

5.1. Overview

5

CAN Bus Remote I/O Modules



The Controller Area Network (CAN) is a serial communication way, which efficiently supports distributed real-time control with a very high level of security. It provides the error process mechanisms and message priority concepts. These features can improve the network reliability and transmission efficiency. Furthermore, CAN supplies the multi-master capabilities, and is especially suited for networking "intelligent" devices as well as sensors and actuators within a system or sub-system.

ICP DAS has been developing various CAN (Controller Area Network) / DeviceNet / CANopen products for several years include PCI interface card, converter, PAC, gateway, and CAN remote I/O. We also provide complete CAN hardware solutions and useful tools for CAN design, analysis and testing of CAN bus / DeviceNet / CANopen applications.

• CANopen / DeviceNet Remote I/O

The CAN-2000C (CANopen) series and CAN-2000D (DeviceNet) slave modules are specially designed for the slave device of the CANopen and DeviceNet protocols. All of these CAN-2000C series modules follow the CANopen Spec DS-301 V4.02 and DS-401 V2.1. The CAN-2000D series follow the DeviceNet specification Volume I/II, Release 2.0.

1

Overview

• 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. The health information is the most important in the industrial applications. In ICP DAS, all the CANopen /DeviceNet remote I/O series has Built-in the heartbeat protocol to increase the reliability of the remote data.

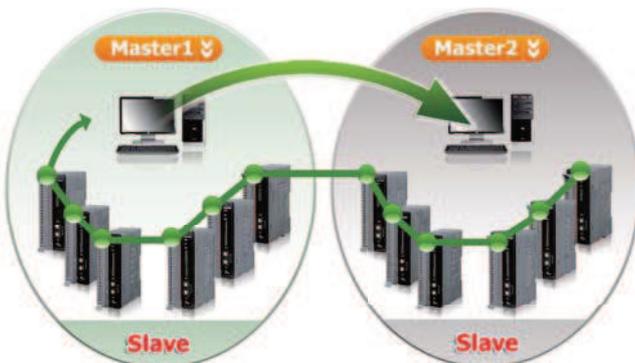


2. Safety & Arbitration

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. Multi-Master Network

A CAN bus network features a multi-master system that broadcasts transmissions to all of the nodes in the system. CANopen and DeviceNet may works in one CAN network.

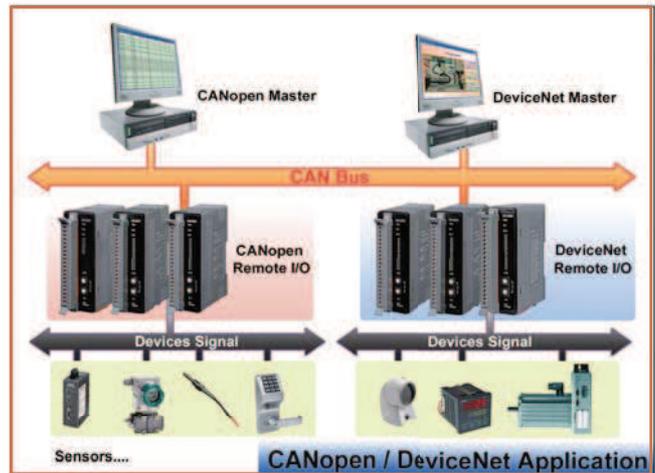
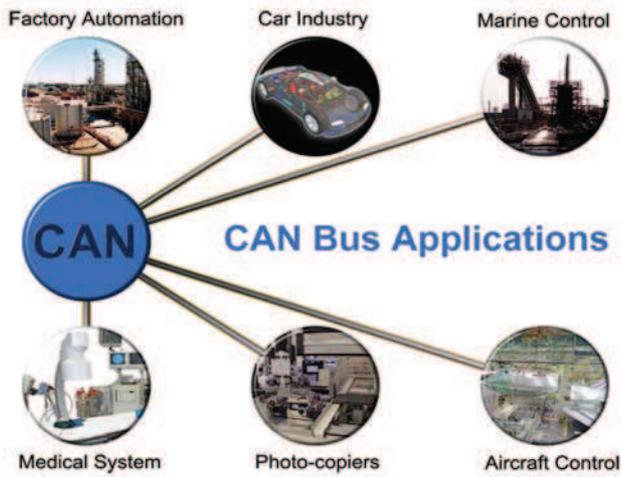


4. CANopen Digit I/O Pair-Connection

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.



