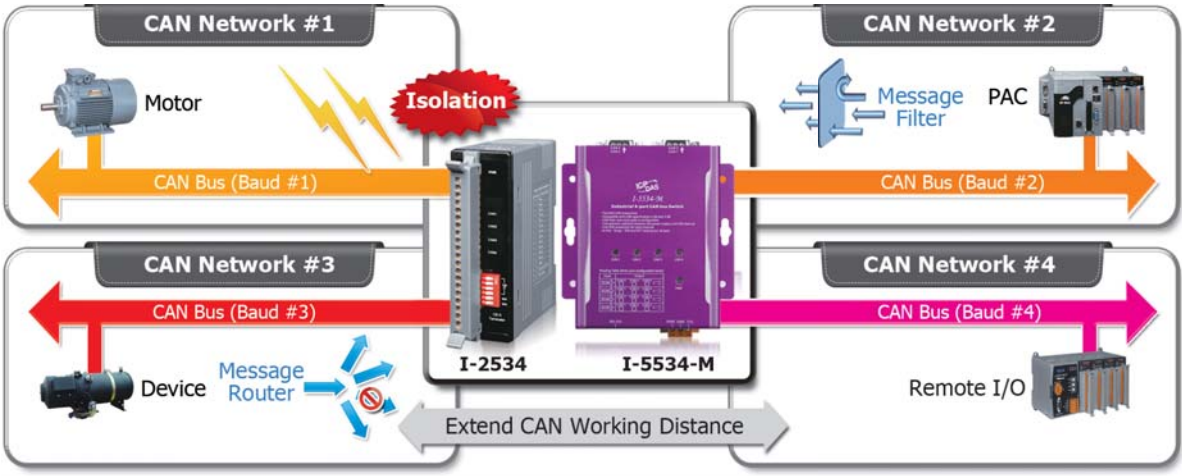
- Compatible with CAN specification 2.0 A/B and FD
- CAN FD support for ISO and Non-ISO (Bosch) standards switchable
- CAN FD bit rates for data field from 100 kbps to 10 Mbps
- CAN bit rates from 10 kbps to 1000 kbps
- Support CAN Bus message filter configuration
- Support CAN/CAN FD frame forwarding rule, mapping rule, merging rule and splitting rule
- The baud rate of each port can be different for highly flexibility



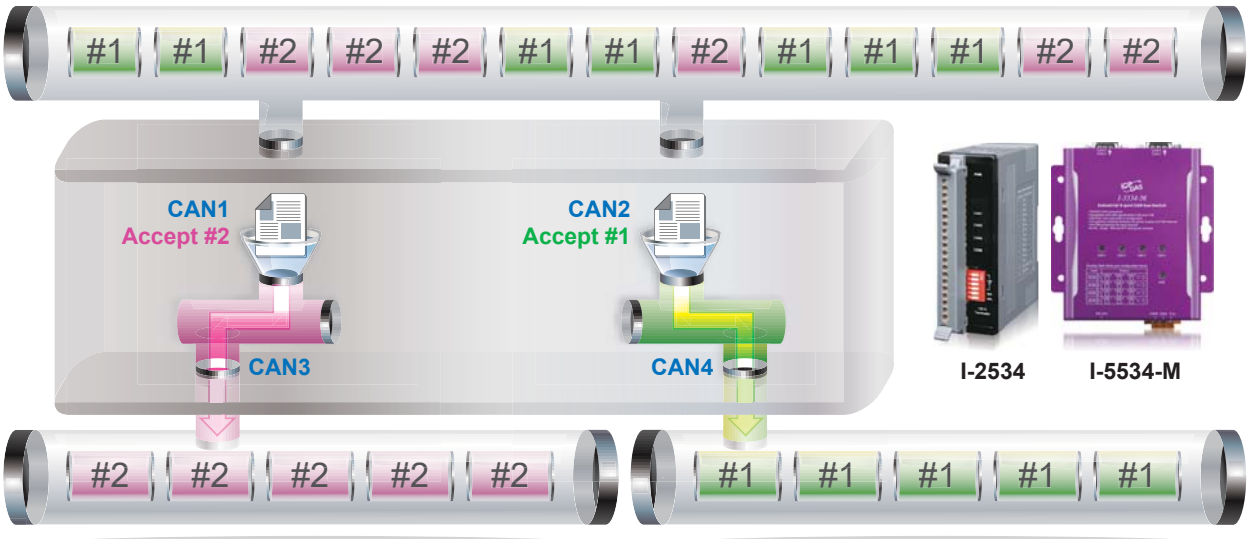
I-2534 I-5534-M Isolated 4-Port CAN Bus Switch

The I-2534/I-5534-M provides 4 isolated independent CAN ports that can be used to link 4 CAN networks. The I-2534/I-5534-M follows the ISO 11898-2 specification which is applied in widely range of CAN-based protocols. In order to fit the industrial application, this module provides the functions of reshaping the CAN signals and isolating the disturbance among 4 CAN ports. When users apply the I-2534/I-5534-M in the CAN networks which use different baud rate, the I-2534/I-5534-M offers the baud rate configuration, CAN message filters, and message router, and effectively help users solve the problems related to network-to-network data exchanging, message filtering and routing, and tree topology for the CAN bus. The transmission distance limitation for each CAN port of the I-2534/I-5534-M is independent, which means that the total length of the network can be extended.

- 4 CAN communication ports
- 3 kV DC-DC isolation and 2500 Vrms isolation
- Fully compatible with the ISO 11898-2 standard
- The message filter for each CAN port is configurable
- I-5534-M is the metallic casing
- Power requirements: Unregulated +10 VDC ~ +30 VDC
- Compatible with CAN specification 2.0 parts A and B
- Supports baud rates from 5 kbps ~ 1 Mbps
- DIP switch for the 120 Ω terminator resistor of the CAN bus
- Rotary switch used to select the baud rate for each CAN port



CAN bus network (Heavy bus loading)



CAN bus with only #2 message (Light bus loading)

CAN bus with only #1 message (Light bus loading)

CAN-ID Mapping Instruction

There is a mapping table in the I-2534 and I-5534-M like below. The mapping mechanism is that the CAN-ID in the [Source CAN-ID] will be changed to the new CAN-ID in the [Forward CAN-ID]. For example with the table which the 0x123 in [Source CAN-ID] and the 0xABC in [Forward CAN-ID], every CAN message which CAN-ID is 0x123 comes to the I-2534 or I-5534-M. The I-2534 and I-5534-M will change the CAN-ID from 0x123 to the 0xABC before forwarding. The mapping table not only changes the CAN-ID but also changes the CAN-Mode (11-bit or 29-bit). Other CAN messages which CAN-ID does not exist in the [Source CAN-ID] will change nothing. Figure 2 and 3 is the mapping concept in CAN1. Figure 1 shows other CAN messages without changes.

Soure CAN-ID	Forward CAN-ID
0x123 (11 bits)	0xABC (29 bits)
0x122 (29 bits)	0x2211 (29 bits)

Example of CAN-ID mapping

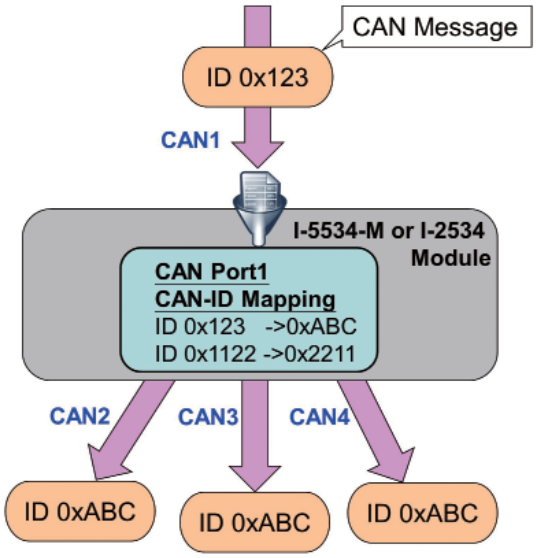


Figure 1

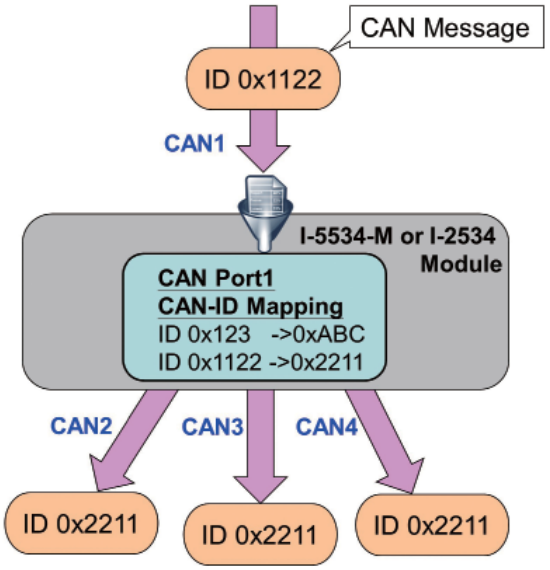


Figure 2

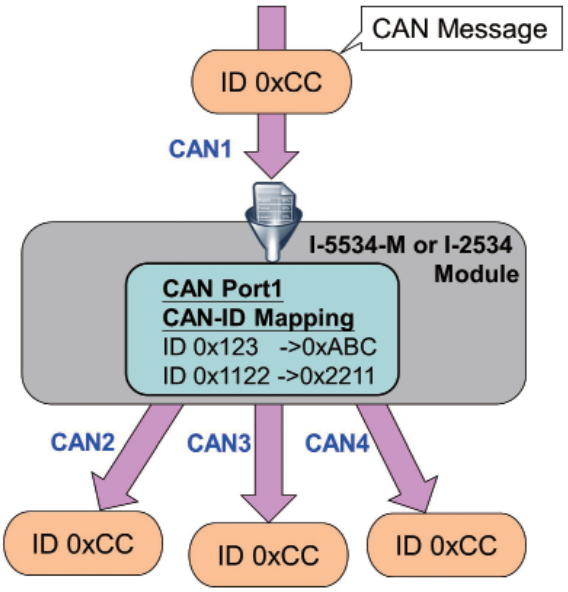


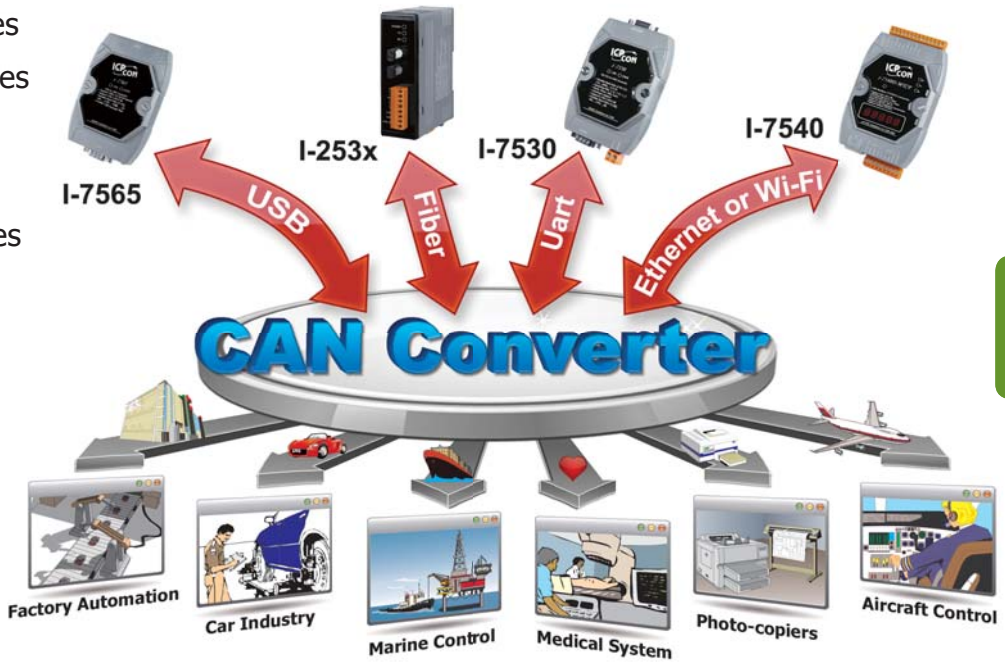
Figure 3

The utility could enable or disable CAN-ID mapping table on each CAN port (Each CAN port provides 32 mapping messages at most). After configuring the mapping table, the utility supports to export as mapping file and import from existing mapping file.

3.3 CAN Converters

ICP DAS CAN converters are used to establish a physical coupling of two or more communication interface, and are infrastructure components with which complex network structures can be implemented. They can be used to implement the data conversion between CAN and USB, Uart, Ethernet or Wi-Fi interface.

- CAN to USB: I-7565 series
- CAN to Fiber: I-253x series
- CAN to Ethernet or Wi-Fi: I-7540 series
- CAN to Uart: I-7530 series



3.3.1 USB to CAN Converters

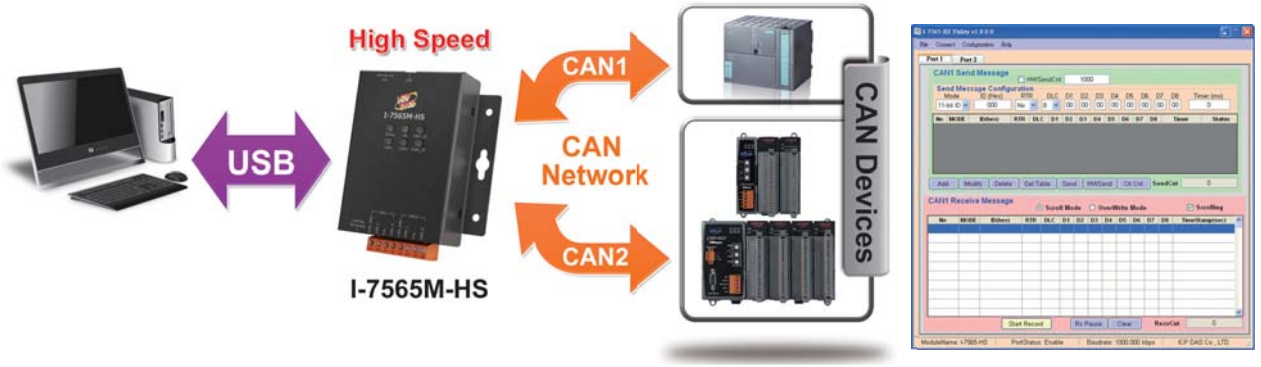
The I-7565 series is the USB to CAN converter with a maximum of two independent CAN channels that supports CAN protocols 2.0A and 2.0B. It becomes very convenient and easy to access and control the CAN devices via the USB port of the PC.

Model Name	I-7565M-HS	tM-7565	I-7565-H1	I-7565-H2	I-7565-CPM	I-7565-DNM
Pictures	2-Port High Performance USB to CAN Converter	1-Port Cost Effective USB to CAN Converter	1-Port High Performance USB to CAN Converter	2-Port High Performance USB to CAN Converter	Intelligent USB to CANopen Converter	Intelligent USB to DeviceNet Converter
						
Compatibility						
Cannel	2	1	1	2	1	1
Connector	8-pin terminal block	7-pin terminal block	9-pin male D-Sub	10-pin terminal block	9-pin male D-Sub	
Baud Rate	10k, 20k, 50k, 100k, 125k, 250k, 500k, 800k, 1M					125k, 250k, 500k
Isolation	3000 Vrms	2500 Vrms	3000 Vrms		3000 VDC	
Protocol	CAN 2.0A/2.0B				CiA 301 V4.02	DeviceNet Volume I ver2.0, Volume II ver2.0
Receive Buffer	512 data frames	256 data frames	256 data frames	128 data frames for each CAN port	1000 data frames	256 data frames
Max. Data Flow	15000 fps for each CAN port	425 fps	3000 fps	1500 fps for each CAN port	-	-

I-7565M-HS High Speed USB to 2-port CAN Bus Converter

I-7565M-HS is a high speed USB to CAN converter with two CAN channels. It improves the transformation speed of other I-7565 series, and allows receiving max. 15000 standard 2.0A CAN frames per second. I-7565M-HS support CAN2.0A/2.0B protocol and different baud rates from 10 kbps to 1000 kbps. The important feature of I-7565M-HS is to support the user-defined baud rate function no matter what the baud rate is. When connecting I-7565M-HS to PC, PC will load the relevant device driver automatically (hot plug & play). Therefore, users can make data collection and processing of CAN Bus network easier and quicker by applying I-7565M-HS.

- Compatible with USB 2.0 (High Speed)
- Support both CAN2.0A and CAN2.0B specifications
- No external power supply (powered by USB)
- Programmable CAN Bus baud rate from 10kbps to 1000kbps
- Support CAN Bus message filter configuration
- Timestamp of CAN message with at least ±10us precision
- Built-in dip-switch to select 120 ohm terminal resister for CAN Bus
- Provide utility tool for users module setting and CAN Bus communication testing conveniently
- Provide API library for user program development



tM-7565 1-Port Cost Effective USB to CAN Converter

The tM-7565 is a tiny USB to CAN converter to fit for narrower environment as a result of its small size. Since it has USB interface, it is easily to be used via laptop. It has isolation on power side and on CAN bus side and it has a good performance. The function of tM-7565 can full compatibly with I-7565. In additional, it provides new function such as listen only. User can use this function to listen CAN bus messages and error detection. According to above features, tM-7565 is an economical and practical USB to CAN converter solution.

- Compatible with CAN specification 2.0A and 2.0B
- Fully compatible with ISO 11898-2 standard
- Support various CAN baud rate from 10K bps to 1M bps
- Support user-defined CAN baud rate
- Support various USB baud rate from 110 bps to 230400 bps
- Build-in selectable 120 Ω terminator resistor
- Software configurable CAN and USB communication parameters
- Power, data flow, and error indicator for CAN and USB
- Watchdog inside
- Support pair connection mode
- Software buffer on CAN bus side and USB side
- Support user-defined end of characters on pair connection mode
- Support listen only mode
- Support time stamp response on USB side

I-7565-H2 High-performance 2-Port USB to CAN Converter

The I-7565-H2 is a high-performance intelligent USB to CAN converter with two CAN port that can help users to make data collection and process on CAN Bus network easily and quickly. It improves the transformation speed of the I-7565, and allows receiving max. 3000 standard 2.0A CAN frames per second. The powerful CPU of the I-7565-H2 provides the accurately time-stamp for each CAN message that is useful to analysis and diagnostic the CAN network.

- Provides a configuration utility that can be used to transmit/receive CAN messages
- Driver supported for Windows XP/7/10 and Linux
- Max. data flow for a single channel is 3000 fps No external power supply required (powered by the USB port)
- Built-in jumper for the 120 Ω terminal resister
- Programmable CAN Bus baud rate from 5 kbps ~ 1 Mbps
- Compatible with CAN specification 2.0 parts A and B
- 2500 Vrms photocoupler isolation on the CAN side
- Supports CAN Bus acceptance filter configuration
- Fully compatible with the ISO 11898-2 standard
- 3 kV galvanic isolation for the CAN port
- Removable terminal block
- Provides two CAN ports

I-7565-CPM Intelligent USB to CANopen Converter

I-7565-CPM can represent an economic master solution of CANopen application. It follows CiA 301 specification such as, SDO, PDO, NMT, SYNC and so on. Besides, I-7565-CPM support EDS file interpretation, Heartbeat, Guarding, Slave Boot-up detection, and EMCY event functions. It is suited for portable diagnostic tool or main control unit of a CANopen network.

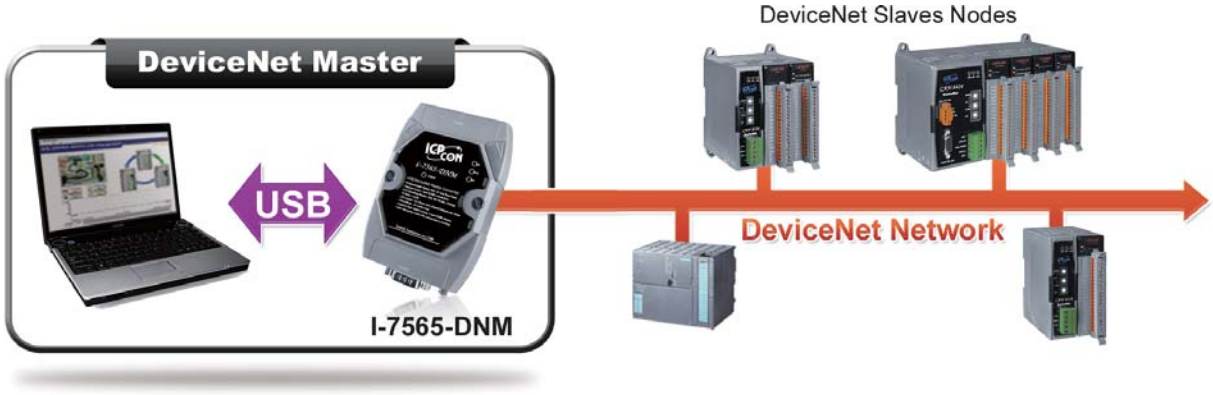
- Support event trigger, such as EMCY event, Guarding event, Heartbeat event, and Slave Boot-up events
- Support baud: 10 Kbps, 20 Kbps, 50 Kbps, 125 Kbps, 250 Kbps, 500 Kbps, 800 Kbps, and 1 Mbps
- Driver supported Windows XP/7/10 and Linux
- Support NMT, PDO, SDO, SYNC and EMCY protocol
- Support VC6, VB6, VB.net, and C# development
- Support Node Guarding and Heartbeat protocol
- Support on-line adding and removing devices
- Fully compliant with USB 1.1/2.0 (Full Speed)
- Support Auto-Search slave device functions
- Allow CiA DS-301 V4.02
- Support EDS File

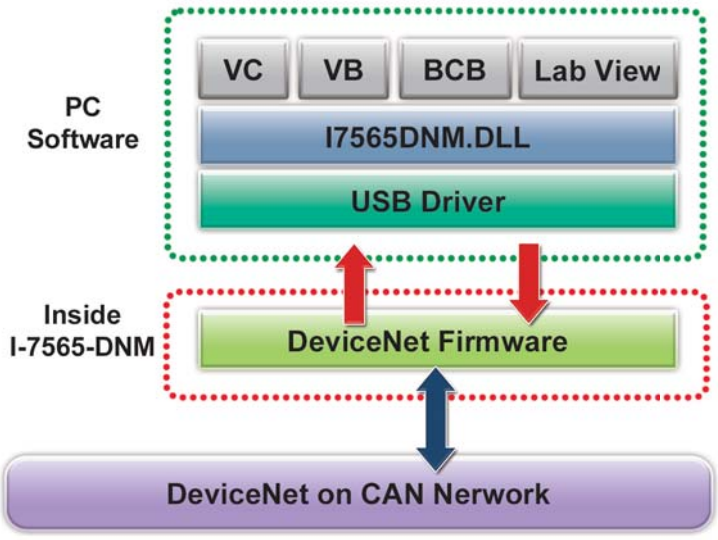
I-7565-DNM Intelligent USB to DeviceNet Converter

I-7565-DNM can represent an economic master solution of DeviceNet application. It is a "Predefined Master-Slave connection Set". I-7565-DNM supports Group 2 only Server and UCMM functions to communication with slave devices. It has an independent CAN Bus communication port to cover a wide range of DeviceNet applications.

Besides, I-7565-DNM uses the new CAN controller Phillips SJA1000T and transceiver 82C250, which provide bus arbitration, error detection with auto correction and re-transmission function. It can be installed on almost any windows-based system. It is popularly applied in the industrial automation, building automation, vehicle, marine, and embedded control network. In order to expand the DeviceNet functions of ICP DAS products, I-7565-DNM is developed for this purpose.

- Fully compliant with USB 1.1/2.0 (Full Speed)
- DeviceNet Version: Volume I & II, Release 2.0
- Programmable Master MAC ID and Baud Rate
- Support Group 2 and UCMM connection
- Support Auto-Search slave device function
- Support Auto-detect Group 2 and UCMM device
- Status LED: RUN, MS, NS
- Baud Rate: 125k, 250k, 500k
- Slave Node: 63 nodes Max
- Support on-line adding and removing devices
- Auto-Reconnect when the connection is broken
- Free Software development tools for Windows
- I/O Length: 512 Bytes Max. (Input/Output) per slave
- I/O Operating Modes: Poll, Bit-Strobe, Change of State/ Cyclic
- Driver supported for Windows XP/ Win7/ Win8/ Win10 32-bit and 64-bit
- No external power supply is required as I-7565 takes it's power from the USB bus

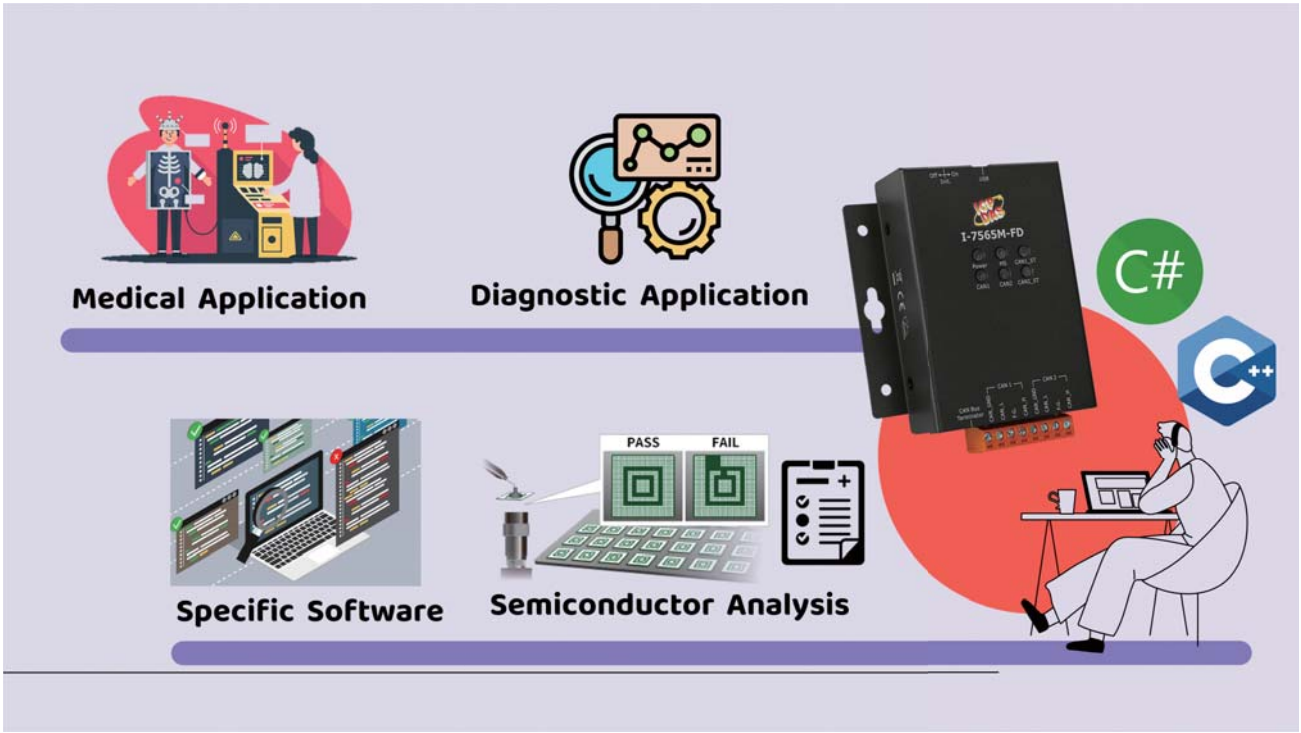




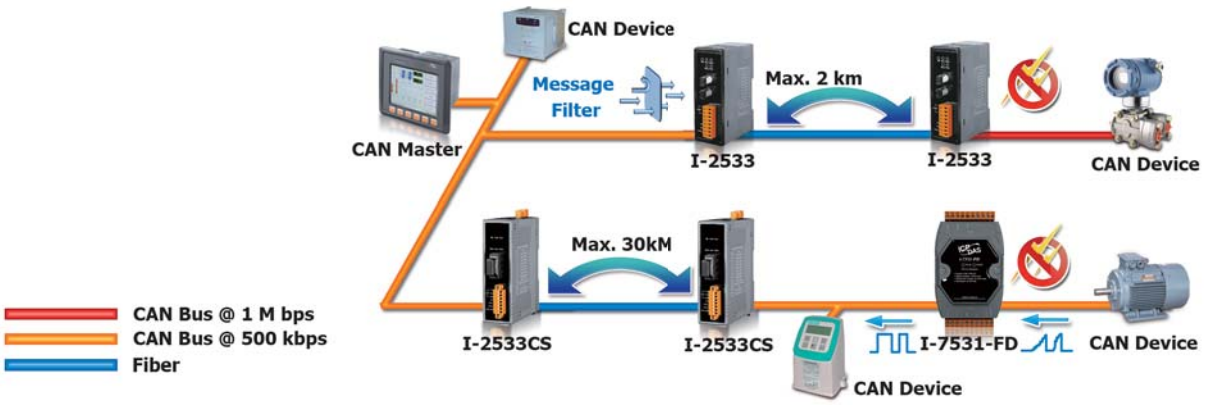
I-7565M-FD USB to 2-port CAN/CAN FD Bus Converter

I-7565M-FD is a USB to CAN/CAN FD (CAN with Flexible Data-Rate) converter with two CAN channels. It allows transmitting/receiving CAN/CAN FD frames and supports CAN2.0A/2.0B and CAN FD (ISO/Bosch) specifications and different baud rates for CAN/CAN FD frame. (10 kbps to 1000 kbps for CAN arbitration phase and 100 kbps to 10 Mbps for CAN FD data phase). When connecting I-7565M-FD to PC, PC will load the relevant device driver automatically (hot plug & play). Therefore, users can make data collection and processing of CAN Bus network easier and quicker by applying I-7565M-FD. The application fields can be CAN Bus monitoring, building automation, remote data acquisition, environment control and monitoring, laboratory equipment & research, factory automation, etc.

- Compatible with USB 2.0 (High Speed)
- Compatible with CAN specification 2.0 A/B and FD
- CAN FD support for ISO and Non-ISO (Bosch) standards switchable
- CAN FD bit rates for data field from 100 kbps to 10 Mbps
- CAN bit rates from 10 kbps to 1000 kbps
- Time stamp resolution 1ms.
- Voltage supply via USB
- Watchdog inside
- Built-in dip-switch to select 120 ohm terminal resister for CAN Bus
- Provide API library for user program development



3.3.2 CAN/CAN FD to Fiber Converter/Bridge



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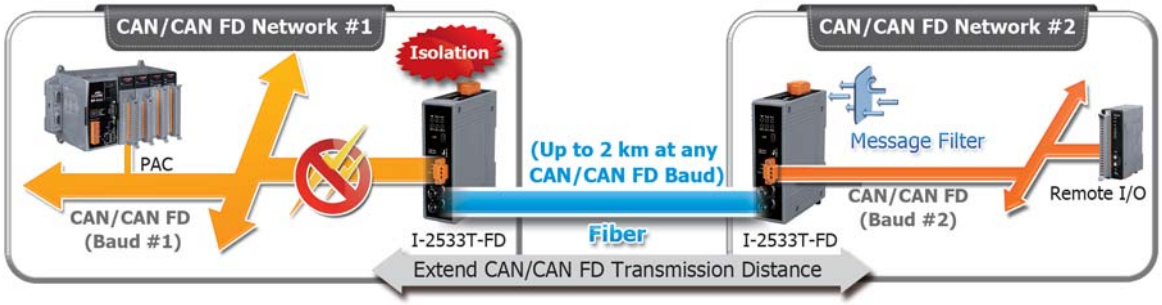
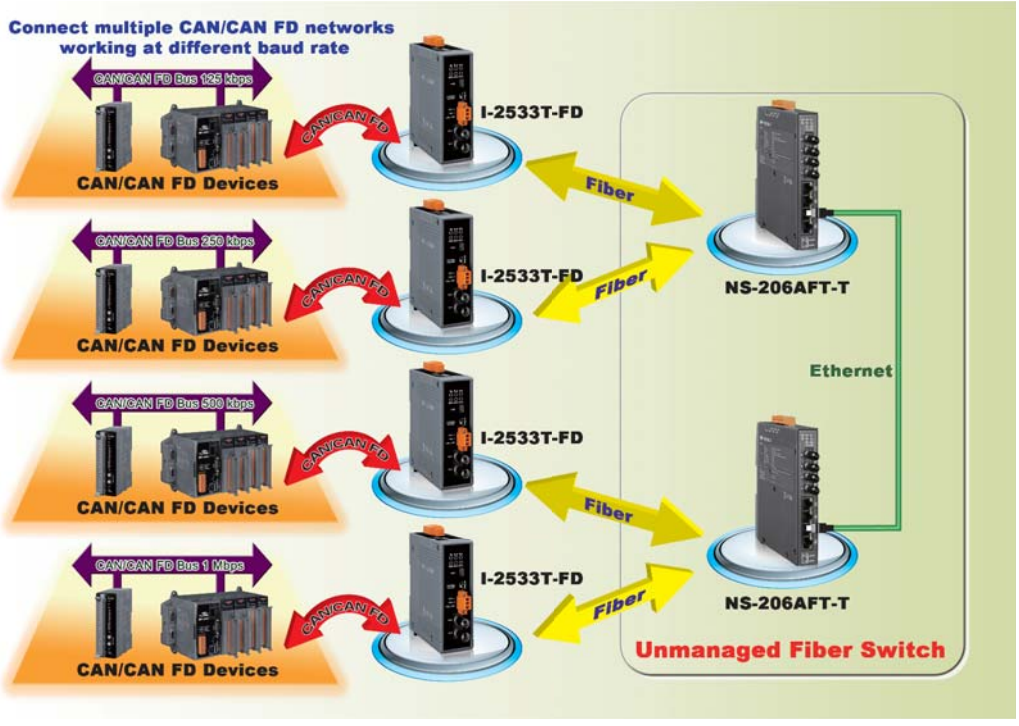
Models	I-2533T-FD	I-2533CS-FD	I-2533	I-2533CS	I-2533CS-60	I-2533CS-A/ I-2533CS-B
Pictures	CAN/CAN FD to Multi-mode Fiber Bridge	CAN/CAN FD to Single-mode Fiber Bridge	CAN to Multi-mode Fiber Bridge	CAN to Single-mode Fiber Bridge		
						
CAN Interface						
Connector	Screwed terminal block (CAN_GND, CAN_L, CAN_H)					
Baud Rate (bps)	CAN: 10k ~ 1M CAN FD: 100k ~ 10M		10 k ~ 1 M			
Transmission Distance (m)	Depends on baud rate					
Propagation Delay	190us (depdens on the CAN baud rate)		250us (depdens on the CAN baud rate)	190us (depdens on the CAN baud rate)		
Terminal Resistor	Switch for 120Ω terminal resistor		DIP switch for the 120 Ω terminator resistor			
Isolation	3000 VDC for DC-to-DC, 2500 Vrms for photo-couple					
Specification	ISO 11898-2, CAN 2.0 A/B and FD		ISO 11898-2, CAN 2.0A and CAN 2.0B			
Fiber Interface						
Connector	ST Duplex type	SC Duplex type	ST Type	SC (Duplex Type)		SC Type
Wave Length (nm)	1310		850	1300 or 1310		TX: 1310, RX: 1550 for I-2533CS-A TX: 1550, RX: 1310 for I-2533CS-B
Fiber Cable (μm)	50/125, 62.5/125 or 100/140	8.3/125, 8.7/125, 9/125 or 10/125	Multi-mode 50/125, 62.5/125 or 100/140	Single-mode 8.3/125, 8.7/125, 9/125 or 10/125		
Transmission Distance	Max. 2km	Max. 30km	Max. 2 km	Max. 30 km	Max. 60 km	Max. 15 km
Power						
Power Supply	Unregulated +10 VDC ~ +30 VDC					
Protection	Power reverse polarity protection, Over-voltage brown-out protection					
Power Consumption	3 W					

I-2533T-FD CAN/CAN FD to Multi-Mode Fiber Bridge

The I-2533T-FD is a local CAN/CAN FD (CAN with Flexible Data-Rate) bridge used to establish a connection between two CAN bus system via multi-mode fiber optic transmission medium. In order to solve the problem between CAN/CAN FD and fiber transmission medium, The I-2533T-FD is specially designed for converting the electrical CAN/CAN FD bus signal to fiber optic cables. Besides, I-2533T-FD has three more important features. First, the transmission distance limitation of the CAN bus system will not affected due to the different CAN/CAN FD baud rate. It means that the total CAN/CAN FD bus working distance can be extended. Second, the bus error on one CAN/CAN FD network will not affect the operation of another CAN/CAN FD network. Finally, the two CAN/CAN FD network can communication with each other by using different CAN/CAN FD baud rate for highly flexibility.

- Compatible with the ISO 11898-2 standard
- Compatible with CAN specification 2.0 A/B and FD
- CAN FD support for ISO and Non-ISO (Bosch) standards switchable
- CAN FD bit rates for data field from 100 kbps to 10000 kbps
- CAN bit rates from 10 kbps to 1000 kbps
- Fiber broken line detection
- Support CAN Bus message filter configuration
- Support firmware update via USB
- Basic CAN message routing function via Group ID settings
- Built-in switchable 120 ohm terminal resistor for CAN Bus

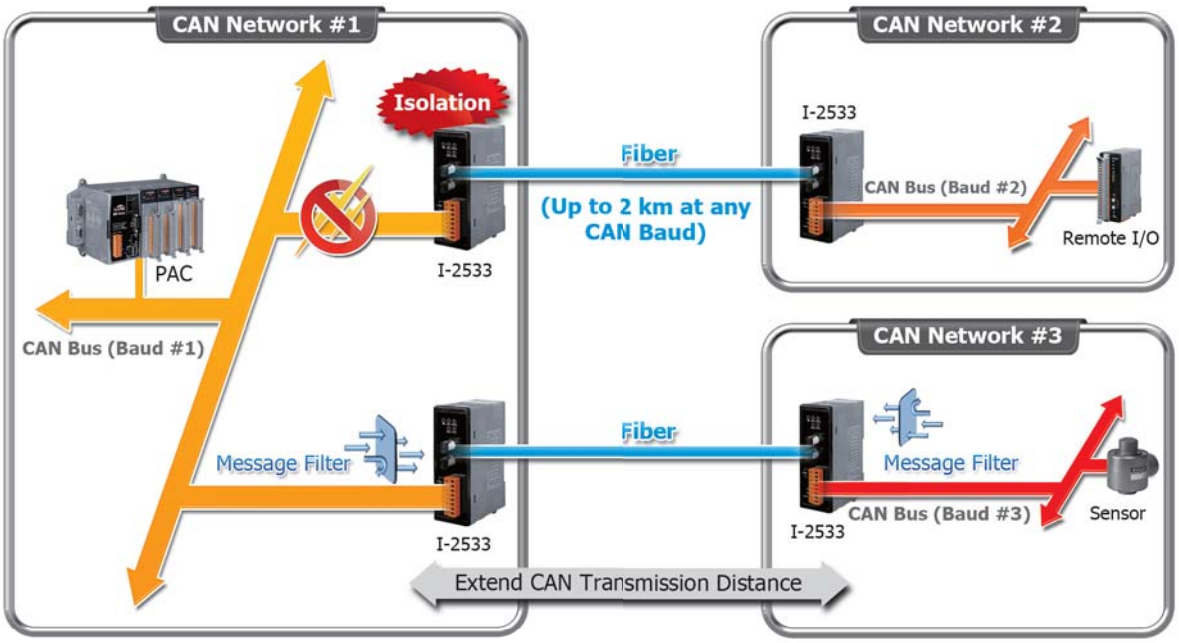


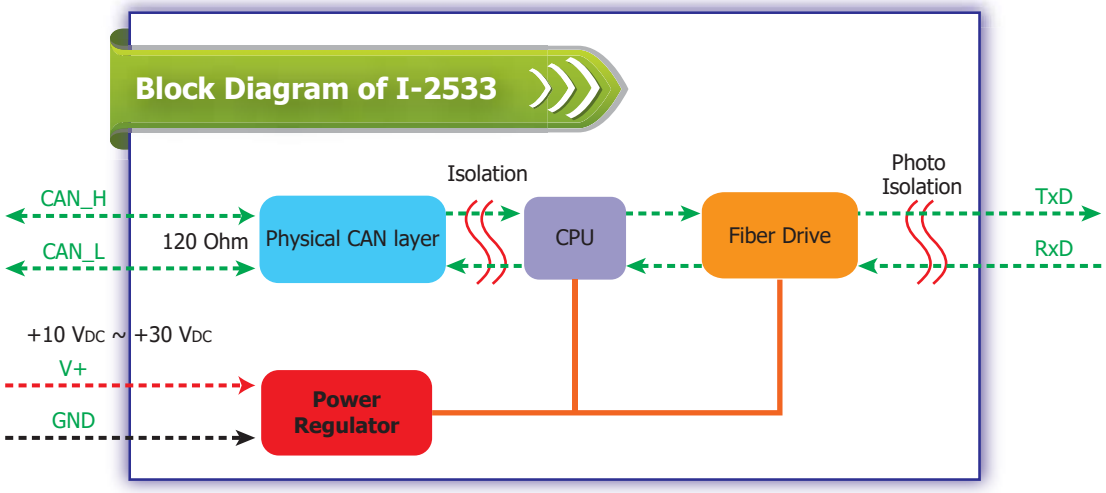


I-2533 CAN to Multi-mode Fiber Bridge

The I-2533 is an intelligent CAN bridge that can be used to establish the connection between two CAN bus systems via fiber optic cable. Similar to the I-2532, the I-2533 can also apply in various CAN-based protocols to convert CAN bus signals to optical signals and reshape the CAN signals. The difference between the I-2532 and I-2533 is the CAN configuration functions and the distance limitation of CAN communication. The I-2533 offers the functions to configure the CAN baud rate and CAN message filters. These are useful when using the I-2533 to link two CAN networks which may have different baud rates. By using the I-2533, the transmission distance limitation of the CAN bus system will not be reduced because of the CAN baud rate, which means that the total network length can be extended. This feature means that users can develop the applications more powerful and flexible with the I-2533.

- Fiber Port: ST (Multi-mode)
- Fiber Cable: 62.5/125 μm
- Up to 100 CAN nodes on each channel
- Broken line detection for fiber cable
- Wavelength: 850 nm
- 2500 Vrms iCoupler isolation on the CAN side
- Built-in switch for the 120 Ω terminator resistor
- Rotary switch for CAN baud rate configuration
- Fully compatible with the ISO 11898-2 standard
- Software utility tool for message filter configuration
- Compatible with CAN specification 2.0 parts A and B
- Max. transmission distance of up to 2 km at any CAN baud rate

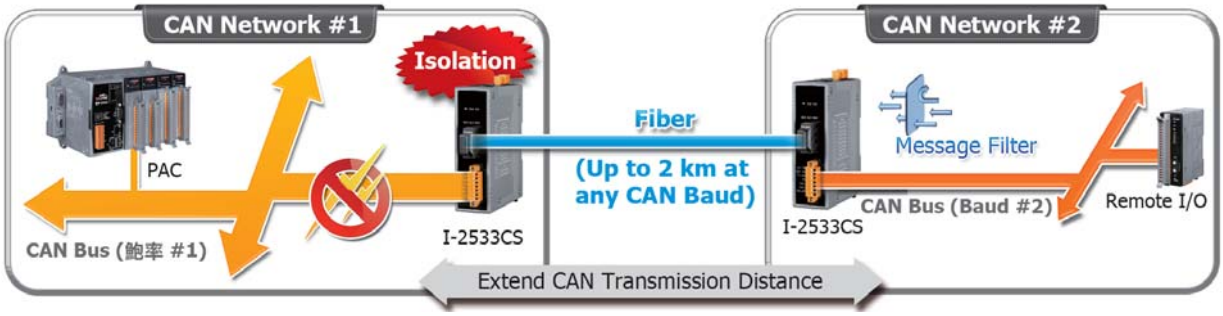


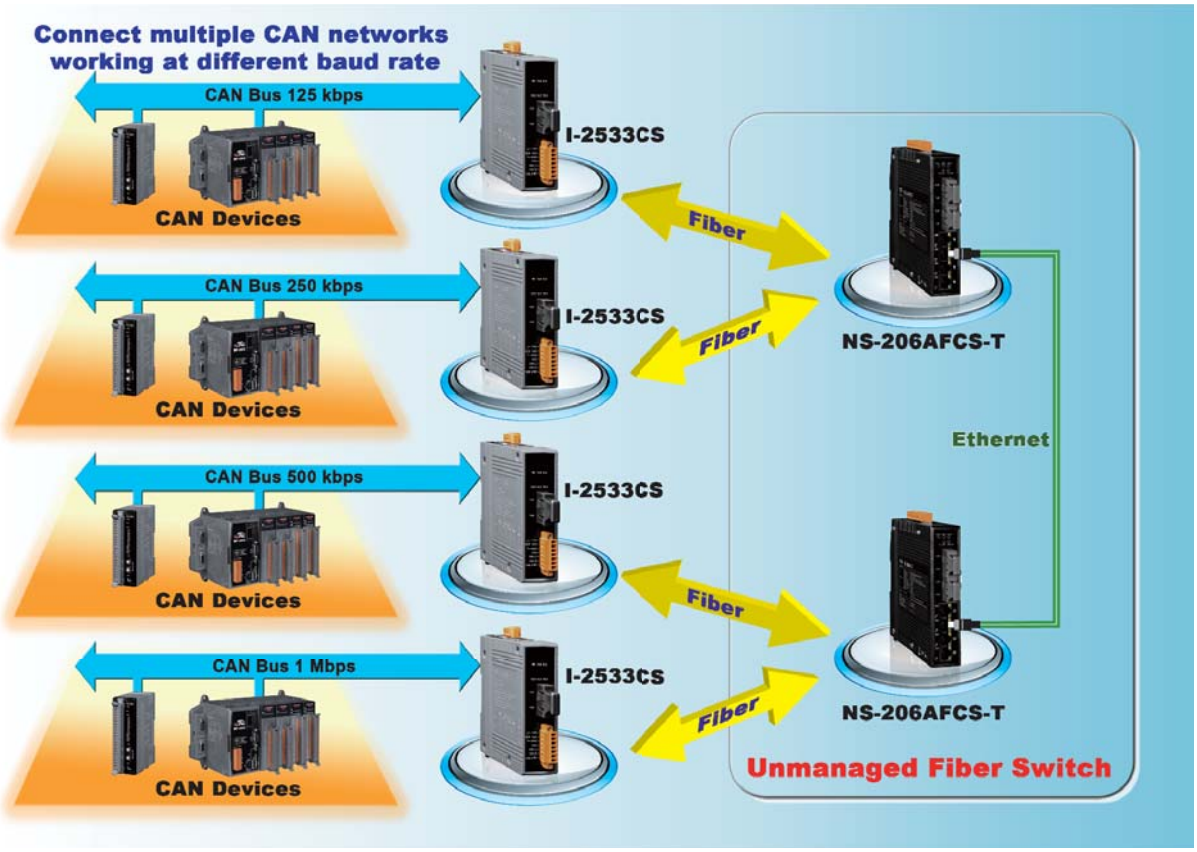


I-2533CS I-2533CS-60 CAN to Single-mode Fiber Bridge

The I-2533CS series (I-2533CS/I-2533CS-60) is a local CAN bridge used to establish a connection between two CAN bus systems via single mode fiber transmission medium. In order to solve the problem between CAN and fiber transmission mediums, the I-2533CS series is specially designed for converting the electrical CAN bus signal to the optical signal- and recover the signal to CAN bus by using another I-2533CS series. Compared with other CAN/Fiber converters, the I-2533CS series has three more important features. First, the transmission distance limitation of the CAN bus system will not be reduced due to higher CAN baud rate. No matter what kind of CAN baud rates you use, the data transmission distance of fiber is up to 30 km (60 km for I-2533CS-60). It means that the total network working distance can be extended.

