ADLINK
TECHNOLOGY INC.

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PCI-7841/cPCI-7841/PM-7841
Dual-Port Isolated CAN Interface Card
User's Manual

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Please give a detailed description of the problem(s):

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1 Introduction

The PCI/cPCI/PM-7841 is a Controller Area Network (CAN) interface card used for industrial PC with PCI, Compact-PCI, and PC104 bus. It supports dual ports CAN's interface that can run independently or bridged at the same time. The built-in CAN controller provides bus arbitration and error detection with auto correction and re-transmission function. The PCI cards are plug and play therefore it is not necessary to set any jumper for matching the PC environment.

The CAN (Controller Area Network) is a serial bus system originally developed by Bosch for use in automobiles, is increasing being used in industry automation. It multi-master protocol, realtime capability, error correction and high noise immunity make it especially suited for intelligent I/O devices control network.

The PCI/cPCI/PM-7841 is programmed by using the ADLINK's software library. The programming of this PCI card is as easy as AT bus add-on cards.

1.1 PCI/cPCI/PM-7841 Features

The PCI-7841 is a Dual-Port Isolated CAN Interface Card with the following features:

- Two independent CAN network operation
- Bridge function supports
- Compatible with CAN specification 2.0 parts A and B
- Optically isolated CAN interface up to 2500 Vrms isolation protection
- Direct memory mapping to the CAN controllers
- Powerful master interface for CANopen, DeviceNet and SDS application layer protocol
- Up to 1Mbps programmable transfer rate
- Supports standard DeviceNet data rates 125, 250 and 500 Kbps
- PCI bus plug and play
- DOS library and examples included

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- compact-PCI industry bus
- DOS library and examples included

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- Up to 1Mbps programmable transfer rate
- Supports standard DeviceNet data rates 125, 250 and 500 Kbps
- DIP-Switch for base address configuration
- Software Programmable Memory-Mapped Address
- PC-104 industry form factor
- DOS library and examples included

1.2 Applications

- Industry automation
- Industry process monitoring and control
- Manufacture automation
- Product testing

1.3 Specifications

PCI-7841 Specification Table

Ports	2 CAN channels (V2.0 A,B)
CAN Controller	SJA1000
CAN Transceiver	82c250
Signal Support	CAN_H, CAN_L
Isolation Voltage	2500 Vrms
Connectors	Dual DB-9 male connectors
Operation Temperature	0 ~ 60°C
Storage Temperature	-20°C ~ 80°C
Humidity	5% ~ 95% non-condensing
IRQ Level	Set by Plug and Play BIOS
I/O port address	Set by Plug and Play BIOS
Power Consumption (without external devices)	400mA @5VDC (Typical) 900mA @5VDC (Maximum)
Size	132(L)mm x 98(H)mm

Table 1-1: PCI-7841 Specifications

cPCI-7841 Specification Table

Ports	2 CAN channels (V2.0 A,B)
CAN Controller	SJA1000
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Table 1-2: cPCI-7841 Specifications

Size	132(L)mm x 98(H)mm

Table 1-2: cPCI-7841 Specifications

PM-7841 Specification Table

Ports	2 CAN channels (V2.0 A,B)
CAN Controller	SJA1000
CAN Transceiver	82c250/82c251
Signal Support	CAN_H, CAN_L
Isolation Voltage	1000 Vrms
Connectors	Dual 5 male connectors
Operation Temperature	0 ~ 60°C
Storage Temperature	-20°C ~ 80°C
Humidity	5% ~ 95% non-condensing
IRQ Level	Set by Jumper
I/O port address	Set by DIP Switch
Memory Mapped Space	128 Bytes by Software
Power Consumption (without external devices)	400mA @5VDC (Typical) 900mA @5VDC (Maximum)
Size	90.17(L)mm x 95.89(H)mm

Table 1-3: PM-7841 Specifications

2 Installation

This chapter describes how to install the PCI/cPCI/PM-7841. At first, the contents in the package and unpacking information that you should be careful are described.

2.1 Before Installing the PCI/cPCI/PM-7841

Your PCI/cPCI/PM-7841 card contains sensitive electronic components that can be easily damaged by static electricity.