• Applications

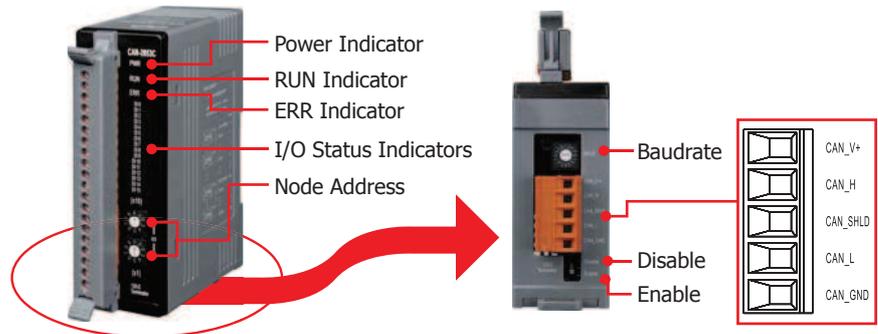


• Hardware

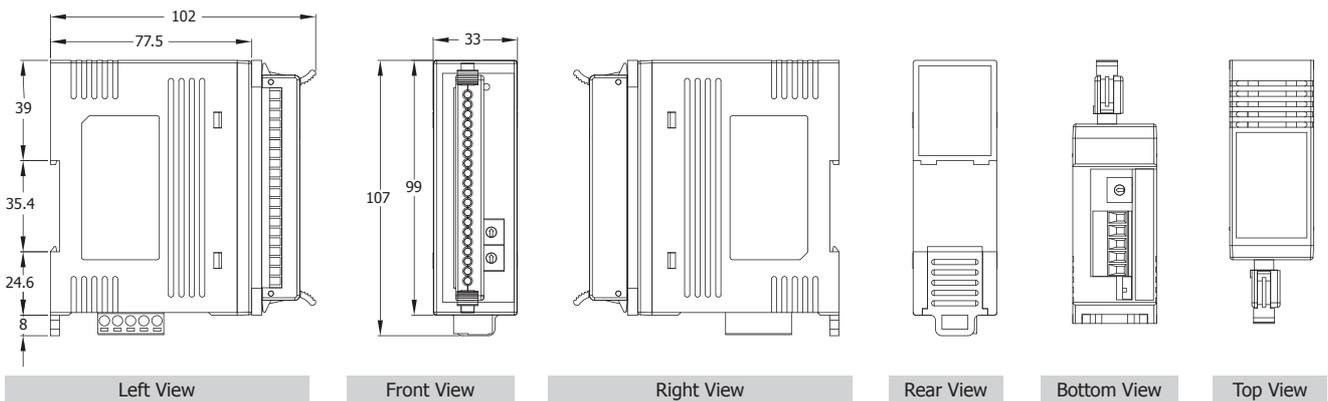
1. Installation



2. Appearance



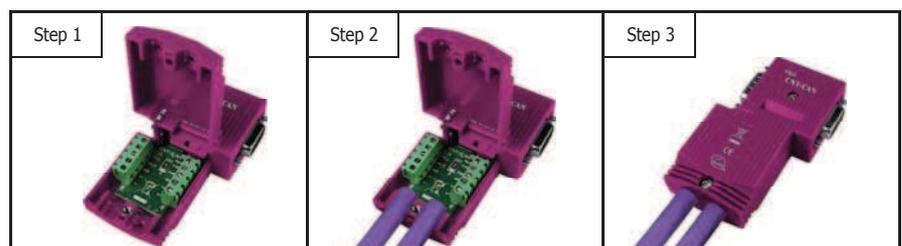
3. Mechanical



4. Optional Accessory



Optional CAN bus connector: CNT-CAN



Installation

5.2. Selection Guide

5.2.1. CANopen Digital I/O Modules

5

CAN Bus Remote I/O Modules

2

Selection Guide

CANopen Digital I/O Modules				
Model Name	CAN-2053C	CAN-2054C	CAN-2057C	CAN-2088C
Pictures				
DI				
Channels	16	8	-	8
Isolation Voltage	3750 V _{rms}	-	-	2500 V _{rms}
Contact	Wet	-	-	Wet
Sink/Source(NPN/PNP)	Sink/Source	-	-	Sink/Source
ON Voltage Level	+3.5 ~ +30 V _{dc}	-	-	+5.5 ~ +30 V _{dc}
OFF Voltage Level	+1 V _{dc} Max.	-	-	+3.5 V _{dc} Max.
Counter	-	-	-	500 kHz, 32-bit
DO				
Channels	-	8	16	-
Isolation Voltage	-	3750 V _{rms}	3750 V _{rms}	-
Type	-	Open Collector	Open Collector	-
Sink/Source(NPN/PNP)	-	Sink	Sink	-
Load Voltage	-	+5 ~ +30 V _{dc}	+5 ~ +30 V _{dc}	-
Max. Load Current	-	700 mA/channel	100 mA/channel	-
Power on Value	-	Yes	Yes	-
Safe Value	-	Yes	Yes	-
Communication				
Connector	5-pin screwed terminal block (CAN_GND, CAN_L, CAN_SHLD, CAN_H, CAN_V+)			
Baud Rate (bps)	10 k, 20 k, 50 k, 125 k, 250 k, 500 k, 800 k, 1 M			
Terminator Resistor	Switch for 120 Ω terminator resistor			
Node ID	1~99 selected by rotary switch			
Protocol	CANopen DS-301 ver4.02, DS-401 ver2.1			
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			
System				
ESD Protection	4 kV Contact for each channel			
Isolation	3000 V _{dc} for DC-to-DC, 2500 V _{rms} for bus-to-logic			
Watchdog	Yes			
Power				
Input range	Unregulated +10 ~ +30 V _{dc}			