- Fully compatible with the ISO 11898-2 standard
- Support both CAN 2.0A and CAN 2.0B
- NXP TJA1042 CAN transceiver
- Wave Length: 1310 nm
- 2500 Vrms isolation on the CAN side
- Transmission distance up to 30 km at any CAN baud rate (60km for I-2533CS-60)
- Build-in switch to select 120 Ω terminal resistor
- Fiber Cable: 8.3/125, 8.7/125, 9/125 or 10/125 μm
- Allow user-defined CAN baud rate
- 3 kV galvanic isolation between the power supply and CAN channel
- Rotary switch for CAN baud rate configuration
- Utility tool for CAN message filter configuration

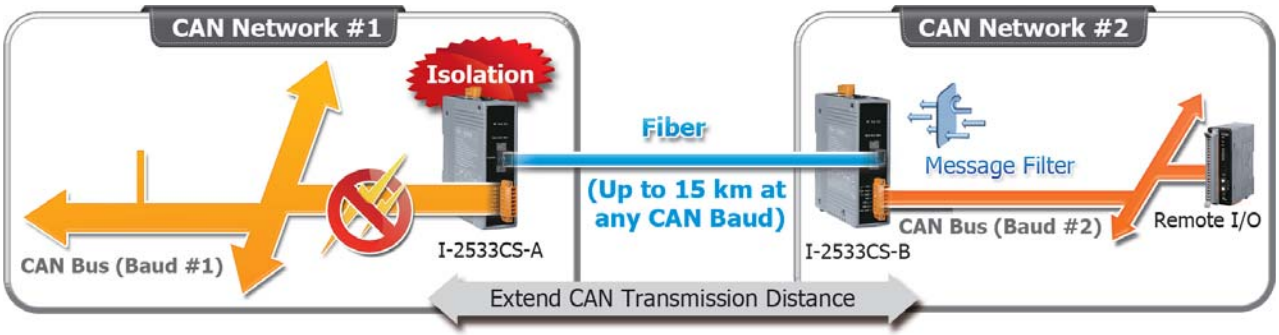


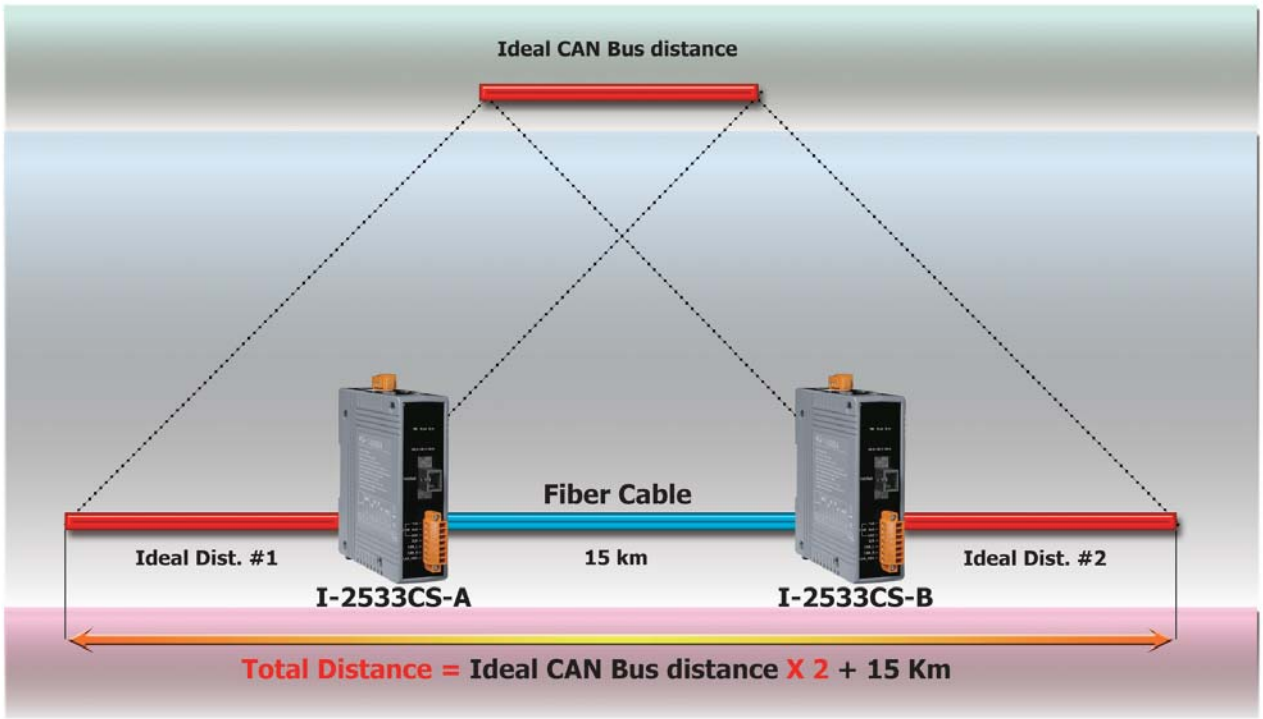


I-2533CS-A I-2533CS-B CAN to Multi-mode Fiber Bridge

The I-2533CS-A/B is a type of CAN-to-Fiber Bridge that can be used to establish a connection between two CAN networks. It supports Wavelength Division Multiplexing (WDM) technology so that only a single fiber cable is needed for transmitting bi-directional CAN data. As the I-2533CS-A and I-2533CS-B must be paired because of hardware limitations, this means that the cost of deploying fiber cable can be effectively reduced. Compared with other CAN/Fiber converters, the I-2533CS-A/B has three significant features. First, the I-2533CS-A/B can be used to overcome the transmission distance limitations of the CAN Bus. Consequently, the transmission distance can be extended to up to 15 km using fiber cable, regardless of the CAN baud rates used in the system.

- Embedded NXP TJA1042 CAN transceiver
- 2500 Vrms isolation on the CAN side
- 120 Ω terminal resistor selectable via DIP switch
- CAN baud rate configurable via rotary switch
- Fiber Type: SC, Single mode, 100 Base-FX
- Utility for CAN message filter configuration
- Allows user-defined CAN baud rates
- Fully compatible with the ISO 11898-2 standard
- Wavelength: • Tx: 1310 nm, Rx: 1550 nm for I-2533CS-A
  • Tx: 1550 nm, Rx: 1310 nm for I-2533CS-B
- Fiber Cable: 8.3/125, 8.7/125, 9/125 or 10/125 μm
- Supports both CAN 2.0A and CAN 2.0B specifications
- Max. transmission distance up to 15 km at any CAN baud rate
- 3 kV galvanic isolation between the power supply and the CAN channel

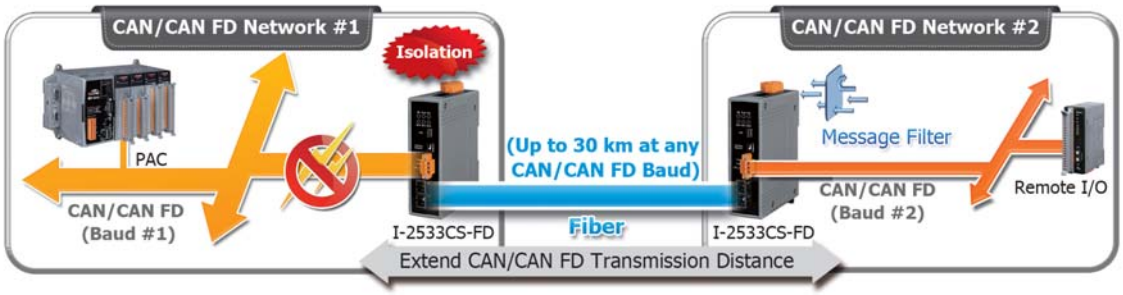


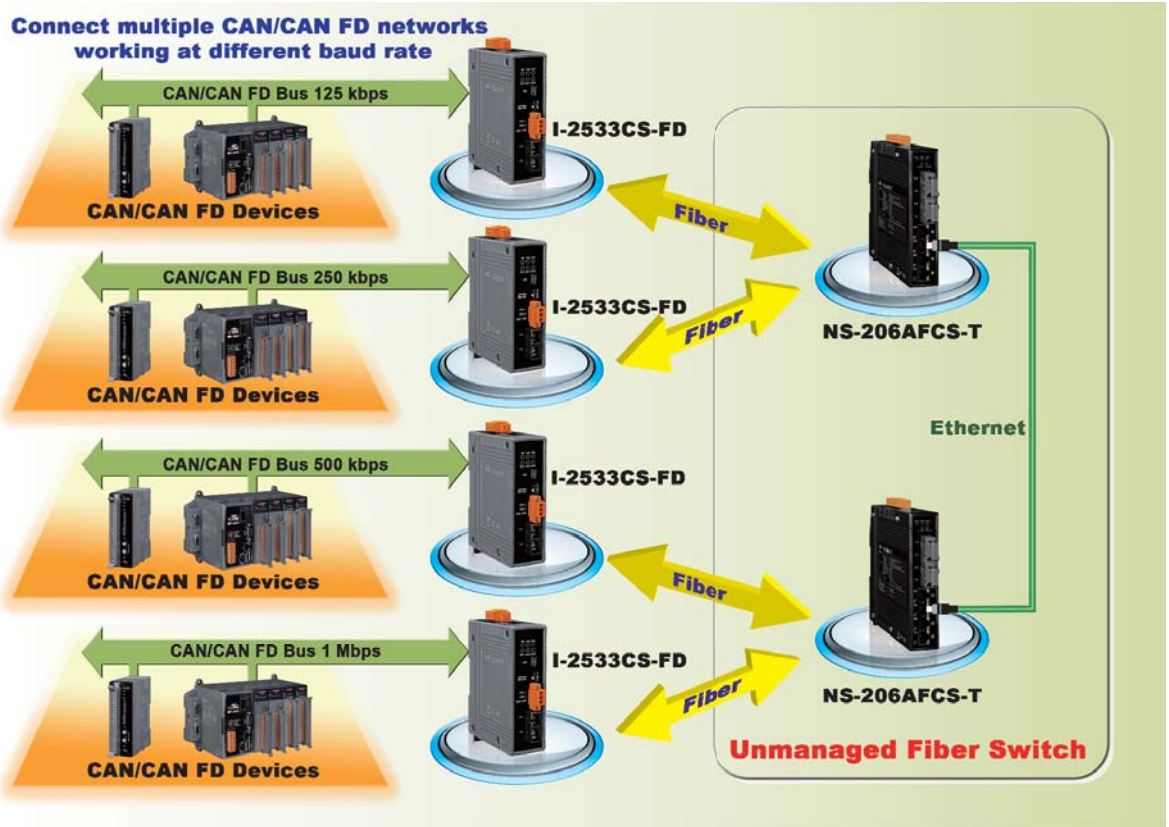


I-2533CS-FD CAN/CAN FD to Single-mode Fiber Bridge

The I-2533CS-FD is a local CAN FD bridge used to establish a connection between two CAN FD system via single mode fiber optic transmission medium. In order to solve the problem between CAN FD and fiber transmission medium, the I-2533CS-FD is specially designed for converting the electrical CAN FD signal to fiber optic cables.

- Compatible with the ISO 11898-2 standard
- Compatible with CAN specification 2.0 A/B and FD
- CAN FD support for ISO and Non-ISO (Bosch) standards switchable
- CAN FD bit rates for data field from 100 kbps to 10000 kbps
- CAN bit rates from 10 kbps to 1000 kbps
- Fiber broken line detection
- Support CAN Bus message filter configuration
- Support firmware update via USB
- Basic CAN message routing function via Group ID settings.
- Built-in switchable 120 ohm terminal resistor for CAN Bus
- Dip switch for CAN/CAN FD baud rate configuration





3.3.3 Ethernet/Wi-Fi to CAN Converters

The Ethernet or Wi-Fi to CAN converters are the solutions that enable CAN networks to be integrated into the Internet/Ethernet or Wi-Fi, whereby remote monitor and control is possible.

The I-7540D-WF supports the wireless transmission of CAN data between a CAN network and a WLAN network according to the 802.11b/g standard. The I-7540D-WF is highly suitable for connecting mobile (e.g., vehicles or machines) or stationary CAN networks and is often used for short ranges up to 100 m.

The Ethernet or Wi-Fi converters help to implement various Ethernet or wireless transmission applications.

Models	I-7540D	I-7540D-MTCP	ECAN-240	I-7540D-WF
Pictures				
CAN Interface				
Channel number	1		2	1
Baud Rate (bps)	10 k, 20 k, 50 k, 125 k, 250 k, 500 k, 800 k, 1 M			
Isolation	1000 VDC for DC-to-DC, 2500 Vrms for photo-couple		3000 VDC for DC-to-DC, 2500 Vrms for photo-couple	
UART Interface				
COM 1	RS-232			
COM 2	RS-485 (Self-Turner inside)		–	–
Baud Rate (bps)	110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200		–	115200
Protocol	ICP DAS Protocol	Modbus RTU	–	For Configuration
Ethernet Interface				
Controller	10/100Base-TX Ethernet Controller (Auto-negotiating, Auto_MDIX)		10/100Base-TX Ethernet Controller (Auto-negotiating, Auto_MDIX)	–
Connector	RJ-45 with LED indicator		RJ-45 with LED indicator	–
Protocol	ICP DAS Protocol	Modbus TCP	Modbus TCP Server/Client UDP, Http for configuration	–
Wi-Fi Interface				
Antenna	–			5 dBi (Omni-Directional)
Standard Supported	–			IEEE 802.11b/g
Operation Mode	–			Infrastructure & Ad-hoc
Encryption	–			WEP, WPA and WPA2
Frequency Ranges	–			2.412 GHz ~ 2.484 GHz
Transmission distance	–			Up to 100 meters
Environment				
Operating Temperature	-25°C ~ +75°C			
Storage Temperature	-30°C ~ +80°C			
Relative Humidity	10 ~ 90% RH, Non-condensing			

I-7540D-MTCP Modbus TCP to CAN Converter

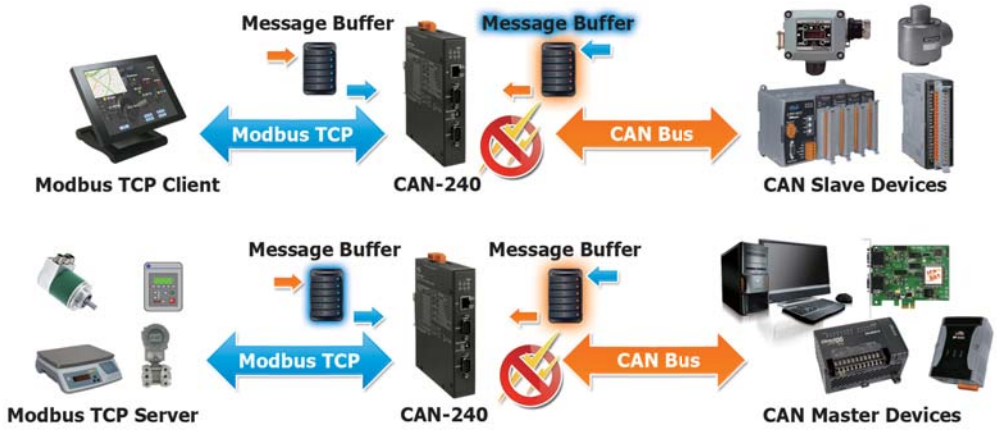
Inheriting to the most of all features of the I-7540D, the I-7540D-MTCP enables CAN networks to be combined with the Internet/Ethernet. It can be used to not only access the CAN network via the Ethernet, but can also realize Ethernet transparent transmission on the CAN network. In order to connect the PLCs, HMIs and SCADAs with the CAN devices more easily and conveniently, the I-7540D-MTCP supports the Modbus TCP server and Modbus RTU slave communication protocol.

- 1 kV galvanic isolation
- Compatible with CAN specification 2.0 parts A and B
- Fully compatible with the ISO 11898-2 standard
- Supports a range of baud rates from 10 kbps ~ 1 Mbps
- Jumper for the 120 Ω terminator resistor of the CAN bus
- Supports Modbus function code: 0x03/0x04/0x10
- 2500 Vrms photocoupler isolation on the CAN side
- Support maximum 24 Ethernet clients connection
- Includes a software utility for monitoring and configuration
- Support 30 specific CAN IDs in Modbus TCP/RTU mode
- Provide the transparent communication between the CAN devices via Ethernet

ECAN-240 Modbus TCP Client/Server to two CAN ports Converter

ECAN-240 is a Ethernet to CAN two ports converter. Users can communicate with different CAN networks at the same time. In order to be used more easily in industry, the ECAN-240 supports Modbus TCP client and Modbus TCP server function. Users can choose one of them for fitting their application.

Furthermore, the two CAN ports have different purposes according to their usages. For example: In pair connection mode, the different CAN networks can be communicated with each other via module configuration.

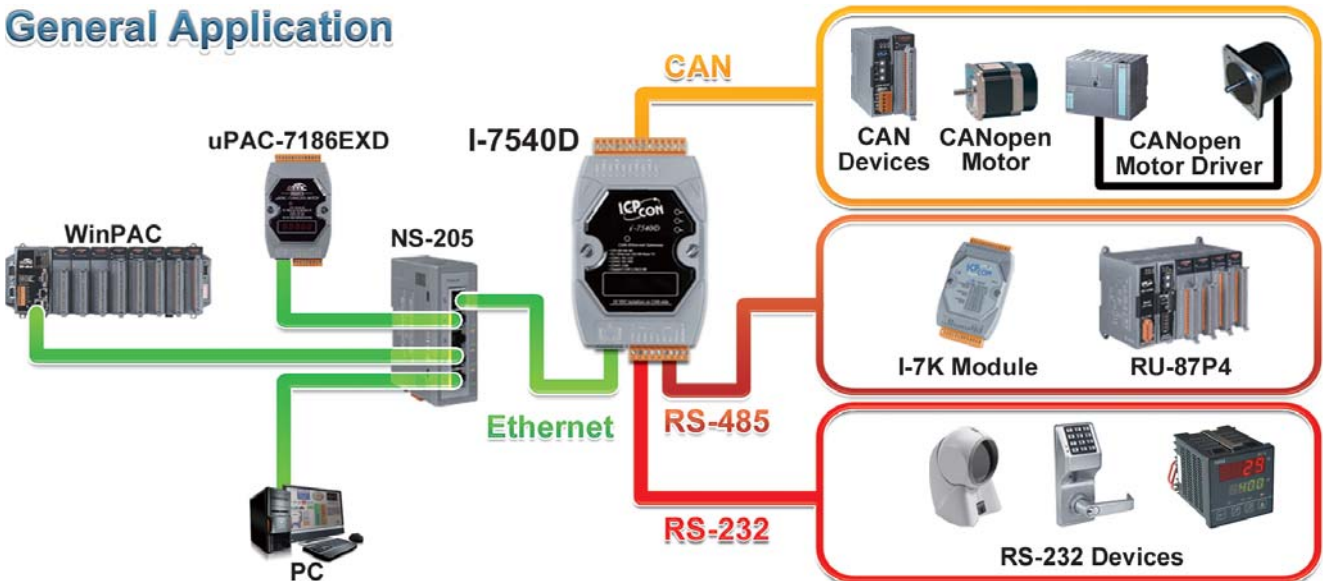


I-7540D Ethernet to CAN Converter

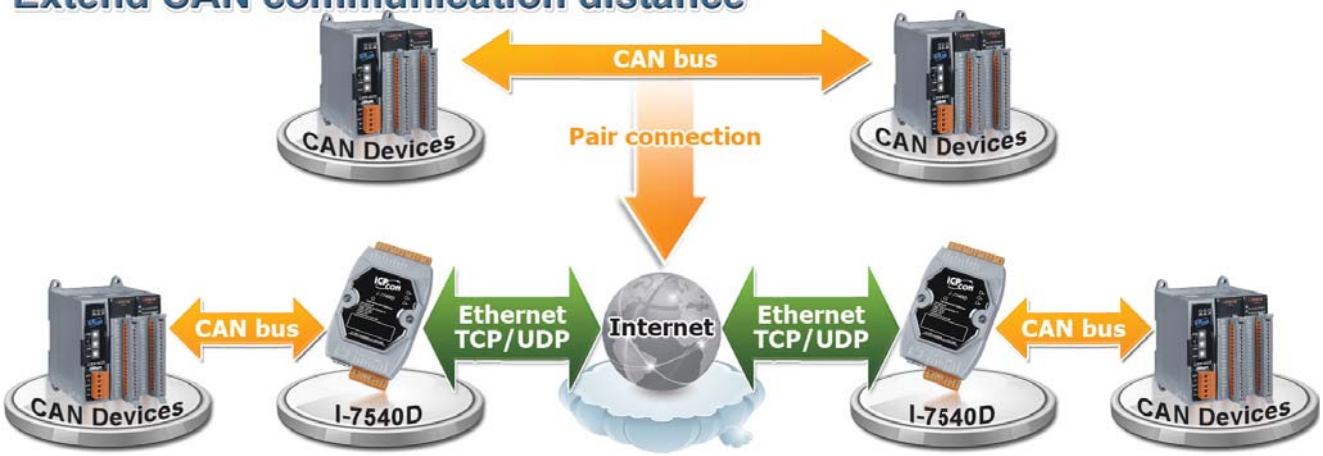
The I-7540D is a CAN to Ethernet converter, and is usually applied as an Ethernet to CAN/RS-232/485 Device Server. It supports socket access functions and virtual COM port technology which helps users to get the CAN, RS-232, RS-485 data via virtual COM port. The I-7540D also provides transparent mode, which enables CAN networks to be coupled together over the Internet/Ethernet, whereby remote monitoring and control is possible. By the features of tiny operating system, protocol independence, small casing and flexibility, it is able to widely fit various RS-232, RS-485 and CAN applications, which may be based on private RS-232 protocol, private CAN protocol, Modbus protocol, CANopen protocol, DeviceNet protocol or J1939 protocol.

- 1 kV galvanic isolation
- 10/100 Base-T Ethernet port
- Supports the Virtual COM technology
- Fully compatible with the ISO 11898-2 standard
- 2500 Vrms photocoupler isolation on the CAN side
- Compatible with CAN specification 2.0 parts A and B
- Supports a range of baud rates from 10 kbps ~ 1 Mbps
- umper for the 120 Ω terminator resistor of the CAN bus
- Provides connections for a maximum of 25 Ethernet clients
- Provide one channel each for CAN, RS-232, RS-485 and Ethernet
- Provide the transparent communication between the CAN devices via Ethernet

General Application



Extend CAN communication distance



I-7540D-WF Wi-Fi to CAN Converter

The I-7540D-WF supports the wireless transmission of CAN data between a CAN network and a WLAN network according to the 802.11b/g standard. It provides CAN to WLAN converter functionality together with wireless transparent transmission on the CAN network. The I-7540D-WF is highly suitable for connecting mobile (e.g., vehicles or machines) or stationary CAN networks and is often used in short ranges up to 100 m. Using an appropriately configured router, CAN data can be determined to pass or filter from the CAN networks to the Ethernet. The wireless connection that is established between two I-7540D-WF units can be used instead of a cable, and enables the connection of CAN networks that would otherwise be difficult to link such as rotational machineries.

- IEEE 802.11 b/g compliant
- Wireless data transmission via WLAN
- Connects CAN networks via a WLAN bridge
- Compatible with CAN specification 2.0 parts A and B
- Wireless transmission distance: up to 100 meters
- Two different operation modes: infrastructure and ad-hoc
- Supports WEP, WPA and WPA2 encryption for wireless LAN
- Point to point or point to multi-point connection via wireless LAN
- Communication efficiency (peak value): one-way is up to 700 fps (client->server, server->client), two-way 350 fps (client<=>server)

Case Studies: The mastery of CAN bus is the mastery of vehicle big data

The on-vehicle CAN bus is the most important network of the vehicle. Various ECUs transmit and share information quickly over the CAN bus.

Vehicle manufacturers read the data from CAN through OBD-II port. Those CAN data help in diagnosing various subsystems for maintenance. Another interesting topic is Big Data for vehicles.

For application developers, the information from CAN also contains various interaction information between the driver and the vehicle. This interaction information includes the driver's assessments of various traffic conditions and the corresponding feedback.

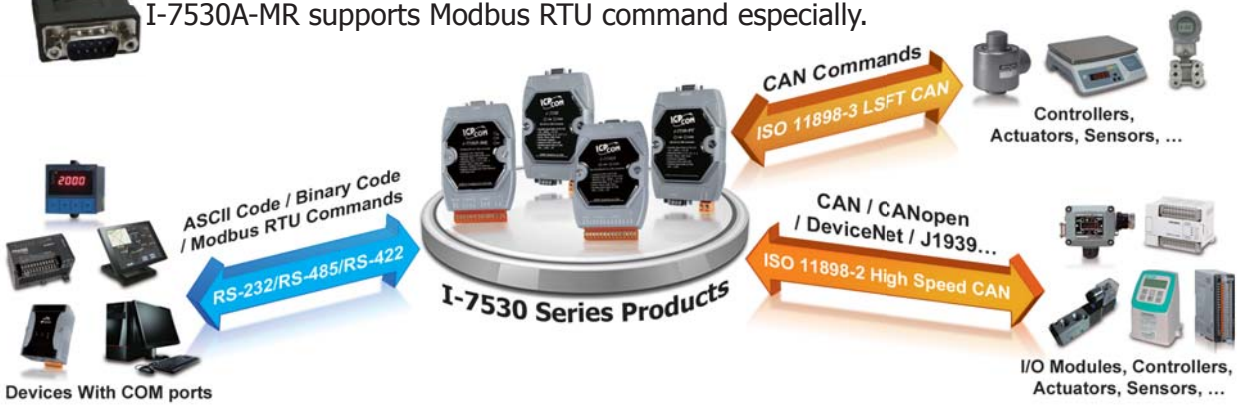
These Big Data can be analyzed and evaluated to provide other useful information, such as:

1. Whether the vehicle has been speeding on the highway for a long time.
2. There is no vehicle ahead, but the driving speed is too slow. This may be considered as over-tiredness or distraction.
3. Whether the driver is used to pressing the accelerator pedal harder, or is used to braking suddenly.
4. Whether the driver turns on the directional lights when turning or whether the turning speed is too high, which may cause a rollover hazard.
5. If the vehicle deviates from the lane and the steering is unstable, whether the fatigue while driving or distraction.

More and more vehicle manufacturers are also beginning to collect this valuable information. In addition to counting and fixing faulty ECUs as a basis for improving vehicles, they can also analyze driving data for fleet managers as evaluation criteria for their drivers. These managers can reward good drivers and warn against bad driving habits. In addition, you can collect data on good driving behavior. This is the driver's real-time judgment and feedback on traffic conditions. These driving habits can be a good training material for machine leaning. These material data is the basic raw data for developing self-driving AI systems in the future.

3.3.4 UART to CAN Converters

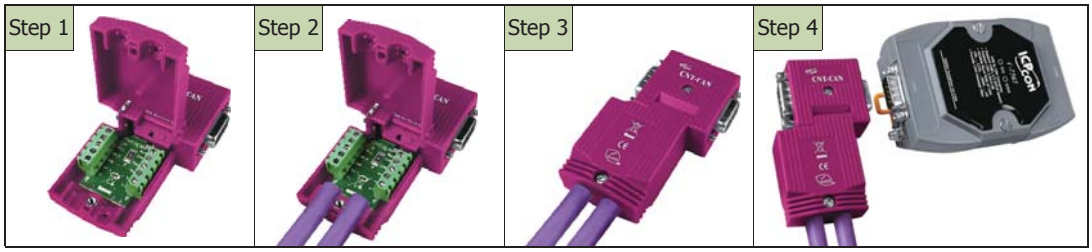
The I-7530 series is the Uart to CAN converter that support CAN protocols 2.0A and 2.0B. The I-7530-FT is designed for the fault tolerance CAN Bus (ISO 11898-3). The I-7530A-MR supports Modbus RTU command especially.



Models	I-7530-FT	I-7530	I-7530A	I-7530A-MR	tM-7530	tM-7530A
Pictures	RS-232 to Fault-Tolerance CAN Converter	RS-232 to CAN Converter	RS-232/422/485 to CAN Converter	Modbus RTU to CAN Converter	Tiny RS-232 to CAN Converter	RS-232/RS-485/RS-422 to CAN Converter
						
CAN Interface						
Baud Rate	10 k, 20 k, 50 k ,125 k bps	10 k, 20 k, 50 k ,125 k, 250 k, 500 k, 800 k, 1 Mbps				
Protocol	ISO 11898-3 (low speed fault tolerance), CAN 2.0A and CAN 2.0B	ISO 11898-2, CAN 2.0A and CAN 2.0B				
Receiver Buffer	1000 data frames				256 data frames	
Isolation	–	3000 VDC for DC-to-DC			1000 VDC for DC-to-DC	
UART Interface						
Type	RS-232		RS-232/422/485		RS-232	RS-232/422/485
Protocol	–			Modbus RTU slave	–	
Receiver Buffer	900 data frames				256 bytes	
System						
Power Consumption	1 W					
Power Input	+10 VDC ~ +30 VDC					

Accessory

Optional CAN bus connector: CNT-CAN



Installation

I-7530-FT Low-Speed/Fault-Tolerance CAN to RS-232 Converter

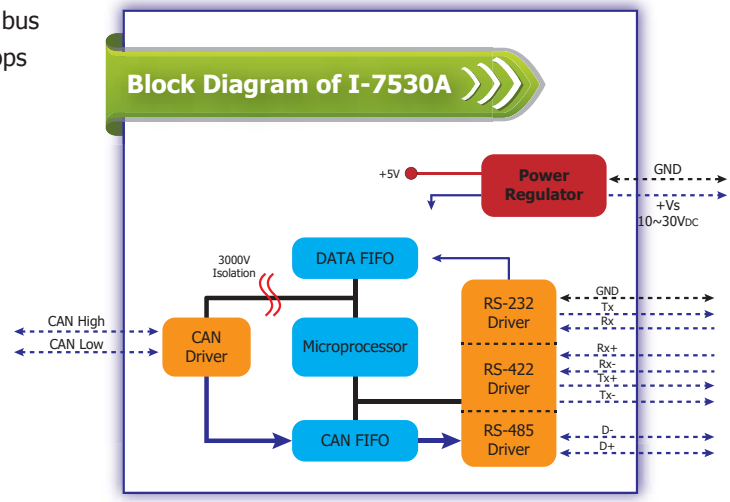
The I-7530-FT is a low speed but reliable CAN to RS-232 converter. The "FT" stands for "Fault Tolerance". It follows ISO 11898-3 standard, and is suited for the applications which may have a lot of noise in the harsh environment. Generally, the I-7530-FT communicates with other CAN devices by two-line CAN bus. As one of the CAN bus lines is malfunction, the I-7530-FT even uses a single line of the CAN bus to access the CAN devices. The utility tool supports sending or receiving CAN messages, and the configuration of the I-7530-FT. This tool is free, and is helpful to diagnostic the CAN networks.

- Max. transmission speed of up to 125 kbps for CAN and 115.2 kbps for RS-232
- Power, data flow and error indicator for CAN and RS-232 transmission
- Compatible with CAN specification 2.0 parts A and B
- Fully compatible with the ISO 11898-3 standard
- Built-in CAN/RS-232 converter firmware
- Built-in RS-232/CAN FIFO buffers

I-7530A CAN to RS-232/422/485 Converter

The I-7530A is an RS-232/422/485 to CAN converter. It is a member of the I-7530 serial family, and inherits all of the features of the I-7530. The CAN interface of the I-7530A follows ISO 11898-2 specification, the maximum CAN baud is up to 1 Mbps. There is one COM port in the I-7530A. As the I-7530A runs, it only receives the commands from one of these COM interfaces (i.e. from the RS-232, RS-485 or RS-422 interface) at the same time, but the CAN messages will be forwarded to all of these COM interfaces.

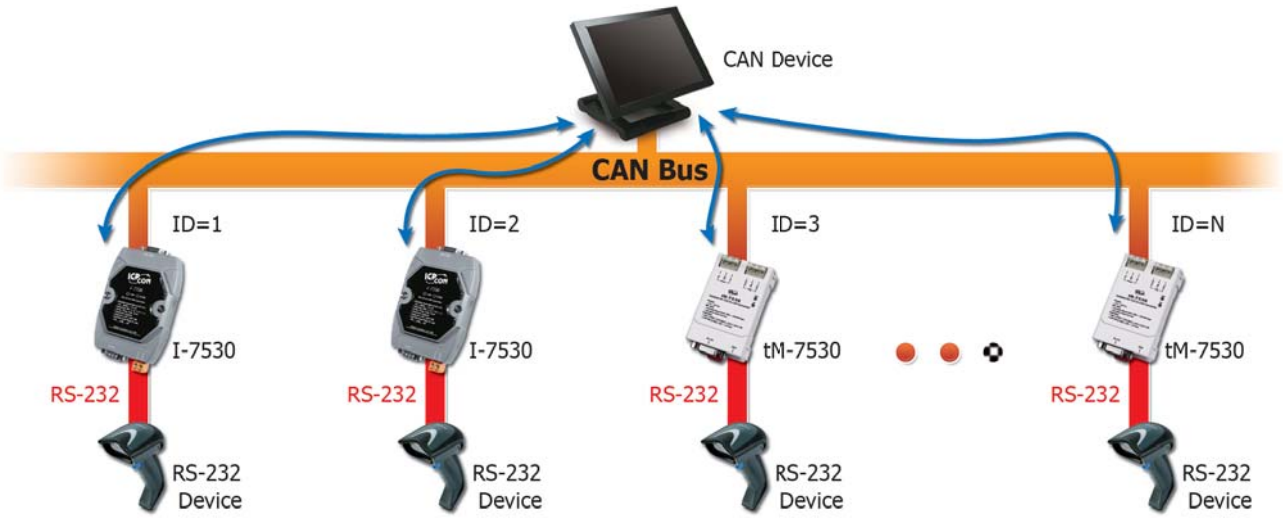
- Provides one channel each for CAN, RS-232, RS-422 and RS-485
- CAN and serial COM parameters can be configured via software
- Jumper for the 120 Ω terminator resistor of the CAN bus
- Supports a range of baud rates from 10 kbps ~ 1 Mbps
- Compatible with CAN specification 2.0 parts A and B
- 2500 Vrms photocoupler isolation on the CAN side
- Fully compatible with the ISO 11898-2 standard
- Supports transparent communication mode
- 3 kV galvanic isolation



I-7530 CAN to RS-232 Converter

The I-7530 is designed for integrating the RS-232 devices into the CAN network. It is a RS-232 to CAN converter which unleashes the power of the CAN bus via an RS-232 communication interface, converting messages between a CAN network and an RS-232 device. Sometimes, users need to control several RS-232 devices at the same time. In this case, the I-7530 provides the station ID for the RS-232 device which is connected with the I-7530. These RS-232 devices can be grouped in a CAN network, and be controlled by one CAN master via setting pair connection mode.

- 3 kV galvanic isolation
- One CAN port and one RS-232 port
- Support transparent communication mode
- Fully compatible with the ISO 11898-2 standard
- 2500 Vrms photocoupler isolation on the CAN side
- Compatible with CAN specification 2.0 parts A and B
- Supports a range of baud rates from 10 kbps ~ 1 Mbps
- Jumper for the 120 Ω terminator resistor of the CAN bus
- CAN and RS-232 parameters can be configured via software



tM-7530 Tiny CAN to RS-232 Converter

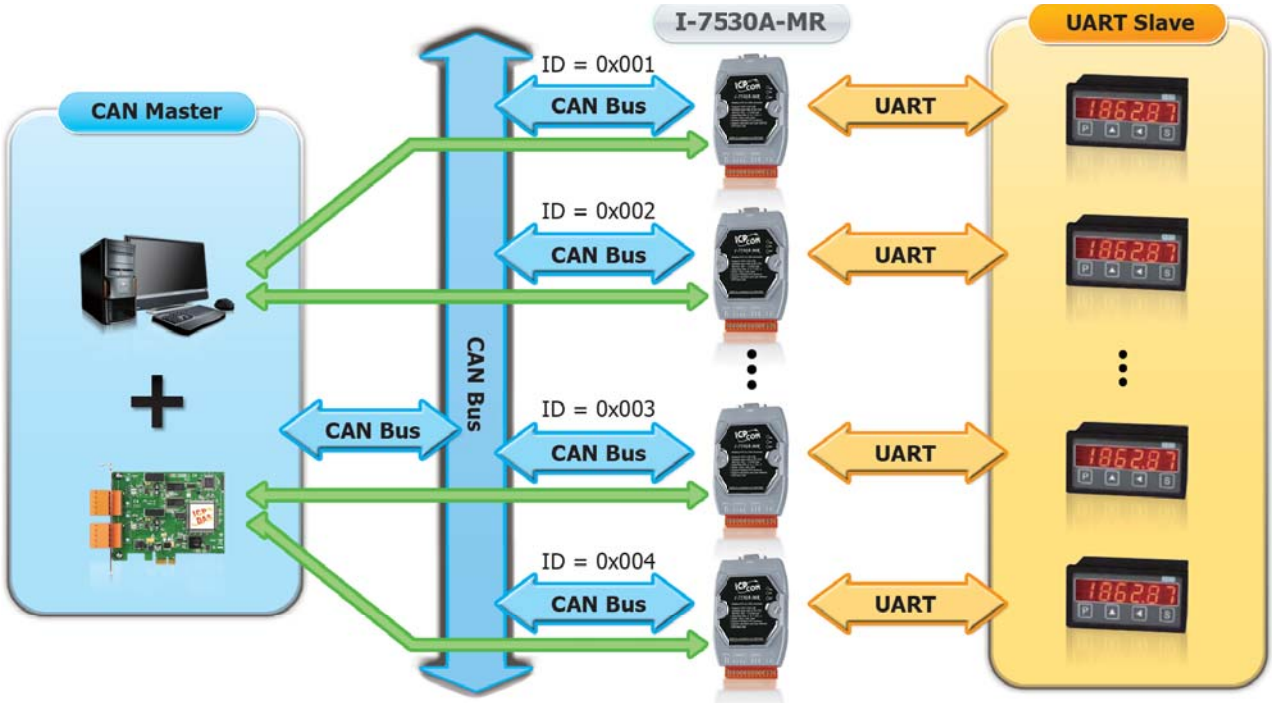
The tM-7530 is a tiny form-factory, cost-efficient, and low consumption module. And it is designed for integrating the RS-232 devices into the CAN network. It is a RS-232 to CAN converter which unleashes the power of the CAN bus via an RS-232 communication interface, converting messages between a CAN network and an RS-232 device. The functional design of tM-7530 is the same as I-7530 series, including basic communication and pair connection mode. tM-7530 supports RS-232 baud rate up to 230400 bps.

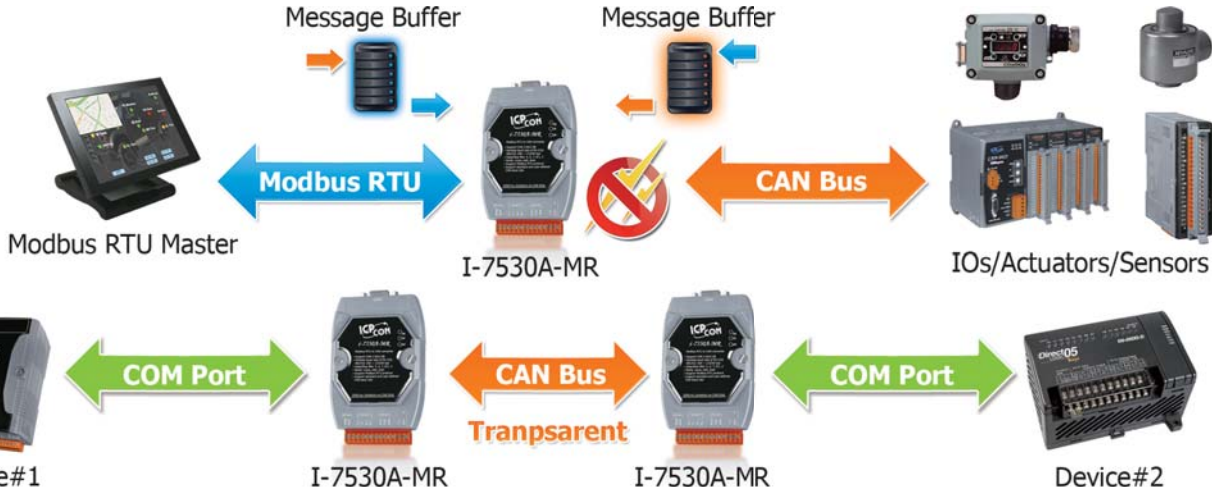
- Compatible with CAN specification 2.0 parts A and B
- Supports a range of baud rates from 10 kbps ~ 1 Mbps
- Option the 120 Ω terminator resistor of the CAN Bus
- 1 kV galvanic isolation
- Fully compatible with the ISO 11898-2 standard
- 2500 Vrms photocouple isolation on the CAN side
- One CAN port and one RS-232 port
- Support transparent communication mode
- CAN and RS-232 parameters can be configured via software
- RS-232 baud rate up to 230400

I-7530A-MR CAN to Modbus RTU Slave Converter

The I-7530A-MR is a CAN bus to Modbus RTU converter and it allows a Modbus RTU master to communicate with CAN devices on a CAN network. Different from the I-7530A, the I-7530A-MR can be a Modbus RTU slave, and it is more suitable for connecting with the PLC, HMI or SCADA which provide the functions of the Modbus RTU master. Besides, the higher COM baud and full-duplex RS-232/RS-422 transparent communication of the I-7530A-MR solve more difficult problems of applications which may not be touched by the I-7530A. The I-7530A-MR provides three kinds of communication modes, ASCII communication mode, Modbus RTU communication mode, and transparent communication mode.