The card should be done on a grounded anti-static mat. The operator should be wearing an anti-static wristband, grounded at the same point as the anti-static mat.

Inspect the card module carton for obvious damage. Shipping and handling may cause damage to your module. Be sure there are no shipping and handing damages on the module before processing.

After opening the card module carton, exact the system module and place it only on a grounded anti-static surface component side up.

Note: DO NOT APPLY POWER TO THE CARD IF IT HAS BEEN DAMAGED.

You are now ready to install your PCI/cPCI/PM-7841.

2.2 Installing PCI-7841

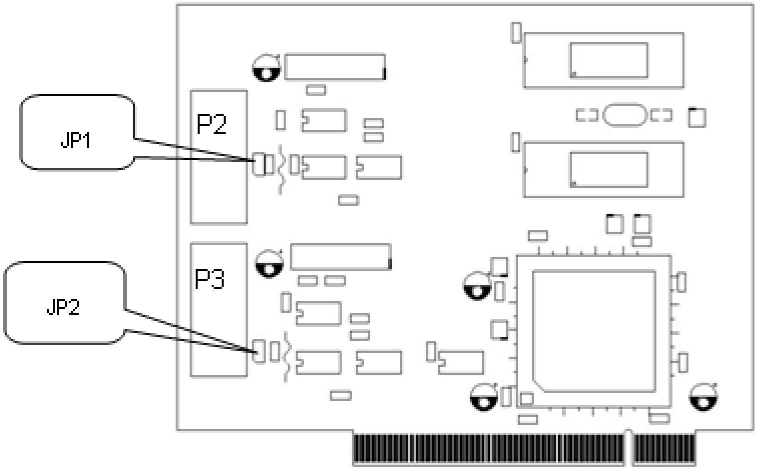
What you have:

In addition to this User's Manual, the package includes the following items:

- PCI-7841 Dual Port PCI Isolated CAN Interface Card
- ADLINK CD-ROM

If any of these items is missing or damaged, contact the dealer from whom you purchased the product. Save the shipping materials and carton in case you want to ship or store the product in the future.

PCI-7841 Layout:

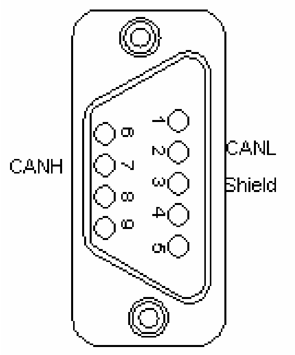


Terminator Configuration

A 120 Ohm terminal resistor is installed for each port, while JP1 enables the terminal resistor for port0 and JP2 enables the terminal resistor for port 1

Connector Pin Definition

P3 and P4 are CAN connectors; pin definition is as follows:



DIP-9 Connector

2.3 Installing cPCI-7841

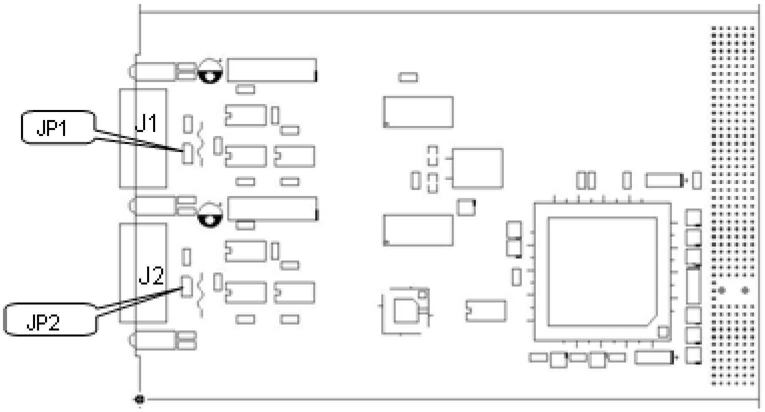
What you have

In addition to this User's Manual, the package includes the following items:

- cPCI-7841 Dual Port Compact-PCI Isolated CAN Interface Card
- ADLINK CD-ROM

If any of these items is missing or damaged, contact the dealer from whom you purchased the product. Save the shipping materials and carton in case you want to ship or store the product in the future.