Power Consumption	1.5 W	1.5 W	1.5 W	2 W
Mechanism				
Installation	DIN-Rail			
Dimensions (W x L x H)	33 mm x 107 mm x 102 mm			
Environment				
Operating Temperature	-25 ~ +75°C			
Storage Temperature	-30 ~ +80°C			
Relative Humidity	10 ~ 90% RH, non-condensing			

5.2.2. CANopen Analog Output Modules

CANopen Analog Output Modules		
Model Name	CAN-2024C	CAN-2028C
Pictures		<i>Available soon</i> 
Channels	4	8
Wiring	Bipolar/Unipolar	Unipolar
Voltage Output Range	0 ~ +5 V _{DC} -5 ~ +5 V _{DC} 0 ~ +10 V _{DC} -10 ~ +10 V _{DC}	-
Current Output Range	0 ~ 20 mA +4 ~ 20 mA	0 ~ 20 mA +4 ~ 20 mA
Resolution	14-bit	12-bit
Accuracy	Voltage : +/- 0.1 % of FSR Current : +/- 0.2 % of FSR	+/- 0.2 % of FSR
Output Capacity	Voltage : 10 V @ 5 mA Current : External +24 V : 1050 Ω	External +24 V : 1050 Ω
Power on Value	Yes	Yes
Safe Value	Yes	Yes
Communication		
Connector	5-pin screwed terminal block (CAN_GND, CAN_L, CAN_SHLD, CAN_H, CAN_V+)	
Baud Rate (bps)	10 k, 20 k, 50 k, 125 k, 250 k, 500 k, 800 k, 1 M	
Terminator Resistor	Switch for 120 Ω terminator resistor	
Node ID	1~99 selected by rotary switch	
Protocol	CANopen DS-301 ver4.02, DS-401 ver2.1	
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	
System		
ESD Protection	4 kV Contact for each channel	
Isolation	3000 V _{DC} for DC-to-DC, 3000 V _{rms} for bus-to-logic	
Watchdog	Yes	
Power		
Input range	Unregulated +10 ~ +30 V _{DC}	
Power Consumption	1.5 W	1.4 W
Mechanism		
Installation	DIN-Rail	
Dimensions (W x L x H)	33 mm x 107 mm x 102 mm	
Environment		
Operating Temperature	-25 ~ +75°C	
Storage Temperature	-30 ~ +80°C	
Relative Humidity	10 ~ 90% RH, non-condensing	