- Compatible with CAN specification 2.0 parts A and B
- Supports CAN bus acceptance filter configuration
- Converts CAN messages to specific ASCII command string
- Provides pair-connection communication between RS-232/RS-485/RS-422 devices via the CAN bus
- Supports Modbus RTU function codes 0x03/0x04/0x10 for reading/writing CAN messages
- Programmable CAN bus baud rate from 10 kbps ~ 1 Mbps, or a user-defined baud rate
- Include a software utility that enables users to easily configure module settings and test CAN bus communication





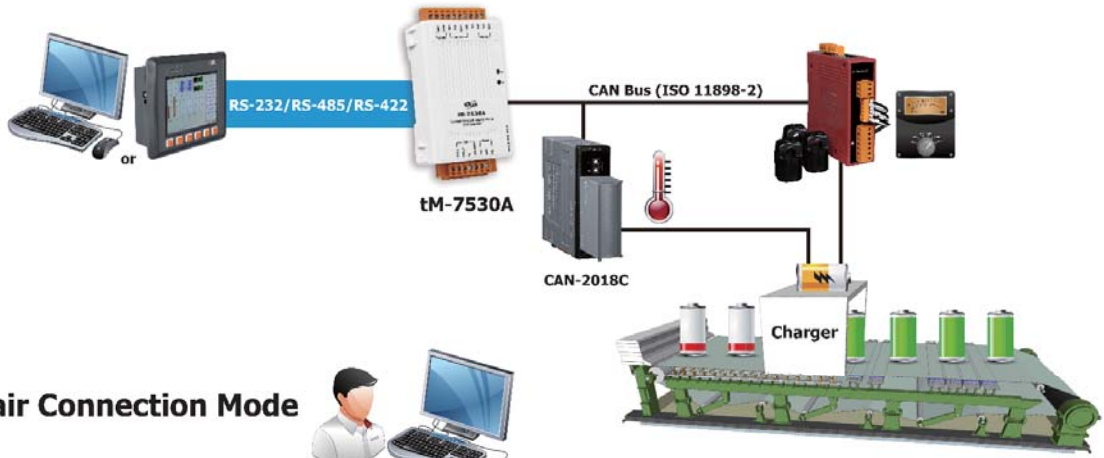
tM-7530A Intelligent UART to CAN Converter

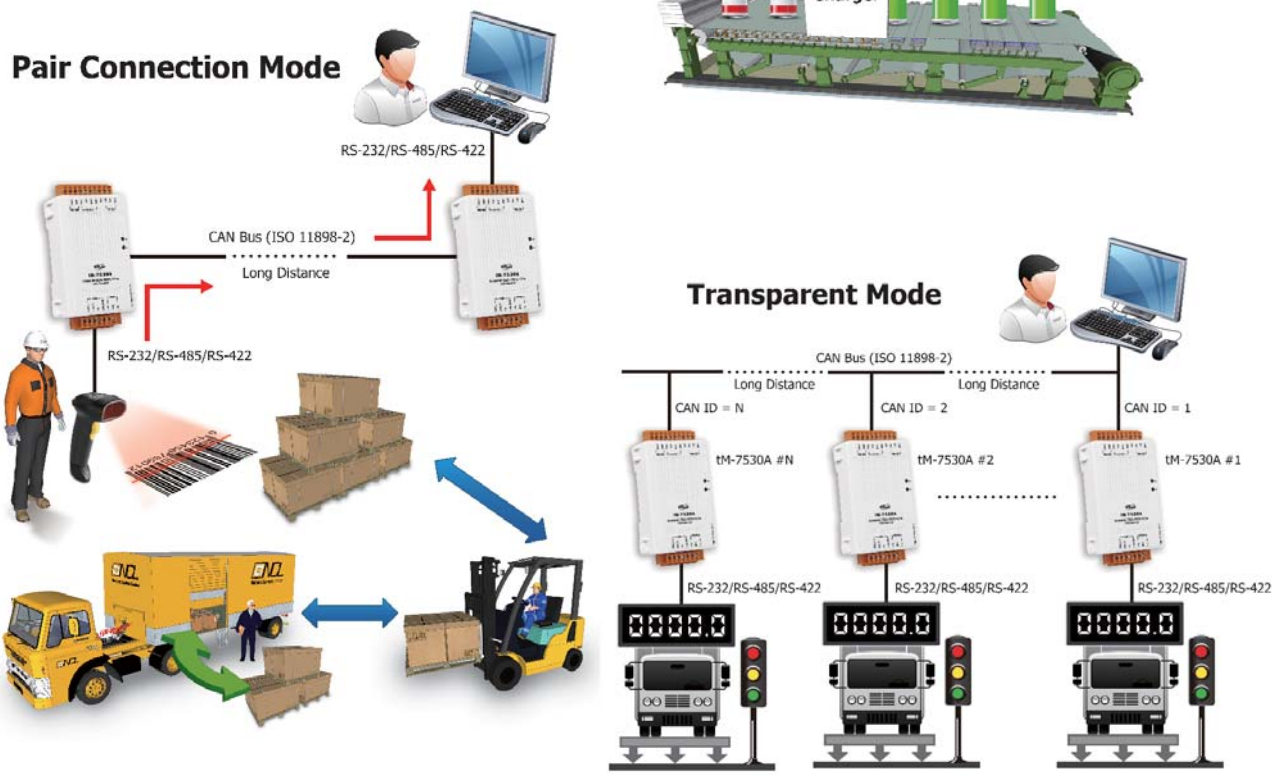
The tM-7530A is a tiny UART/CAN to fit narrower environment as a result of its small size. It has isolation on power side and on CAN bus side and its performance is better than other UART/CAN module. The function of tM-7530A can full compatibly with I-7530 and tM-7530. In additional, it provides new function such as listen only. User can use this function to listen CAN bus messages and error detection. According to above features, tM-7530A is an economical and practical UART/CAN converter solution.

- Watchdog inside
- Fully compatible with ISO 11898-2 standard
- Support various CAN baud rate Max. 1M bps
- Support user-defined CAN baud rate
- Support various UART baud rate Max. 230400 bps
- Build-in selectable 120 Ω terminal resistor
- Power, data flow and error indicator for CAN and UART
- Support various communication mode
- Software buffer on CAN bus side and UART side
- Support user-defined end of characters on pair connection mode
- Support time stamp response on UART side

4

tM-7530A Application



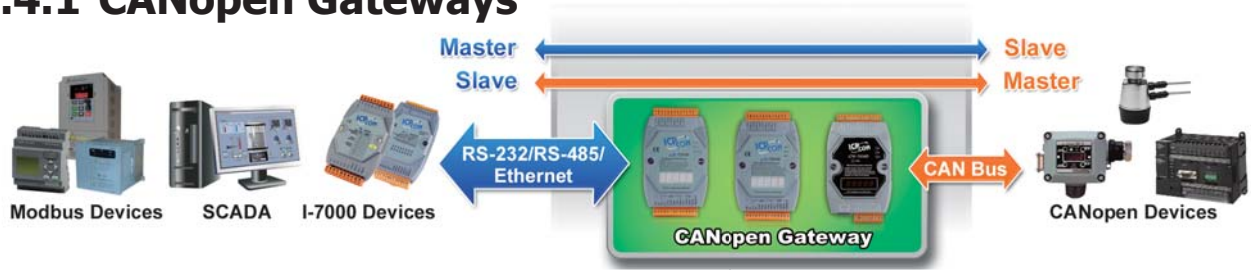


3.4 Gateway/Protocol Converters

The stand-alone industrial gateways are designed to connect existing devices to the fieldbus via the serial bus or the Ethernet. Easy to use and setup, no programming required. Following protocols are supported by ICP DAS gateways:

- **Modbus RTU**: a kind of protocol based on the RS-232/485 network. The Modbus RTU devices may be a PLC, a Modbus RTU sensor, ICPDAS M-7000 series modules and so forth.
- **Modbus TCP**: a kind of protocol based on the Ethernet. The Modbus TCP devices may be a PLC, a Modbus TCP sensor, ICPDAS ET-7000 series modules and so forth.

3.4.1 CANopen Gateways

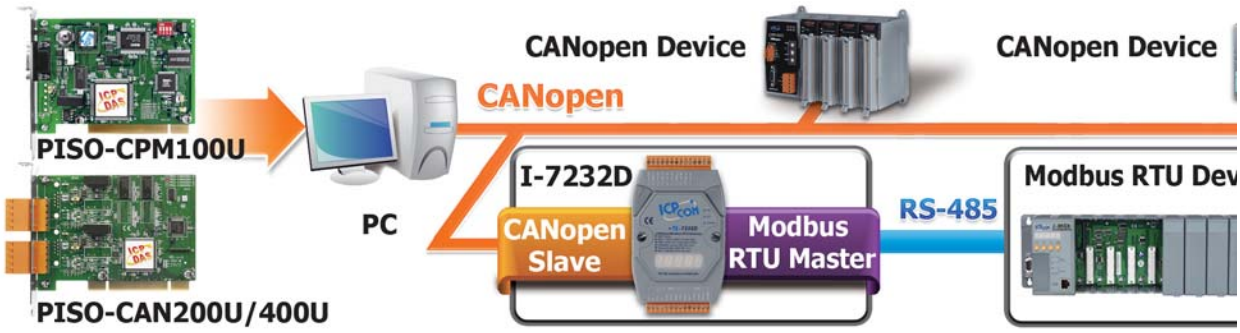


Model Name	I-7232D	GW-7433D	GW-7553-CPM
Pictures	CANopen Slave to Modbus RTU Master Gateway	Modbus TCP/RTU Slave to CANopen Master Gateway	PROFIBUS DP Slave to CANopen Gateway
			
CANopen Interface			
CANopen Interface	1 channel (CAN_H, CAN_L), and the other is for bypass		
CANopen Function	CANopen slave	CANopen master	CANopen master
CANopen Version	CiA 301 v 4.02 and CiA 401 v2.01		
Guarding Function	Yes		
Heartbeat Function	Heartbeat Producer	Heartbeat Consumer	
Emergency Message	Yes	-	-
UART Interface			
COM1 Connector	RS-232		
COM1 Function	Only for configuration	Modbus RTU Slave	Only for Configuration
COM2 Connector	RS-485		-
COM2 Function	Modbus RTU Master	Modbus RTU Slave	-
Ethernet Interface			
Ethernet	-	10/100 Base-TX	-
Ethernet Function	-	Configuration or Modbus TCP Server	-
PROFIBUS Interface			
Transmission Distance (m)	-		Depend on baud rate (for example, max. 1200 m at 9.6 kbps)
Protocol	-		DP-V0 Slave
Max. Input/Output Length	-		240/240 bytes
System			
Power Input	10 ~ 30 VDC		
Operating Temperature	-25 ~ +75°C		
Storage Temperature	-30 ~ +80°C		

I-7232D CANopen Slave to Modbus RTU Master Gateway

The I-7232D is a CANopen slave to Modbus RTU master gateway, and allows a CANopen master to have ability to access the Modbus slave devices. In the CANopen network, the I-7232D is a NMT slave, SDO server, PDO producer, and PDO consumer. From the view of the Modbus network, it is a Modbus RTU master which polls all the predefined data of the Modbus RTU slaves, and bypass the CANopen control commands to the Modbus slaves. Like the I-7231D, the EDS file is also provided by the utility tool. Users can easily apply the I-7232D in the standard CANopen master with the EDS file.

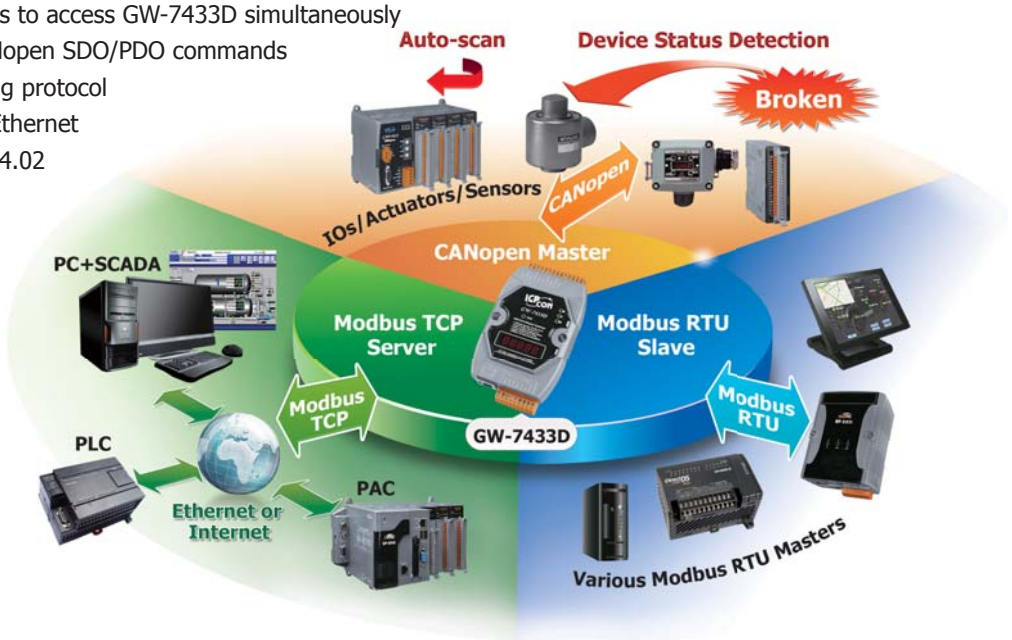
- PDO: Event-triggered, RTR, cyclic, acyclic SYNC and dynamic PDO mapping
- CANopen Version: DS-301 v4.02 , DSP-401 v2.1
- Support Max. 10 Modbus RTU commands
- Error Control: Node Guarding protocol
- Product EDS file dynamically by utility
- No of SDOs: 1 server, 0 client
- NMT: Slave



GW-7433D Modbus TCP/RTU Slave to CANopen Master Gateway

The GW-7433D is an economic communication between the Modbus protocol and the CANopen protocol. This module is able to collect the information of the CANopen slaves periodically, and returns these data to the Modbus TCP client or Modbus RTU master while receiving the Modbus commands. When the Modbus TCP client or Modbus RTU master needs to output data to the CANopen slaves, the GW-7433D transfers the received Modbus commands to the CANopen messages to handle the CANopen slaves. Both of the Modbus TCP server and the Modbus RTU slave functions can work on the GW-7433D simultaneously. The GW-7433D also offers the Modbus registers for recording the life statuses of the CANopen slaves.

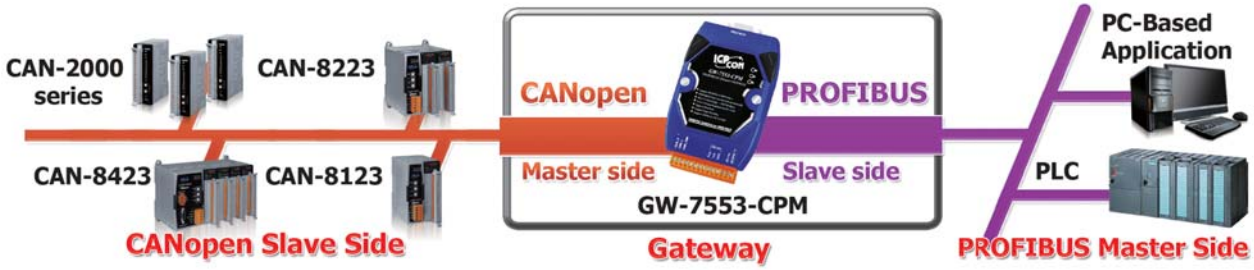
- Allow 5 Modbus TCP masters to access GW-7433D simultaneously
- Support more than 120 CANopen SDO/PDO commands
- Error Control: Node Guarding protocol
- Configuration by utility via Ethernet
- CANopen Version: DS-301 v4.02
- PDO: Event-triggered, RTR
- Emergency Message: Yes
- NMT: Master



GW-7553-CPM PROFIBUS DP Slave to CANopen Master Gateway

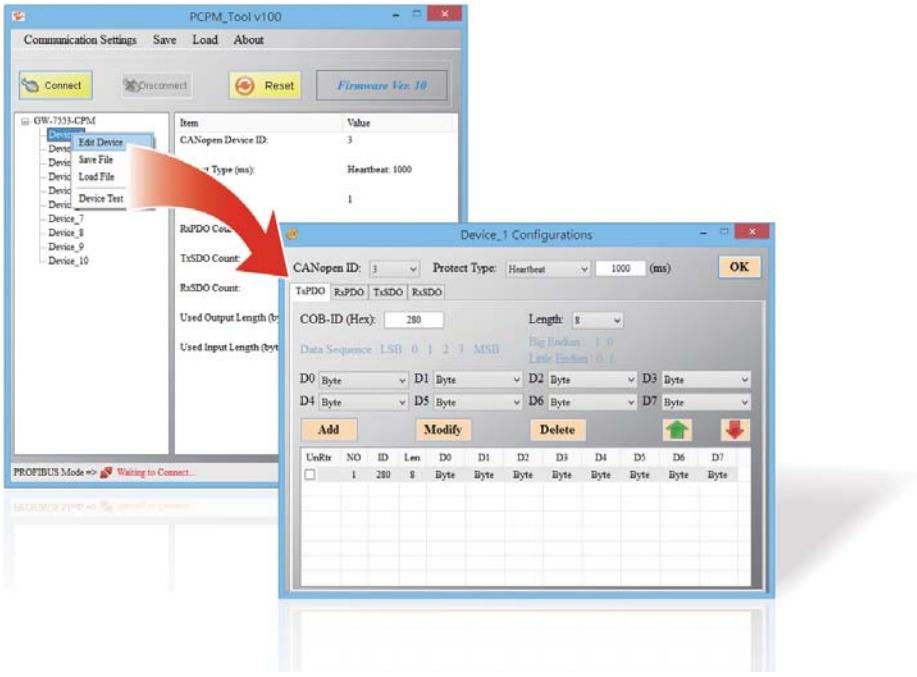
The GW-7553-CPM is designed for the slave device of PROFIBUS DP protocol. It allows PROFIBUS master to access CANopen slave devices. These CANopen slave device may be a sensor, actuators, ICPDAS CAN-2000 series modules and so forth. In addition, we also provide the utility software for users to configure the GW-7553-CPM. By using this module, users can put their CANopen slave devices into PROFIBUS network very easily.

- Protocol: PROFIBUS DP-V0 slave
- 240 bytes Max. input data length
- 240 bytes Max. output data length
- Support Heartbeat function
- Support Node Guarding
- PROFIBUS address 0 ~ 126 set by DIP switch
- Follow the CiA CANopen Standard DS-301 v4.02
- Support 110 CANopen SDO/PDO commands
- 3000 VDC isolation protection on PROFIBUS side
- Network isolation protection: 2500 Vrms high speed iCoupler
- Detect Transmission rate (9.6 to 12000 kbps) on PROFIBUS automatically



Utility Features:

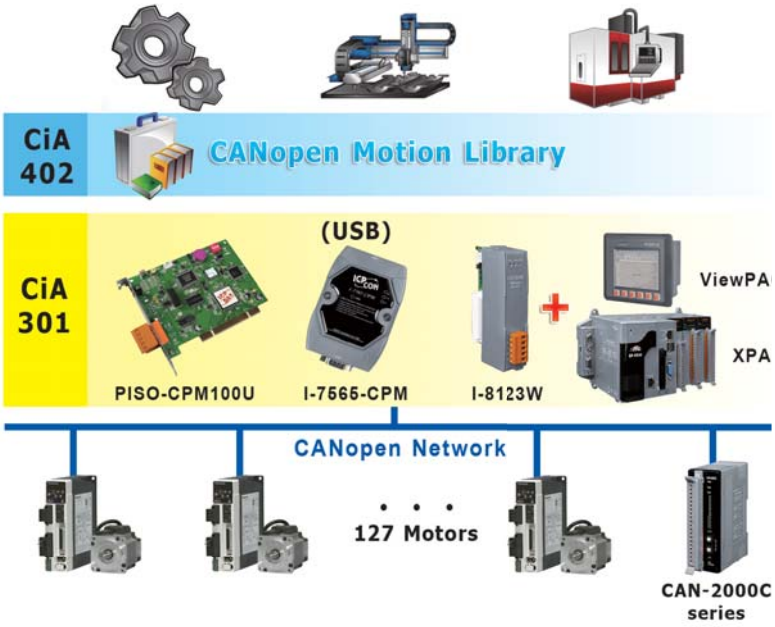
- Provide TxPDO, RxPDO, TxSDO, and RxSDO CANopen messages
- Provide Communication Log of CANopen network
- Show PROFIBUS configuration of the gateway
- Provide CANopen test function
- Show diagnostic messages



3.4.2 CANopen Motion Solution

Introduction:

The CANopen Motion Library is compliant with the CANopen standard CiA 402, and provides a variety of motion control functions, such as position control, velocity control, torque control, synchronous action etc. The CiA 402 is one of the standard CANopen application profiles, and is specially designed for motion control systems. In addition to making the management of the CANopen-based motors easy, the CANopen protocol, which is based on the CAN bus, can help to reduce the need for wire connections between the controller and the motors, and provides rapid troubleshooting functions. While controlling the motors, CANopen-based remote I/O modules that comply with the CiA 402 standard can also be accessed at the same time. Therefore, developing a motion control application becomes easier and more convenient.



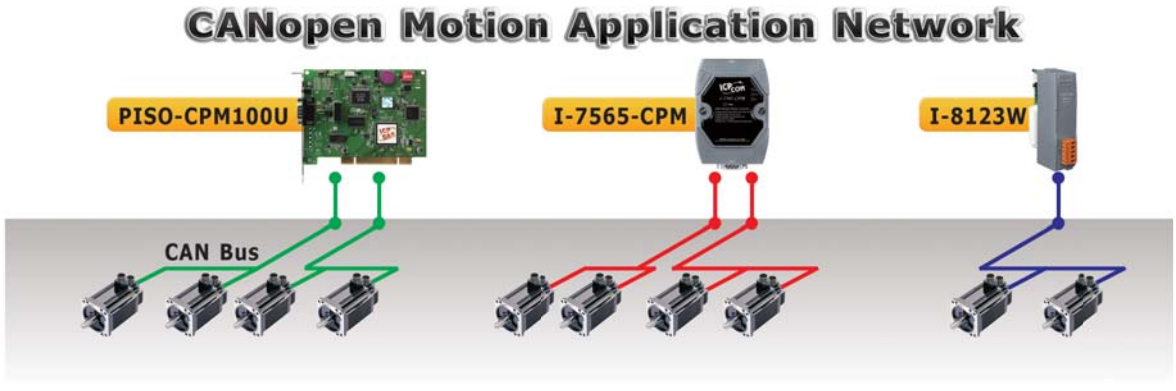
Features:

- Compliant with the CiA 402 v1.1 Standard
- Supports a max. of 127 motors in a single network
- Absolute and relative position control
- Velocity, torque or jog control
- Supports synchronous action for a maximum of 127 motors
- Supports various homing control methods
- Supports torque limitation via CANopen commands
- Supports the node guarding and heartbeat protocols
- Supports dynamic PDO object configuration
- Bus distance ranges between 25 m to 5000 m
- Supports baud rates of 10 Kbps, 20 Kbps, 50 Kbps, 125 Kbps, 250 Kbps, 500 Kbps, 800 Kbps and 1 Mbps

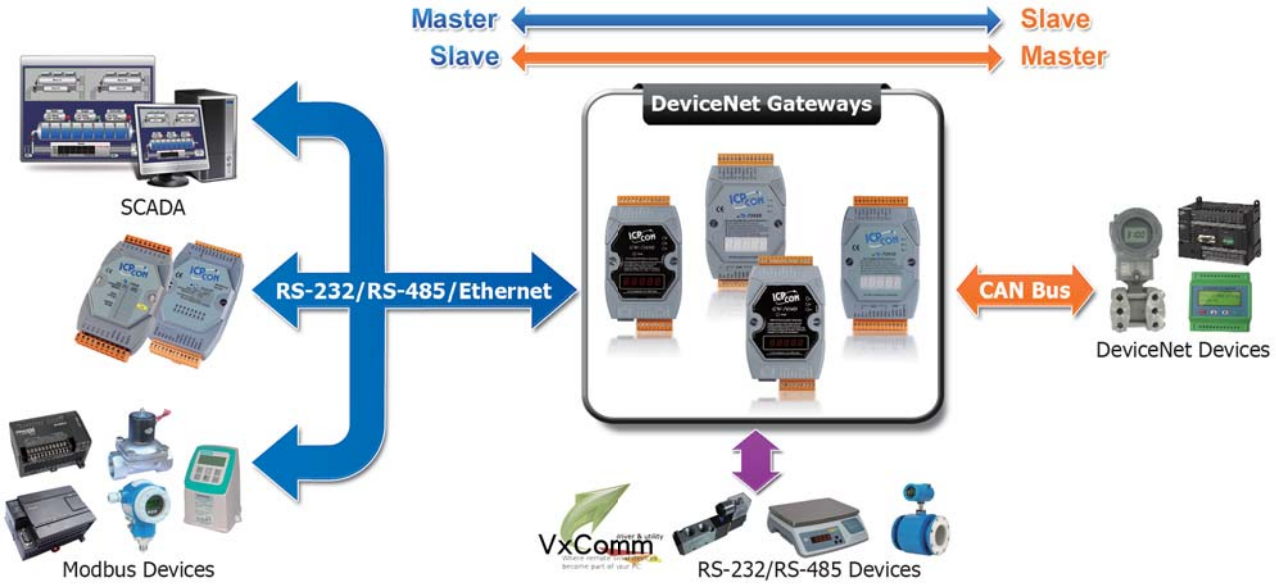
Benefits

- Suitable for distributed multi-axis motion control systems. E.g., distributed sun tracker systems, conveyer transmission control systems, and so on
- Reduces the cost of wiring, especially time requirements
- Support a range of motors with no limit on certain types
- The CAN hardware has a range of error detection and error correction mechanisms, which provides the safest communication bus
- Able to use different CANopen I/O modules and motors in the same CANopen network
- The range of the CANopen bus can be extended for long distance applications. For example, for solar or wind farm application systems
- The CANopen bus can be converted to fiber to protect against high noise interference

Typical Application Network:



3.4.3 DeviceNet Gateways

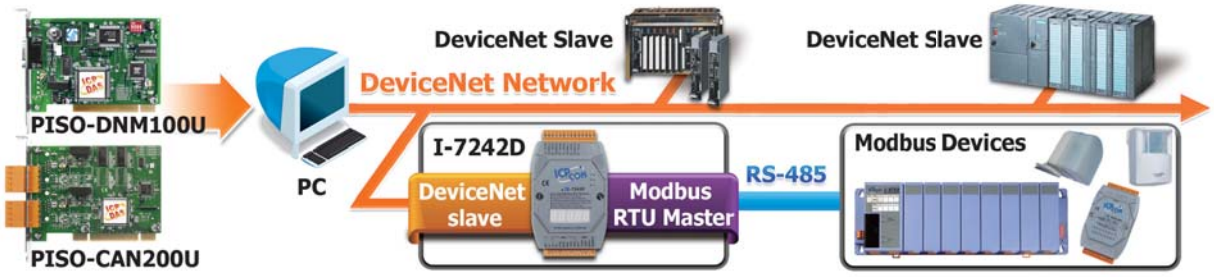


Model Name	I-7242D	GW-7243D	GW-7434D
Pictures	DeviceNet Slave to Modbus RTU Master Gateway	DeviceNet Slave to Modbus TCP/RTU Master Gateway	Modbus TCP/RTU Slave to DeviceNet Master Gateway
			
DeviceNet Interface			
DeviceNet Connector	1 channel (CAN_H, CAN_L), and the other is for bypass		
DeviceNet Function	DeviceNet slave		DeviceNet master
DeviceNet Baud Rate	125k, 250k, 500k bps		
DeviceNet Specification	DeviceNet specification Volume I/II, Release 2.0		
I/O operating modes	Polling, Bit-Strobe, Change of State/ Cyclic	Polling	Polling, Bit-Strobe, Change of State/ Cyclic
Shutdown Message			
COM1 Connector	RS-232		
COM1 Function	Only for configuration		Modbus RTU Master/Slave, VxComm
COM2 Connector	RS-485		
COM2 Function	Modbus RTU Master	Modbus RTU/ASCII Master	Modbus RTU Master/Slave, VxComm
Ethernet Interface			
Ethernet	-	10/100 Base-TX (Auto-negotiating, Auto MDI/MDI-X, LED indicators)	
Ethernet Function	-	Modbus TCP Client	Configuration, Modbus TCP Server, VxComm
System			
WDT	Yes (0.8 second)		
Power Input	10 ~ 30 VDC		
Operating Temperature	-25 ~ +75°C		
Storage Temperature	-30 ~ +80°C		

I-7242D DeviceNet Slave to Modbus RTU Master Gateway

The I-7242D allows a master located on a DeviceNet network to enter into a dialogue with the slaves on a Modbus RTU network. It's a "Group 2 Only Slave" device in the DeviceNet network, and supports "Predefined Master/Slave Connection Set". From the view of the Modbus network, it is a Modbus RTU master which polling all the predefined data of the Modbus RTU slaves, and bypass the DeviceNet control commands to the Modbus slaves. The I-7242D also has the utility tool which is used to configure the I-7242D's parameters and build the EDS file. Through the EDS file to the I-7241D, it is easy to apply the Modbus RTU devices in DeviceNet applications.

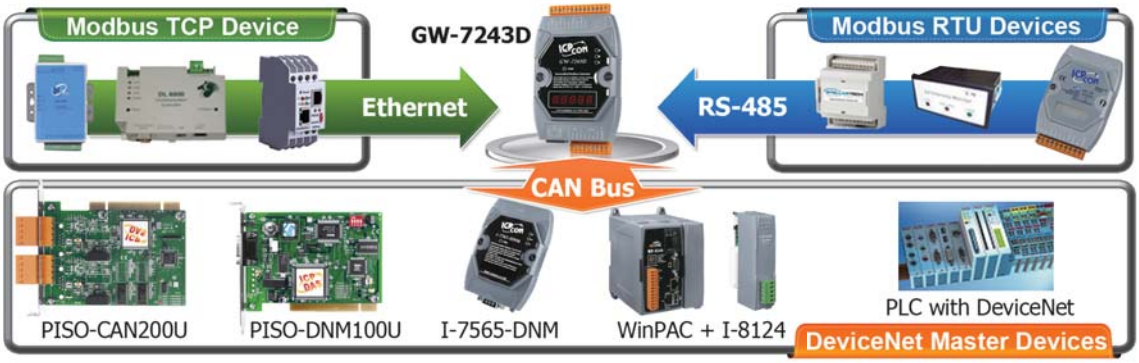
- I/O operating modes: Polling, Bit-Strobe, Change of State/Cyclic
- Support Predefined Master/Slave Connection Set (Group 2 Only Server)
- Comply with DeviceNet specification volume I, release 2.0 & volume II, release 2.0
- Support Offline Connection Set, Device Heartbeat message and Device Shutdown message
- Support Max. 10 Modbus RTU series modules
- Provide dynamic Assembly Objects mapping



GW-7243D DeviceNet Slave to Modbus TCP/RTU/ASCII Master Gateway

The GW-7243D offers the DeviceNet slave and Modbus master functions. In the DeviceNet network, the module acts as a Group 2 Only Server device, and waits for connecting with the DeviceNet master. In the Modbus network, the GW-7243D is a master device, and cyclically sends the commands to access the Modbus slave devices. Both the Modbus TCP client and Modbus RTU/ASCII master interfaces of the GW-7243D can work simultaneously. This feature means that users are able to integrate different kinds of Modbus slave devices together into the DeviceNet network no matter these devices provide Ethernet, RS-232 or RS-485 communication interfaces. In order to simplify the use of the GW-7243D, the GW-7243D Utility tool for configuration and EDS file production is given. This is helpful to build the applications easily and quickly.

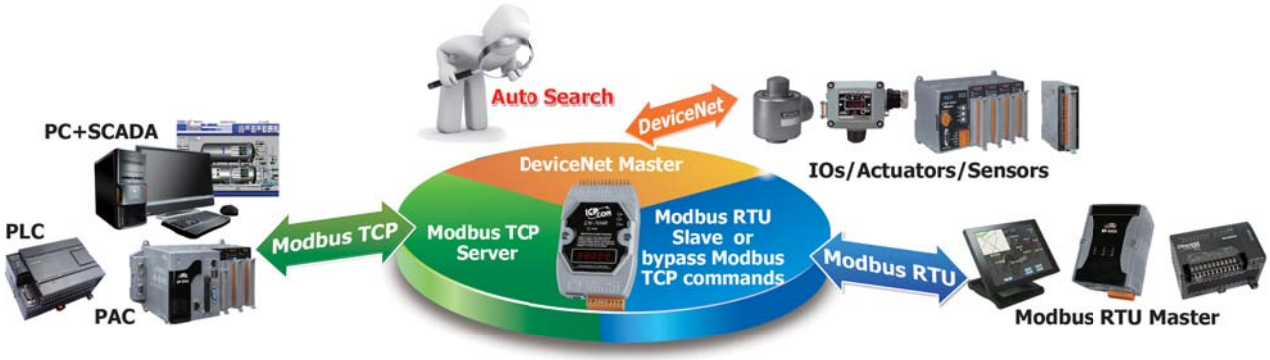
- Group 2 Only Server DeviceNet subscriber
- Support Explicit and Poll Connection
- Maximum support 4 Modbus TCP devices
- Maximum support 5 Modbus TCP commands for each Modbus TCP device
- Maximum support 10 Modbus RTU/ASCII commands for each COM port
- Support Modbus function codes: 0x01, 0x02, 0x03, 0x04, 0x05, 0x06, 0x0F and 0x10



GW-7434D Modbus TCP/RTU/ASCII Slave to DeviceNet Master Gateway

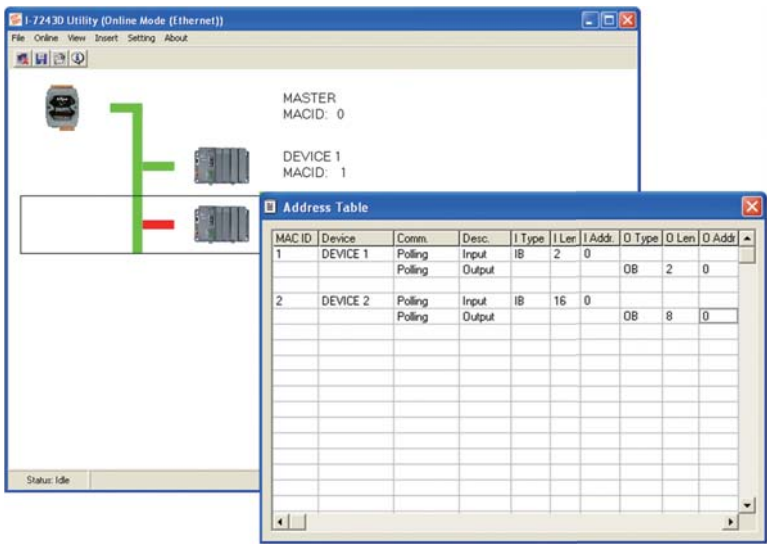
The GW-7434D is an economic solution that provides a communication protocol transformation between the DeviceNet protocol and the Modbus TCP protocol. This module solves the problem to connect an existing DeviceNet network to the Ethernet-based PLC, HMI or SCADA for setting up a control or monitoring system. Different to the GW-7243D, the GW-7434D offers the Predefined Master connection Set function and Group 2 only Server function as a DeviceNet master, and enables accessing the DeviceNet slaves automatically and cyclically. If the PLC, HMI or SCADA would like to access the DeviceNet slaves and simultaneously communicate with the Modbus slaves or COM-based devices connected with the RS-232 or RS-485 ports of the GW-7434D, the GW-7434D can be the Modbus TCP server or VxComm server to exchange the data with those devices.

- Support maximum DeviceNet devices up to 63
- Predefined Master/Slave Connection Set
- Support VxComm technique for every COM ports of controllers, setting by Utility
- Programmable DeviceNet Master MAC ID
- Programmable DeviceNet Master MACID and transfer-rate 125K, 250K, 500K
- Total DeviceNet I/O Length: 1280 bytes max. (Input/Output) for all DeviceNet slaves
- Supports maximum 512 bytes Modbus I/O data for DeviceNet I/O to map
- Supports Modbus RTU to DeviceNet master, setting by Utility



We provide GW-7434D Utility tools for Windows, it includes:

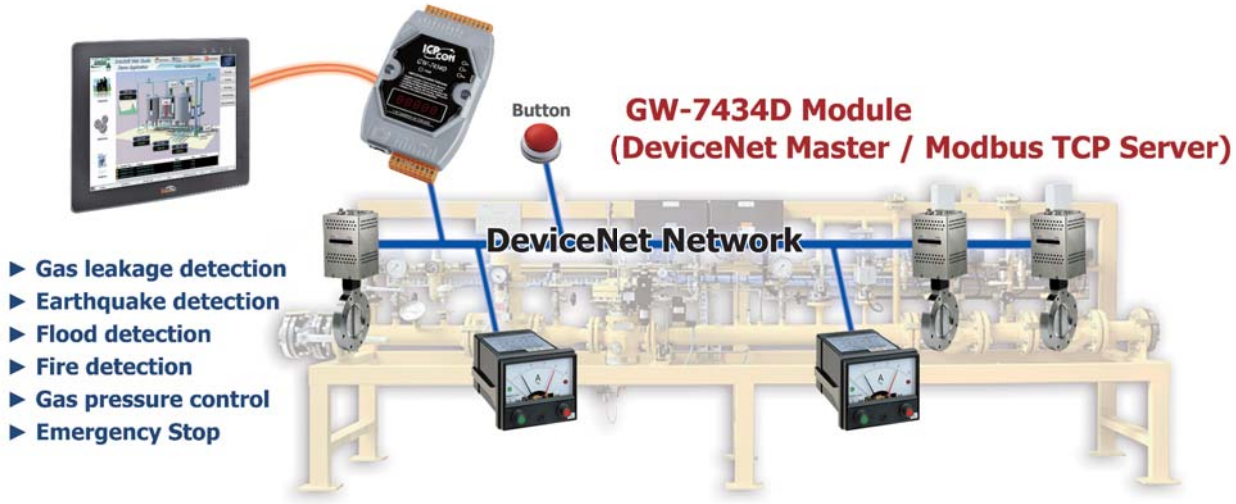
- Online add/remove DeviceNet devices via Ethernet
- Online monitor and configure devices status via Ethernet
- Get/Set Modbus/TCP input/output memory address
- Support DeviceNet I/O mapping table
- Show DeviceNet devices connection status
- Support communication mode setting



Case Studies: DeviceNet Gas Pressure Reducing Station

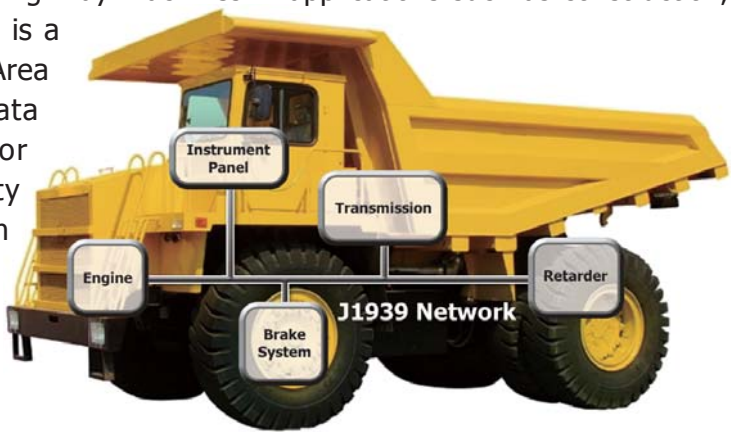
Nowadays, natural gas companies use high-pressure gas delivery methods to deliver natural gas quickly to consumers. However, high-pressure pipelines cannot be used directly by consumers; they must be decompressed before they can be used safely. Therefore, natural gas decompression stations must be established to reduce the level of source pressure. Natural gas is a highly hazardous gas and an important source of energy for human life and industrial and commercial development. Decompression stations have become one of the facilities in advanced cities, and gas decompression stations distributed in various places have become a target of monitoring gas pipeline systems at the end of their service life.

This decompression system uses DeviceNet communication network to connect various sensing meters and controlling valves and other important devices. The system uses HMI to monitor DeviceNet sensor data while providing real-time on-site data to the gas company. HMI uses GW-7434D to connect to the on-site DeviceNet sensor, collects various gas supply and pressure data, and can automatically adjust pressure and flow calculations. Most importantly, it has an all-weather warning system function. The monitoring system can detect gas leaks. In addition, it has intelligent automation functions such as pressure monitoring, flood detection, earthquake detection and fire detection, which can quickly cut off the natural gas supply in a crisis, prevent disasters and automatically notify the gas supply company to deal with it.



3.4.4 J1939 Gateways

J1939 is the vehicle bus standard used for communication and diagnostics among vehicle components, originally by the car and heavy duty truck industry in the United States. Because of the success of applying in vehicles, J1939 has become the accepted industry standard and the vehicle network technology of choice for off-highway machines in applications such as construction, material handling, and forestry machines. It is a higher-layer protocol based on Controller Area Network (CAN), which provides serial data communications between microprocessor systems (ECU) in any kind of heavy duty vehicles. The messages exchanged between these units can be data such as vehicle road speed, torque control message from the transmission to the engine, oil temperature, and many more.

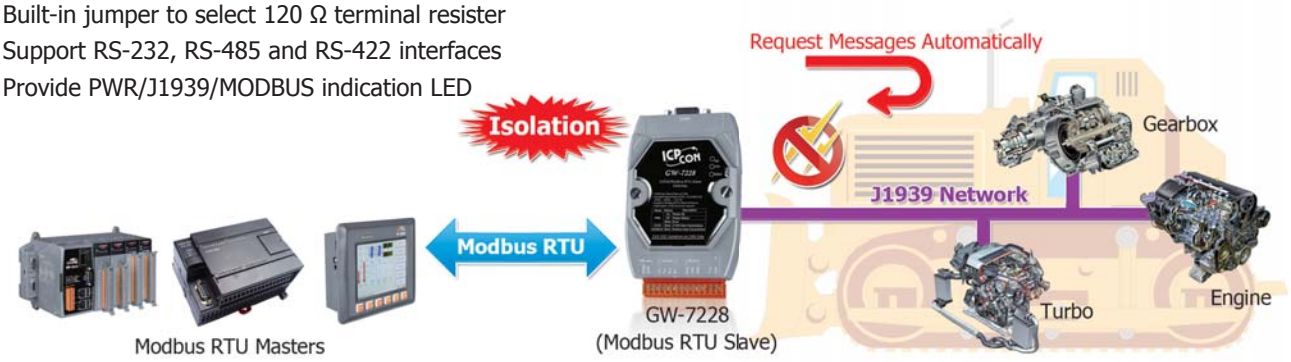


Models	GW-7228	GW-7238D
Pictures		
Hardware		
J1939 Channels	1	
CAN Interface		
Isolation	3000 VDC for DC-to-DC 2500 Vrms for photo-couple	1000 VDC for DC-to-DC 2500 Vrms for photo-couple
Terminator Resistor	Selectable 120 Ω terminator resistor by jumper	
Specification/Protocol	ISO-11898-2, CAN 2.0A and CAN 2.0B/J1939	
UART Interface		
COM 1/Protocol	RS-232/RS-422/RS-485/Modbus RTU	RS-232/Modbus RTU
COM 2/Protocol	–	RS-485 (Self-Turner inside)/Modbus RTU
Ethernet Interface		
Controller	–	10/100Base-TX Ethernet Controller (Auto-negotiating, Auto_MDIX)
Connector/Protocol	–	RJ-45 with LED indicator/Modbus TCP
Power		
Power Supply	Unregulated +10 VDC ~ +30 VDC	
Protection	Power reverse polarity protection, Over-voltage brown-out protection	
Environment		
Operating Temperature	-25°C ~ +75°C	
Storage Temperature	-30°C ~ +80°C	

GW-7228 Modbus RTU Slave to J1939 Master Gateway

The GW-7228 enables the Modbus RTU master to exchange the data with the devices in the J1939 network. This module provides the Modbus slave functions on the RS-232, RS-422, and RS-485 ports so that the Modbus RTU master can easily control and monitor the J1939-based devices. If users use one of the communication ports for application, the other two ports can be used to monitor the Modbus communication situations between the Modbus master and the GW-7228. This feature is helpful for diagnosis while setting up an application system. For J1939 CAN networks, the GW-7228 supports PDU1, PDU2, broadcast and destination specific type of J1939 messages, and is widely applied in the Diesel power-train, in-vehicle networks for trucks and buses or where the Modbus RTU and J1939 protocols transformation is needed.