cPCI-7841 Layout

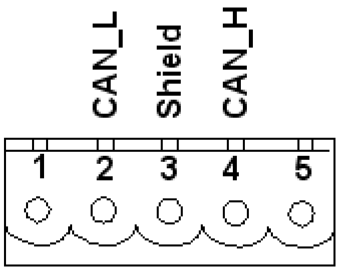


Terminator Configuration

A 120 Ohm terminal resistor is installed for each port, while JP1 enables the terminal resistor for port0 and JP2 enables the terminal resistor for port 1

Connector Pin Definition

J1 and J2 are CAN connectors; pin definition is as follows:



Combicon-Style Connector

2.4 Installing PM-7841

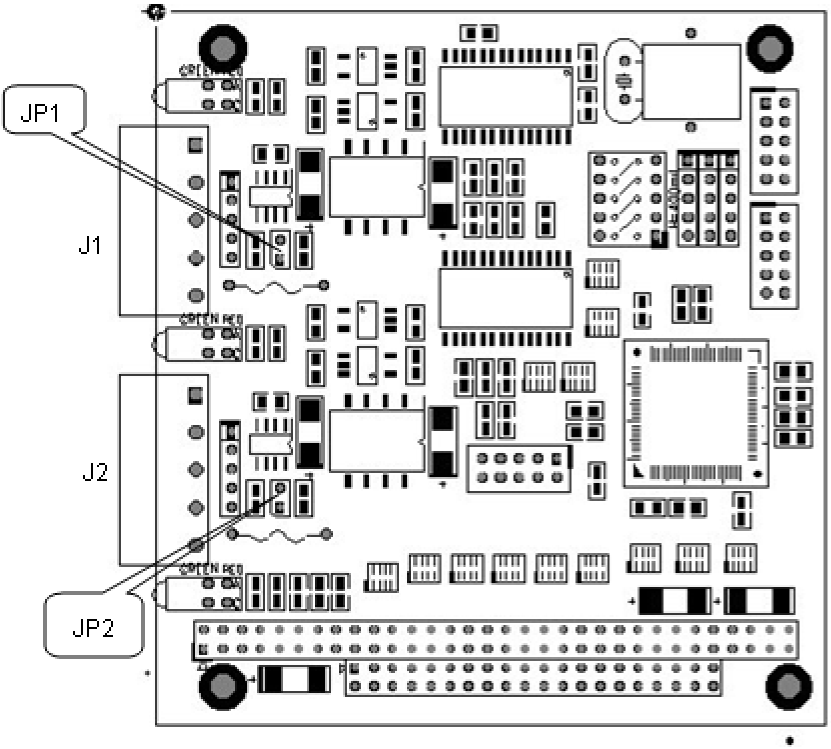
What you have

In addition to this User's Manual, the package includes the following items:

- PM-7841 Dual Port PC-104 Isolated CAN Interface Card
- ADLINK CD-ROM

If any of these items is missing or damaged, contact the dealer from whom you purchased the product. Save the shipping materials and carton in case you want to ship or store the product in the future.

PM-7841 Layout



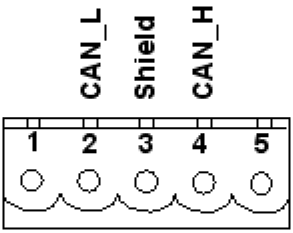
Terminator Configuration

A 120 Ohm terminal resistor is installed for each port, while JP1 enables the.

terminal resistor for port0 and JP2 enables the terminal resistor for port 1.

Connector Pin Define

J1 and J2 are CAN connectors; pin definition is as follows:



2.5 Jumper and DIP Switch Description

You can configure the output of each channel and base address by setting jumpers and DIP switches on the PM-7841. The card's jumpers and switches are preset at the factory. Under normal circumstances, you should not need to change the jumper settings.

A jumper switch is closed (sometimes referred to as "shorted") with the plastic cap inserted over two pins of the jumper. A jumper is open with the plastic cap inserted over one or no pin(s) of the jumper.

2.6 Base Address Setting

The PM-7841 requires 16 consecutive address locations in I/O address space. The base address of the PM-7841 is restricted by the following conditions.