5.2.3. DeviceNet Digital I/O Modules

DeviceNet Digital I/O Modules				
Model Name	CAN-2053D	CAN-2054D	CAN-2057D	CAN-2088D
Pictures				
DI				
Channels	16	8	-	8
Isolation Voltage	3750 V _{rms}	-	-	2500 V _{rms}
Contact	Wet	-	-	Wet
Sink/Source(NPN/PNP)	Sink/Source	-	-	Sink/Source
ON Voltage Level	+3.5 ~ +30 V _{dc}	-	-	+5.5 ~ +30 V _{dc}
OFF Voltage Level	+1 V _{dc} Max.	-	-	+3.5 V _{dc} Max.
Counter	-	-	-	500 kHz, 32-bit
DO				
Channels	-	8	16	-
Isolation Voltage	-	3750 V _{rms}	3750 V _{rms}	-
Type	-	Open Collector	Open Collector	-
Sink/Source(NPN/PNP)	-	Sink	Sink	-
Load Voltage	-	+5 ~ +30 V _{dc}	+5 ~ +30 V _{dc}	-
Max. Load Current	-	700 mA/channel	100 mA/channel	-
Power on Value	-	Yes	Yes	-
Safe Value	-	Yes	Yes	-
Communication				
Connector	5-pin screwed terminal block (CAN_GND, CAN_L, CAN_SHLD, CAN_H, CAN_V+)			
Baud Rate (bps)	125 k, 250 k, 500 k			
Terminator Resistor	Switch for 120 Ω terminator resistor			
Node ID	0~63 selected by rotary switch			
Protocol	Volume I, Release 2.0 & Volume II, Release 2.0, Errata 5			
DeviceNet subscribe	Group 2 Only Server			
Explicit Connection	Yes			
Polled I/O Connection	Yes			
Bit-Strobe I/O Connection	Yes			
Heartbeat message	Yes			
Shutdown message	Yes			
System				
ESD Protection	4 kV Contact for each channel			
Isolation	3000 V _{dc} for DC-to-DC, 2500 V _{rms} for bus-to-logic			
Watchdog	Yes			
Power				
Input range	Unregulated +10 ~ +30 V _{dc}			
Power Consumption	1.5 W	1.5 W	1.5 W	2 W
Mechanism				
Installation	DIN-Rail			
Dimensions (W x L x H)	33 mm x 107 mm x 102 mm			
Environment				
Operating Temperature	-25 ~ +75°C			
Storage Temperature	-30 ~ +80°C			
Relative Humidity	10 ~ 90% RH, non-condensing			

5.2.4. DeviceNet Analog Output Modules

DeviceNet Analog Output Modules		
Model Name	CAN-2024D	CAN-2028D
Pictures		Available soon 
Channels	4	8
Wiring	Bipolar/Unipolar	Unipolar
Voltage Output Range	0 ~ +5 V _{DC} -5 ~ +5 V _{DC} 0 ~ +10 V _{DC} -10 ~ +10 V _{DC}	-
Current Output Range	0 ~ 20 mA +4 ~ 20 mA	0 ~ 20 mA +4 ~ 20 mA
Resolution	14-bit	12-bit
Accuracy	Voltage : +/- 0.1 % of FSR Current : +/- 0.2 % of FSR	+/- 0.2 % of FSR
Output Capacity	Voltage : 10 V @ 5 mA Current : External +24 V : 1050 Ω	External +24 V : 1050 Ω
Power on Value	Yes	Yes
Safe Value	Yes	Yes
Communication		
Connector	5-pin screwed terminal block (CAN_GND, CAN_L, CAN_SHLD, CAN_H, CAN_V+)	
Baud Rate (bps)	125 k, 250 k, 500 k	
Terminator Resistor	Switch for 120 Ω terminator resistor	
Node ID	0~63 selected by rotary switch	
Protocol	Volume I, Release 2.0 & Volume II, Release 2.0, Errata 5	
DeviceNet subscribe	Group 2 Only Server	
Explicit Connection	Yes	
Polled I/O Connection	Yes	
Bit-Strobe I/O Connection	Yes	
Heartbeat message	Yes	
Shutdown message	Yes	
System		
ESD Protection	4 kV Contact for each channel	
Isolation	3000 V _{DC} for DC-to-DC, 3000 V _{rms} for bus-to-logic	
Watchdog	Yes	
Power		
Input range	Unregulated +10 ~ +30 V _{DC}	
Power Consumption	1.5 W	1.4 W
Mechanism		
Installation	DIN-Rail	
Dimensions (W x L x H)	33 mm x 107 mm x 102 mm	
Environment		
Operating Temperature	-25 ~ +75°C	
Storage Temperature	-30 ~ +80°C	
Relative Humidity	10 ~ 90% RH, non-condensing	

5.3. CAN Bus Board/CAN Bus Software

5

• PC Based Solution

To access the CAN-2000 I/O modules, we provide communication boards for PC based solution and communication modules for PAC solution.