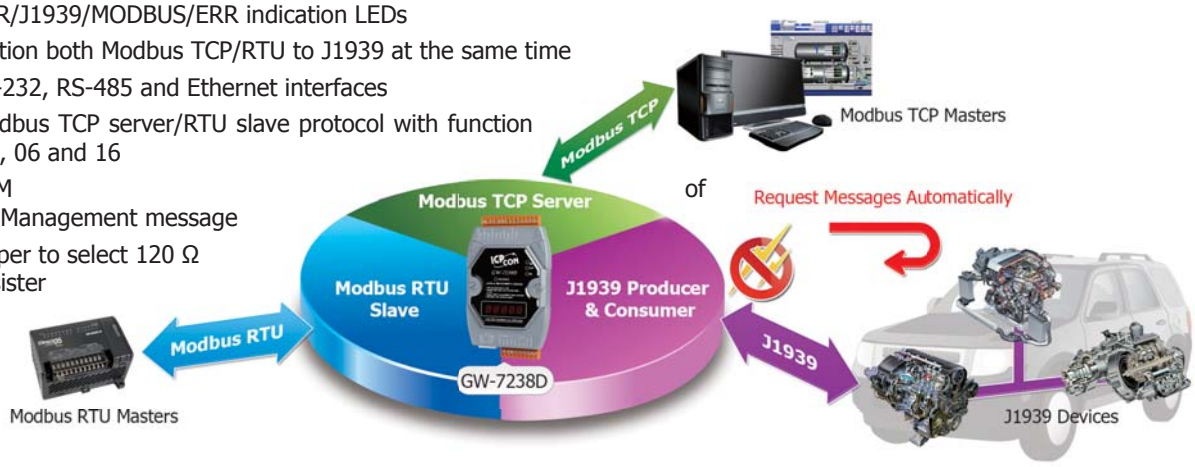
- Transmission and reception of all types of J1939 messages, including PDU1, PDU2, broadcast and destination specific
- Support Modbus RTU slave protocol with function codes 03, 04, 06 and 16
- Support BAM of Connection Management message
- Built-in jumper to select 120 Ω terminal resister
- Support RS-232, RS-485 and RS-422 interfaces
- Provide PWR/J1939/MODBUS indication LED



GW-7238D Modbus TCP/RTU Slave to J1939 Master Gateway

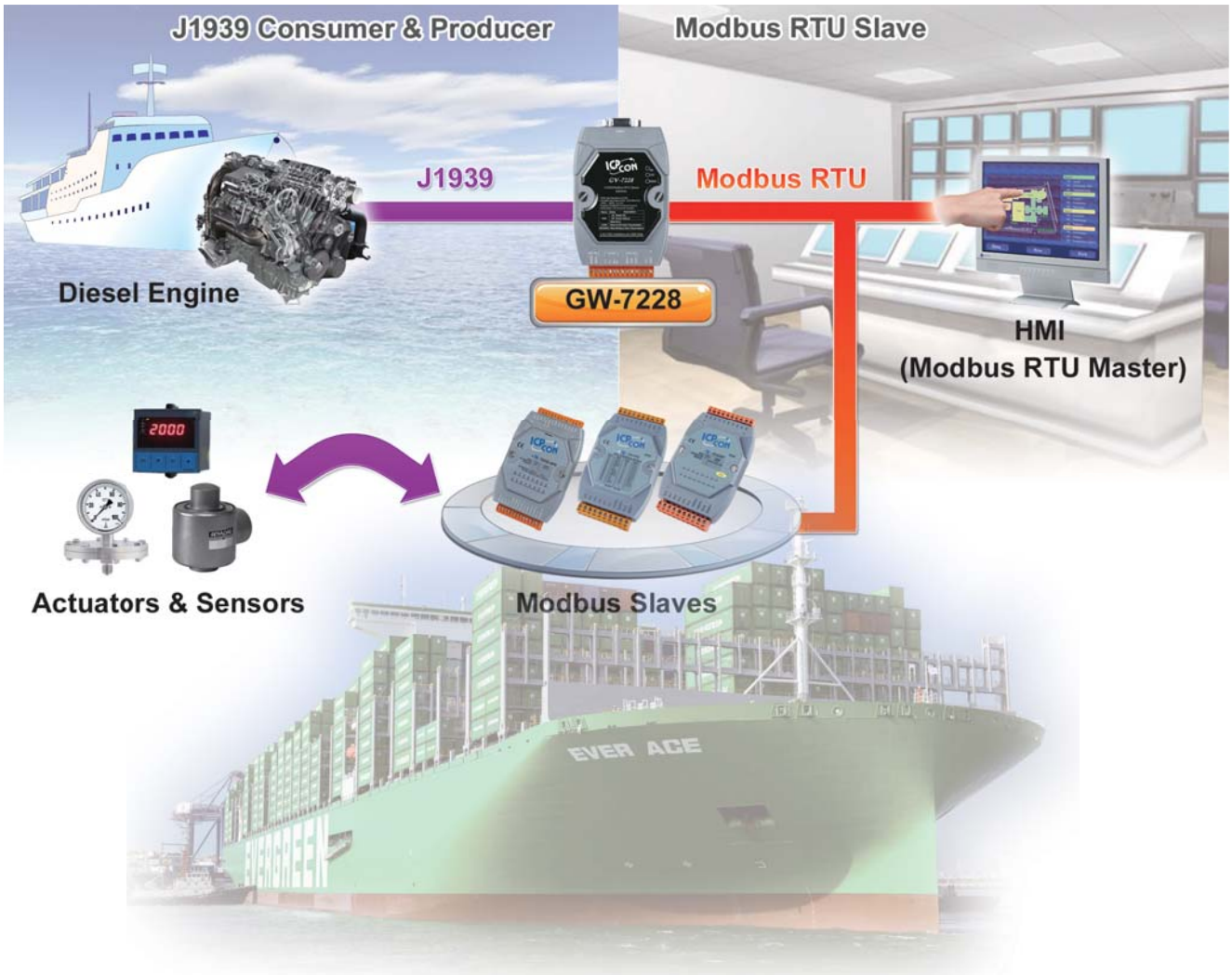
Similar to the GW-7228, the GW-7238D is a J1939 to Modbus master gateway. The main difference is that the GW-7238D has an Ethernet port as the Modbus TCP server, and allows connecting with up to 5 Modbus TCP clients. The GW-7238D also offers an RS-232 and RS-485 ports which are the Modbus RTU slaves and enable the Modbus RTU master to exchange the data with the devices in the J1939 network. Both the Modbus TCP server and the Modbus RTU slave functions of the GW-7238D can work simultaneously. This feature means that users can apply the GW-7238D in their applications more flexibly and more economically. For J1939 CAN networks, the GW-7238 supports PDU1, PDU2, broadcast and destination specific type of J1939 messages, and is widely applied in the various J1939-based applications.

- Transmission and reception of all types of J1939 messages, including PDU1, PDU2, broadcast and destination specific
- Provide PWR/J1939/MODBUS/ERR indication LEDs
- Communication both Modbus TCP/RTU to J1939 at the same time
- Support RS-232, RS-485 and Ethernet interfaces
- Support Modbus TCP server/RTU slave protocol with function code 03, 04, 06 and 16
- Support BAM Connection Management message
- Built-in jumper to select 120 Ω terminal resister



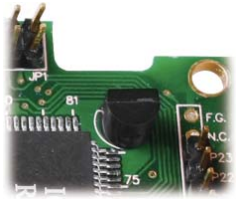
Case Studies

The user from the vessel power research institute needs to set up an engine test system to adjust the performance of the vessel engines. In this system, the Volvo Penta Diesel engine which offers the J1939 communication interface is used. The user would like to control and monitor the engine parameters, such as the engine oil temperature, the engine coolant temperature, the engine rotational speed, the toque speed and the value of the frequency switch, on the touch screen which provides the RS-485 interface as a Modbus RTU master. In order to overcome the problem of the data exchange between the J1939 network and the Modbus RTU network, the user applies the GW-7228 to resolve this issue. The GW-7228 provides the J1939 interface and the Modbus RTU slave function. In the J1939 network, the GW-7228 listens to the J1939 network and obtains all of the J1939 messages automatically sent from the engine. When receiving the Modbus RTU messages from the touch screen, the GW-7228 returns the data of the engine or commands the engine to change the rotational speed and toque that is corresponding to the content of the Modbus commands.



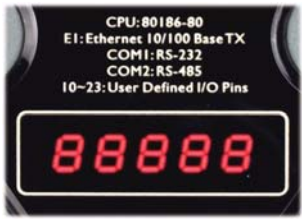
3.5 Palm-size Programmable CAN Controllers

The palm size PACs (Programmable Automation Controller) includes I-7188XBD-CAN, uPAC-7186EXD-CAN and µPAC-5001D-CAN2. With abundant and various peripherals and communication ports, the PAC can integrate different communication interface, like CAN bus, RS-232, RS-485, Ethernet and so on. In order to increase the modules openness and applications flexibility, the PAC provides MiniOS7, a DOS-like real-time single-task operation system for adapting to all kinds of needs. Users can develop application programs via C/C++ compiler.



Unique 64-bit Hardware Serial Number

Built-in RTC - Real Time Clock



5-Digit 7-Segment LED Display

microSD expansion

Model Name	I-7188XBD-CAN	uPAC-7186EXD-CAN	uPAC-5001D-CAN2
Pictures			
System Software			
OS	MiniOS7 (DOS-like embedded operating system)		
Development Software			
Download Interface	RS-232 (COM1) or Ethernet		
Language	C language		
Compilers	TC++ 1.01, TC 2.01, BC++3.1 ~ 5.2x, MSC 6.0, MSVC++ (before version 1.5.2)		
CPU Module			
CPU	80188, 40 MHz or compatible	80186, 80 MHz or compatible	
SRAM/Flash	512KB / 512KB		
microSD Expansion	-		Up to 2 GB
EEPROM	2 KB	16 KB	
NVRAM	31 Bytes (battery backup, data valid up to 10 years)		
RTC (Real Time Clock)	Provide second, minute, hour, date, day of week, month, year		
64-bit Hardware Serial Number	Yes, for Software Copy Protection		
Watchdog Timers	Yes (0.8 second)		
Communication Ports			
Ethernet	-	10/100 Base-TX (Auto-negotiating, Auto MDI/MDI-X, LED indicators)	
COM 1	RS-232		
COM 2	RS-485		
CAN	1 channel	1 channel	2 channels
Environmental			
Operating Temperature	-25 ~ +75°C		
Storage Temperature	-30 ~ +80°C		
Power			
Input Range	10 ~ 30 VDC		12 ~ 48 VDC

3.6 PC-based CAN Bus Boards

Communication Boards:

The following CAN Bus communication boards are designed for different interface and different CAN port number.

The common features are:

1. Compatible with CAN specification 2.0 parts A and B
2. Fully compatible with ISO 11898-2 standard
3. Supports baud rate from 10 kbps to 1 Mbps
4. 2 kV galvanic isolated
5. Direct memory mapping to the CAN controller

Software Support:

- For Windows:
  - LabView CAN Driver
  - DASYLab CAN Driver
  - RTX CAN Driver
  - PISOCNX ActiveX Object
  - NAPOPC.CAN DA Server
  - InduSoft Driver
- For Linux:
  - SocketCAN Device Driver

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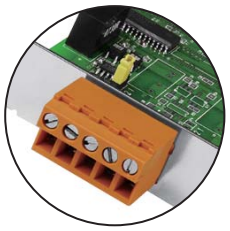
PC-based CAN Communication Boards

Model Name	PEX-CAN200i	PCM-CAN200	PISO-CAN200U	PISO-CAN400U	PISO-CAN800U
Pictures					
CAN Channel	2	2	2	4	8
Bus Interface	X1 PCI Express	Universal PCI			
Baud Rate	Programmable transfer rate up to 1 Mbps				
Terminator Resistor	Jumper for 120 Ω terminator resistor				
Galvanic Isolation	2 kV				
PC APIs	API for VB, VC, BCB, VB.Net, C#.Net				
RTX Driver	Yes				-
LabVIEW Driver	Yes				
InduSoft Driver	Yes				
OPC Server	Yes				
OCX	Yes				
SocketCAN Driver	Yes				-
Device Driver	Windows XP/7/8.1/10, Linux				

Connector Types: -T/-D

Each CAN Bus board provide two type of connectors, i.e. DB9 and Terminal Block.

PISO-xxxxx-D



PISO-xxxxx-T

Optional Accessory:

Optional Cable for PISO-CAN800U

CA-9-3705:

DB-37 Male (D-sub) to 4-Port DB-9 Male (D-sub) cable. 0.3 M (90°)

CA-9-3715D:

DB-37 Male (D-sub) to 4-Port DB-9 Male (D-sub) cable. 1.5 M (180°)

Model Name	PISO-CM100U	PISO-CM200U	PISO-DNM100U	PISO-CPM100U
Pictures				
CAN Channel	1	2	1	
Bus Interface	Universal PCI		Universal PCI	
On-board CPU	Yes			
On-board CPU OS	MiniOS7	-	MiniOS7	
On-board CPU APIs	C/C++		-	
Default Firmware	CAN 2.0A/2.0B		DeviceNet Master	CANopen Master
EDS File Support	-			Yes
Terminator Resistor	Jumper for 120 Ω terminator resistor			
Galvanic Isolation	2 kV			
PC APIs	API for VB, VC++, BCB, Delphi		API for VB, VC++, VB.Net, C#.Net	
LabVIEW Driver	-		Yes	-
InduSoft Driver	Yes			Yes
Device Driver	Windows XP/7/8.1/10, Linux			

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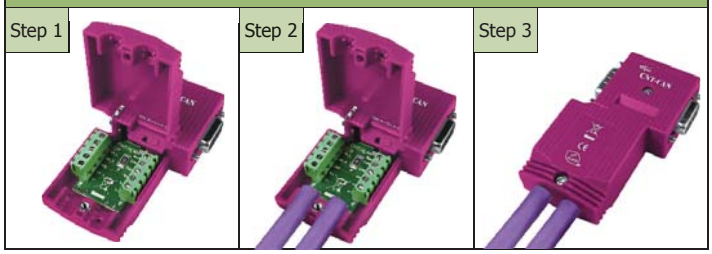
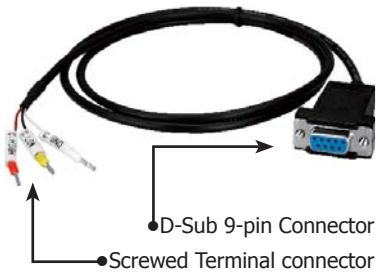
Optional Accessory:

Optional CAN Bus connector: **CNT-CAN**

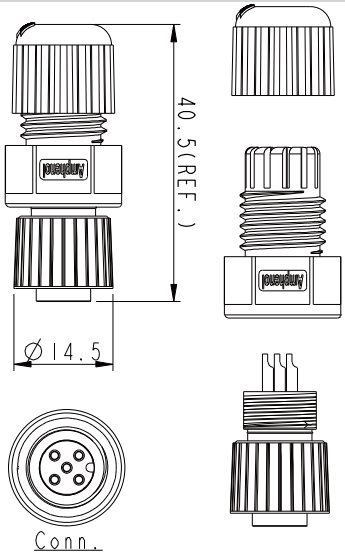
Installation

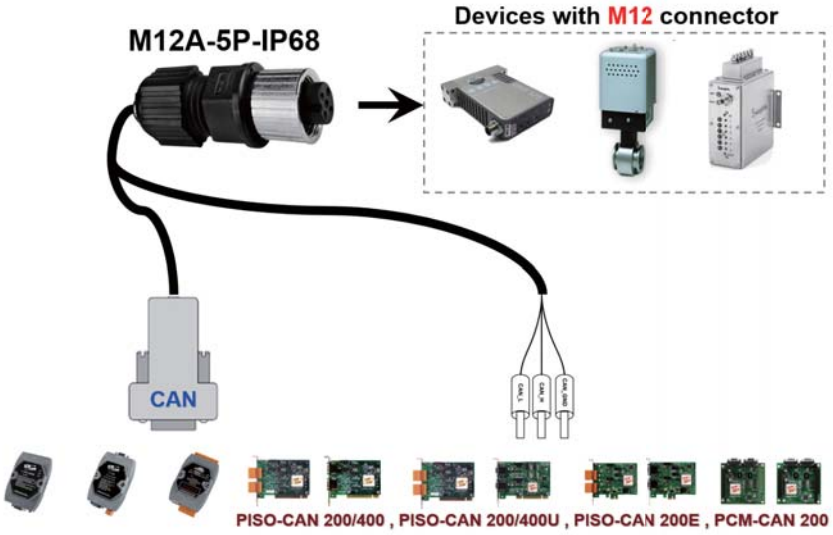


CA-0910-C



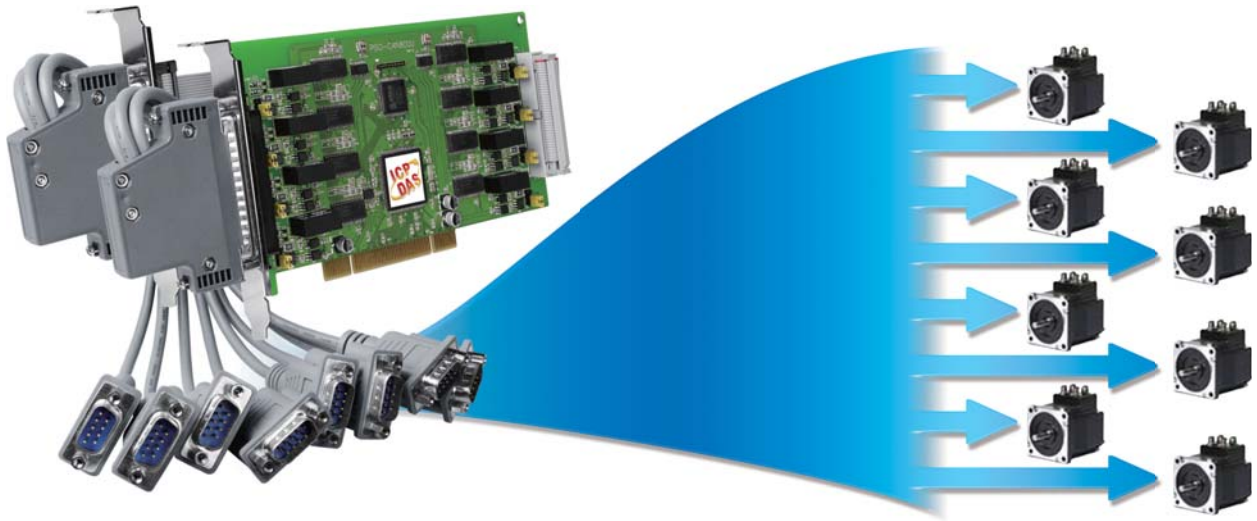
Optional CAN Bus connector: **M12A-5P-IP68**





CAN bus boards

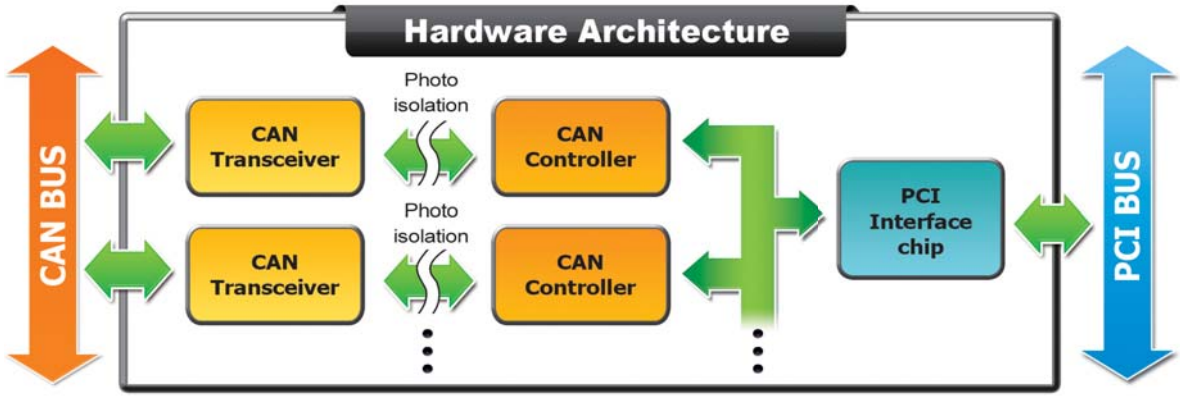
The PCI and PCI Express CAN bus boards use the new CAN controller Phillips SJA1000T and transceiver TJA1042, which provide bus arbitration, error detection with auto correction and re-transmission function. It can be installed in a 5V or 3.3V PCI slot and supported truly "Plug & play".

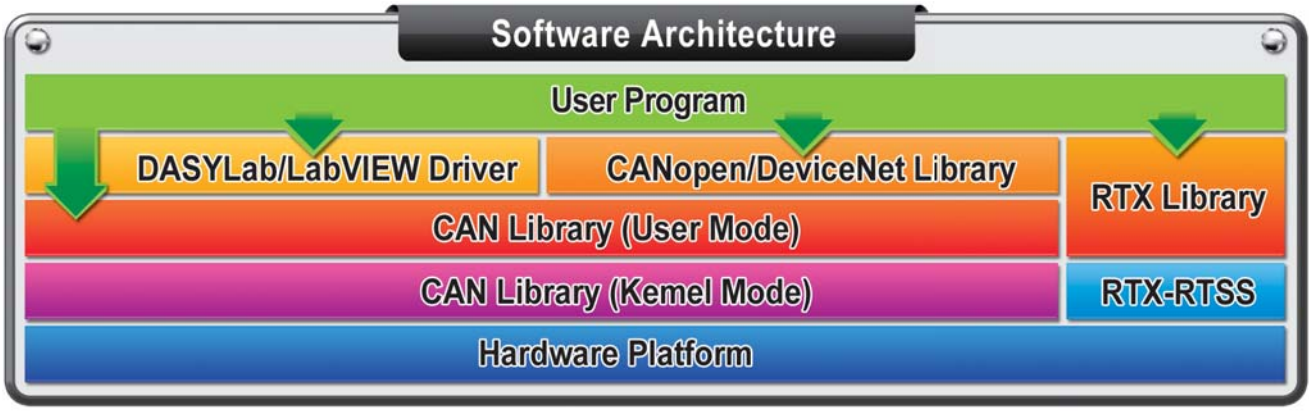


PISO-CAN800U-D: 8-Port isolated PCI CAN board

Features:

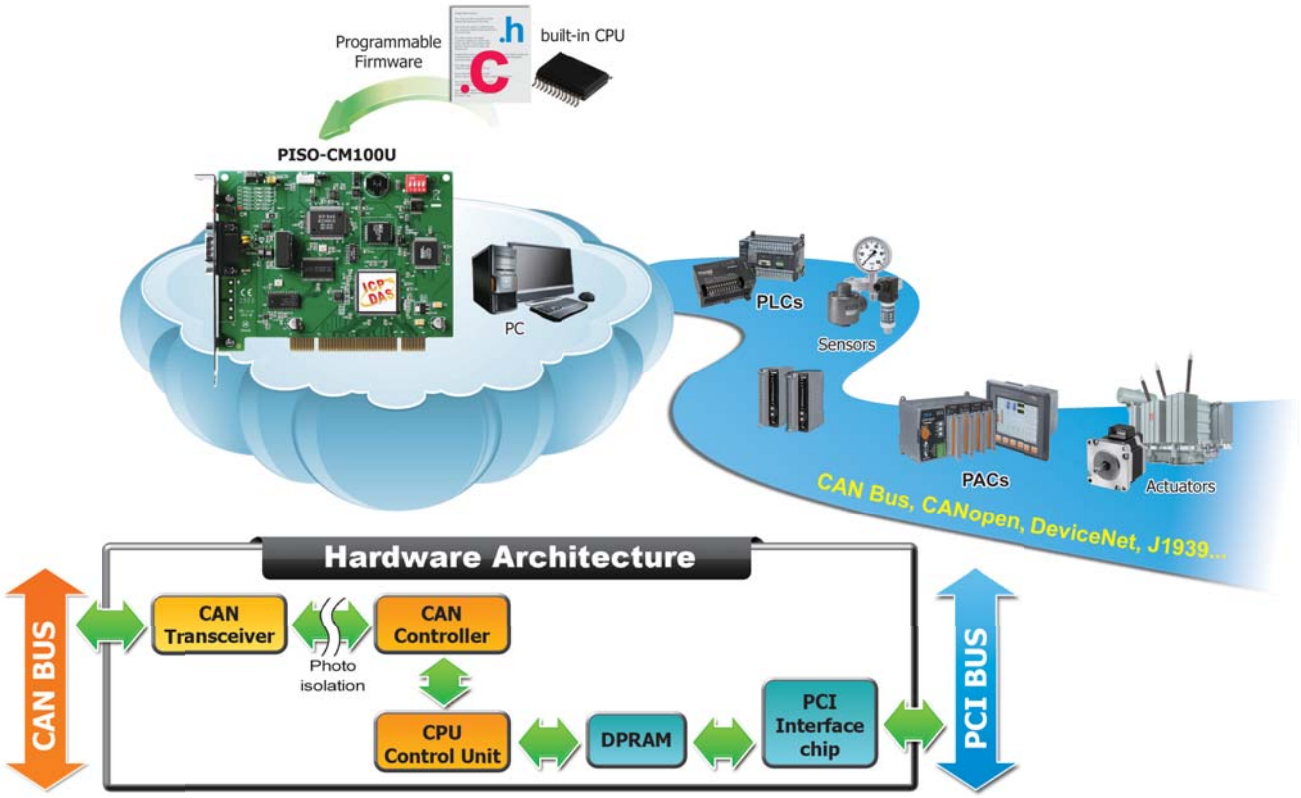
- Compatible with CAN specification 2.0 parts A and B
- Support a range of baud rates from 10 kbps ~ 1 Mbps
- 2500 Vrms photocoupler isolation on the CAN side
- VB, VC++, Delphi, and Borland C++ builder demos are provided
- Universal PCI card, supports both the 5 V and the 3.3 V PCI bus
- Built-in jumper for the 120 Ω terminator resistor of the CAN bus
- Fully compatible with the ISO 11898 -2 standard
- Provide 1/2/4/8 independent CAN channels
- 2 kV galvanic isolation for each CAN port
- Direct memory mapping to the CAN controller
- Supports LabVIEW and DASYLab drivers





PISO-CM100U: CAN board with built-in programmable CPU

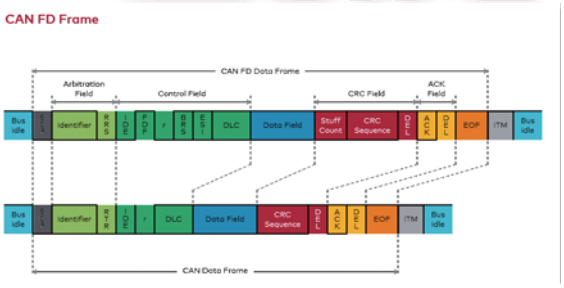
As a stand-alone CAN controller, the PISO-CM100U represents a powerful and economic solution. It has an internal 16-bit 80186 compactable CPU for the complex protocol interpretations and implementations. Owing to the real-time DOS-like OS, MiniOS7, the PISO-CM100U can cover most of all time-critical CAN-based applications, such as self-defi ne CAN protocol, CANopen, DeviceNet, J1939, and so forth. Therefore, when users develop their projects, the PISO-CM100U is helpful to handle the process of the CAN messages, and share the CPU loading of the PC or embedded system. Besides, the PISO-CM100U allows users designing the fi rmware of the PISO-CM100U. Through the library and demos, it is easy to fi nish the user-defi ned fi rmware to satisfy the users' requirements. easy to fi nish the user-defi ned fi rmware to satisfy the users' requirements.



Built-In CPU Specifications

System Software	
OS	MiniOS7 (DOS-like embedded operating system)
Program Download Interface	RS-232 (needs an optional cable: CA-0904)
Programming Language	C language
Compilers to create.exe Files	TC++ 1.01 TC 2.01 BC++3.1 ~ 5.2x MSC 6.0 MSVC++ (before version 1.5.2)
CPU Module	
CPU	80186, 80 MHz
SRAM / Flash	512 KB / 512 KB
EEPROM	16 KB
DPRAM	8 KB
NVRAM	31 Bytes (battery backup, data valid up to 10 years)
RTC (Real Time Clock)	Provides second, minute, hour, date, day of week, month, year
Watchdog Timers	Yes (0.8 second)

3.7 PC-based CAN FD Boards

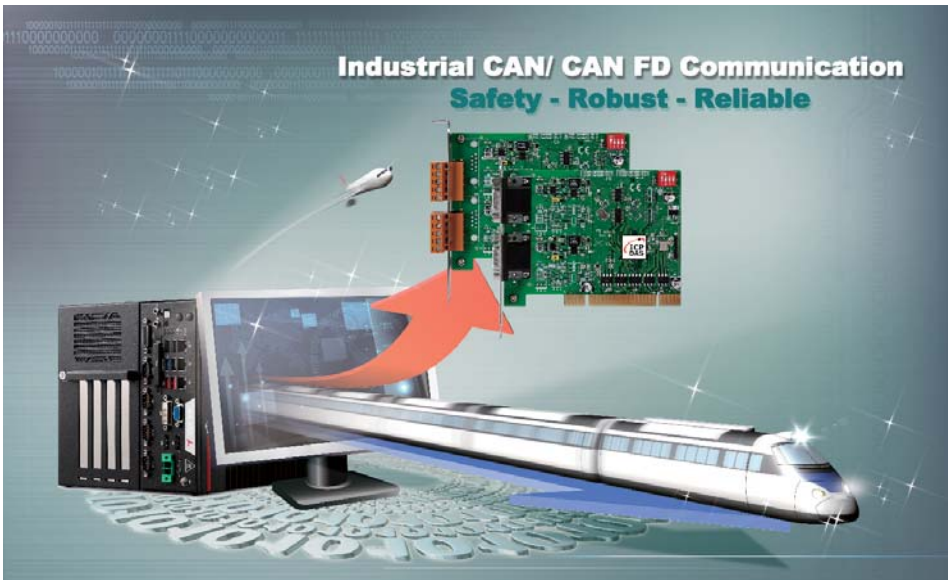


CAN FD (Controller Area Network Flexible Data-Rate) is a data-communication protocol typically used in the automotive industry. It supports up to 64 data bytes per data frame vs. 8 data bytes for Classical CAN. This reduces the protocol overhead and leads to an improved protocol efficiency. It was developed to meet the need to increase the data transfer rate and with larger frame sizes.CAN FD supports dual bit rates: The nominal (arbitration) bit-rate limited to 1 Mbit/s as given in Classical CAN - and the data bit-rate up to 10 Mbit/s are achievable.

4

CAN / CAN FD boards

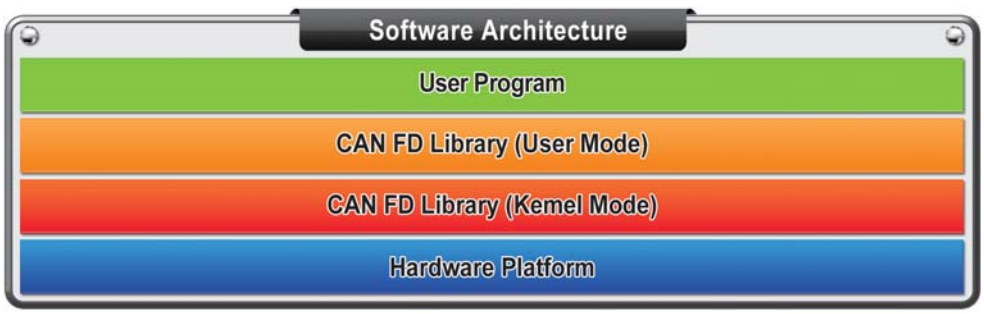
The PCI and PCI Express CAN/CAN FD boards use the new CAN/CAN FD controller, which provide bus arbitration, error detection with auto correction and re-transmission function. The CAN FD bit rates supports from 100 kbps to 10000 kbps within the data field. It can be installed in a 5V or 3.3V PCI slot and supported truly "Plug & play".



PISO-CAN200U-FD / PISO-CAN400U-FD: 2-Port/4-Port Isolated PCI CAN FD board

Features:

- Compatible with CAN specification 2.0 A/B and FD
- CAN FD bit rates for data field from 100 kbps to 10 Mbps
- CAN bit rates from 10 kbps to 1000 kbps
- 2500 Vrms photocoupler isolation on the CAN side
- Built-in jumper for the 120 Ω terminator resistor
- Provide 2/4 independent CAN/CAN FD channels
- 2 kV galvanic isolation for each CAN port
- Independent CAN controllers for each CAN port
- Supports windows drivers



Software

LabVIEW CAN Driver

The LabVIEW driver includes a configuration utility to configure the ICP DAS's DeviceNet hardware in your PC. By means of this driver, you don't need to Study the complex and abstruse technology of the DeviceNet protocol.

- OS environment: Windows 2000/XP
- Supports NI LabVIEW version 8.0 or later
- Supports CAN specification 2.0A and 2.0B
- Provides 3000-record Rx buffer for each CAN port
- Offers functions for directly accessing SJA1000 register
- Supports time-stamp for each received CAN messages

PISOCANX ActiveX Object

PISOCANX uses ActiveX technology to simplify the procedure while developing the application by using PISO-CAN series CAN card. The ActiveX object (OCX) can be not only used in general program development environment, but used in the SCADA software which supports the ActiveX technology.

- OS environment: Windows 2000/XP
- Allows polling mode and interrupt mode
- Provides 3000-record Rx buffer for each CAN port
- Supports functions for directly accessing SJA1000 register
- Allows users to read the card No. and relative information
- Supports time-stamp for each received CAN messages

RTX CAN Driver

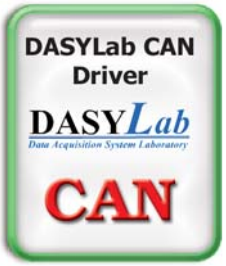
The RTX CAN Driver helps users to develop the highly real-time CAN bus applications on Windows OS by PISOCAN series boards. The name and parameters of the APIs in the RTX driver are the same as the ones in the Windows driver. Users don't need to pay more efforts to study how to use the APIs of the RTX driver.

- OS environment: Windows2000 SP4, and Windows XP SP2
- Supports interrupt function if the PISO-CAN series CAN card can
- get the independent IRQ
- Direct I/O control and highly real-time feature
- Supports RTX version 8.0 and RTX 2011
- Provides VC 6.0 demos

CANcheck

CANcheck is one software which is used to verify the functions of CAN devices from any manufacturers. It provides users to design the test commands and the expected response. When starting the test, the software will go the predefined procedure to send the messages and check if the responses are correct.

- OS environment: Windows XP, Window 7
- Support: ICP DAS CAN board, CAN converter
- No need to write any programs. The graphical interface is
- ready-made and easy to operate.
- Can be used to operate and diagnose lights, windows, dashboard
- or other vehicular electronic systems.
- Supports CAN 2.0A and CAN 2.0B specifications.



DASYLab CAN Driver

DASYLab CAN driver makes users interactively develop PC-based applications by simply attaching functional icons. DASYLab offers real-time analysis, control, and the ability to create custom graphical user interfaces. Besides, it can require weeks of training to master. This is useful in some application cases.

- OS environment: Windows 2000/XP
- Supports DASYLab version 8.0
- Follows CAN specification 2.0A and 2.0B
- Supports maximum 64 CAN ports and 4096 block size
- Provides Intel mode and Motorola mode for remote CAN device
- Offers two kinds of languages, German and English

NAPOPC.CAN DA Server

NAPOPC.CAN DA Server is a CAN OPC server to be as an expert bridge between ICP DAS CAN products and the OPC client of the third party software. Besides, it also provides the easy-to-use integral APIs to access the different CAN ports without through the OPC server.

- OS environment: Windows 2000/XP
- Follows OPC 1.0, OPC 2.0 Data Access Standards
- Configures CAN hardware filter by the Virtual CAN Driver
- Provides CAN Engine Utility to monitor the CAN messages
- Collects the data from different CAN devices in one OPC server

SocketCAN Device Driver

The SocketCAN driver is a kind of device driver based on the Linux operating system with x86 hardware platform.
Users can implement their SocketCAN-based application on the Linux platform by using PISO-CAN series board.

- OS environment: Linux kernel version 2.6.31 ~ 3.2.20 (x86 hardware platform only)
- Provides CANopen/DeviceNet master static library Standard interface for SocketCAN package.
- Supports Virtual CAN interface. Users can map several virtual CAN port into one physical CAN port.
- Provides the RAW socket, CANopen master and DeviceNet master demos

CAN Test Tool

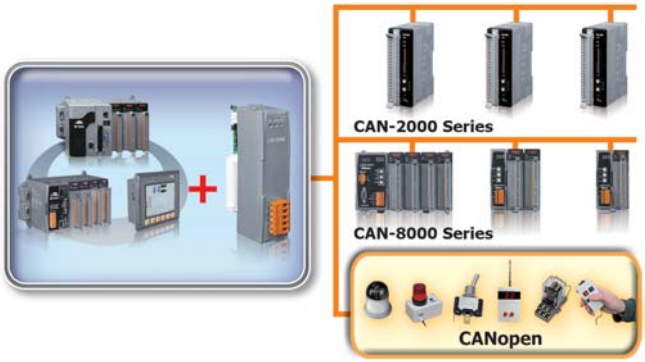
CAN test tool helps users to test the CAN communication of CAN series of ICP DAS. You can use these devices to be an simple CANopen master/slave, DeviceNet master/slave, J1939 transmitter/receiver to test the DUT (device under test).It can easily and quickly test if the DUT works well or not.

- OS environment: Windows XP, Window 7
- Support: ICP DAS CAN board, CAN converter
- Test Function: Two CAN port test to each other, Test with other CAN device, CANopen Master, CANopen Slave, DeviceNet Master, DeviceNet Slave, J1939 Receiver, J1939 Transmitter
- Auto scan all supported ICP DAS CAN device on your PC

3.8 PAC-based CAN Modules

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/DeviceNet systems easily.

For the especial CAN bus applications, the I-8120W and I-87120W are designed for users to apply in PAC series. The default firmware of I-8120W and I-87120W 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.



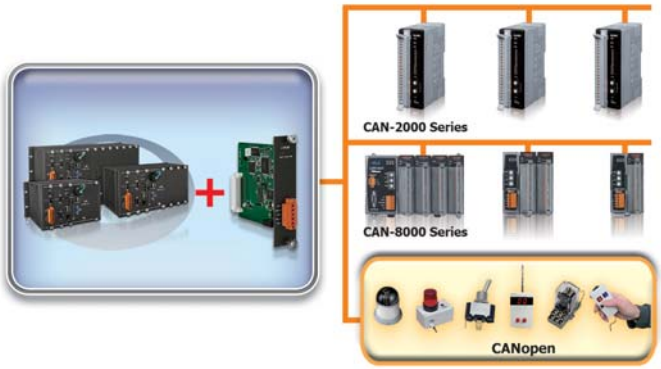
CAN/CANopen/DeviceNet Communication Module (Parallel/Serial Bus)						
Model Name	**I-8120W**	**I-87120**	**I-8123W**	**I-87123**	**I-8124W**	**I-87124**
Pictures						
Communication						
Port	1					
Protocol	CAN 2.0 A/2.0 B		CANopen CiA 301 ver 4.02, CiA 401 ver 2.1		DeviceNet Volume I ver 2.0, Volume II ver 2.0	
System						
Hot Swap	-	Yes	-	Yes	-	Yes
Data Communication	Parallel Interface	Serial Interface	Parallel Interface	Serial Interface	Parallel Interface	Serial Interface
User-defined Firmware	Yes		-		-	
Isolation	2500 Vrms					
Power Consumption	2 W					
Connector	5-pin Terminal Block					
Optional Accessories	CA-0904 Cable					


CA-0904

Model Name	**I-8120W**	**I-87120**	**I-8123W**	**I-87123**	**I-8124W**	**I-87124**
PAC Driver Support						
I-8000, iP-8000	-	BC, TC	-	BC, TC	-	BC, TC
VP-2111						
WP-8000-CE7	VB.Net 2005, C#.Net 2005					
VP-2000-CE7 VP-4000-CE7						
XP-8000-WES7	VB.Net 2005, C#.Net 2005, VC 2005					
iPPC Series						
LP-8000	-	GCC	-	GCC	-	GCC

These CAN Bus communication modules are the solutions to the various CAN application requirements in PAC-9000 family with rich CAN bus protocols. The I-9123 and I-9124 separately support CANopen and DeviceNet master protocols. Users can apply them in PAC-9000 to connect to CANopen and DeviceNet devices to reach various CANopen/DeviceNet systems easily.

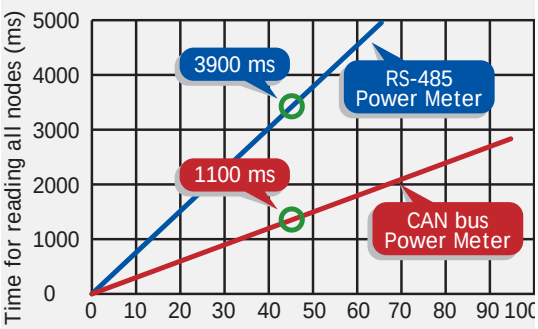
For the especial CAN bus applications, the I-9120 are designed for users to apply in PAC-9000 series. The default firmware of I-9120 provides the transmission and reception of CAN bus messages in PAC-9000. In addition, users can design the specific firmware in these modules to reduce the loading of the PAC-9000 in C language.



CAN/CANopen/DeviceNet Communication Module			
Model Name	**I-9120**	**I-9123**	**I-9124**
Pictures			
Communication			
Interface	ISO 11898-2 CAN		
Port	1		
Max. Speed (K bps)	1000	1000	500
Controller Chip	SJA1000T		
Transceiver Chip	82C250		
Protocol	CAN 2.0 A/2.0 B	CANopen CiA 301 ver 4.02, CiA 401 ver 2.1	DeviceNet Volume I ver 2.0, Volume II ver 2.0
System			
Data Communication	Parallel Interface		
User-defined Firmware	Yes	-	-
Isolation	2500 Vrms		
Connector	5-pin Terminal Block		
Optional Accessories	CA-0904 Cable		
 CA-0904			
Model Name	**I-9120**	**I-9123**	**I-9124**
PAC Driver Support			
WinCE7 PAC	WP-9000-CE7 series VB.Net 2010, C#. Net 2010, VC 2010		
WES7 PAC	XP-9000-WES7 series VB.Net 2010, C#. Net 2010, VC 2010		
Win10 IoT PAC	ALX-9000-IoT and XP-9000-IoT series VB.Net 2010, C#. Net 2010, VC 2010		
Linux PAC	LP-9000 and LX-9000 series GCC		

3.9 Power Meter

ICP DAS brings the most powerful, cost-effective, advanced Smart Power Meters PM-3000-CPS series that gives you access to real-time electric usage for three-phase power measurement. They support CANopen protocols for easy gathering the real-time power consumption information by the CAN interface. It supports not only polling mode, but also Auto-response mode which lets the power meter automatically reply the CAN messages in the predefined time period. This makes the communication more efficient while building a large power monitor system.



The Comparison figure of the scan Time

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Models	PM-3033-CPS	PM-3133-CPS	PM-3112-CPS	PM-3114-CPS	PM-4324-CPS
Pictures					
AC Power Measurement					
Wiring	1P2W-1CT 1P3W-2CT 3P3W-2CT 3P3W-3CT 3P4W-3CT	1P2W-1CT 1P3W-2CT 3P3W-2CT 3P3W-3CT 3P4W	1P2W-2CT	1P4W-4CT	1P2W-1CT 1P3W-2CT 3P3W-2CT 3P3W-3CT 3P4W
Measurement Voltage	10 ~ 500 V		10 ~ 300 V		10 ~ 500 V
Measurement Current	1A or 5A	CTØ10 mm (60 A); CTØ16 mm (100 A); CTØ24 mm (200 A); CTØ36 mm (300 A); CTØ36 mm (400 A)	CTØ10 mm (60 A); CTØ16 mm (100 A); CTØ24 mm (200 A)		CTØ10 mm (60 A); CTØ16 mm (100 A); CTØ24 mm (200 A); CTØ36 mm (300 A); CTØ36 mm (400 A)
Measurement Frequency	50/60 Hz				
W Accuracy	Better than 0.5% (PF=1)		Better than 1% (PF=1)		Better than 0.5% (PF=1)
Power Parameter Measurement	True RMS voltage (Vrms), True RMS current (Irms), Active Power (kW), Active Energy (kWh), Apparent Power (kVA), Apparent Energy (kVAh), Reactive Power (kVAR), Reactive Energy (kVARh), Power Factor (PF), Frequency				
Data Update Rate	1 Second				
Alarm Output					
Power Relay	N/A	Form A (Normal Open) x 2; 5 A @ 250 VAC (47 ~ 63 Hz), 5 A @ 30 VDC			
Power					
Input Range	+12 VDC ~ +48 VDC				+85 VAC~ +264 VAC
Power Consumption	2 W				6 W
Environment					
Operating Temperature	-20°C ~ +70°C				
Storage Temperature	-25°C ~ +80°C				

Model CAN Bus Power Meter

PM-3033-CPS

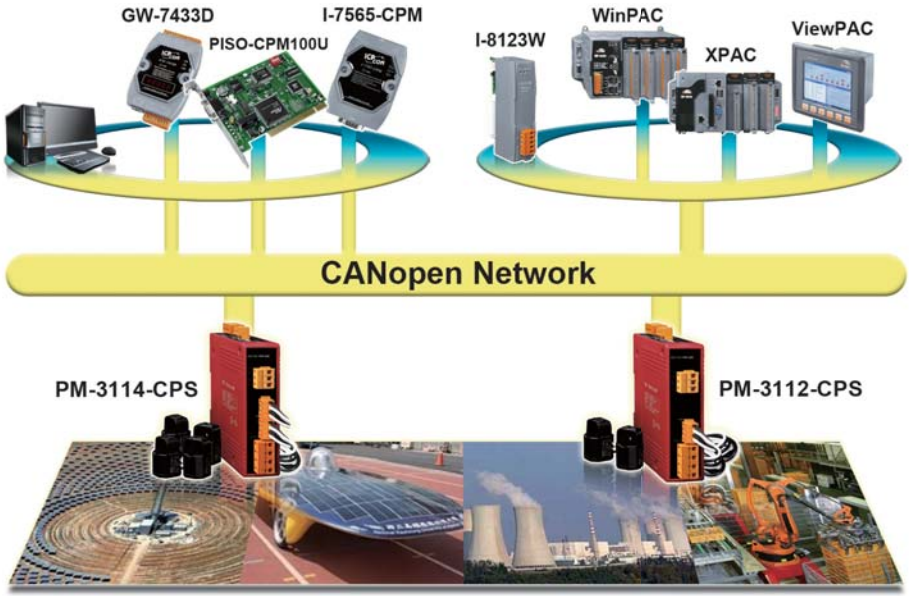
PM-3112-CPS

PM-3133-CPS

PM-3114-CPS

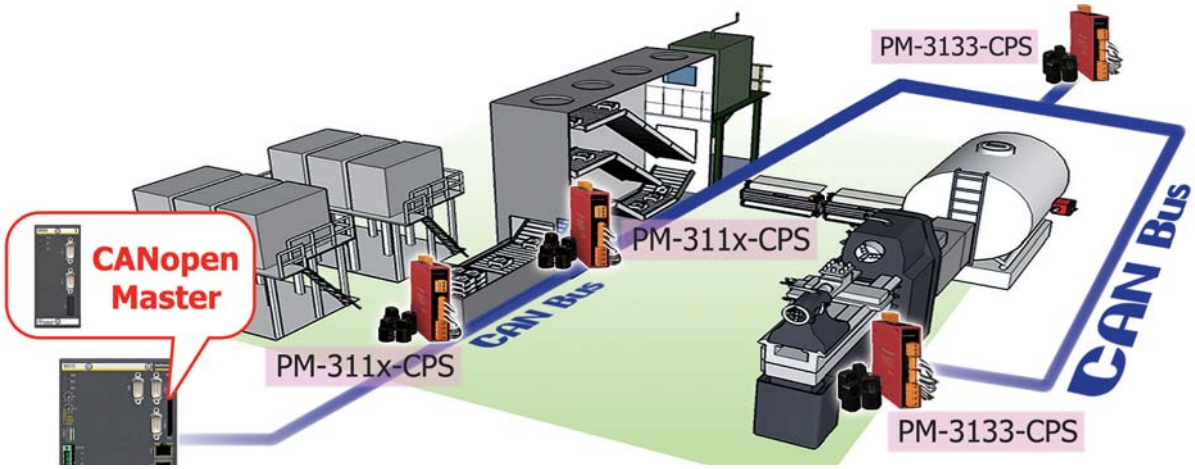
The Smart Power Meter PM-3000 Series can give you access to real-time electric usage for power management. With its high accuracy (<1%, PF=1), the power meter series can be applied to both low voltage primary side and/or medium/high voltage secondary side and enables the users to obtain reliable and accurate energy consumption readings from the monitored equipment in real time under operation. These compact size and cost-effective power meters are equipped with revolutionary wired clip-on CT (various types, support input current up to 200 A).