Communication Boards:

The following CAN bus communication boards are designed for different interface and different CAN port number. All of them have the same features:

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

Software Support:

ICP DAS provides following SDK for the PC based CAN bus communication boards

► For Windows:

- ✓ LabView CAN Driver,
- ✓ DASyLab CAN Driver,
- ✓ RTX CAN Driver
- ✓ PISOCNX Active Object,
- ✓ NAPOPC.CAN DA Server

► For Linux:

- ✓ SocketCAN Device Driver

Model Number	Description
 PEX-CAN200i-(D/T)	2-CAN PCI Express board (D-Sub/Terminal Connector)
 PISO-CAN200U-(D/T)	2-CAN Universal PCI board (D-Sub/Terminal Connector)
 PISO-CAN400U-(D/T)	4-CAN Universal PCI board (D-Sub/ Terminal Connector)
 PCM-CAN100-D	1-CAN PCI-104 board (D-Sub Connector)
 PCM-CAN200-D	2-CAN PCI-104 board (D-Sub Connector)
 PCM-CAN200P-D	2-CAN PCI-104+ board (D-Sub Connector)
 PISO-CM100U-(D/T)	1-CAN Programmable Universal PCI board (D-Sub/Terminal Connector)

CAN Bus Remote I/O Modules

3

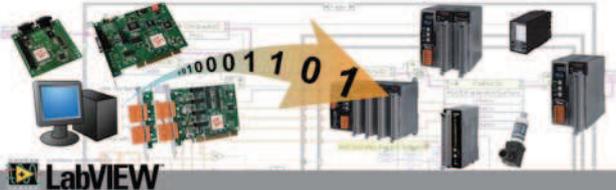
CAN Bus Board/CAN Bus Software

LabVIEW CAN Driver



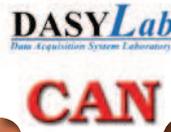
The LabVIEW driver includes a configuration utility to configure the ICP DAS's DeviceNet hardware in your PC. By means of this driver, you don't need to have the complex and abstruse technology of the DeviceNet protocol.

- ✓ OS environment: Windows 2000 / XP
- ✓ NI LabVIEW support version 8.0 or later
- ✓ Support CAN specification 2.0A and 2.0B
- ✓ Provide 3000-record Rx buffer for each CAN port
- ✓ Support functions for directly accessing SJA1000 register
- ✓ Support timestamp information for each received CAN messages



CAN LabVIEW Driver

DASyLab CAN Driver



DASyLab is a kind of data acquisition software. It lets you 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
- ✓ Support DASyLab support version 8.0
- ✓ Support CAN specification 2.0A and 2.0B
- ✓ Support maximum 64 CAN ports
- ✓ Block size range is 1 ~ 4096
- ✓ Provide Intel mode and Motorola mode for remote CAN device
- ✓ Support two kinds of languages, German and English

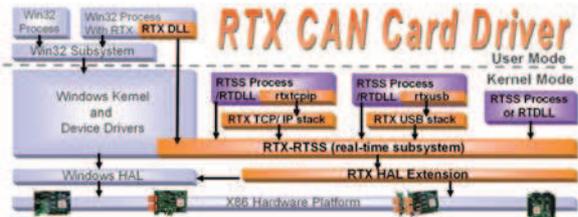


RTX CAN Driver



The RTX CAN Driver helps users to develop the highly real-time CAN bus applications on Windows OS by PISO-CAN series in ICP DAS. The name and parameters of the APIs in the RTX driver are the same as 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
- ✓ Support interrupt function if the PISO-CAN series CAN card can get the independent IRQ
- ✓ Direct I/O control and highly real-time feature
- ✓ Support RTX version 8.0 or late
- ✓ Provide VC 6.0 demos
- ✓ Real-time Test:
 - ★ Platform: Windows XP SP2+PISO-CAN200E
 - ★ Device: I-7186EXD-CAN with MiniOS7 (single tasking OS)
 - ★ Send and receive 10000 CAN 2.0B 8-byte messages. Repeat this procedure for 10 times