- Current Measurements Up to 200 A with Different CT Ratio
- Supports 2 Power Relay Output (Form A)
- Voltage Measurements Up to 300 V
- W Accuracy Better than 1% (PF=1)
- Energy Analysis for 1P2W, 1P4W
- True RMS Power Measurements
- Clip-on CT for Easy Installation
- Supports CAN Bus Interface
- Supports CANopen Protocol



Case Studies: Power Control System of Factory

In this case, user add several PM-3114-CPS into existing CANopen network for monitoring power system of factory. The PM-3133-CPS and PM-311x-CPS can be accessed by any standard CANopen master. It makes the communication more efficient when collecting a lot of remote power information.



3.10 CAN Bus Data Logger

The CAN bus data logging device serves for logging of communication over the CAN data bus. Each received data packet is given a specific time mark, which shows the precise arrival time of data. The actual time mark is obtained from the internal real time clock (RTC), therefore it is independent of the global system time. Data logging on a common SD card allows further analysis and system monitoring on a PC. The CAN-Logger100/200 device by ICP DAS is the result of extensive CAN bus testing and CAN bus programming and is suited for all type of CAN bus application.

Models	CAN-Logger100	CAN-Logger200
Pictures		
CAN Interface		
Channel Number	1	2
Connector	5-Pin male M12 x 1	5-Pin male M12 x 2
Terminator Resistor	DIP switch for the 120 Ω terminator resistor	
Isolation	3000 VDC for DC-to-DC, 2500 Vrms for photocoupler	
Specification	ISO-11898-2, CAN 2.0A and CAN 2.0B	
CAN Filter	Utility tool	
USB Interface		
Connector	USB Type B x 1	
Compatibility	USB 2.0 High Speed	
Max. Data flow	Transmit: 4000 fps ; Receive: 1000 fps	
Software Driver	Windows 2K/XP/7/8	
Data Logger Capability		
Storage Media	SDHC type flash – support 4 to 32 GB	
Recording Format	Binary	
Time Stamp Resolution	10 us	
Configuration	Utility tool	
Trigger	Log continuously	
Data Logger	Maximum message rate, receive: 15000 msgs/s	
Power		
Power Supply	USB power or CAN bus power (Unregulated +10 ~ +30 VDC) delivery	
Protection	Power reverse polarity protection, Over-voltage brown-out protection	
Environment		
Operating Temperature	-25°C ~ +75°C	
Storage Temperature	-30°C ~ +80°C	

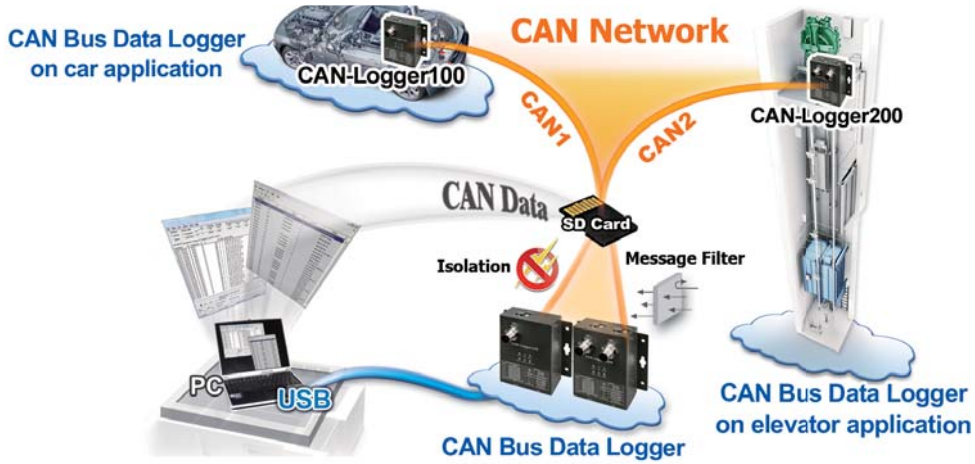
Model USB to 1/2-port CAN bus data logger device

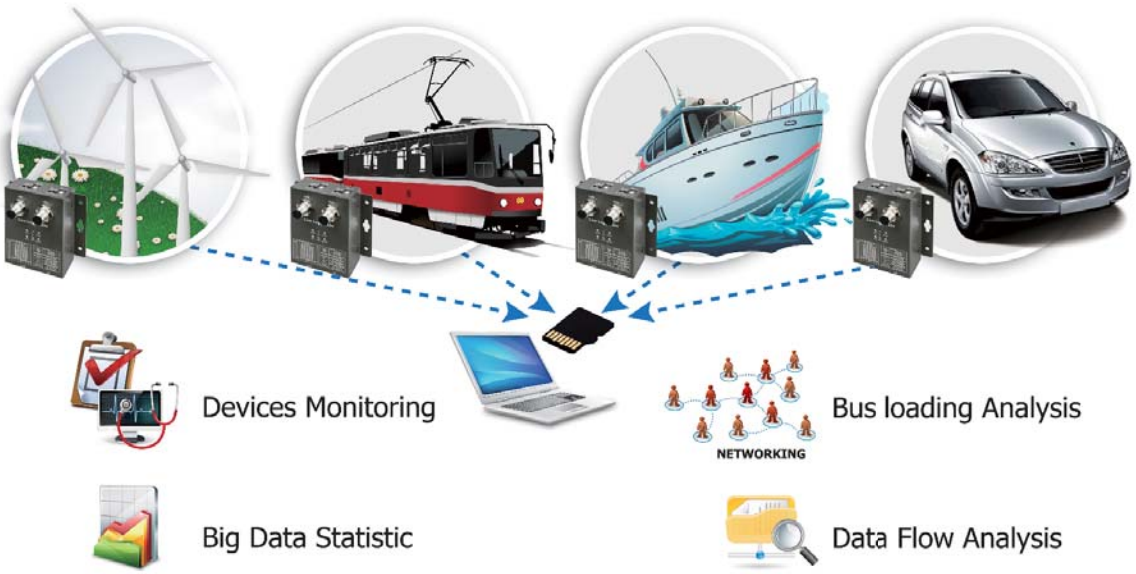
CAN-Logger100

CAN-Logger200

The CAN-Logger series devices (CAN-Logger100 / CAN-Logger200) are high-performance intelligent CAN bus data logger device with one/two CAN port that can help to make data collection and to process on a CAN bus network easier and quicker. The powerful CPU of the CAN-Logger devices provide the accurately time-stamp for each CAN message and supports storage media like SD or SDHC type flash for saving these CAN messages that is useful to analysis and diagnostic the CAN Bus network. In order to enhance the portability of the CAN-Logge, this module is powered by the USB interface or M12 connectors of CAN bus interface. The CAN-Logger devices use the standard USB HID driver of the Windows system.

- CAN-Logger100 provides one CAN port. CAN-Logger200 provides two CAN ports
- Power by the USB port or CAN port
- 3 kV galvanic isolation for the CAN port
- Full compatible with the ISO 11898-2 standard
- 2500 Vrms photocoupler isolation on the CAN side
- Supports CAN bus acceptance filter configuration
- Compatible with CAN specification 2.0 parts A and B
- Programmable CAN bus baud rate from 10 kbps ~ 1 Mbps
- Built-in jumper for the 120 Ω terminal resistor of the CAN side
- Supports 4 to 32 GB SDHC type flash for saving CAN messages
- CAN messages are time-stamped with 10 microseconds resolution
- Provides a configuration utility that can be used to transmit/receive CAN messages





3.11 I/O Modules and Units

CAN-2000 series and CAN-8000 series are designed for combining sensors and actuators into CCON, CANopen or DeviceNet network. All of them provide corresponding EDS files for standard CANopen or DeviceNet master interfaces. CAN-2000 series is a palm-size and stand-along slave device. It specially suits for distribution control system, and can be placed in a limited space even in the case of machine. CAN-8000 series is useful for centralizing control system. It provides 1/2/4/8 slots for flexible I/O selections to match various applications. Each slot allows you plugging one I-8000/I-87K series I/O module to expand I/O channels, and hot-swap technique is supported.

▲CAN-2000 series ▲CAN-8000 series

CANopen: CAN-8x2**3**, CAN-2xxx**C**

DeviceNet: CAN-8x2**4**, CAN-2xxx**D**

Features:

1. Heartbeat Messaging

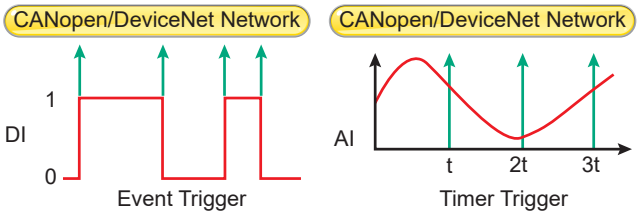
The heartbeat protocol is generally used to negotiate and monitor the availability of remote I/O devices. It is a message like the heartbeat sent by CANopen/DeviceNet remote I/O modules at a regular time. The users could use this mechanism to indicate the health of the remote I/O. All the CANopen/DeviceNet remote I/O series from ICP DAS has the heartbeat protocol to increase the reliability of the remote data.

2. Safety & Arbitration

CAN bus provides five mechanisms for achieving the utmost safety of data transfer. There are powerful for error detection, signaling and self-checking are implemented in every CAN node. If two or more nodes start transmitting messages at the same time, the arbitration mechanism is applied to guarantee that one of these messages can be sent successfully according to the priority.

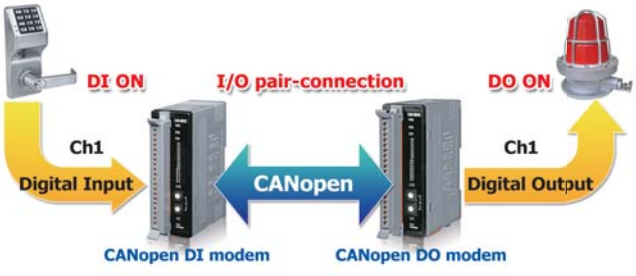
3. Auto Response of Input Data

The input data of CANopen/DeviceNet I/O modules allows to be responded automatically by event trigger or timer trigger. For example, DI data will be responded to the master when the DI data is changed. The AI data can be responded cyclically by predefined time period.



4. CANopen Digital I/O Pair-Connection

CANopen Digital I/O Pair-Connection is a special function for CANopen remote I/O. It can send the DI value that detected by the CANopen DI slave to other CANopen DO slaves through the CANopen network, and then these CANopen DO slaves will output the value. It is useful for users who need to detect a DI signal and output a DO alarm in time.



Communication:

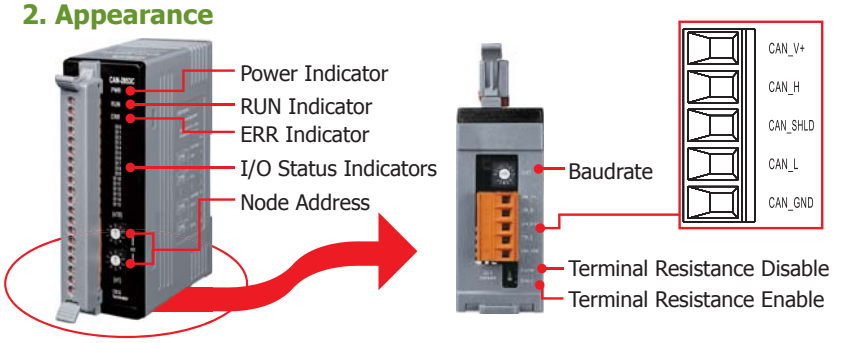
	CANopen I/O Modules	DeviceNet I/O Modules
Communication		
Node ID	CAN-2000C series: 1 ~ 99 selected by rotary switch CAN-8x23 series: 1~127 selected by rotary switch	0~63 selected by rotary switch
Protocol	CANopen CiA 301 ver4.02, CiA 401 ver2.1	Volume I, Release 2.0 & Volume II, Release 2.0, Errata 5
No. of PDOs	10 Rx, 10 Tx (support dynamic PDO)	-
PDO Mode	Event Triggered, Remotely requested, Cyclic and acyclic SYNC	-
Error Control	Node Guarding protocol and Heartbeat Producer protocol	-
Emergency Message	Yes	-
DeviceNet subscribe	-	Group 2 Only Server
Explicit Connection	-	Yes
Polled I/O Connection	-	Yes
Bit-Strobe I/O Connection	-	Yes
Heartbeat message	Yes	Yes
Shutdown message	-	Yes

Hardware :

1. Installation

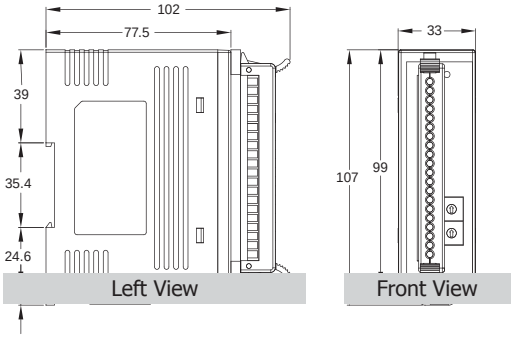
DIN-Rail Mounting

2. Appearance

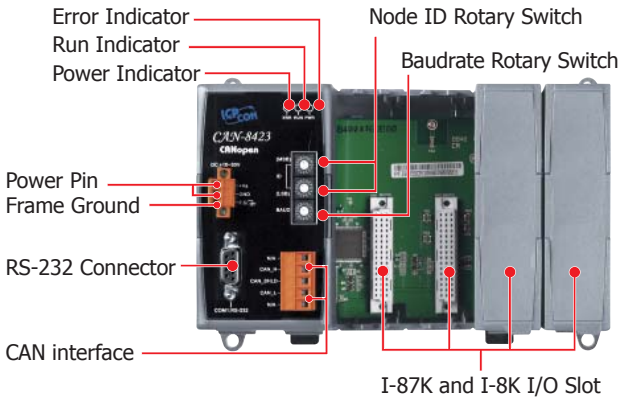


CAN-8423

3. Dimensions (Units: mm)

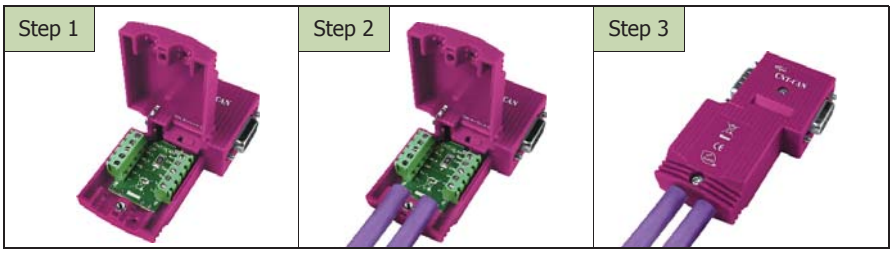


Left View | Front View



4. Optional Accessory

Optional CAN bus connector: CNT-CAN



Installation

3.11.1 Analog Input Modules

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. 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 equipments.

Thermocouple Introduction

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

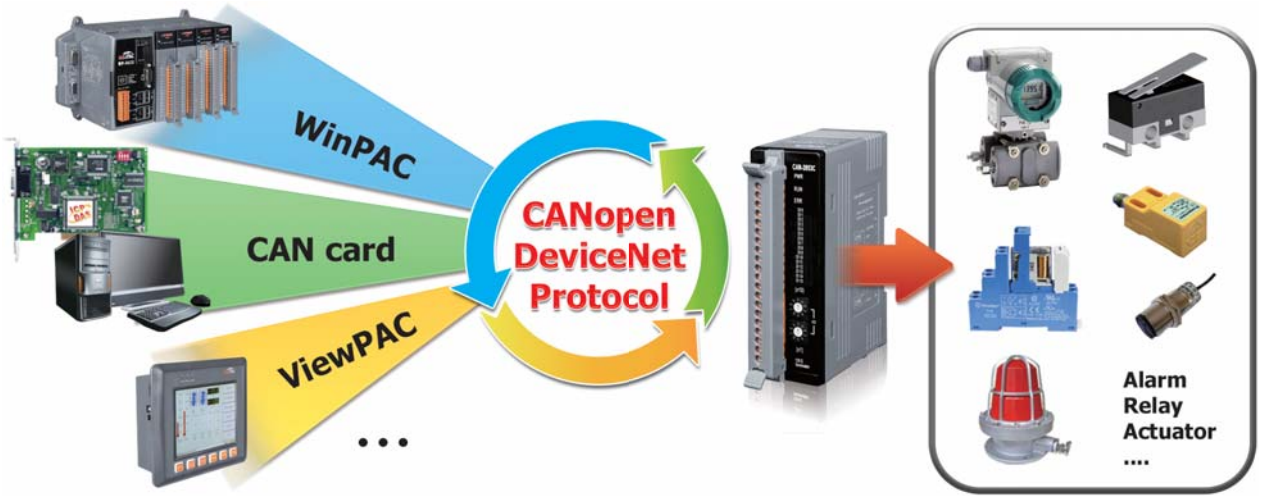
Based on the Seebeck effect in thermoelectricity, the temperature difference results voltage difference on the two wires.

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

Model Name	CANopen	CAN-2015C	CAN-2017C	CAN-2018C	CAN-2019C
	DeviceNet	CAN-2015D	CAN-2017D	CAN-2018D	CAN-2019D
Pictures		8-Ch RTD Input Module	8-Ch AI Module	8-Ch Thermocouple Input Module	10-ch Universal AI Module
					
AI					
Channels		8	8	8	10
Wiring		2/3 wire	Differential	Differential	Differential
Individual Channel		Yes	Yes	Yes	Yes
Sensor Type		RTD (Pt100, Pt1000, Ni120, Cu100, Cu1000, JPT100)	-	Thermocouple (J, K, T, E. R. S, B, N, C)	Thermocouple (J, K, T, E, R, S, B, N, C)
Voltage Input Range		-	±10 V, ±5 V, ±1 V ±500 mV, ±150 mV	±2.5 V, ±1 V, ±500 mV ±100 mV, ±50 mV, ±15 mV	±10 V, ±5V, ±2.5 V ±1 V, ±500 mV, ±100 mV ±50 mV, ±15 mV
Current Input Range		-	±20 mA (Required External 125 Ω Resistor)		
Resolution		16-bit	16-bit	16-bit	16-bit
Sampling Rate		10 Hz	10 Hz	10 Hz	10 Hz
Accuracy		±0.05 % of FSR	±0.1 % of FSR	±0.1 % of FSR	±0.1 % of FSR
Zero Drift		±0.5 μV/ °C	±10 μV/ °C	±10 μV/ °C	±10 μV/ °C
Span Drift		±20 μV/ °C	±25 μV/ °C	±25 μV/ °C	±25 μV/ °C
Overvoltage Protection		120 VDC / 110 VAC	240 Vrms	240 Vrms	240 Vrms
Input Impedance		20 MΩ	2 MΩ	400 kΩ	400 kΩ
System					
Isolation		3000 VDC for DC-to-DC, 3000 Vrms for bus-to-logic			
Watchdog		Yes			
Power					
Input range		Unregulated +10 ~ +30 VDC			
Environment					
Operating Temperature		-25 ~ +75°C			
Storage Temperature		-30 ~ +80°C			

3.11.2 Analog Output Modules

All of the CAN-2000 modules provide the EDS files for the standard CANopen and DeviceNet master. The analog output has various output ranges, i.e., ±10 V, ±5 V, 0~20 mA, etc. Each channel can be individually configured to the same or different output range. It is very convenient for applying the CAN-2000 modules into the CANopen and DeviceNet network.



Models	CANopen	CAN-2024C	CAN-2026C	CAN-2028C
	DeviceNet	CAN-2024D	CAN-2026D	CAN-2028D
Pictures		4-Ch AO Module	2-Ch AO, 6-Ch AI,1-Ch DO and 2-Ch DI Module	8-Ch AO Module
				
AO				
AO Channels		4	6	8
Wiring		Bipolar/Unipolar	Bipolar/Unipolar	Unipolar
Voltage Output Range		0 ~ +5 V ±5 V 0 ~ +10 V ±10 V	0 ~ +5 V ±5 V 0 ~ +10 V ±10 V	-
Current Output Range		0 ~ 20 mA +4 ~ 20 mA	-	0 ~ 20 mA +4 ~ 20 mA
Resolution		14-bit	12-bit	12-bit
Accuracy		Voltage : ±0.1 % of FSR Current : ±0.2 % of FSR	±0.1 % of FSR	±0.2 % of FSR
Output Capacity		Voltage : 10 V @ 5 mA Current : External +24 V : 1050 Ω	10 V @ 20 mA	External +24 V : 1050 Ω
Power on Value		Yes	Yes	Yes
Safe Value		Yes	Yes	Yes
System				
Isolation		3000 VDC for DC-to-DC, 3000 Vrms for bus-to-logic		
Watchdog		Yes		
Power				
Input range		Unregulated +10 ~ +30 VDC		
Environment				
Operating Temperature		-25 ~ +75°C		
Storage Temperature		-30 ~ +80°C		

3.11.3 Digital I/O Modules

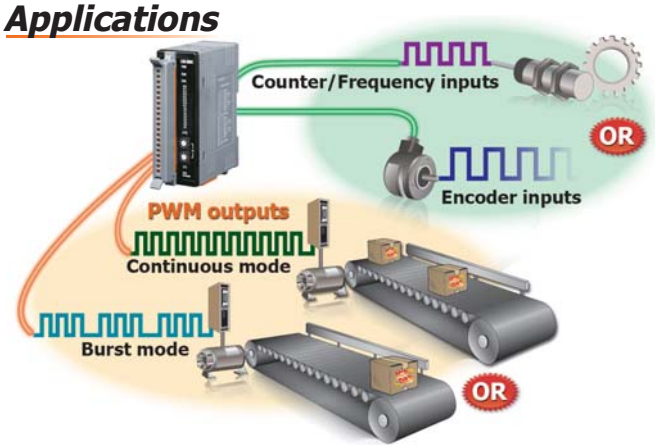
PWM Introduction

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. CAN-2088C and CAN-2088D have 8 PWM output channels and 8 digital inputs. It can be used to implement powerful and cost effective analog control systems.

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

Applications



Models	CANopen	CAN-2053C	CAN-2054C	CAN-2055C	CAN-2057C	CAN-2060C	CAN-2088C
	DeviceNet	CAN-2053D	CAN-2054D	CAN-2055D	CAN-2057D	CAN-2060D	CAN-2088D
Pictures		16-Ch DI	8-Ch DI, 8-Ch DO	8-Ch DI, 8-Ch DO	16-Ch DO	4-Ch DI, 4-Ch Relay Output	8-Ch DI, 8-Ch PWM Output
							
DI							
Channels		16	8		-	4	8
Isolation Voltage		3750 Vrms				3750 Vrms	2500 Vrms
Contact		Wet				Wet/Dry	Wet
Sink/Source (NPN/PNP)		Sink/Source				Sink/Source	Sink/Source
ON Voltage Level		+3.5 ~ +30 VDC				+10 ~ +50 VDC	+5.5 ~ 30 VDC
OFF Voltage Level		+1 VDC Max.				+4 VDC Max.	+3 VDC Max.
Counter		-				10 kHz	500 kHz Max.
DO							
Channels		-	8	8	16	4	8
Isolation Voltage			3750 Vrms	3750 Vrms	3750 Vrms	3750 Vrms	2500 Vrms
Type			Open Collector	Open Collector	Open Collector	Form A	PWM, TTL
Sink/Source (NPN/PNP)			Sink	Source	Sink	Sink	Sink
Load Voltage			+5 ~ +30 VDC	+5 ~ +30 VDC	+5 ~ +30 VDC	+5 ~ +30 VDC	+3.5 ~ +5 VDC
Max. Load Current			700 mA/channel	700 mA/channel	100 mA/channel	5A/channel	10 mA/Channel
Power on Value			Yes	Yes	Yes	Yes	-
Safe Value			Yes	Yes	Yes	Yes	-
System							
Isolation		3000 VDC for DC-to-DC, 2500 Vrms for bus-to-logic					
Power							
Input range		Unregulated +10 ~ +30 VDC					
Environment							
Operating Temperature		-25 ~ +75°C					
Storage Temperature		-30 ~ +80°C					

3.11.4 CANopen I/O Units

Features

- One ISO 11898-2 High Speed CAN Port
- Hot Swap Allowed
- Auto Configuration
- Standard CANopen LED Indicator
- Rotary Switch For Baud Rate and Node ID
- CANopen DS 301 Ver 4.02 Specification
- CANopen DS 401 Ver 2.1 Specification
- 1/2/4/8 I/O Slots for I-87K and I-8K Series Modules

Specifications

Models	CAN-8123	CAN-8223	CAN-8423	CAN-8823
CAN Interface				
Controller	NXP SJA1000T with 16 MHz clock			
Connector	5-pin screwed terminal block (GND, CAN_L, CAN_SHLD, CAN_H, V+)		5-pin screwed terminal block (N/A, CAN_L, CAN_SHLD, CAN_H, N/A)	9-pin screwed terminal block (N/A, CAN_L, CAN_SHLD, CAN_H, N/A)
Node ID	1~127 (By rotary switch)			
Baud Rate (bps)	10 k, 20 k, 50 k, 125 k, 250 k, 500 k, 800 k, 1 M (By rotary switch)			
Transmission Distance (m)	Depend on baud rate (for example, max. 1000 m at 50 kbps)			
Isolation	1000 VDC for DC-to-DC, 2500 Vrms for photo-couple			
Terminator Resistor	Jumper for 120 Ω terminator resistor			
Specification	ISO 11898-2, CAN 2.0A and CAN 2.0B			
Protocol	CANopen CiA 301 ver4.02, CiA 401 ver2.1			
I/O Expansion Slot				
Hot Swap	Only for I-87K modules			
Auto Configuration	Yes			
Support Module Type	High profile I-87K module, low profile I-87K module and I-8K module			High profile I-8K and I-87K module
Slots Numbers	1	2	4	8
Mechanism				
Dimensions (W x L x H)	64 mm x 119 mm x 91 mm	95 mm x 132 mm x 91 mm	188 mm x 132 mm x 91 mm	312 mm x 132 mm x 91 mm
Installation	DIN-Rail Mounting	DIN-Rail or Wall Mounting		
Environmental				
Operating Temperature	-25 ~ +75°C			
Storage Temperature	-30 ~ +80°C			
Humidity	10 ~ 90% RH (Non-condensing)			
Power				
Input Range	20 W unregulated +10 ~ +30 VDC			
Reverse Polarity Protection	Yes			
Frame Ground	No		Yes	
Consumption	1 W	2 W	2.5 W	3 W
Power Board Driving	20 W			

3.11.5 DeviceNet I/O Units

Features

- One ISO 11898-2 High Speed CAN Port
- Hot Swap Allowed
- Auto Configuration
- Standard DeviceNet LED Indicator
- Rotary Switch For Baudrate and Node ID
- DeviceNet Volume I Ver 2.0, Volume II Ver 2.0
- Predefined Master/Slave Connection Set
- 1/2/4/8 I/O Slots for I-87K and I-8K Series Modules

Specifications

Models	CAN-8124	CAN-8224	CAN-8424	CAN-8824
CAN Interface				
Controller	NXP SJA1000T with 16 MHz clock			
Connector	5-pin screwed terminal block (GND, CAN_L, CAN_SHLD, CAN_H, V+)		5-pin screwed terminal block (N/A, CAN_L, CAN_SHLD, CAN_H, N/A)	9-pin screwed terminal block (N/A, CAN_L, CAN_SHLD, CAN_H, N/A)
Node ID	1~63 (By rotary switch)			
Baud Rate (bps)	125 k, 250 k, 500 k (By rotary switch)			
Transmission Distance (m)	Depend on baud rate (for example, max. 500 m at 125 kbps)			
Isolation	1000 VDC for DC-to-DC, 2500 Vrms for photo-couple			
Terminator Resistor	Jumper for 120 Ω terminator resistor			
Specification	ISO 11898-2, CAN 2.0A and CAN 2.0B			
Protocol	DeviceNet Volume I ver2.0, Volume II ver2.0 Predefined Master/Slave Connection set			
I/O Expansion Slot				
Hot Swap	Only for I-87K modules			
Auto Configuration	Yes			
Support Module Type	High profile I-87K module, low profile I-87K module and I-8K module			High profile I-8K and I-87K module
Slots Numbers	1	2	4	8
Mechanism				
Dimensions (W x L x H)	64 mm x 119 mm x 91 mm	95 mm x 132 mm x 91 mm	188 mm x 132 mm x 91 mm	312 mm x 132 mm x 91 mm
Installation	DIN-Rail Mounting	DIN-Rail or Wall Mounting		
Environmental				
Operating Temperature	-25 ~ +75°C			
Storage Temperature	-30 ~ +80°C			
Humidity	10 ~ 90% RH (Non-condensing)			
Power				
Input Range	Unregulated +10 ~ +30 VDC			
Reverse Polarity Protection	Yes			
Frame Ground	No		Yes	
Consumption	1.7 W	2 W	2.5 W	3 W
Power Board Driving	20 W			

3.11.6 I/O Module Support List of CAN-8000 Units

Type	I-8K Series I/O High Profile	I-87K Series I/O High Profile	Description
AI module		I-87005W	8-Ch Thermistor Input Module
		I-87013W	4-Ch RTD Input Module
		I-87015W	7-Ch RTD Input Module
		I-87015PW	7-Ch RTD Input Module
		I-87016W	2-Ch Strain Gauge Input Module
	I-8017HW	I-87017W	8-Ch Voltage/Current Input Module
		I-87017W-A5	8-Ch Voltage/Current Input Module
		I-87017RW	8-Ch Voltage/Current Input Module
		I-87017RCW	8-Ch Current Input Module
		I-87018W	8-Ch Thermocouple Input Module
		I-87018RW	8-Ch Thermocouple Input Module
		I-87018ZW	10-Ch Thermocouple Input Module
		I-87019RW	8-Ch Universal AI Module
AO module			2-Ch Voltage/Current Output Module
	I-8024W	I-87024W	4-Ch Voltage/Current Output Module
			6-Ch AI, 2-Ch AO, 2-Ch DI, 2-Ch DO Module
DI module	I-8040W	I-87040W	32-Ch DI (wet, sink/source) Module
	I-8040PW	I-87040PW	32-Ch DI (wet, sink/source) Module
	I-8046W	I-87046W	16-Ch DI (dry, source) Module
	I-8051W	I-87051W	16-Ch DI (dry, source) Module
	I-8052W	I-87052W	8-Ch DI (wet, sink/source) DI Module
	I-8053W	I-87053W	16-Ch DI (wet/dry, sink/source) Module
	I-8053PW	I-87053PW	16-Ch DI (wet/dry, sink/source) Module
		I-87053W-A5	16-Ch DI (wet/dry, sink/source) Module
		I-87053W-E5	16-Ch DI (wet/dry, sink/source) Module
		I-87053W-AC1	16-Ch DI (VAC) Module
	I-8058W	I-87058W	8-Ch DI (VAC) Module
		I-87059W	8-Ch DI (VAC) Module
DO module	I-8037W		16-Ch DO (Open Collector, source) Module
	I-8041W	I-87041W	32-Ch DO (Open Collector, sink) Module
	I-8041AW		32-Ch DO (Open Collector, source) Module
	I-8056W		16-Ch DO (Open Collector, sink) Module
	I-8057W	I-87057W	16-Ch DO (Open Collector, sink) Module
	I-8060W		6-Ch Power Relay Module
	I-8064W	I-87064W	8-Ch Power Relay Module
		I-87065W	8-Ch AC SSR Relay Module
		I-87066W	8-Ch DC SSR Relay Module
	I-8068W	I-87068W	8-Ch Power Relay Module
	I-8069W	I-87069W	8-Ch PhotoMOS Relay Module
DI & DO module	I-8042W		16-Ch DI (wet, sink/source), 16-Ch DO (Open Collector, sink) Module
	I-8050W		16-Ch universal DIO (wet, sink) Module
	I-8054W	I-87054W	8-Ch DI (wet, sink/source), 8-Ch DO (Open Collector, sink) Module
	I-8055W	I-87055W	8-Ch DI (dry, source), 16-Ch DO (Open Collector, sink) Module
	I-8063W	I-87063W	4-Ch DI (wet, sink/source), 4-Ch Power Relay Module
Counter module	I-8084W		8-Ch Counter/Frequency Input Module
PWM module	I-8088W		8-Ch DI, 8-Ch PWM Output Module

Note: CAN-8823 and CAN-8824 only support high profile I-8K and I-87K modules.

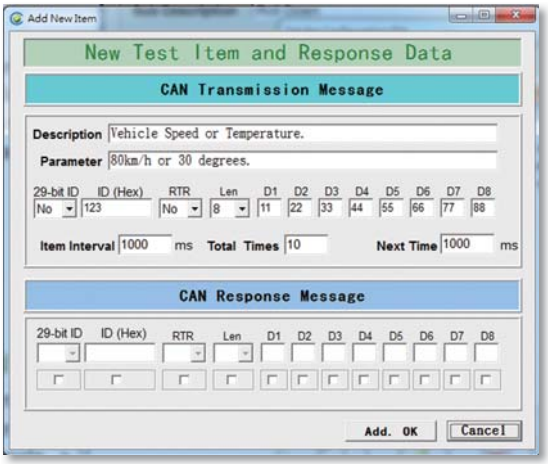
3.12 CANcheck

CANcheck – the software is developed by ICP DAS for CAN device detection and diagnosis. It is consisted of seven parts.

4

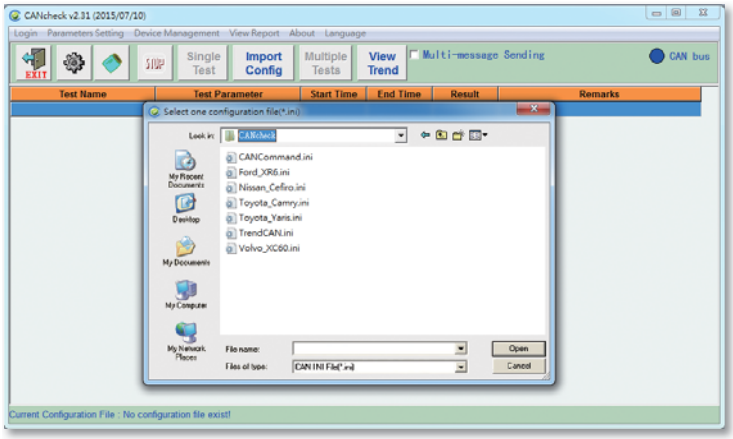
• CAN Message Modeling

Users can model the vehicle CAN protocol or other special CAN protocol, set to the CANcheck software, the software will be able to follow the CAN command set and command transfer cycle. Users could provide the meaningful description for each CAN command. This helps to manage and identify all the complex CAN commands.



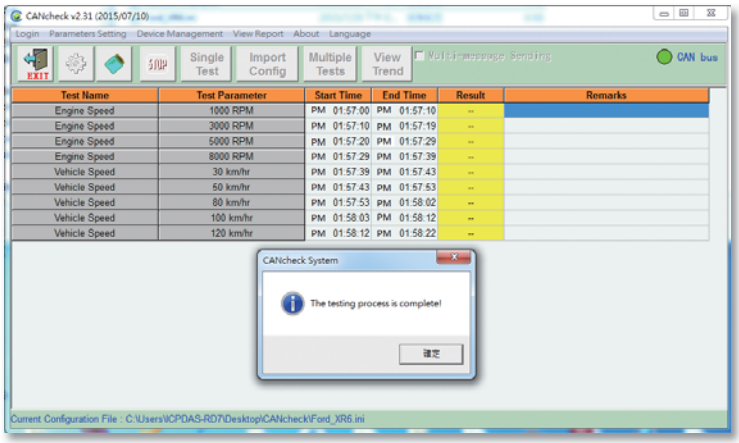
• CAN Message Management

Different CAN message sets can be stored in different configuration files. The user can easily pipe different configuration files for different test cases. For example, a car factory can store several different cars' data in different configuration files, and then call the corresponding one as needed to test each car.



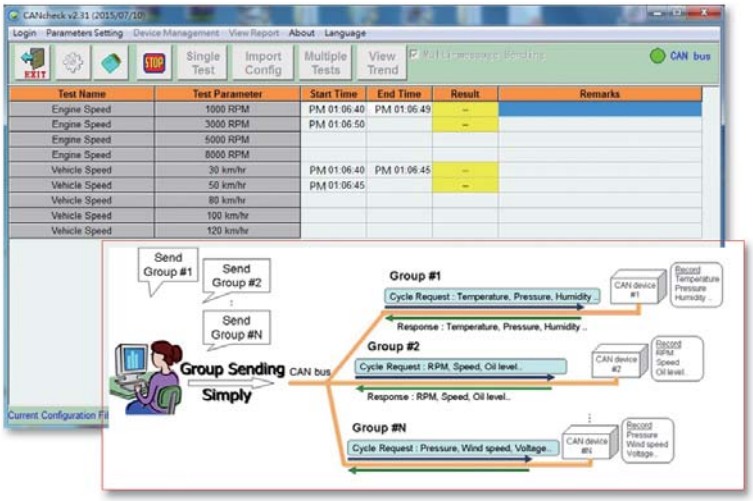
• CAN Message Verification

Different CAN instruments have different command sets; correspondingly, the return messages also differ. CANcheck can be used to perform verification of expected return messages – an easy way of error-checking operations. This feature does away with manual log-checking, and with it human error and tedium.



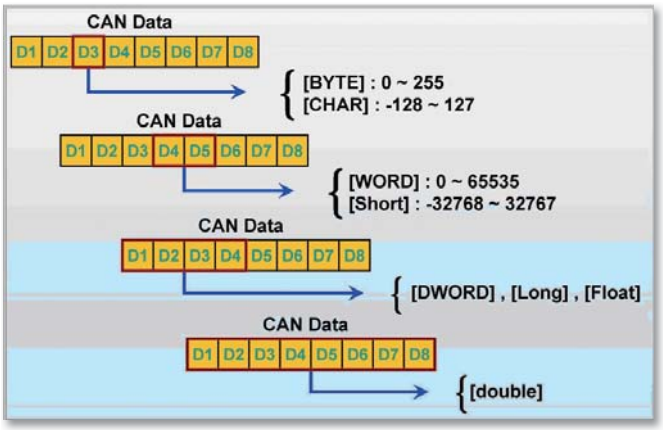
• CAN Message Group

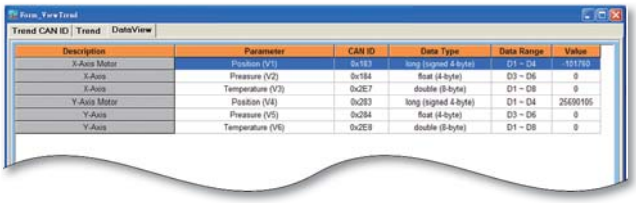
In most of CAN applications, the CAN master sometimes iteratively polls entire remote devices with the sequential CAN commands. In the multi-message sending mode, CAN messages will be divided into groups according to CAN-ID. In single group, the CAN commands will be sent sequentially at specific time interval. Every group could work individually at the same time. It will simplify the CAN application projects and help to manage CAN devices more efficiently.



• CAN Data Conversion

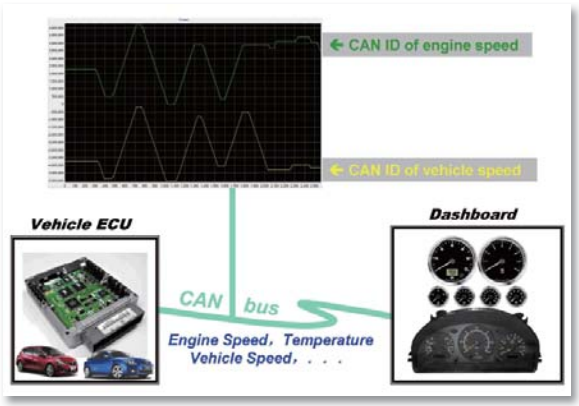
The CANcheck software provides the functionality of implementing the conversion of the CAN data. The CAN data of the specific CAN ID could be converted to the value of "long" type, "float" type and etc. When receiving the specific CAN messages, the CAN data will be converted to the specific data type and data value quickly and automatically. The users could focus on those converted value and need not to convert for each raw data manually. This conversion will help the users to deal with the huge raw data more friendly.

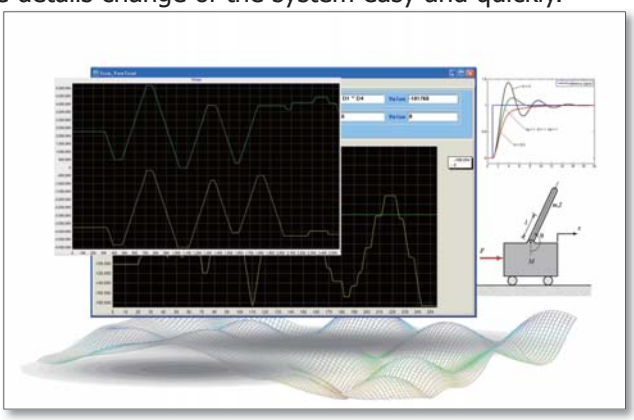




• Trend Chart Functionality

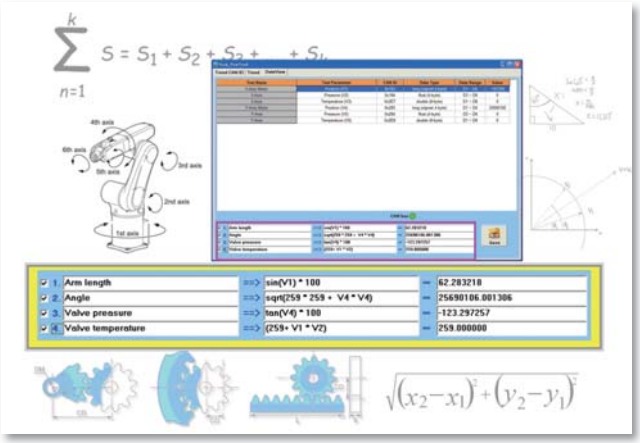
The CAN messages transmitted on the CAN bus always contains much important information. One part of the information is used to control the system by the host controller, and the other which may not be used by the host controller is interested during the trial run. The CANcheck offers the visualization tool, the trend chart, to monitor the information. It can transfer the raw CAN data into the meaningful and physical information, such as engine speed, vehicle speed and fuel consumption, and show these on the trend chart. Without any modification of the host controller, users can obtain the details change of the system easy and quickly.





• Real-Time Mathematic Functions

In some applications, the meaningful information must be obtained via a serious of complex mathematical calculation from the raw CAN messages. The CANcheck allows users to arrange up to 4 groups of the mathematical formulas which will transfer the raw data to the useful information instantly while the CAN messages are received. Combined with the trend chart, it is a very useful and helpful toolkit for monitoring or debugging the systems.