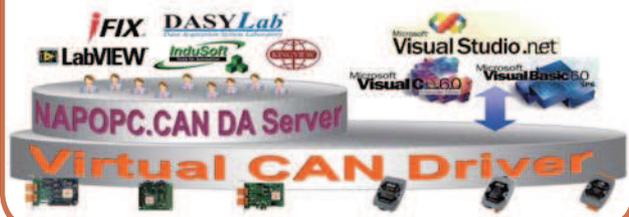


NAOPC.CAN DA Server



NAOPC.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
- ✓ Follow OPC 1.0, OPC 2.0 Data Access Standards
- ✓ Configure CAN hardware filter by the APIs of the Virtual CAN Driver
- ✓ Provide CAN Engine Utility to monitor the CAN messages
- ✓ Collect the data from the different CAN devices in one OPC server
- ✓ Provide the CAN devices and the virtual CAN port No. mapping table
- ✓ Load previous configuration or scan all CAN devices manually while the Virtual CAN Driver boots up
- ✓ Provide the APIs of the Virtual CAN Driver



PISOCANX ActiveX Object



PISOCANX uses ActiveX technology to simply 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
- ✓ Allow polling mode and interrupt mode
- ✓ Provide 3000-record Rx buffer for each CAN port
- ✓ Support functions for directly accessing SJA1000 register
- ✓ Allow users to read the card No. and relative information
- ✓ Support timestamp information for each received CAN messages
- ✓ VC6, VB demos are given



SocketCAN Device Driver



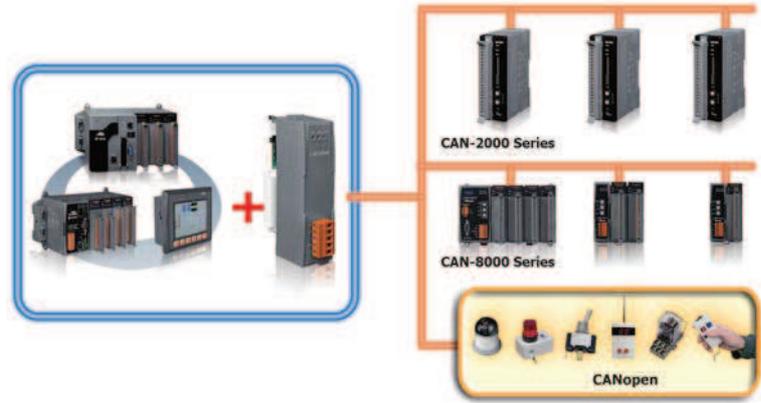
SocketCAN driver is a kind of device driver based on the Linux operating system, and it contains the implementation interface of the network stack and the hardware driver. The hardware manufacturers develop the hardware driver of SocketCAN driver for their hardware interface, and the network stack provides the standard BSD Socket APIs for users.

- ✓ OS environment: Linux kernel version 2.6.31~2.6.34 (x86 hardware platform only)
- ✓ Provide CANopen/DeviceNet master static library Standard interface for SocketCAN package. Users can use extended BSD socket APIs, you can program the CAN application as building a socket program
- ✓ Support Virtual CAN interface. Users can map several virtual CAN port into one physical CAN port. Each virtual CAN port has its own socket. Through these sockets, users can build the multi-thread application more easily
- ✓ Provide the RAW socket, CANopen master and DeviceNet master demos



• PAC Based Solution

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

Interface	ISO 11898-2 CAN					
Port	1					
Terminator	120 Ω Selected By Jumper					
Max. Speed (K bps)	1000		1000		500	
Controller Chip	SJA1000T					
Transceiver Chip	82C250					
Protocol	CAN 2.0 A/2.0 B		CANopen DS-301 ver 4.02, DS-401 ver 2.1		DeviceNet Volumn I ver 2.0, Volumn 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					



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	eVC++ 4.0, VB.Net 2005, C#.Net 2005					
VP-2000						
XP-8000-CE6, XP-8000-Atom-CE6	VB.Net 2005, C#.Net 2005, VC 2005					
XP-8000, XP-8000-Atom	VB.Net 2005, C#.Net 2005, VC 6					
LP-8000	-	GCC	-	GCC	-	GCC

More products refer to Industrial CAN Bus Products Catalog

- CAN bus series
- CANopen series
- DeviceNet series
- J1939 series