The detailed features are:

(1) No need to write any programs. The graphical interface is ready-made and easy to operate.

(2) Limited to neither the vehicle nor instrument brand; it's interoperable.

(3) The CAN communication protocol settings file protects against security leaks, ensuring safe operation.

(4) Can set the returned CAN discrimination, eliminating the hassle of wading through logs and manually interpreting results.

(5) Can be used to operate and diagnose lights, windows, dashboard or other vehicular electronic systems and components.

(6) Supports CAN 2.0A and CAN 2.0B specifications.

(7) The test command planning interface to set the test command, the transfer cycle, detecting the reply command and users' description.

(8) Can store commands to the specific file.

(9) Supports both the single- and multi-function tests. In multi-function testing, the software provide multi-message sending option.

(10) Provides time stamps for the beginning and end of each test.

(11) Displays real-time CAN status

(12) Provides the data conversion from the received CAN messages automatically.

(13) Supports two trends to display the real-time waveform which comes from the CAN messages.

(14) Provides four free-edited mathematic functions to transfer the raw data instantly and automatically.

(15) Provides English, Traditional Chinese and Simple Chinese interfaces.

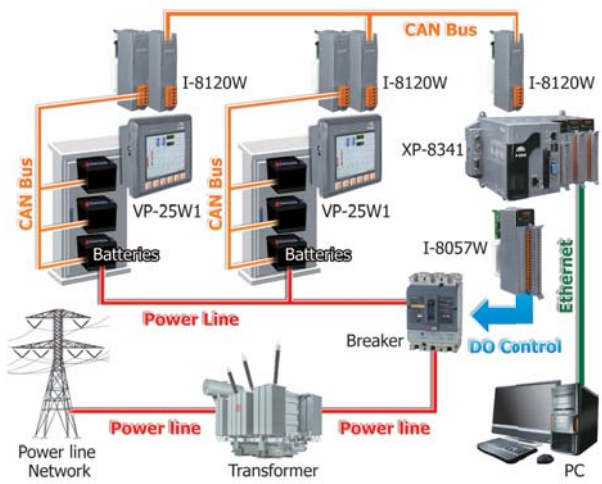
Supported OS: Windows XP, 7

Supported CAN board, converter: PISO-CAN100U,PISO-CAN200U, PISO-CAN400U, PISO-CAN-800U, PEX-CAN200i, PCM-CAN200, PCM-CAN200P, I-7530, I-7530-FT, I-7530A, I-7530A-MR, I-7540D, I-7540D-MTCP, I-7565, I-7565-H1, I-7565-H2

Ordering Information

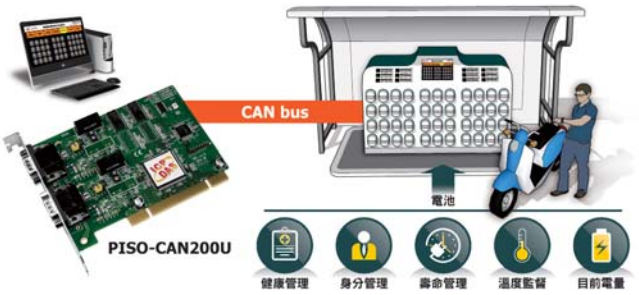
CANcheck	Software for CAN device detection and diagnosis, USB keypro included

3.13 Case Studies



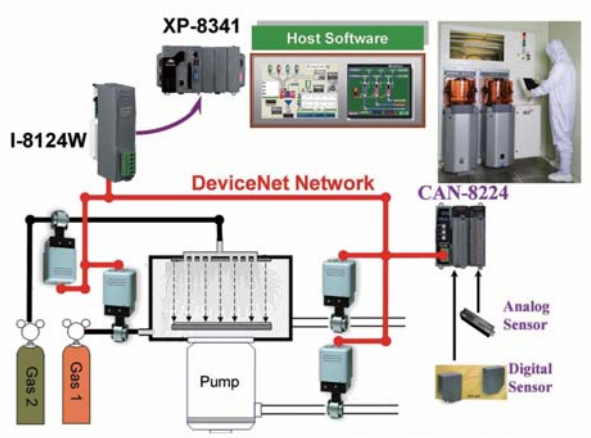
Energy Storage System

- Location: Guangdong, China
- Product: I-8120W, I-8057W, VP-25W1, XP-8341
- The result of the quantity control of each recipe material seriously affects the quality of the concrete. In order to adjust each quantity promptly, CAN Bus is applied. In this system, the PISO-CM100U is used to monitor the weight of each material from the load cells, and sends the recipe to the PLC. Meanwhile, the PC updates all the data to the screen. By using the user-defined firmware in the CPU of the PISO-CM100U, the PC loading can be effectively reduced, and the system becomes more smooth and reliable.



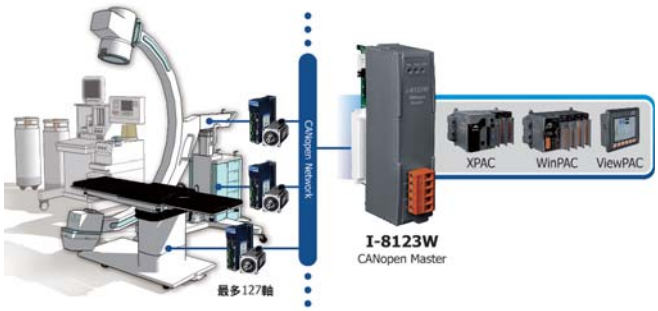
Charging System in the Battery Exchange Station

- Location: Taiwan
- Product: PISO-CAN200U
- The battery exchange station uses PISO -CAN200U for real-time monitoring control of all battery charging conditions, including battery temperature, SOC, charging current .... and so on, each battery is unique system code, so you can count the usage hours of each battery and the number of charging and discharging, can estimate the battery life and calculate the battery health rating.



CVD/PECVD Semiconductor Machine

- Product: XP-8341, I-8124W, CAN-8124
- 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.

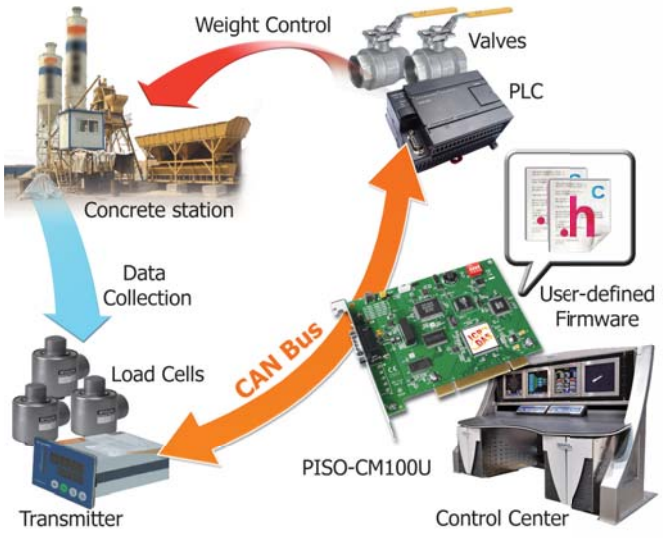


X-Ray Fluoroscopy Operation Table

- Location: Taiwan
- Product: XP-8341, I-8123W, CAN-2054C
- The Moden operation table uses CANopen motion control. External noise cannot cause motor malfunction. The multi-axis interpolation function of the I-8123W allows it to be used in surgical procedures. When the bed rotates the patient, it can maintain a specific positioning point or tumor position in the patient's body and still remain in the original three-dimensional space without shifting. This surgical bed has received a number of medical certifications and patents in many countries.

Concrete Station Monitor & Control System

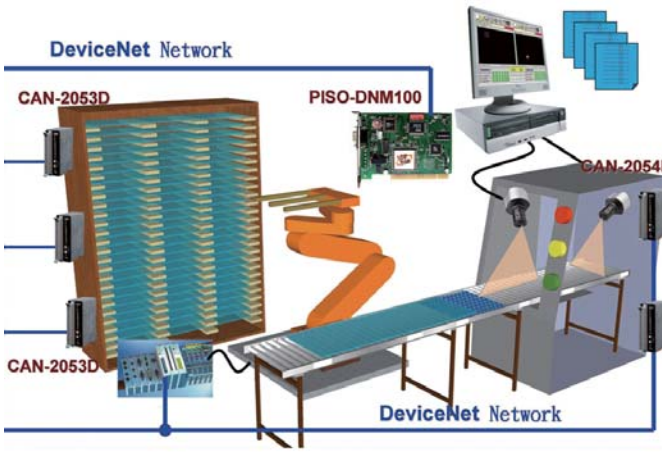
- Location: Hunan, China
- Product: PISO-CM100U
- The result of the quantity control of each recipe material seriously affects the quality of the concrete. In order to adjust each quantity promptly, CAN Bus is applied. In this system, the PISO-CM100U is used to monitor the weight of each material from the load cells, and sends the recipe to the PLC. Meanwhile, the PC updates all the data to the screen. By using the user-defined firmware in the CPU of the PISO-CM100U, the PC loading can be effectively reduced, and the system becomes more smooth and reliable.



4

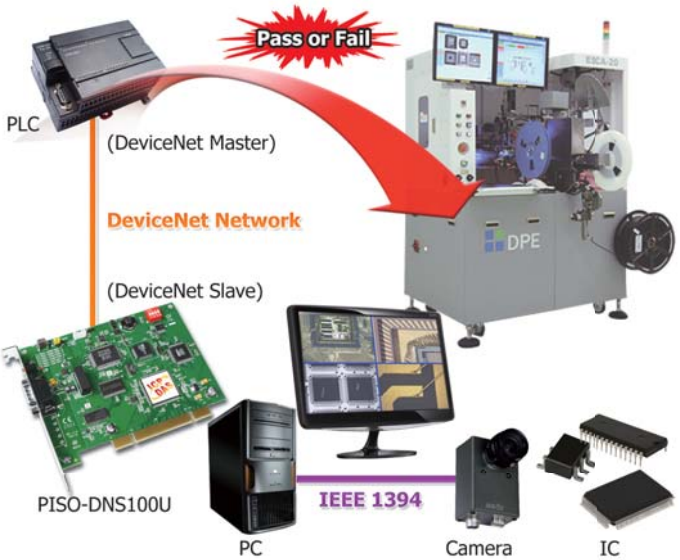
LCD Glass Inspection System

- Product: PISO-DNM100U, CAN-2053D, CAN-2054D
- The system is to check that the LCD glass is good or not. Nowadays, the LCD is larger and larger. They need a system to check glass instead of human. There exists a DeviceNet network to control all remote I/O devices. The PC and PISO-DNM100U acts the DeviceNet master and accesses the remote device like sensor, barcode, robot and etc. There exists inspection software in the PC. It would make the robot to load the glass into the equipment. Complete inspecting the glass, the software would record the result of the glass and unload the glass. This system really helps finding defect glass and improving the quality of the product.



IC Inspection Machine

- Location: Hsinchu, Taiwan
- Product: PISO-DNS100U
- The IC inspection process is necessary for a good quality control. Though the PLC is cheap and stable, the IC inspection is a tough work for a PLC. The customer uses PC+ camera + PISO-DNS100U to do the IC inspection, and uses PLC to control the mechanism for rejecting the defective ICs. After finishing the inspection, the PC writes the result to the PISO-DNS100U. Because the PLC is a DeviceNet master, it can easily get the information from the PISO-DNS100U via DeviceNet network.



4. PROFIBUS Products

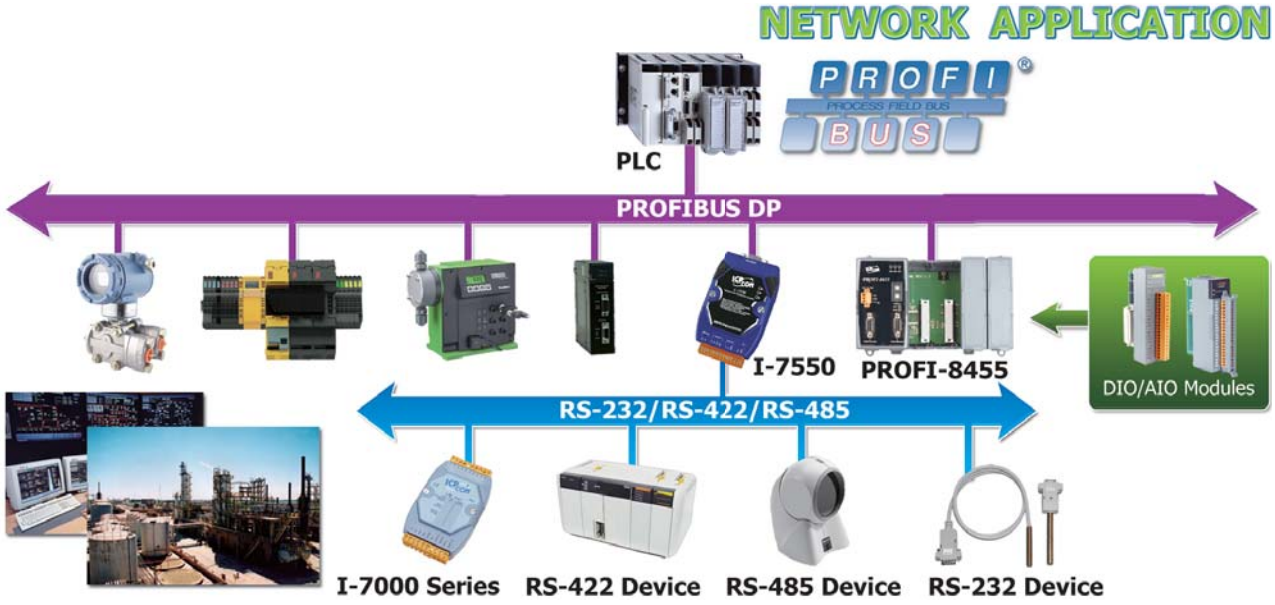
4.1 Overview

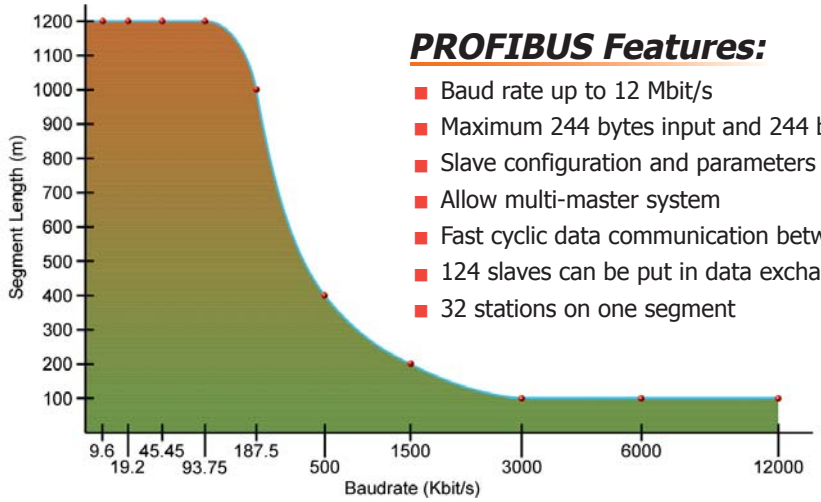
PROFIBUS (Process Field Bus) is a standard for fieldbus communication in automation technology and was first promoted (1989) by BMBF (German department of education and research). It is the world's most successful fieldbus, with more than 31 million devices installed by the end of 2009. Over 5.4 million of these were in the process industries.

PROFIBUS (PROCESS FIELD BUS) which is anchored in the international standards IEC 61158 and IEC 61784, is an open, digital communication system with a wide range of applications, particularly in the fields of factory and process automation. It is suitable for both fast, time-critical applications and complex communication tasks. ICP DAS provides a lot PROFIBUS DP products and help the user develop PROFIBUS application system easily. We have been developing and studying PROFIBUS DP for years. ICP DAS will always secure user's industrial safety and stable automation system as our mission.

Features:

- 124 slaves can be put in Data Exchange
- Maximum 244 bytes input and 244 bytes output per slave
- Fast Cyclic data communication between master and slave
- Slave configuration and parameters are set from the master side by GSD file
- Allow Multi-master system
- 32 stations on one segment
- Baudrate up to 12Mbit/s



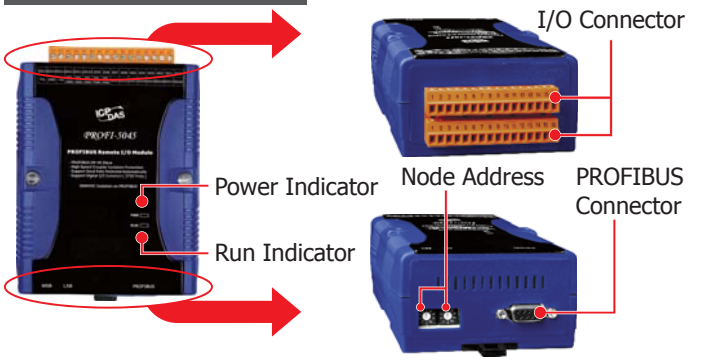


PROFIBUS Features:

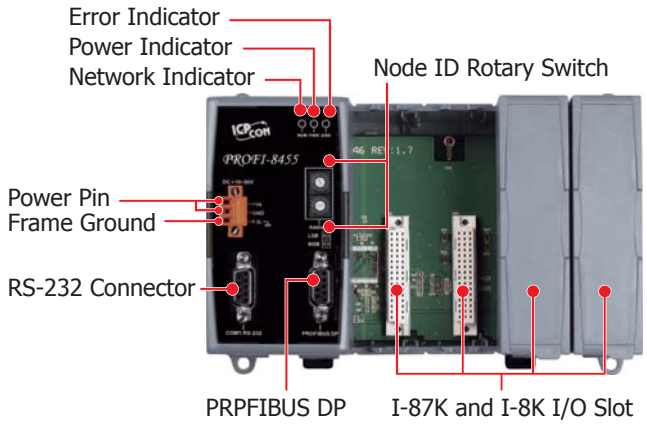
- Baud rate up to 12 Mbit/s
- Maximum 244 bytes input and 244 bytes output per slave
- Slave configuration and parameters are set from the master side by GSD file
- Allow multi-master system
- Fast cyclic data communication between master and slave
- 124 slaves can be put in data exchange
- 32 stations on one segment

Appearance:

PROFI-5000



PROFI-8455

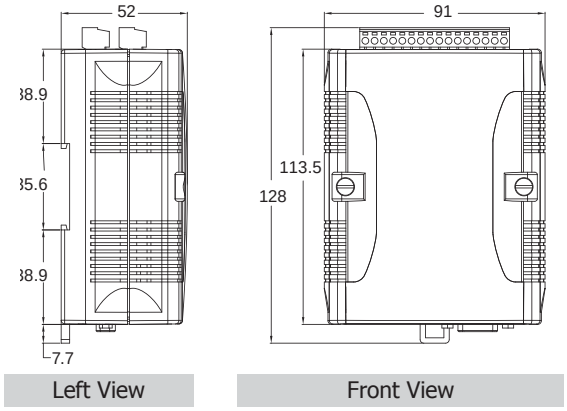


Hardware:

1. Installation

DIN-Rail Mounting

2. Dimensions (Units: mm)



Left View | Front View

OSI Model

Application	PROFIBUS DP (DP-V0,DP-V1,DP-V2)	IEC 61158-600-2 IEC 61158-500-2
Presentation	Not Used	
Session		
Transport		
Network		
Data Link	Fieldbus Data Link (FDL)	IEC 61158-400-3 IEC 61158-300-2
Physical	RS-485/IEC 1158-2/Fiber Optic	IEC 61158-2

Engineering Tools		GSD,EDD,FDT					User Program
Application Profiles	Specific Profiles	PROFI drive	PA Devices	Ident Systems	Encoder	...	
	Common Profiles	PROFIsafe, I&M, iPar-Server, Time Stamp, Redundancy					

Selection Guide

Model Name		Description
Converters	I-7550	PROFIBUS to RS-232/422/485 Converter
	I-7550E	PROFIBUS to Ethernet Converter
	PROFI-2510	Isolated PROFIBUS Repeater
	PROFI-2541	PROFIBUS to Fiber (ST connector) Converter
	PROFI-2541-SC	PROFIBUS to Fiber (SC connector) Converter
	PROFI-2542-SC	PROFIBUS to Single mode Fiber (SC connector) Converter
Gateway	GW-7552	PROFIBUS DP Slave to Modbus RTU Master Gateway
	GW-7553	PROFIBUS DP Slave to Modbus TCP/RTU Master Gateway
	GW-7553-CPM	PROFIBUS DP Slave to CANopen Master Gateway
	GW-7557	PROFIBUS DP Slave to HART Master Gateway
Remote I/O Modules	PROFI-5017	PROFIBUS-DP I/O Module with 8-Ch Voltage Inputs
	PROFI-5017C	PROFIBUS-DP I/O Module with 8-Ch Current Inputs
	PROFI-5018	PROFIBUS-DP I/O Module with 10-Ch Thermocouple Inputs
	PROFI-5024	PROFIBUS-DP I/O Module with 4-Ch Voltage/Current Outputs
	PROFI-5045	PROFIBUS-DP I/O Module with 24-Ch DO
	PROFI-5050	PROFIBUS-DP I/O Module with 16-Ch DI, 8-Ch DO
	PROFI-5051	PROFIBUS-DP I/O Module with 24-Ch DI
	PROFI-5052	PROFIBUS-DP I/O Module with 12-Ch DI
	PROFI-5053	PROFIBUS-DP I/O Module with 24-Ch DI
	PROFI-5055	PROFIBUS-DP I/O Module with 8-Ch DI, 8-Ch DO
	PROFI-5060	PROFIBUS-DP I/O Module with 8-Ch DI, 6-Ch Relay
Remote I/O units	PROFI-8155	PROFIBUS-DP I/O Unit with 1 I/O slot
	PROFI-8255	PROFIBUS-DP I/O Unit with 2 I/O slots
	PROFI-8455	PROFIBUS-DP I/O Unit with 4 I/O slots
	PROFI-8855	PROFIBUS-DP I/O Unit with 8 I/O slots
Accessories	CNT-PROFI	PROFIBUS 9-pin D-Sub Male Connector

4.2 PROFIBUS Converters & Repeaters

The PROFIBUS repeaters/converters are used to solve the issues of the PROFIBUS segment, transmission distance and disturbance when setting up a PROFIBUS network. If it is necessary to integrate the different communication interface, the PROFIBUS converter is helpful. The application architectures as following figures provide the examples to show when and how to apply these products.

Models	I-7550	I-7550-E	PROFI-2510
Pictures	PROFIBUS to RS-232/422/485 Converter	PROFIBUS to Ethernet Converter	Isolated PROFIBUS Repeater
			
PROFIBUS Channel	1		2
PROFIBUS Baud Rate (bps)	9.6 k ~ 12 M		
PROFIBUS Protocol	DP-V0 Slave		DP-V0/DP-V1/DP-V2
PROFIBUS Address	0 ~ 126 set by DIP switch		–
PROFIBUS Transmission Distance (m)	Depend on baud rate		
COM 1	RS-232/RS-485/RS-422	RS-232	–
COM 1 Baud Rate (bps)	1.2 K ~ 115.2 K	115.2 K	–
Ethernet Speed	–	10/100 M	–
Ethernet Protocol	–	TCP/UDP Server/Client	–

Models	PROFI-2541	PROFI-2541-SC	PROFI-2542-SC
Pictures	PROFIBUS to Fiber Converter	PROFIBUS to Fiber Converter	PROFIBUS to Fiber Converter
			
PROFIBUS Channel	1		
PROFIBUS Baud Rate (bps)	9.6 k ~ 3 M		9.6 K~12 M
PROFIBUS Protocol	DP-V0/DP-V1/DP-V2		
PROFIBUS Transmission Distance (m)	Depend on baud rate		
Fiber Channel	1		
Fiber Connector	ST (Multi-mode)	SC (Multi-mode)	SC (Single-mode)
Fiber Transmission Distance (m)	1.4 km Max. (in 62.5/125 μm fiber cable)		10 KM Max.

Accessories:

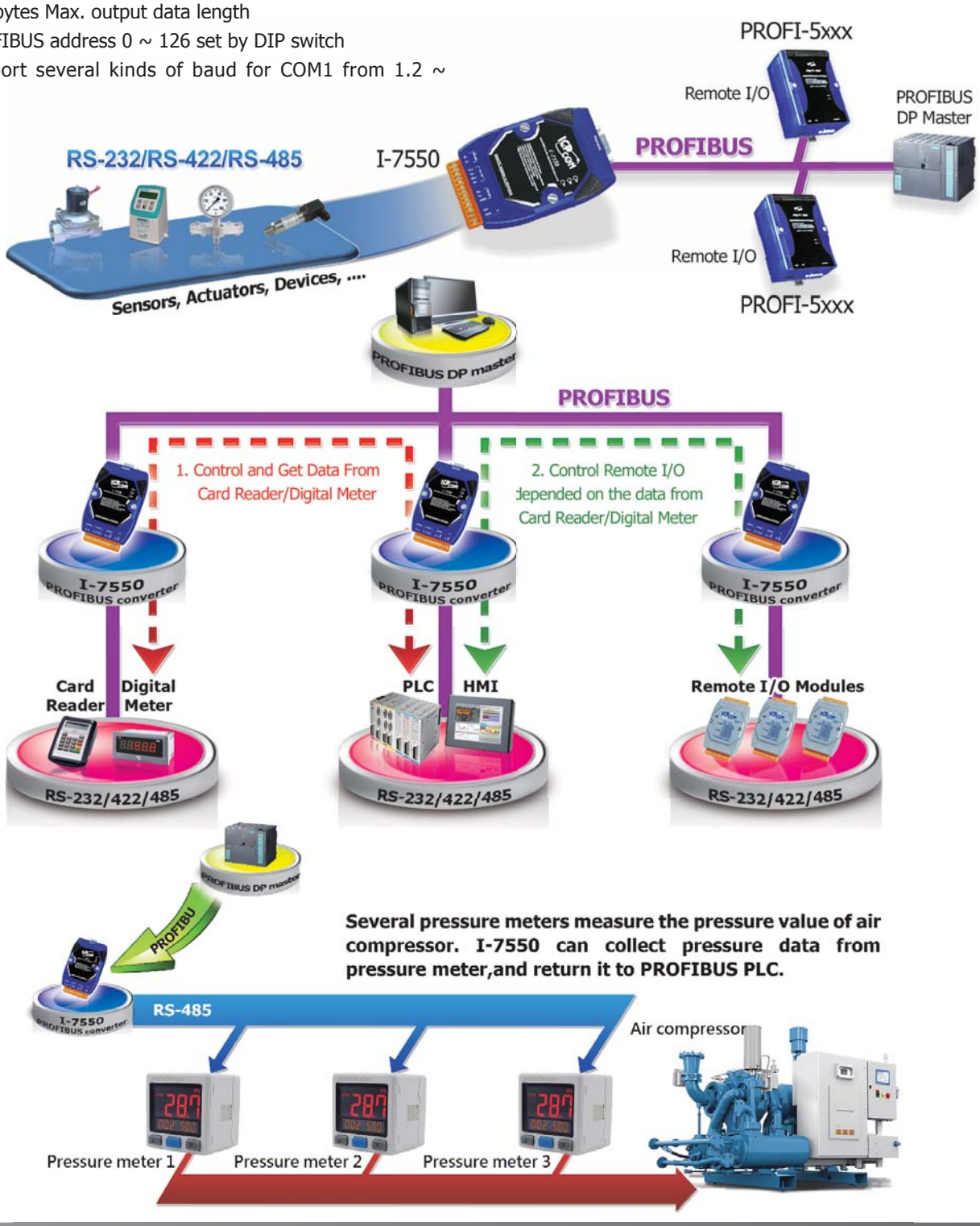
Optional PROFIBUS connector: CNT-PROFI

Installation

I-7550 PROFIBUS to RS-232/422/485 Converter

The I-7550 converter is specially designed for the slave device of PROFIBUS DP protocol. It offers RS-232, RS-422, and RS-485 communication ports. With the hybrid design of the COM 1, you can choose one type of this COM port for implement. Through the I-7550, applying RS-232/RS-422/RS-485 devices into PROFIBUS network is getting easily.

- Protocol PROFIBUS DP-V0 slave
- Detect transmission rate (9.6 to 12000 kbps) on PROFIBUS automatically
- 128 bytes Max. input data length
- 128 bytes Max. output data length
- PROFIBUS address 0 ~ 126 set by DIP switch
- Support several kinds of baud for COM1 from 1.2 ~ 115.2 kbps
- Network isolation Protection: 2500 Vrms high speed iCoupler
- 3000 VDC isolation protection on PROFIBUS side



I-7550-E PROFIBUS to Ethernet Converter

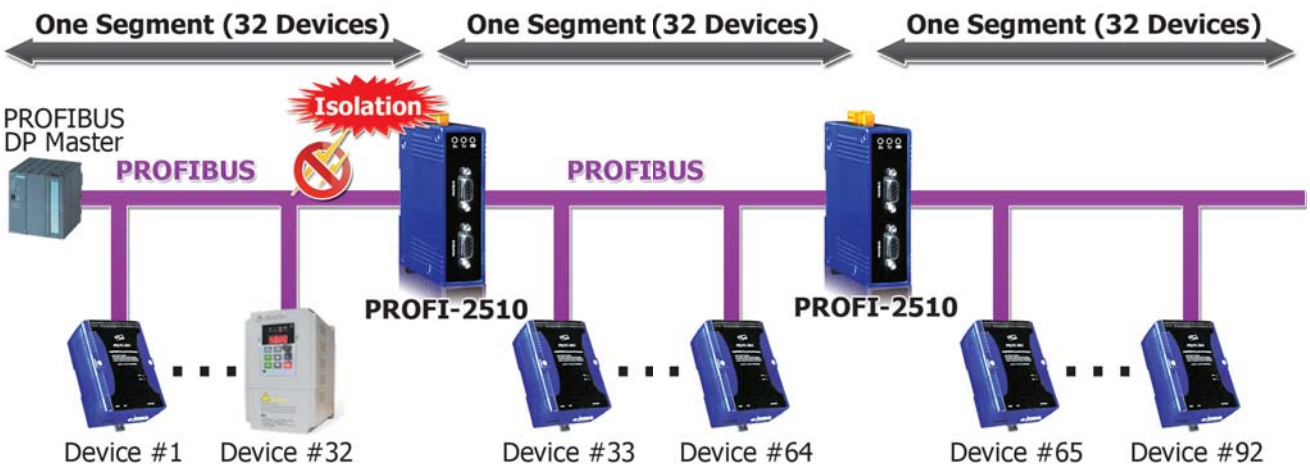
The I-7550-E converter is a PRFIBUS DP slave device that provides the communication between PRFIBUS master device and Ethernet device. In the Ethernet network, the I-7550-E offers TCP and UDP Protocol. It can be set as Server to access TCP/UDP clients, or be set as Client to connect with TCP/UDP Server. I-7550-E also provides web configuration that helps user setup the communication of Ethernet. Through the I-7550-E, applying Ethernet device into PROFIBUS network is getting easily.

- Protocol PROFIBUS DP-V0 slave
- 240 bytes Max. input data length
- 240 bytes Max. output data length
- Support Web Configuration
- Support TCP/UDP Client/Server
- Support Ethernet/RS-232 update firmware
- PROFIBUS address 0 ~ 126 set by DIP switch
- Support one 10/100 Base-TX Ethernet port
- Network isolation protection: 2500 Vrms high speed iCoupler
- Detect transmission rate (9.6 to 12000 kbps) on PROFIBUS automatically

PROFI-2510 Isolated PROFIBUS Repeater

The PROFI-2510 is a PROFIBUS repeater adaptor. According to the RPOFIBUS DP specification, there are maximum 32 devices in one PROFIBUS network segment. The maximum bus length of one segment is decided by the network baud rate. Any two segments need to be connected with each other by a repeater adaptor. If the users' application structure includes more than 32 PROFIBUS devices in the network or has more than 1 network segment in order to extend the total bus length, the PROFI-2510 is helpful to solve the issue of the bus length or device number expansion. As other Fieldbus networks, the PROFIBUS network also follows daisy-chain topology. Through the PROFI-2510, it is allowed that users are able to set up their PROFIBUS networks by using various topologies, such as stub lines, tree topology, and star topology.

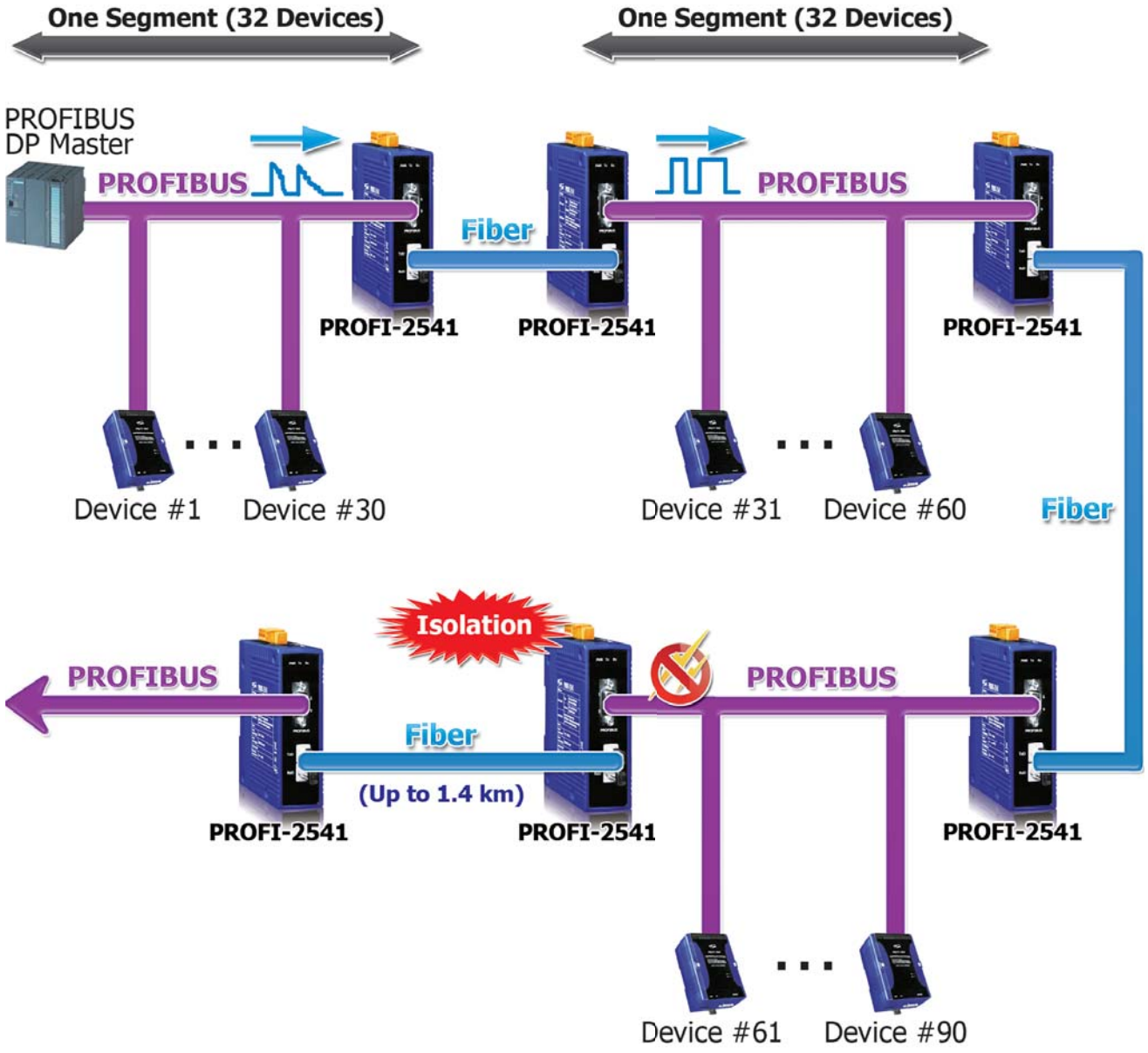
- Provide status LEDs
- 2500 VDC isolation protection on PROFIBUS side
- 4 kV Contact ESD protection for any terminal
- Detect transmission rate (9.6 k ~ 12000 kbps) automatically
- Wide range of power input (10 ~ 30 VDC) and operating temperature (-25 ~ +75°C)
- No additional space needed in the cabinet
- Can be used as a bus extension or spur line
- Increases the number of nodes



PROFI-2541 PROFI-2541-SC Isolated 4-Port CAN Bus Switch

Similar to the PROFI-2510, the PROFI-2541 can reshape the PROFIBUS waveform disturbed by the noise, and expand the connectable number of the PROFIBUS devices in the network. The difference is that the PROFI-2541 offers the fiber optic interface which can transfer the PROFIBUS messages to fiber signals, and users can extend the PROFIBUS bus length as the maximum transmission distance of the applied fiber optic. Users can use one pair of the PROFI-2541s instead of more repeaters while extending the bus length. The PROFI-2541 has passed the test of the 4 kV contact ESD, and provides the isolation protections on each PROFIBUS communication port. This feature means that the PROFIBUS-2541 can offer effective protection, and prevent the devices of one segment from the noise of the other segments.

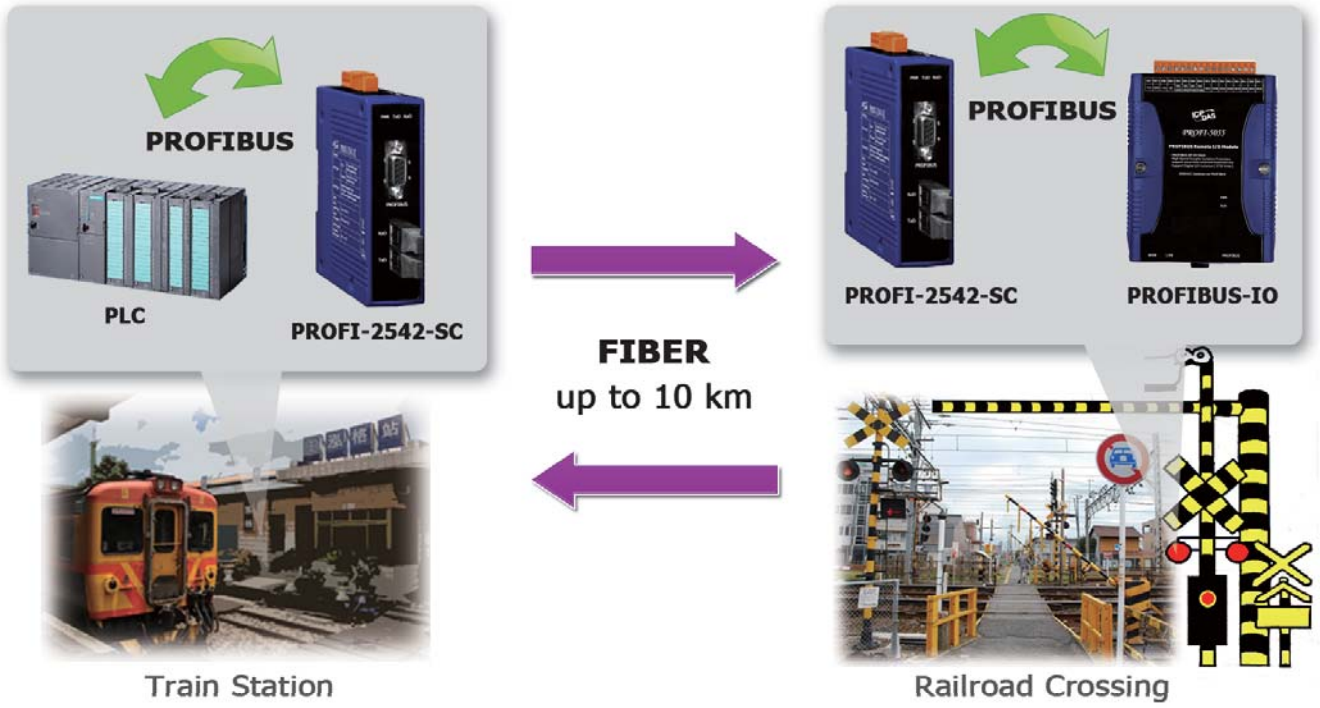
- Fiber Port: ST (Multi-mode)
- Wave Length: 850 nm
- Provide status LEDs
- 2500 VDC isolation protection on PROFIBUS side
- 4 kV Contact ESD protection for any terminal
- Detect transmission rate (9.6 k ~ 3000 kbps) automatically
- Wide range of power input (10 ~ 30 VDC) and operating temperature (-25 ~ +75°C)



PROFI-2542-SC Isolated PROFIBUS Repeater

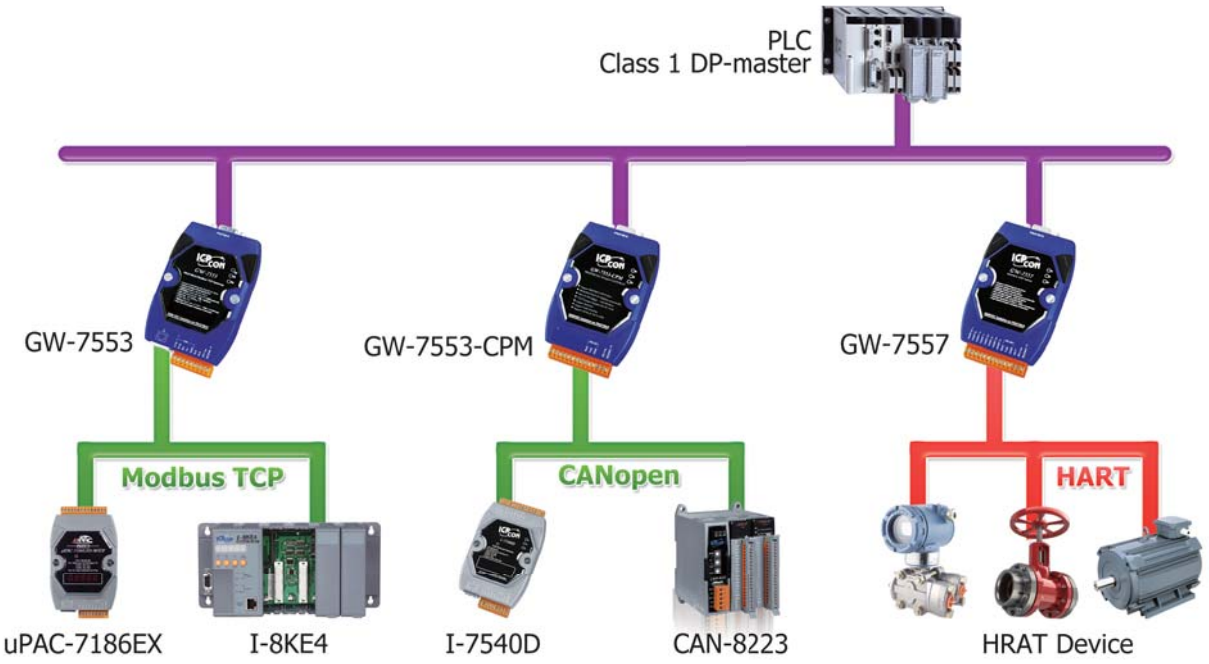
The PROFI-2542-SC is a PROFIBUS to single mode fiber optic converter which secures PROFIBUS data transmission via single mode fiber optic for providing immunity from EMI/RFI interference. It is used in PROFIBUS applications for transferring PROFIBUS signal from wire to single mode fiber optic and vice versa, and is the perfect solution for applications where transmission must be protected from electrical exposure, surges, lighting or chemical corrosion.

- Protocol : PROFIBUS DP
- Detect transmission rate (9.6 ~ 12000 kbps) automatically
- Max transmission speed up to 12 Mbps for PROFIBUS
- Transparency on both side
- Fiber Port: SC (Single-mode)
- Wave Length: 1310 nm
- Network Isolation Protection: High Speed iCoupler
- 3000 VDC isolation protection on PROFIBUS side
- 4 kV ESD Protection
- Removable terminal block



4.3 PROFIBUS Gateways

The PROFIBUS gateway is used to solve data-exchanging between different communication network and PROFIBUS network. If it is necessary to integrate different communication protocols to PROFIBUS, the PROFIBUS gateway is helpful. The application architectures as following figures provide the examples to show when and how to apply these products.

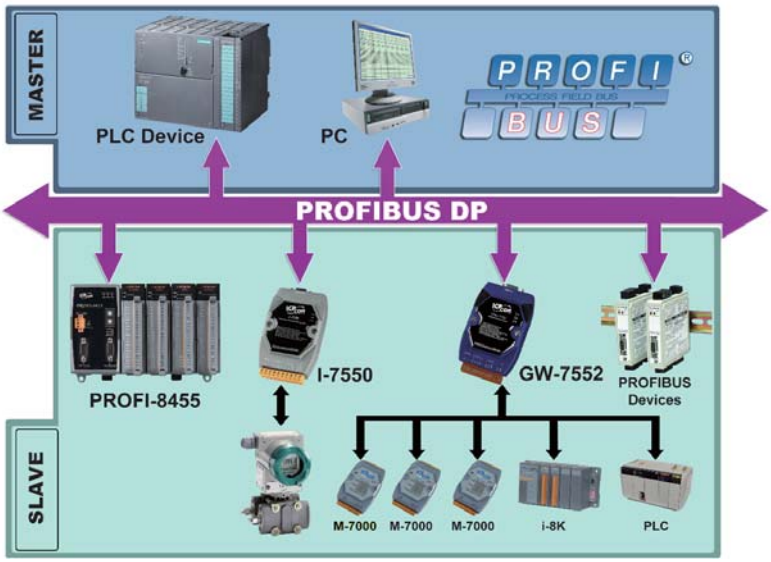


Models		GW-7552	GW-7553	GW-7553-CPM	GW-7557
Pictures		PROFIBUS DP Slave to Modbus RTU Gateway	PROFIBUS DP Slave to Modbus TCP/RTU Gateway	PROFIBUS DP Slave to CANopen Gateway	PROFIBUS DP Slave to HART Master Gateway
					
PROFIBUS	Channel	1			
	Baud Rate (bps)	9.6 k ~ 12 M			
	Protocol	DP-V0 Slave	DP-V0 Slave/DP-V1 Slave	DP-V0 Slave	
	Input/Output Data Length	132/131 Bytes	240/240 Bytes		
COM port	Type	1 x RS-232/422/485	1 x RS-232		
	Baud Rate (bps)	2.4 k ~ 115.2 k			
	Protocol	Modbus RTU/ASCII, Master/Slave		Only for configuration	
Ethernet Port	Speed	–	10/100 M	–	–
	Protocol	–	Modbus TCP Server/ Client	–	–
HART	Channel	–		–	4
	Protocol	–		–	HART Master
CANopen	Channel	–		1	–
	Baud Rate (bps)	–		10 K, 20 K, 50 K, 125 K, 250 K, 500 K, 800 K, 1 M	–
	Protocol	–		CANopen master	–

GW-7552 PROFIBUS DP Slave to Modbus RTU Master Gateway

The GW-7552 gateway is a PROFIBUS DP slave. It allows the PROFIBUS master to access the Modbus RTU devices. In the Modbus network, the GW-7552 can be a master to access the Modbus slaves, or be a slave to provide the data from the PROFIBUS master. The flexible design lets the GW-7552 widely applying in the many applications.

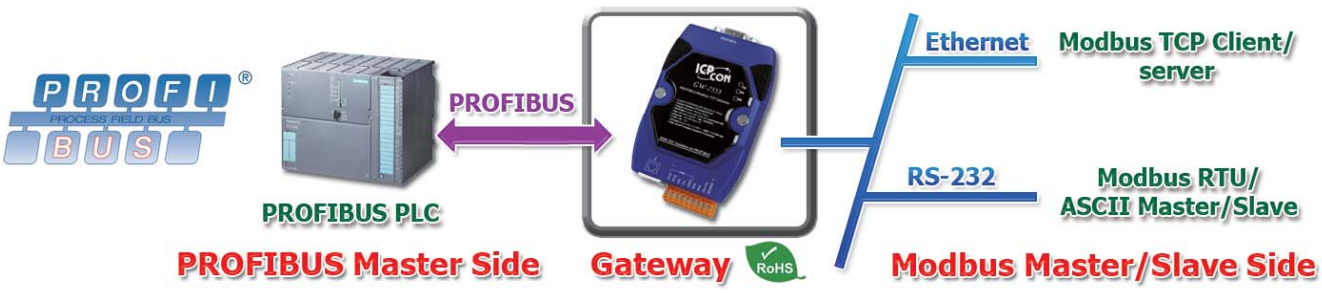
- Protocol PROFIBUS DP-V0 Slave
- 132 bytes Max. input data length
- 131 bytes Max. output data length
- Support Modbus master mode and slave mode
- PROFIBUS address 0 ~ 126 set by DIP switch
- 3000 VDC isolation protection on PROFIBUS side
- Support several kinds of baud for COM1 from 2.4 ~ 115.2 kbps
- Network Isolation Protection: 2500 Vrms High Speed iCoupler
- Detect transmission rate (9.6 to kbps) 12000 on PROFIBUS automatically



GW-7553 PROFIBUS DP Slave to Modbus TCP/RTU Gateway

The GW-7553 is used for data-exchange between the Modbus TCP/RTU network and the PROFIBUS network. It provides not only the Modbus TCP client and server functions, but the Modbus RTU master and slave functions. Therefore, the GW-7553 can satisfy most of the applications of the data transfer between Modbus and PROFIBUS.

- Protocol PROFIBUS DP-V0 & DP-V1 slave
- Support one 10/100 Base-TX Ethernet port
- Support one RS-232 port
- 240 bytes Max. input data length
- 240 bytes Max. output data length
- Support Modbus TCP/RTU/ASCII protocol
- PROFIBUS address 0 ~ 126 set by DIP switch
- 3000 VDC isolation protection on PROFIBUS side
- Network isolation protection: 2500 Vrms high speed iCoupler
- Detect transmission rate (9.6 to 12000 kbps) on PROFIBUS automatically



GW-7553-CPM PROFIBUS DP Slave to CANopen Master Gateway

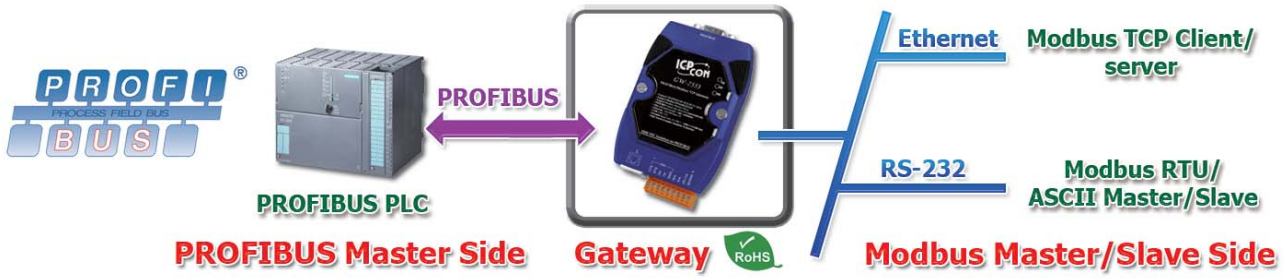
The GW-7553-CPM is designed for the slave device of PROFIBUS DP protocol. It allows PROFIBUS master to access CANopen slave devices. These CANopen slave device may be a sensor, actuators, ICPDAS CAN-2000 series modules and so forth. In addition, we also provide the utility software for users to configure the GW-7553-CPM. By using this module, users can put their CANopen slave devices into PROFIBUS network very easily.

- Protocol: PROFIBUS DP-V0 slave
- 240 bytes Max. input data length
- 240 bytes Max. output data length
- Support Heartbeat function
- Support Node Guarding
- PROFIBUS address 0 ~ 126 set by DIP switch
- Follow the CiA CANopen Standard DS-301 v4.02
- Support 110 CANopen SDO/PDO commands
- 3000 VDC isolation protection on PROFIBUS side
- Network isolation protection: 2500 Vrms high speed iCoupler
- Detect Transmission rate (9.6 to 12000 kbps) on PROFIBUS automatically

GW-7557 PROFIBUS DP Slave to HART Master Gateway

The GW-7557 is designed for the slave device of PROFIBUS DP protocol. It allows the PROFIBUS master to access the HART slave devices. These HART devices may be a transmitter, an actuator, a current output device and so forth. Owing to the GW-7557, you can communicate the HART slave devices into PROFIBUS network very easily.

- Protocol: PROFIBUS DP-V0 slave
- 240 bytes Max. input data length
- 240 bytes Max. output data length
- Support HART Short/Long frame
- PROFIBUS address 0 ~ 126 set by DIP switch
- Support HART mode: point-to-point/multi-drop
- Support 4 HART channels, each for Max. 15 HART modules
- 3000 VDC isolation protection on PROFIBUS side
- Network isolation protection: 2500 Vrms high speed iCoupler
- Detect transmission rate (9.6 to 12000 kbps) on PROFIBUS automatically



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4.4 PROFIBUS Remote I/O Modules

PROFIBUS Analog Input Modules			
Model Name	**PROFI-5017**	**PROFI-5017C**	**PROFI-5018**
Pictures	8-Ch Voltage Input Module	8-Ch Current Input Module	10-Ch Thermocouple Input Module
			
Channels	8	8	10
Wiring	Differential	Differential	Differential
Individual Channel	Yes	Yes	Yes
Sensor Type	-	-	Thermocouple (J, K, T, E. R. S, B, N, C)
Voltage Input Range	±10 V ±5 V ±2.5 V ±1.25 V	-	±2.5 V ±1 V ±500 mV ±100 mV ±50 mV ±15 mV
Current Input Range	-	±20 mA (Required External 125 Ω Resistor)	±20 mA (Required External 125 Ω Resistor)
Resolution	14-bit	14-bit	16-bit
Sampling Rate	10 Hz	10 Hz	10 Hz
Accuracy	±0.1% of FSR	±0.2% of FSR	±0.1% of FSR
Zero Drift	±0.5 μV/ °C	±10 μV/ °C	±0.5 μV/ °C
Span Drift	±20 μV/ °C	±25 μV/ °C	±25 ppm
Overvoltage Protection	120 VDC / 110 VAC	240 Vrms	N/A
Input Impedance	20 MΩ	2 MΩ	20 kΩ
Common Mode Rejection	150 dB	86 dB	150 dB
Normal Mode Rejection	100 dB	100 dB	100 dB

PROFIBUS Analog Output Modules		
Model Name		**PROFI-5024**
Pictures		4-Ch Voltage/Current Output Module
		
Channels		4
Wiring		Differential
Voltage Output Range		±10 V
Current Output Range		0 ~ 20 mA, 4 ~ 20 mA
Resolution		12-bit
Accuracy	For Voltage Output	±0.1% of FSR
	For Current Output	±0.2% of FSR
Isolation		3000 VDC

PROFIBUS Digital I/O Modules							
Model Name	**PROFI-5045**	**PROFI-5050**	**PROFI-5051**	**PROFI-5052**	**PROFI-5053**	**PROFI-5055**	**PROFI-5060**
Pictures							
DI							
Channels	-	16	24	12	24	8	8
Isolation Voltage		-	3750 Vrms	5000 Vrms	-	3750 Vrms	3750 Vrms
Contact		Dry	Wet	Wet	Dry	Wet	Wet
Sink/Source (NPN/PNP)		Sink/Source	Sink/Source	Sink/Source	-	Sink/Source	Sink/Source
ON Voltage Level		+4 ~ +30 VDC	+10 ~ +50 VDC	+4 ~ +30 VDC	Open	+10 ~ +50 VDC	+4 ~ +30 VDC
OFF Voltage Level		+1 VDC Max.	+4 VDC Max.	+1 VDC Max.	Close to IN.GND	+4 VDC Max.	+1 VDC Max.
Input Impedance		-	10 KΩ	3 KΩ	-	10 KΩ	3 KΩ
DO							
Channels	24	8	-	-	-	8	4
Isolation Voltage	3750 Vrms	-				3750 Vrms	-
Type	Open Collector	Open Collector				Open Collector	Relay (Form C)
Sink/Source (NPN/PNP)	Sink	Sink				Sink	-
Load Voltage	+10 ~ +40 VDC	+10 ~ +30 VDC				+10 ~ +40 VDC	0 ~ 125 VDC 0 ~ 30 VDC
Max. Load Current	650mA/channel	30 mA/channel				650 mA/channel	0.6 A @ 125 VDC 2 A @ 30 VDC
Communication							
Connector	9-pin female D-Sub						
Baud Rate (bps)	9.6 k, 19.2 k, 45.45 k, 93.75 k, 187.5 k, 500 k, 1.5 M, 3 M, 6 M, 12 M						
Controller	Profichip VPCLS2						
Transceiver	ADI ADM2486						
Protocol	DP-V0						
Node Address	0 ~ 99 selected by rotary switch						
System							
ESD Protection	4 kV Contact for each channel						
Isolation	3000 VDC for DC-to-DC, 2500 Vrms for bus-to-logic						
Watchdog	Yes						
Power							
Input range	Unregulated +10 ~ +40 VDC						
Power Consumption	1 W	1 W	1 W	1 W	1 W	1 W	1 W
Mechanism							
Installation	DIN-Rail						
Dimensions (W x L x H)	91 mm x 128 mm x 52 mm						
Environment							
Operating Temperature	-25 ~ +75°C						
Storage Temperature	-30 ~ +80°C						
Relative Humidity	10 ~ 90% RH, Non-condensing						

Application:

Optional PROFIBUS connector: CNT-PROFI

Installation

4.5 PROFIBUS Remote I/O Units

Features

- Protocol & hierarch y: DP-V0 & DP-V1 Slave
- Detect transmission Rate Automatically (Max.12 Mbps)
- Support Device-Related & Channel-Related Diagnosis
- Address 0 ~ 126 Set by Rotary Switches or SSA-Telegram
- Support Hot-Swap for I-87K High-Profile I/O Modules
- 3000 VDC Isolation Protection on PROFIBUS side
- 1/2/4/8 I/O Slots for I-87K and I-8K Series I/O Modules
- 4 KV ESD Protection (contacting for any terminal)

Introduction

The PROFI-8x55 Remote I/O Unit is designed for the slave device of PROFIBUS DP protocol. It supports up to 1/2/4/8 slots for ICPDAS I-8k, I-87k series I/O modules. In addition, we also provide hot-swap function for I-87k High Profiles series I/O modules. To setup network, users can choose and configure I/O modules by using the GSD file without any other setting tools.

System Specifications

Models	PROFI-8155	PROFI-8255	PROFI-8455	PROFI-8855
UART Interface				
COM 1	On-Board at JP1 (RS-232 for Update Firmware purpose). Note 1.		at Front Panel	
I/O Expansion Slot				
Hot Swap	Yes			
Auto Configuration	Yes			
Support Module Type	High/low profile I-8K & I-87K I/O module			High profile I-8K & I-87K I/O module
Slots Numbers	1	2	4	8
PROFIBUS Features				
Protocol & Hierarchy	DP-V0 & DP-V1 (Read/Write)		DP-V0 Slave	DP-V0 Slave
Address Setting	0~126 set by Rotary Switches or SSA-telegram set by DP-Master (Class 2)		0~126 set by Rotary switches	
Supports Transmission Rate (Kbps)	9.6, 19.2, 45.45, 93.75, 187.5, 500, 1500, 3000, 6000, 12000			
Transmission Rate Setting	detected automatically			
Indicators	PWR, ERR, and RUN LEDs			
I/O modules Configuration	Configured by GSD file			
Network Isolation Protection	High Speed iCoupler			
DC Isolation Protection	3000 VDC on PROFIBUS side			
Max. Input/Output Data Length	128 Bytes			240 Bytes
Number of Channel of Diag.	32		39	
Device-Related Diag. Type	Offline Detection			
Programmable Diag. period	Supported			
Mechanism				
Dimensions (W x L x H)	64 x 119x 91 (mm)	95 x 132 x 91 (mm)	188 x 132x 91 (mm)	312 x 132 x 91 (mm)
Environmental				
Operating Temperature	-25 ~ +75°C			
Storage Temperature	-30 ~ +80°C			
Humidity	10 ~ 90% RH (Non-condensing)			
Power				
Input Range	Unregulated +10 ~ +30 VDC			
Reverse Polarity Protection	YES			
Frame Ground	YES			
Consumption	3 W	3 W	5 W	5.5 W
Power Board Driving	8 W	8 W	25 W	25 W

Note 1: CA-0904 : transform from 4-pin connector to 9-pin Female D-Sub connector.

I/O Module Support List of PROFIBUS-8000 Units

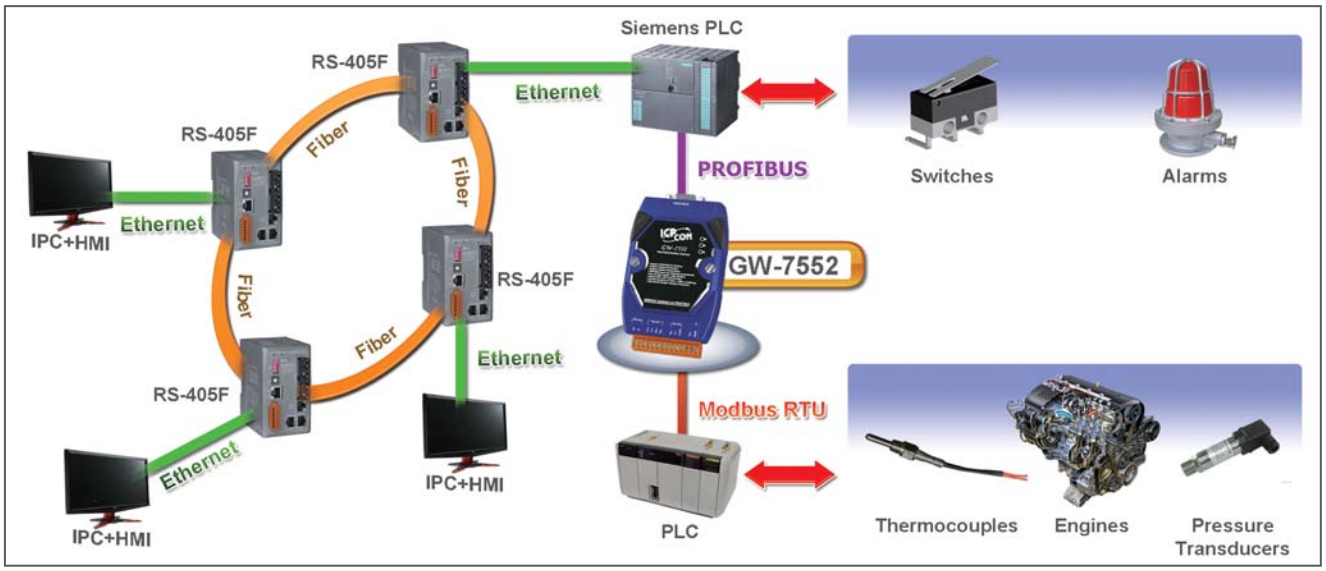
Type	I-8K Series I/O High Profile	I-87K Series I/O High Profile	Description
AI module		I-87013W	4-Ch RTD Input Module
		I-87015W	7-Ch RTD Input Module
		I-87015PW	7-Ch RTD Input Module
	I-8017HW	I-87017W	8-Ch Voltage/Current Input Module
		I-87017W-A5	8-Ch Voltage/Current Input Module
		I-87017RW	8-Ch Voltage/Current Input Module
		I-87017RCW	8-Ch Current Input Module
		I-87018W	8-Ch Thermocouple Input Module
		I-87018RW	8-Ch Thermocouple Input Module
		I-87018ZW	10-Ch Thermocouple Input Module
		I-87019RW	8-Ch Universal AI Module
AO module			2-Ch Voltage/Current Output Module
	I-8024W	I-87024W	4-Ch Voltage/Current Output Module
			6-Ch AI, 2-Ch AO, 2-Ch DI, 2-Ch DO Module
DI module	I-8040W	I-87040W	32-Ch DI (wet, sink/source) Module
	I-8040PW	I-87040PW	32-Ch DI (wet, sink/source) Module
		I-87046W	16-Ch DI (dry, source) Module
	I-8051W	I-87051W	16-Ch DI (dry, source) Module
	I-8052W	I-87052W	8-Ch DI (wet, sink/source) DI Module
	I-8053W	I-87053W	16-Ch DI (wet/dry, sink/source) Module
	I-8053PW	I-87053PW	16-Ch DI (wet/dry, sink/source) Module
		I-87053W-A5	16-Ch DI (wet/dry, sink/source) Module
		I-87053W-E5	16-Ch DI (wet/dry, sink/source) Module
		I-87053W-AC1	16-Ch DI (VAC) Module
	I-8058W	I-87058W	8-Ch DI (VAC) Module
		I-87059W	8-Ch DI (VAC) Module
DO module	I-8037W		16-Ch DO (Open Collector, source) Module
	I-8041W	I-87041W	32-Ch DO (Open Collector, sink) Module
	I-8041AW		32-Ch DO (Open Collector, source) Module
	I-8056W		16-Ch DO (Open Collector, sink) Module
	I-8057W	I-87057W	16-Ch DO (Open Collector, sink) Module
	I-8060W		6-Ch Power Relay Module
	I-8064W	I-87064W	8-Ch Power Relay Module
		I-87065W	8-Ch AC SSR Relay Module
		I-87066W	8-Ch DC SSR Relay Module
	I-8068W	I-87068W	8-Ch Power Relay Module
	I-8069W	I-87069W	8-Ch PhotoMOS Relay Module
DI & DO module	I-8042W		16-Ch DI (wet, sink/source), 16-Ch DO (Open Collector, sink) Module
	I-8050W		16-Ch universal DIO (wet, sink) Module
	I-8054W	I-87054W	8-Ch DI (wet, sink/source), 8-Ch DO (Open Collector, sink) Module
	I-8055W	I-87055W	8-Ch DI (dry, source), 16-Ch DO (Open Collector, sink) Module
	I-8063W	I-87063W	4-Ch DI (wet, sink/source), 4-Ch Power Relay Module
Counter module			8-Ch Counter/Frequency Input Module
		I-87082W	2-Ch Counter/Frequency Input Module

Note: PROFI-8855 only support high profile I-8K and I-87K series I/O modules.

4.6 Case Studies

Vessel Propulsion Control and Monitor System

- Location: Kaohsiung, Taiwan
- Product: GW-7552
- Description: The propulsion system is the most important and complex part of one ocean fishing vessels. It is composed of many electronic devices to control and monitor the engine speed, cooling system, residual fuel content, exhaust gas temperature, engine oil pressure, and so forth. Each of these devices may be handled by several PLCs via the different communication interfaces. In order to integrate the information from these devices, the user uses the GW-7552 for data-exchange between the Siemens PLC and the Modbus PLC. Therefore, the HMI can collect and configure the important parameters of the propulsion systems quickly and easily through the GW-7552.

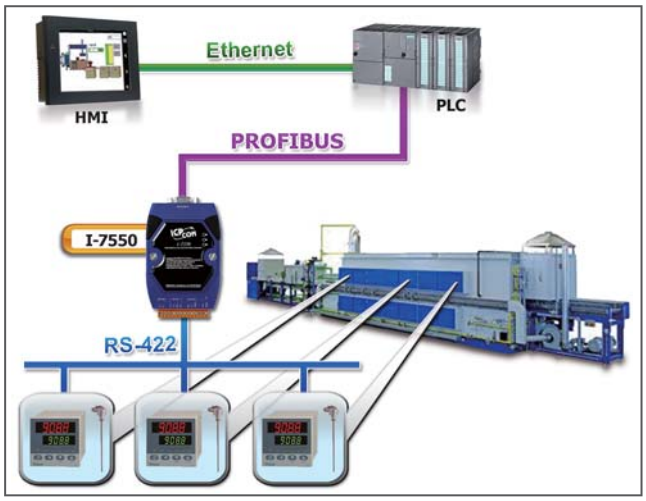


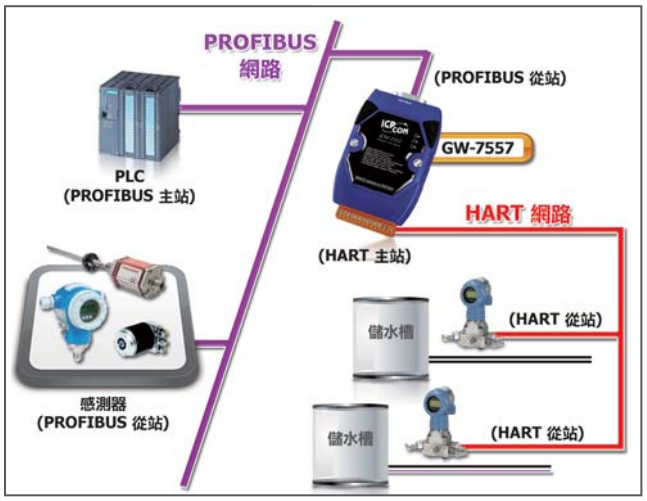
High Temperature Industrial Furnaces Monitoring System

- Location: China
- Product: I-7550
- Description: An industrial furnace refers to equipment which is used to provide heat for a certain process or reaction.
  Precise temperature profiles are absolutely mandatory for the often highly complex processes involved in firing, annealing and hardening of different materials. In order to achieve accurate and stable temperature control, the user use I-7550 to collect temperature information to ensure energy-optimized control of the processes.

Flow Control System

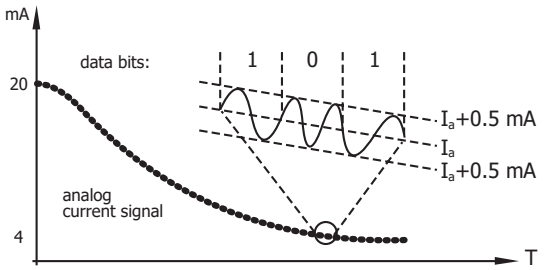
- Location: Kaohsiung, Taiwan
- Product: GW-7557
- Description: Beverage manufacturers use flow meters whose communication interface of flow meter is HART to monitor flow production line. However, the other end communication interface of main controller is PROFIBUS. In order to integrate the information from flow meters, customer can use the GW-7557 to acquire data quickly and easily between main controller and flow meters.





5. HART Products

5.1 Overview



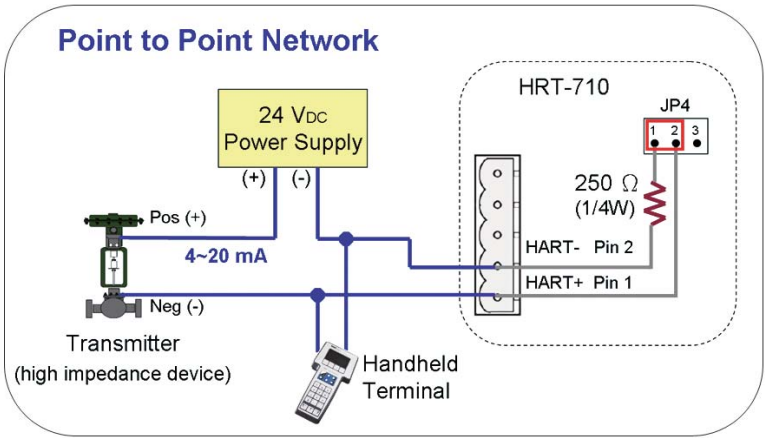
HART Field Communications Protocol extends this 4 ~ 20 mA standard to enhance communication with smart field instruments. The protocol preserves the 4 ~ 20 mA signal and enables two-way digital communications to occur without disturbing the integrity of the 4 ~ 20 mA signal. Unlike other communication technologies, the HART protocol can maintain compatibility with existing 4 ~ 20 mA systems with a uniquely backward compatible solution. Here are two main operational modes of HART instruments: analog/digital mode, and multi-drop mode

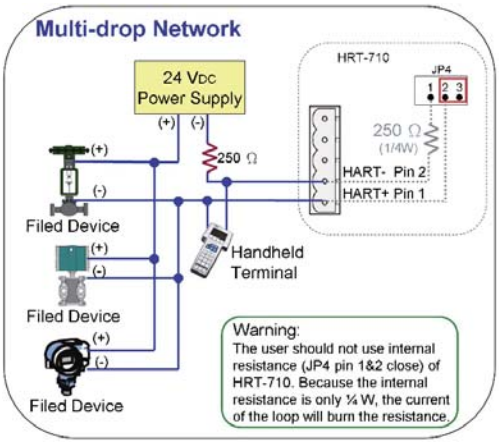
Peer-to-Peer mode

The analog and digital signals can be communicated in this mode. Here the digital signals are overlaid on the 4 ~ 20 mA loop current. Both the 4 ~ 20 mA current and the digital signal are valid output values from the instrument. The polling address of the instrument is set to "0". Only one instrument can be put on each instrument cable signal pair.

Multi-drop mode (digital)

In this mode, only the digital signals are used. The analog loop current is fixed at 4 mA. In multi-drop mode it is possible to have up to 15 instruments on one signal cable. The polling addresses of the instruments will be in the range 1 ~ 15. Each meter needs to have a unique address.





Features:

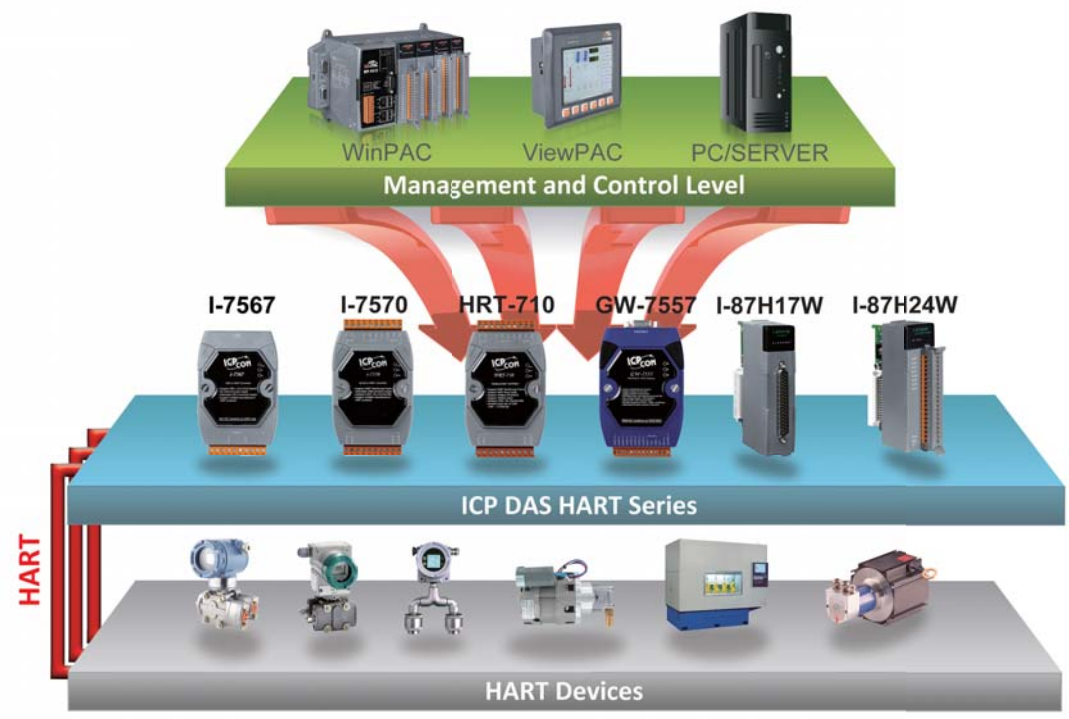
- Increase plant Availability
- Improve regulatory compliance
- Simultaneous transmission of digital data
- Compatibility with standard 4 ~ 20 mA wiring
- Risk reduction through a highly accurate and robust protocol
- HART is a no risk solution for enhanced field communication
- Relatively easy to understand and use, the HART protocol provides access to the wealth of additional information (variables, diagnostics, calibration, etc.)

Selection Guide

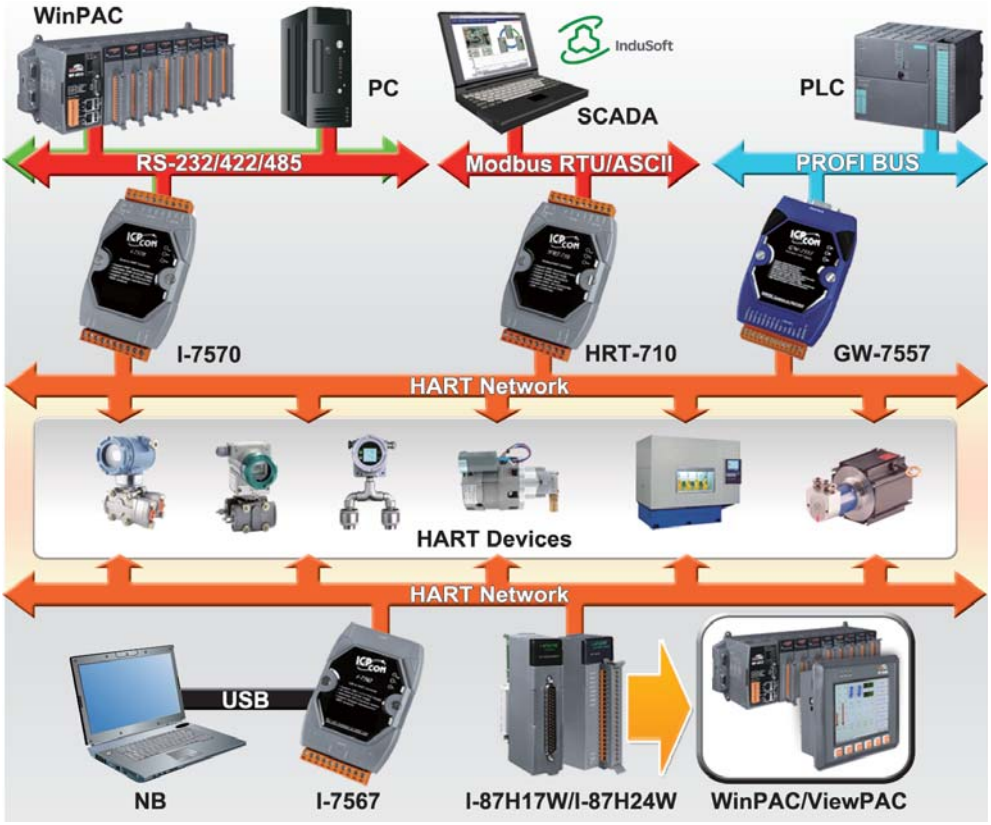
Model Name		Description
Converter	I-7547	Ethernet to HART Converter
	I-7567	USB to HART Converter
	I-7570	RS-232/422/485 to HART Converter
	HRT-227CS	HART to Single Mode Fiber Converter
	HRT-328-A4	HART-to-Analog Converter and Loop Monitor
Gateway	HRT-710	Modbus RTU/ASCII Slave to HART Master Gateway
	HRT-310	Modbus RTU/ASCII Slave to HART Master Gateway (Upright)
	HRT-711	Modbus TCP Slave to HART Master Gateway
	GW-7557	PROFIBUS DP Slave to HART Master Gateway
Remote I/O Unit	I-87H17W	8-Ch Current Input HART Master Module, for PAC
	I-87H24W	4-Ch Current Output HART Master Module, for PAC
Signal Filter	HRT-370	HART Signal Filter with one AI and one HART channel

5.2 HART System Integration Solution

ICP DAS have deeply researched on the HART bus technology for many years. The total HART products have been developed by ICP DAS including HART converter, HART gateway and HART I/O modules. The HART converter can be used to access HART devices via COM, USB or Ethernet interface. The HART gateway can integrate HART communication to the different protocols like Modbus, PROFIBUS etc. The HART I/O module can be used to access or control HART devices directly. Therefore, by using ICP DAS HART products, users can easily and quickly integrate HART devices and complete the data acquisition to SCADA, HMI or PLC system.



The following diagram will illustrate the HART bus applications and understand the roles of ICP DAS HART communication modules in HART network.



5.3 HART Products

5.3.1 HART Converters

I-7547 Ethernet to HART Converter

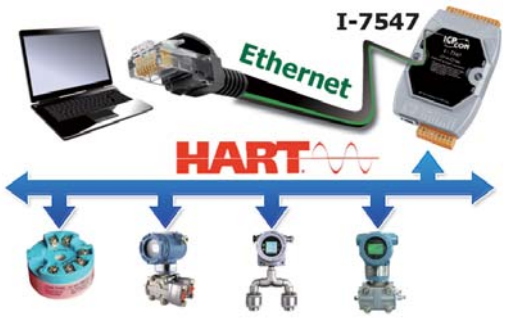
The I-7547 is an Ethernet to HART converter designed as the master device of HART protocol. It allows users to access the HART slave via Ethernet. These HART slave devices may be a transmitter, actuator, current output device and so forth. In addition, by using the HC_Tool utility, users can configure module and test HART communication easily and quickly.

Features

- Support HART Short/Long frame
- Support HART Burst mode
- Support point-to-point or multi-drop HART mode
- Support connecting up to 15 HART slave devices
- Allow two HART masters
- Support firmware update via Ethernet
- Selectable 250 Ω load resistor
- Provide four HART channels
- Support HART Pair-Connection
- Support FDT (Field Device Tool) technology

Utility Features

- Search all HART devices automatically
- Provide HART Universal & Common-Practice command for HART device configuration
- Provide module configuration and HART
- Provide data logging for HART communication



I-7567 USB to HART Converter

I-7567 is a USB to HART converter specially designed as the master device of HART protocol. Through it, users can easily access the HART network via USB port which is implemented as a virtual COM port on PCs or notebooks. Because the I-7567 is powered by the USB interface, the external power is not necessary. Moreover, the I-7567 provides the Utility tool which is helpful for diagnosing and configuring the HART network.

Features

- Support HART Short/Long frame
- Support HART Burst mode
- Allow two HART masters
- 4 kV ESD protection
- Support firmware update via USB
- 3000 VDC intra-module isolation
- Provide selectable 250 Ω load resistor
- Allow to connect with Max. 15 HART modules
- Compatible with USB 1.1 and 2.0 standards
- Powered by USB (external power is not necessary)
- Support FDT (Field Device Tool) technology (like: PACTware/FieldCare/Seimens PDM…)
- Support HART OPC Server provided by HART COMMUNICATION FOUNDATION (HCF)
- Support the in point-to-point or multi-drop HART network mode

Utility Features

- Search all HART devices automatically
- Provide HART Universal & Common-Practice command for HART device configuration
- Provide module configuration and HART
- Provide data logging for HART communication

I-7570 RS-232/422/485 to HART Converter

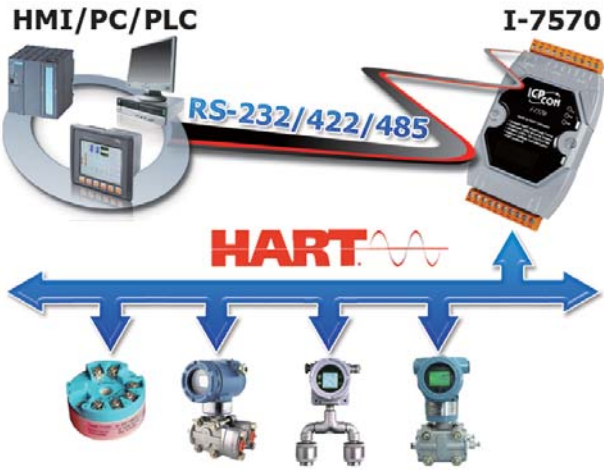
The I-7570 is a Serial to HART converter specially designed as the master device of HART protocol. By using I-7570, the HART devices, such transmitters, actuators, gauges, meters, and the current output devices, can be easily integrated into the HMI/PLC/PC devices via serial port which may be RS-232/RS-422/RS-485 interface. In order to diagnose and configure the HART network more easily, the I-7570 Utility tool with friendly configuration interface is given. It is helpful for diagnosing and configuring the HART network.

Features

- Support HART Short/Long frame
- Support HART Burst mode
- Allow two HART masters
- Allow to connect with Max. 15 HART modules
- Provide selectable 250 Ω load resistor
- Isolated COM 1: 3-wire RS-232/RS-422/RS-485
- Support firmware update via COM1
- Support FDT (Field Device Tool) technology (like: PACTware/FieldCare/Seimens PDM…)
- Support HART OPC Server provided by HART COMMUNICATION FOUNDATION (HCF)
- Support the in point-to-point or multi-drop HART network mode

Utility Features

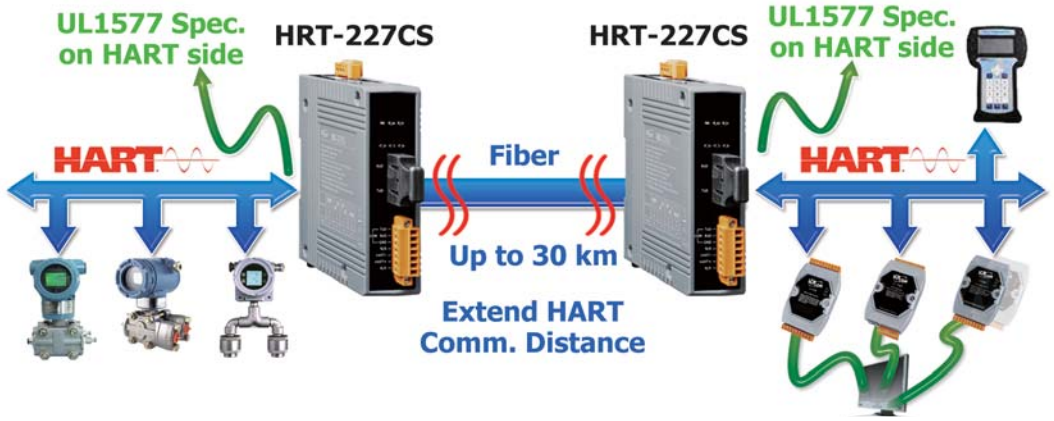
- Search all HART devices automatically
- Provide HART Universal & Common-Practice command for HART device configuration
- Provide data logging for HART communication



HRT-227CS HART to Single Mode Fiber Converter

The HRT-227CS is a HART to Fiber converter paired used to extend HART communication distance via single mode fiber optic transmission medium. In order to solve the problem between HART and fiber transmission medium, HRT-227CS is specially designed for converting the HART signal to fiber optic cables. Built-in a HART 250 Ω loop resistor adjustable by dip switch. Therefore, users can make data collection and processing of HART network easier and quicker by applying HRT-227CS. In addition, we also provide the free HC_Tool utility for module configuration easily.

- Support HART Short/Long frame
- Support HART Burst mode
- Allow two HART masters
- Fiber broken line detection
- 4KV ESD Protection
- Selectable 250Ω loop resistor
- Support firmware update via COM port
- Support point-to-point or multi-drop HART mode
- Support connecting up to 15 HART slave devices
- Fiber Type: SC ; Single mode ; 100 Base-FX
- Fiber max. transmission distance up to 30 km
- The HART port with the same Group ID can communicate with each other

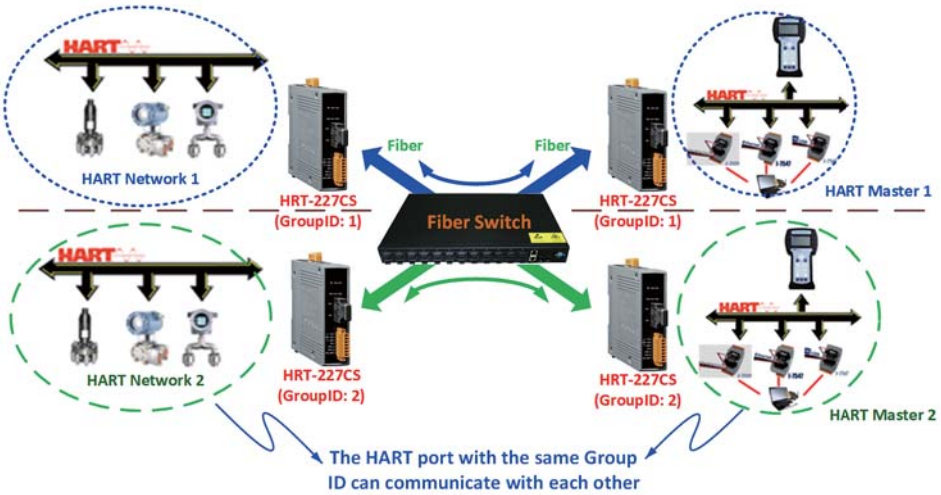


Group ID Application

The HART port in HRT-227CS with the same module "Group ID" can communicate with each other via fiber optics. When using on star topology application, it can be used to distinguish the different HART networks connected together with fiber switch.

[Example]

(1) The above HART network 1 uses two HRT-227CS with Group ID=1.
(2) The below HART network 2 uses two HRT-227CS with Group ID=2.
(3) These two HART networks connected together via HRT-227CS with fiber switch.
=> The HART network 1 and network 2 can communicate simultaneously without any interfere.



5.3.2 HART Gateways

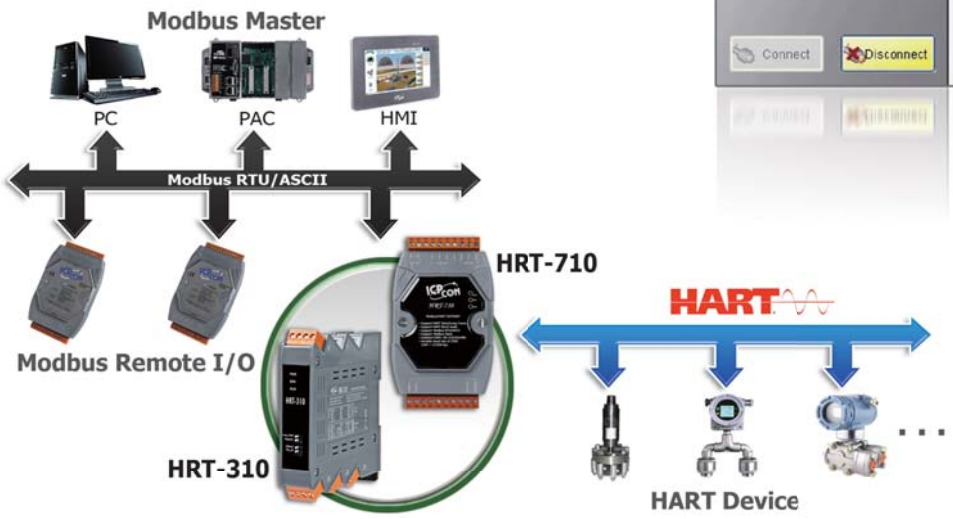
HRT-710 HRT-310 Modbus RTU/ASCII Slave to HART Master Gateway

The HRT-710/HRT-310 is a Modbus RTU/ASCII slave to HART master gateway. It provides an economic solution for Modbus master device to access the HART slave devices. In order to diagnose and configure the HART network more easily, the HG_Tool Utility with friendly configuration interface is given.

- Support HART Short/Long frame
- Support HART Burst mode
- Allow two HART Masters
- Support Modbus Slave mode
- Provide LED indicators
- Isolated COM 1: RS-232/422/485
- Connecting up to 15 HART modules
- Support Modbus RTU and ASCII format
- Working in point-to-point or multi-drop HART mode
- Support firmware update via Com Port
- Support on-line replacement of HART devices
- Support acquire Long Frame Address automatically

Utility Features

- Provide the system and communication configuration of HRT-710
- Provide the Modbus address table for HART command data
- Provide the diagnostic information of HRT-710 module and HART device
- Provide send/receive HART command to access HART device
- Provide "Load/Save" module configuration file to apply to other HRT-710 quickly



	HRT-710	HRT-310
Din Rail Installation	Horizontal	Upright
HART Signal	Standard	Enhanced for send/recv Signal (For long distance comm.)
Loop Power	No	Support
Built-In Resistor	250 Ω (1/4W)	250 Ω (1W)

HRT-711 Modbus TCP Slave to HART Master Gateway

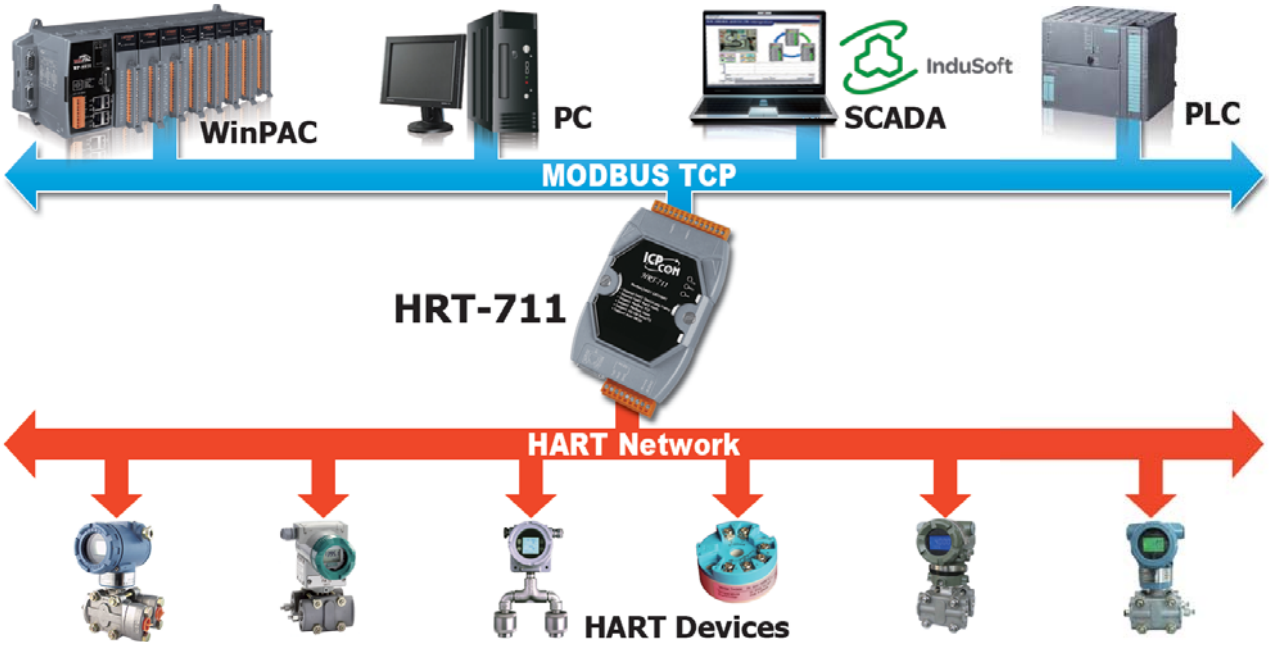
The HRT-711 is a new Modbus/TCP to HART Gateway. It allows the Modbus/TCP Master to access the HART Slave devices. These HART devices may be a transmitter, an actuator, a current output device and so forth. By using the HRT-711, users can integrate their HART devices into Modbus network easily. Therefore, HRT-711 can be a powerful gateway to exchange the data between Modbus and HART network. Moreover, the HRT-711 can be applied in the various hard environments because its high isolation protection designs. This design makes users to apply widely application for the remote data acquisition, control, process automation, and factory automation, etc.

Features

- Support HART Short/Long frame
- Support HART Burst mode
- Allow two HART Masters
- Working in point-to-point or multi-drop HART mode
- Connecting up to 15 HART modules
- Support Modbus TCP
- Support Modbus Slave mode
- Support firmware update via Com Port
- Support on-line replacement of HART devices
- Support acquire Long Frame Address automatically

Utility Features

- Provide the system and communication configuration of HRT-711
- Provide the Modbus address table for HART command data
- Provide the diagnostic information of HRT-711 module and HART device
- Provide send/receive HART command to access HART device
- Provide "Load/Save" module configuration file to apply to other HRT-711 quickly



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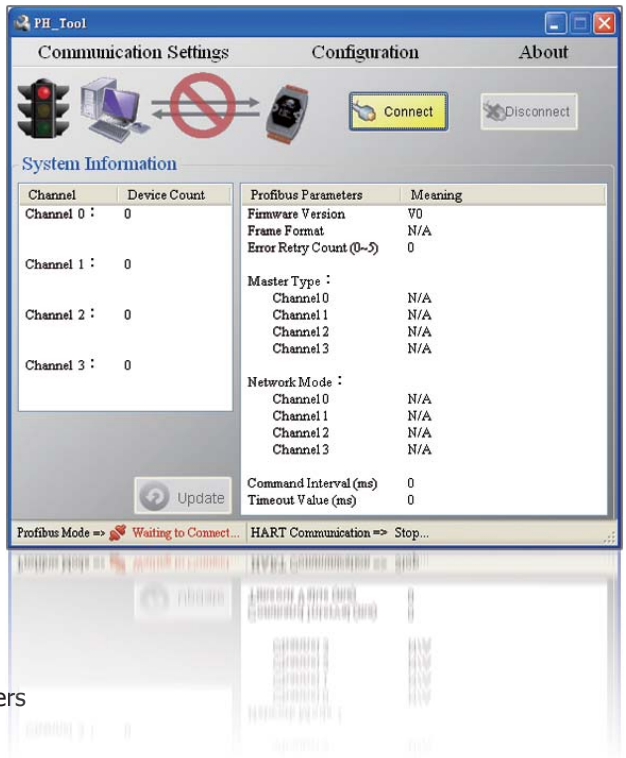
GW-7557 PROFIBUS DP Slave to HART Master Gateway

The GW-7557 is designed for the slave device of PROFIBUS DP protocol. It allows the PROFIBUS master to access the HART slave devices. These HART devices may be a transmitter, an actuator, a current output device and so forth. Owing to the GW-7557, you can put the HART slave devices into PROFIBUS network very easily.

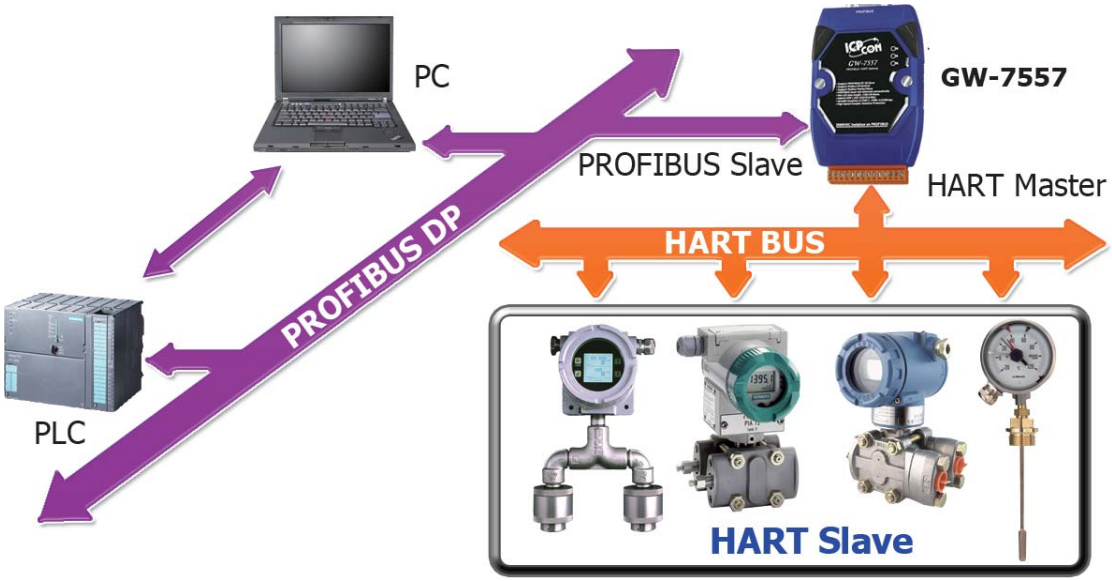
Features

- Support PROFIBUS DP-V0 slave
- Protocol & Hierarchy: DP-V0 Slave
- Detect transmission rate (9.6 ~ 12000 kbps) automatically
- Max transmission speed up to 12 Mbps for PROFIBUS and 115.2 kbps for COM Port
- Max I/O Data Length: 240/240 Bytes
- Support 4 HART Channels
- Support HART Short/Long frame
- Support HART Burst mode
- Allow two HART Masters
- Working in point-to-point or multi-drop HART mode
- Connecting up to 15 HART modules
- Network Isolation Protection: High Speed iCoupler
- 3000 VDC isolation protection on PROFIBUS side
- 4 kV ESD Protection



Utility Features

- Read/Write module configuration of the
- Provide auto-scan function for HART communication parameters
- Provide test function for HART slave devices
- Show PROFIBUS user parameters of the GW-7557

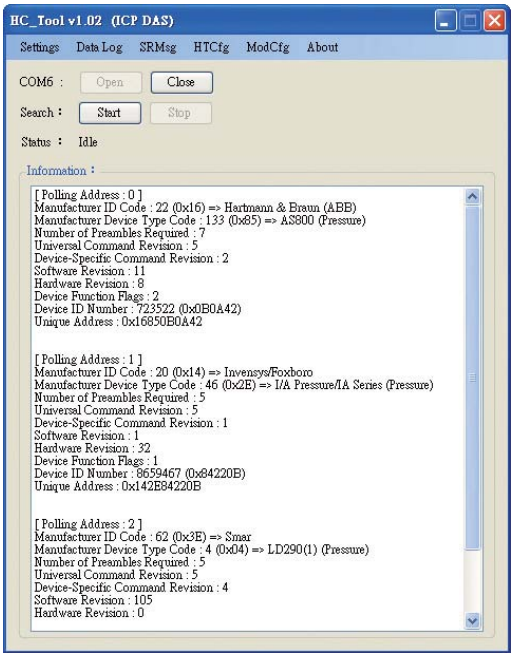


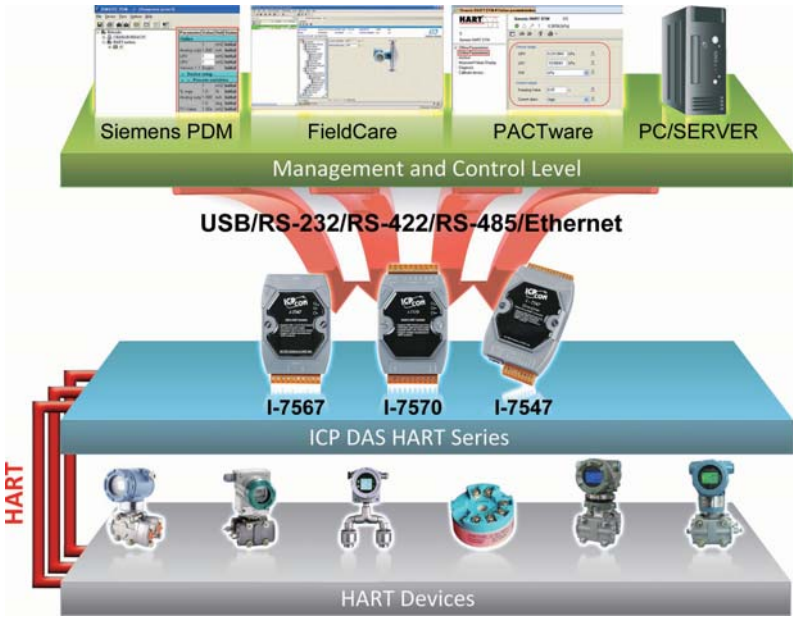
HART Converter Features

(1) Provide Free Software Tool : (HC_Tool)=> Support HART devices for searching and configuration and communication record.

(2) Support HART OPC Server=> Integrate HART data to SCADA or HMI easily and quickly.

(3) Support FDT (Field Device Tool) Software.





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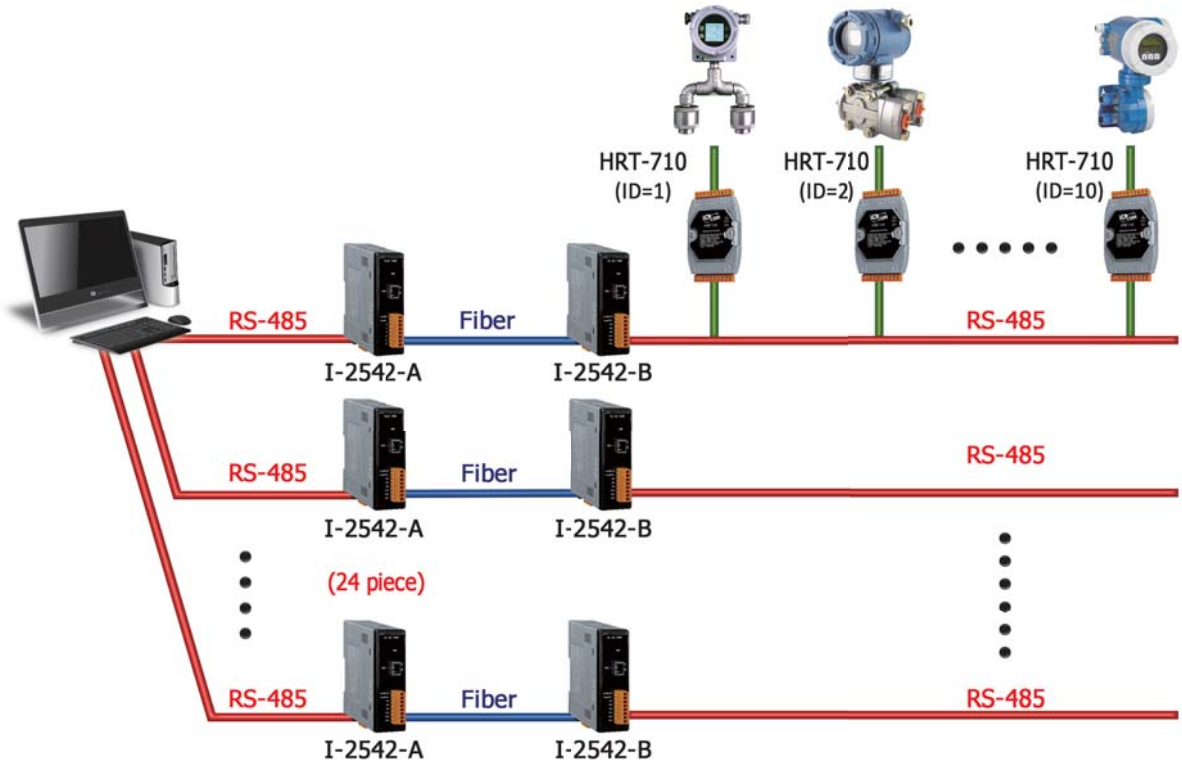
HART Gateway Application

Integrate about 200 HART devices by using HRT-710 via RS-485 with 24 ports to PC and fiber for distance extension.

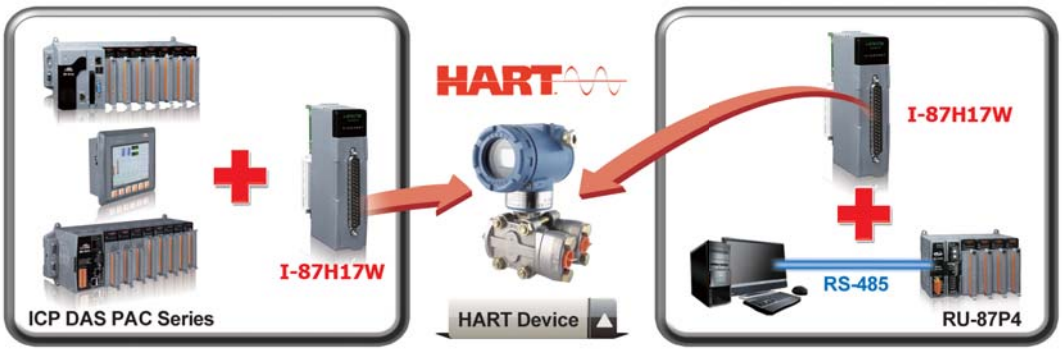


5.3.3 HART I-8000 I/O Modules

I-87H17W 8-Ch Current Input HART Master Module

The I-87H17W is an 8-Ch HART analog input module. It can measure 4~20 mA current and act as a HART master, allowing communication with HART field devices. Users can measure current directly without any external resistor. The I-87H17W adopts DCON protocol and can be used in WinPAC, ViewPAC, XPAC, LinPAC and iPAC series PAC.

- Open wire detection
- Support 4 ~ 20 mA current input
- 2-wire or 4-wire transmitters of HART
- Allow to connect with Max. 15 HART modules
- 4 kV ESD protection and 2500 VDC
- Support point-to-point or multi-drop HART network mode
- Support HART Short/Long frame
- Support HART Burst mode
- Support DCON protocol
- Allow two HART masters
- Support DCON protocol

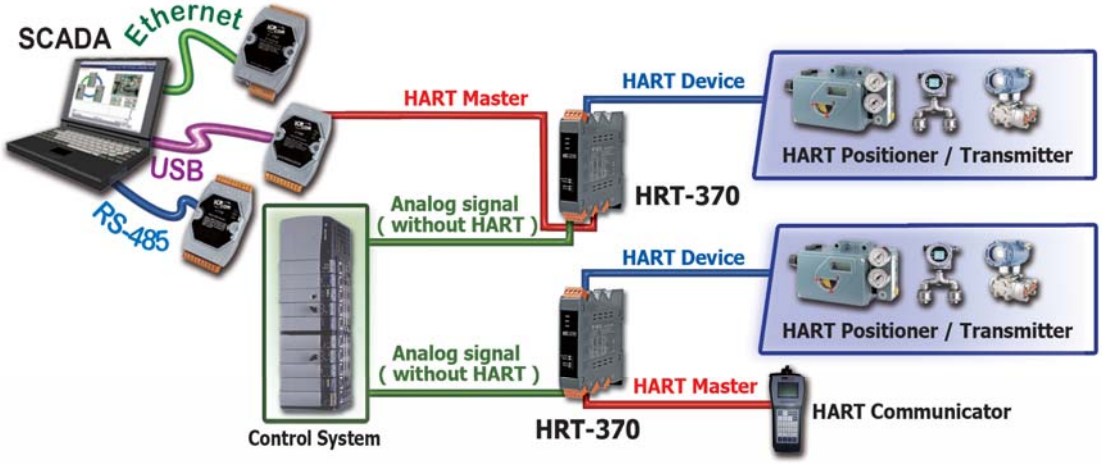


5.3.4 HART Signal Filter Modules

HRT-370 HART Signal Filter

HRT-370 can receive a 4 to 20 mA DC current signal from HART device or control system analog output and passes the signal bi-directionally and uninterruptedly. Besides, HRT-370 also provides a HART interface to communicate with HART device. By using HRT-370, it can effectively isolate the HART device communication signal from control system analog signal.

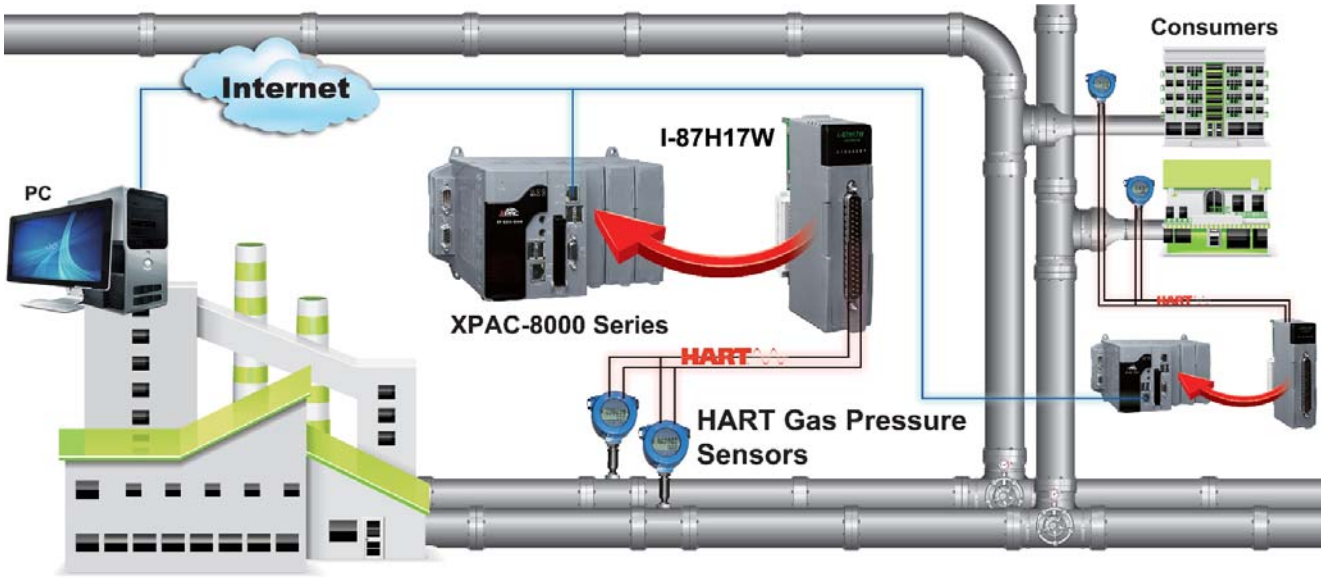
- Support the in point-to-point or multi-drop HART network
- Allow to connect to the Max. 15 HART modules
- Support 4 ~ 20 mA current input
- 2-wire or 4-wire transmitters of HART
- Support HART Short/Long frame
- Support HART Burst mode
- Allow two HART masters
- Provide LED indicators



5.4 Case Studies

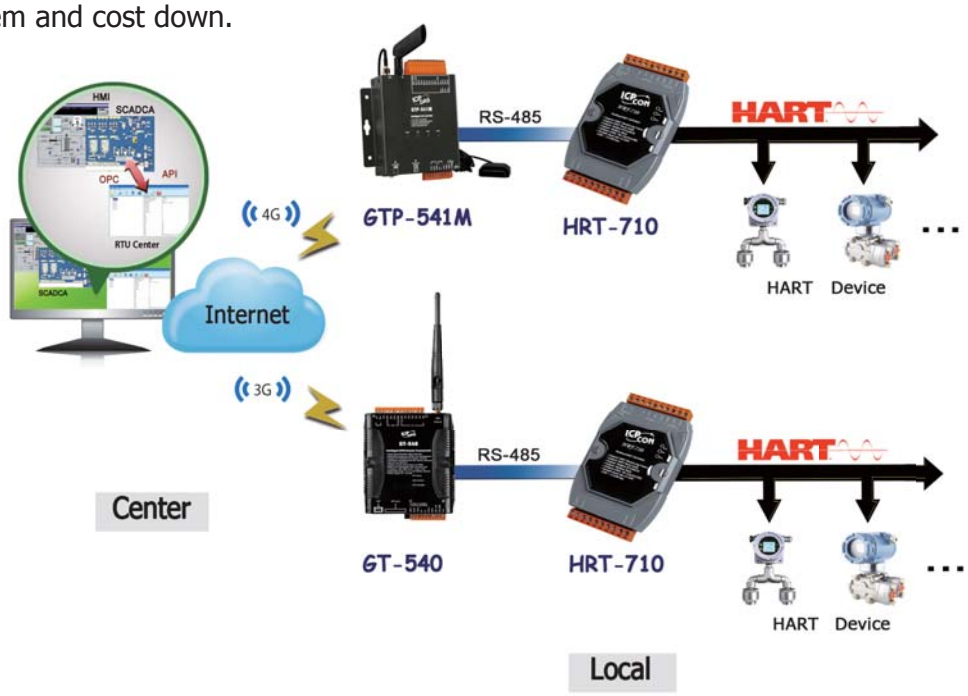
Pressure Detection of Gas Pipeline

In general, the process of the natural gas transported to users' families requires long-distance pipeline. The gas pressure in the pipeline will be reduced gradually from high to medium until low. If the gas pipeline ruptures and nobody knows it, it will cause the great loss of company. Further, it even causes the more serious disaster. So the most important mission for gas transportation system is strict control of the gas pipeline pressure. The gas company uses HART bus manometer for stable measurement and easy maintenance. The XPAC-8000 controller and I-87H17W with eight HART AI channels are used to collect these HART manometers data quickly and easily. Through Ethernet, the control center can monitor all gas pipeline pressure remotely.



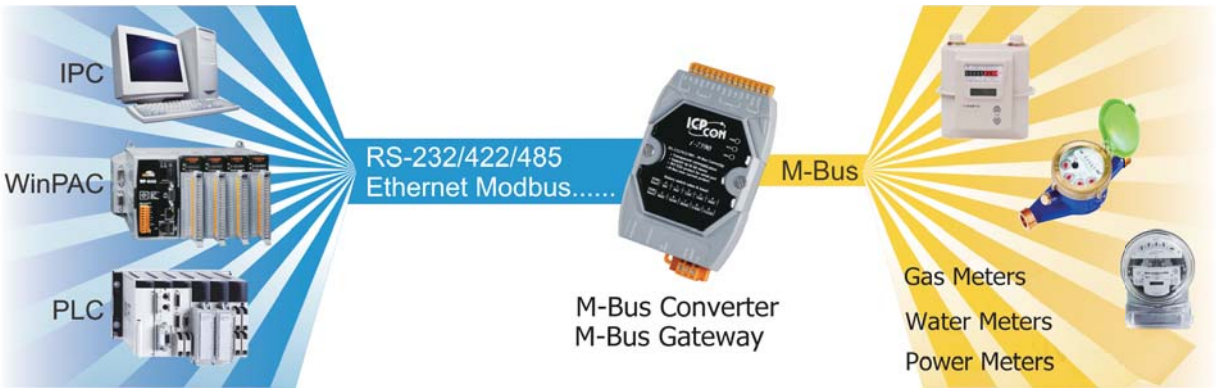
Integrate GT-540/ GT-541Ms to get HART device data via 3G/ 4G

In traditional HART surveillance system, it usually collects HART device information like flow, temperature, pressure via cable connection. Therefore, it will cost much time and money in the configuration and maintenance. If using wireless instead of wired, it will provide the flexibility of control system and cost down.



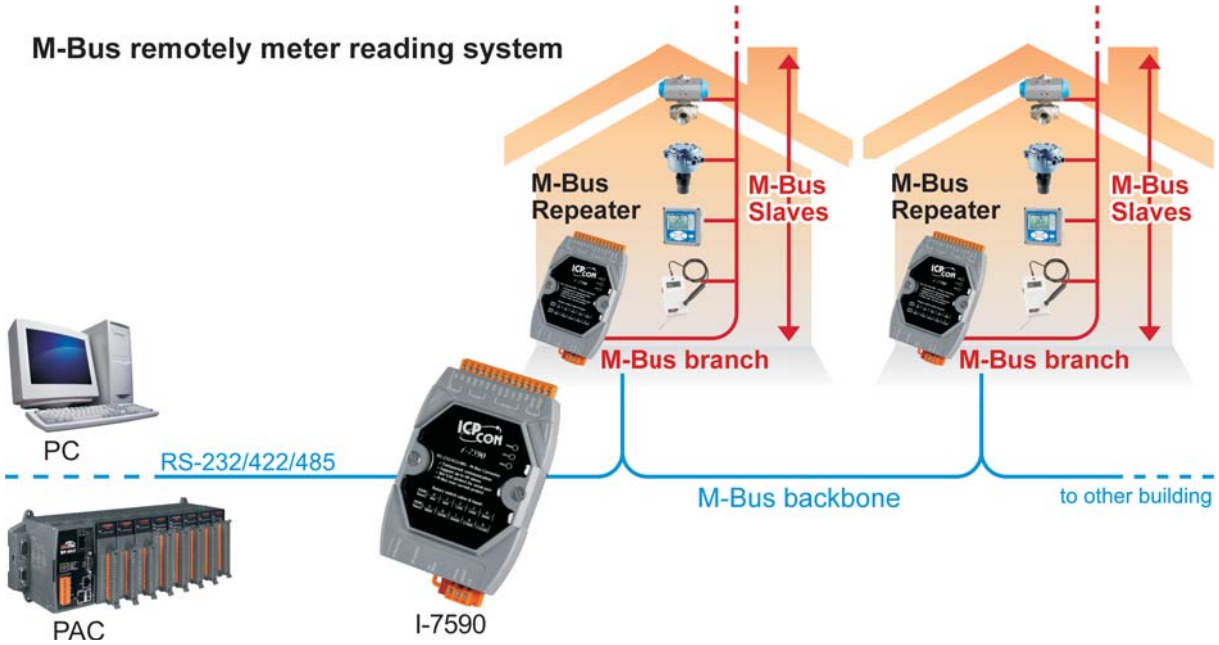
6. M-Bus Products

6.1 Overview



The M-Bus ("Meter-Bus") is a European standard for remote reading of meters. It is usable for most types of consumption meters as well as for various sensors and actuators.

The M-Bus was developed to fill the need for a system for the networking and remote reading of utility meters in the home. This bus fulfills the special requirements of remotely powered or battery-driven systems. When interrogated, different from the classical manual reading, the meters deliver the data they have collected to a common master, such as a PAC, connected at periodic intervals to read all utility meters of a building.



Features:

- Large number of connectable devices
- Possibility for network expansion
- Fail-safe characteristics/robustness
- Minimum cost
- Minimum power consumption in the meters
- Acceptable transmission speed

Applications:

- Automatic meter reading system
- Remotely powered system
- Types meters integrated application

Selection Guide

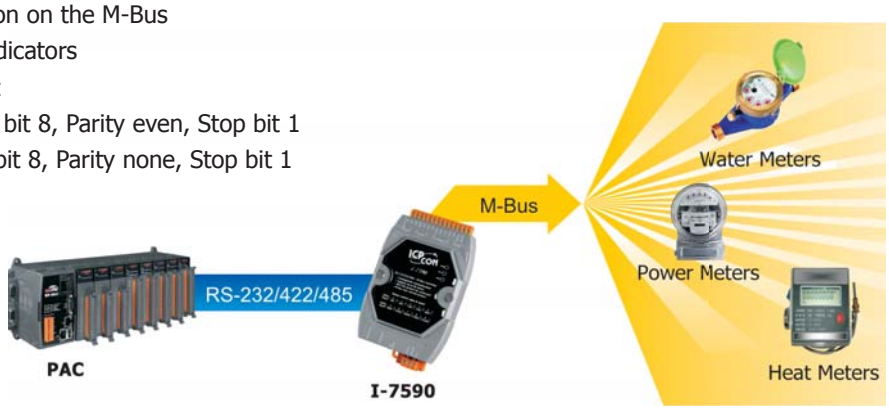
Models		Description
M-Bus converter	I-7590	RS-232/422/485 to M-Bus converter
M-Bus Repeater	I-3591	M-Bus Repeater
M-Bus gateway	GW-7828	Modbus RTU slave to M-Bus master gateway
	GW-7838	Modbus TCP server to M-Bus master gateway

6.2 M-Bus Converter

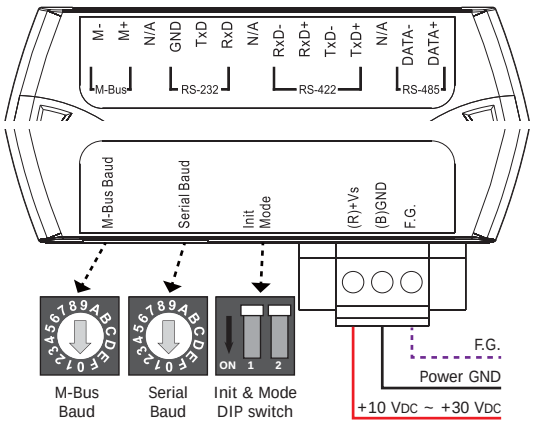
I-7590 RS-232/422/485 to M-Bus converter

The I-7590 is specially designed for M-Bus slave device. It offers RS-232, RS-422 and RS-485 three kinds of communication way. For the hardware of the I-7590, it has two rotary switches for serial port and M-Bus port baud rate. This design allows master baud rate to be different from the M-Bus slave baud rate. For the communication of the I-7590, it uses transparent communication. It solves the problem when performing protocol conversion between the master and the slave, and makes the communication easier. I-7590 is perfect for use when a new M-Bus device is added to an old RS-485 network or when the master firmware and configuration required not being changed.

- Baud rate: Adjustable by rotary switch from 300 to 115200 bps
- Overcurrent and short-circuit protection on the M-Bus
- Provide PWR, MTX and MRX 3 LED indicators
- 4 kV ESD protection on the serial port
- Default M-Bus port data format: Data bit 8, Parity even, Stop bit 1
- Default serial port data format: Data bit 8, Parity none, Stop bit 1
- Update firmware from serial port
- Support up to 100 M-Bus slaves
- Provides transparent communication

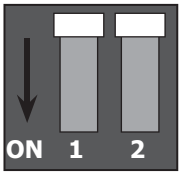


Pin Assignments:



Rotary & DIP Switch:

Switch Value	0	1	2	3	4	5
Baud (bps)	300	600	1200	2400	4800	9600
Switch Value	6	7	8	9	A ~ F	
Baud (bps)	19200	38400	57600	115200	User-defined	



1 Init	2 Mode	Description
OFF	OFF	Run Firmware
OFF	ON	Configure
ON	OFF	Update Firmware

6.3 M-Bus Repeater

I-3591 M-Bus Repeater

The I-3591 is a M-bus repeater which could be a component of the M-bus system. It is designed for use in plants where extensive bus lines are required, or where large numbers of meters need to be connected, for example in district heat networks that supply heat to entire sections of towns.

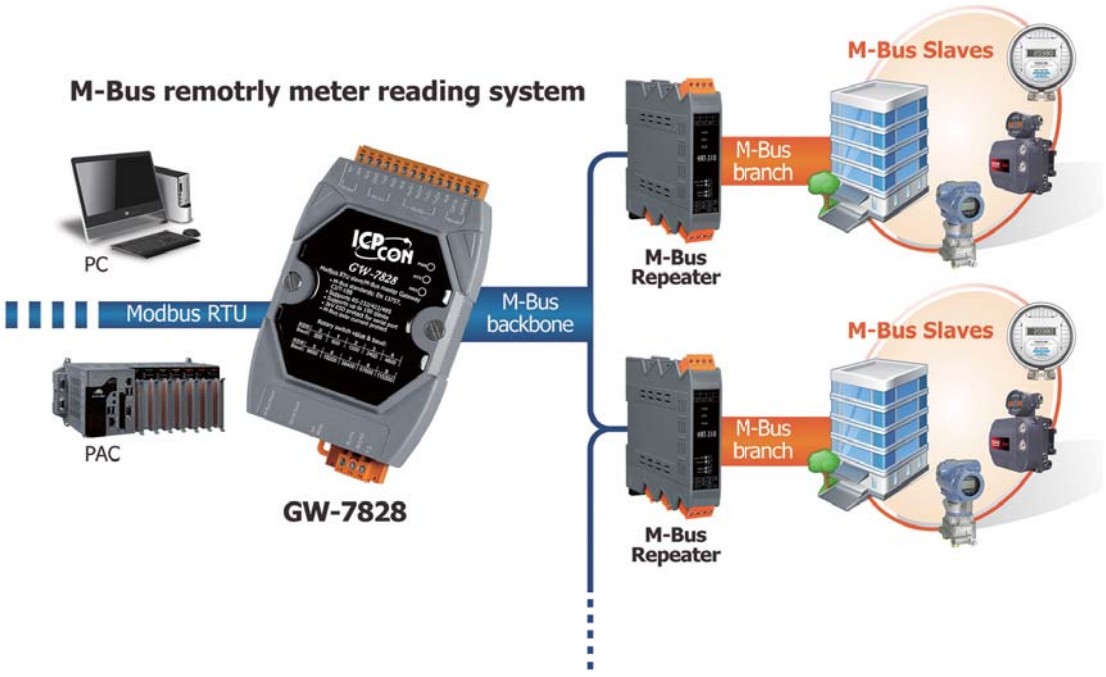
- M-Bus to M-Bus Repeater
- Supports M-Bus slaves: 100
- Overcurrent detection
- Duplicate node id detection
- M-Bus Baud rate: Automatic baud rate detection
- M-Bus Data Format: Automatic data format detection

6.4 M-Bus Gateway

GW-7828 Modbus RTU to M-Bus Gateway

The GW-7828 gateway is a Modbus RTU slave device that allows the Modbus RTU master to access the M-Bus slave devices. These M-Bus devices may be a water meter, electric meter, power meter and so forth. Owing to the GW-7828, you can put the M-Bus slave devices into Modbus network very easily.

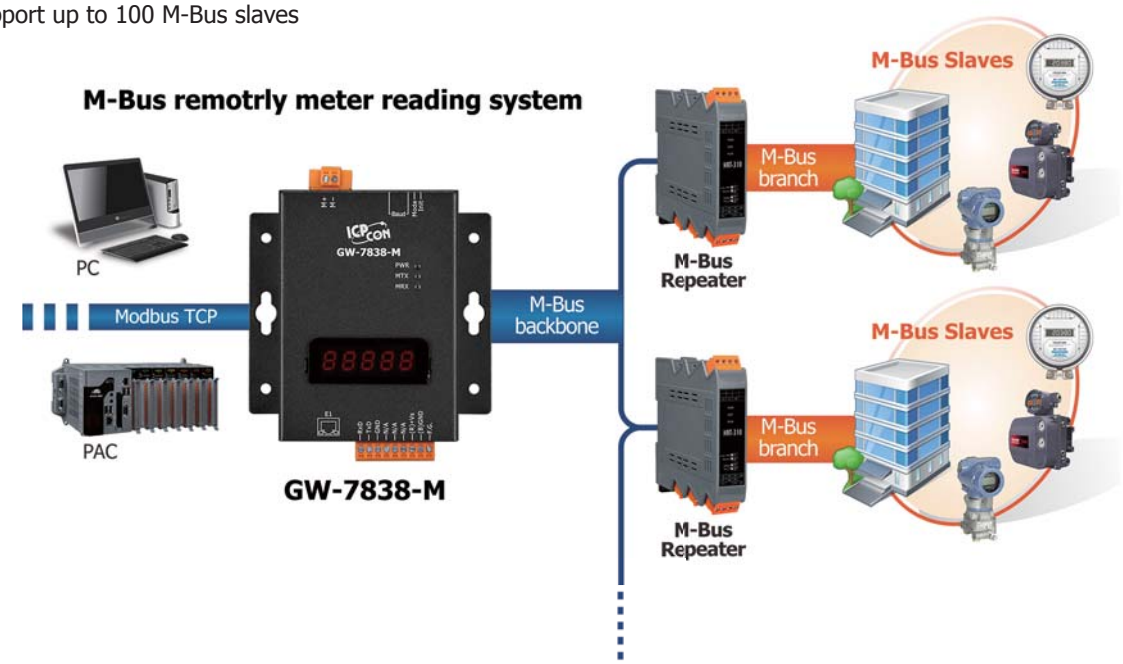
- Wide range of power input (+10 VDC ~ +30 VDC) and operating temperature (-25°C ~ +75°C)
- Support EN-13757 and CJ/T 188-2004
- Modbus RTU baud rate: Support from 300 to 115200 bps
- Overcurrent and short-circuit protection on the M-Bus
- M-Bus baud rate: Support from 300 to 115200 bps
- Provide PWR, MTX/RX and ERR 3 LED indicators
- Support com port configure
- 4 kV ESD protection on the serial port
- Support up to 100 M-Bus slaves

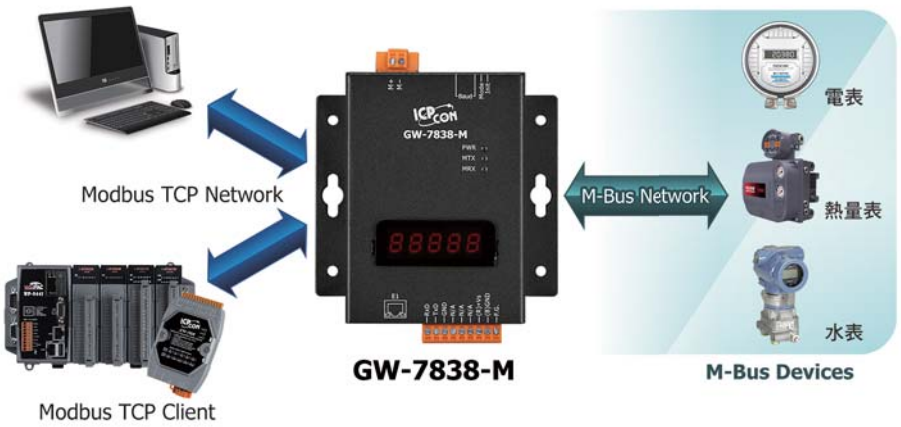


GW-7838 Modbus TCP to M-Bus Gateway

The GW-7838 gateway is a Modbus TCP server device that allows the Modbus TCP client to access the M-Bus slave devices. These M-Bus devices may be a water meter, electric meter, power meter and so forth. Owing to the GW-7838, you can put the M-Bus slave devices into Modbus TCP network very easily.

- Wide range of power input (+10 VDC ~ +30 VDC) and operating temperature (-25°C ~ +75°C)
- Support EN-13757 and CJ/T 188-2004
- Overcurrent and short-circuit protection on the M-Bus
- M-Bus baud rate: Support from 300 to 115200 bps
- Provide PWR, MTX/RX and ERR 3 LED indicators
- Support com port and Ethernet configure
- 4 kV ESD protection on the serial port
- Support up to 100 M-Bus slaves





7

PAC 9000 Series

- AXP/ALX-9000 Series
- XP-9000-WES7/
- XP-9000-IoT/
- LX-9000/LP-9000 Series
- e-9K Series Module
- I-9K Series Module
- 2000 Series PAC
- iBPC Series BoxPC
- Touch Monitor

PC-based I/O Boards

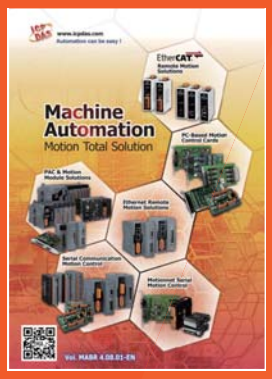
- PCI Express Bus Data Acquisition Boards
- PCI Bus Data Acquisition Boards
- ISA Bus Data Acquisition Boards

Energy Management Solution

- InduSoft SCADA Software
- Smart Power Meter Concentrator
- Smart Power Meter
- True RMS Input Module
- TouchPAD Devices - VPD Series

Intelligent IIoT Edge Controller & I/O Module

- WISE IIoT Edge Controller & I/O Module
- Cloud Management
- Applications
- Product Specifi cation
- Intelligent Surveillance Solution



Machine Automation

- Motionnet Solutions
- EtherCAT Motion Control Solutions
- Ethernet Motion Control Solutions
- Serial Communication Motion Control Solutions
- PC-based Motion Control Cards
- PAC Solutions - Motion Modules

Smart Building, Smart Home Automation

- Video Intercom & Access Control
- Touch HMI - TouchPAD Series
- Smart Lighting Control
- Energy Saving - PM/PMC Series
- Environmental - DL/CL Series
- Motion Detector - PIR Series
- Wi-Fi Wireless - WF Series
- Infrared Wireless - IR Series
- ZigBee Wireless - ZT Series
- IIoT Server & Concentrator
- LED Display - iKAN Series

TouchPAD HMI Solutions

- Introduction
- TPD/VPD Products Series
- Video Intercom & Access Control Series
- TPD/VPD Application

Wireless Solution

- WLAN Products
- Radio Modems
- 3G/4G Products
- NB-IoT Solution
- GPS Products
- Bluetooth LE Converters
- ZigBee Products
- Infrared Wireless Modules
- Wireless Modbus Data Concentrators
- WLS (Wireless Locating System)

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