1. The base address must be within the range 200hex to 3F0hex.
2. The base address should not conflict with any PC reserved I/O address.

The PM-7841's I/O port base address is selectable by an 5 position DIP switch SW1 (refer to Table 2.1). The address settings for I/O port from Hex 200 to Hex 3F0 is described in Table 2.2 below. The default base address of your PM-7841 is set to hex 200 in the factory(see Figure below).

SW1 : Base Address = 0x200

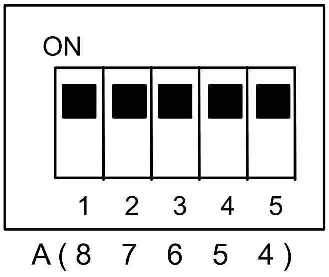


Figure 2-1: Default Base Address Configuration

I/O port address(hex)	fixed A9	1 A8	2 A7	3 A6	4 A5	5 A4
200-20F	OFF (1)	ON (0)	ON (0)	ON (0)	ON (0)	ON (0)
210-21F	OFF (1)	ON (0)	ON (0)	ON (0)	ON (0)	OFF (1)
:						
(*) 2C0-2CF	OFF (1)	ON (0)	OFF (1)	OFF (1)	ON (0)	ON (0)
:						
300-30F	OFF (1)	OFF (1)	ON (0)	ON (0)	ON (0)	ON (0)
:						
3F0-3FF	OFF (1)	OFF (1)	OFF (1)	OFF (1)	OFF (1)	OFF (1)

```
(*): default setting ON   : 0
X: don't care        OFF  : 1
```

Note: A4,…, A9 correspond to PC-104(ISA) bus address lines.

2.7 IRQ Level Setting

A hardware interrupt can be triggered by the external Interrupt signal which is from JP3 ad JP4.

The jumper setting is specified as below:

Note: Be aware that there is no other add-on cards sharing the same interrupt level in the system.

Interrupt Default Setting = IRQ15

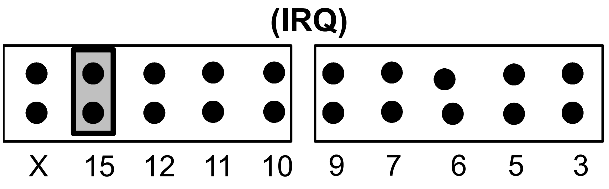


Figure 2-2: IRQ Settings

3 Function Reference

The cPCI/PCI-7841 functions are organize into the following sections:

- CAN layer functions
- Card Initialization and configuration functions
- CAN layer I/O functions
- CAN layer status functions
- CAN layer Error and Event Handling functions
- DeviceNet layer functions
- Send and Receive packet functions
- Connection establish and release functions
- DeviceNet object class functions

The particular functions associated with each function are presented in next page.

3.1 Functions Table

CAN layer functions

Function Type	Function Name
PM-7841 Initial	PM7841_Install()
	GetDriverVersion()
	CanOpenDriver()
	CanCloseDriver()
	CanConfigPort()
	CanDetectBaudrate()
	_7841_Read()
	_7841_Write()
	CanEnableReceive()
	CanDisableReceive()
	CanSendMsg()
	CanRcvMsg()
	CanGetRcvCnt()

	CanClearOverrun()
	CanClearRxBuffer()
	CanClearTxBuffer()
	CanGetErrorCode()
	CanGetErrorWarningLimit()
	CanSetErrorWarningLimit()
	CanGetRxErrorCount()
	CanGetTxErrorCount()
	CanSetTxErrorCount()
	CanGetPortStatus()
	CanGetLedStatus()1
	CanSetLedStatus()1

Error and Event handling functions	
Operation System	Function Name
DOS	CanInstallCallBack()
	CanRemoveCallBack()
Windows 95/98/NT	CanInstallEvent()

Note: only for compact PCI and PC-104 version.

PORT_STRUCT structure define

The PORT_STRUCT structure defines the mode of id-mode, acceptance code, acceptance mask and baud rate of a physical CAN port. It is used by the CanPortConfig(), and CanGetPortSta-tus() functions.

```
typedef struct _tagPORT_STRUCT
{
int mode;       // 0   for 11-bit;     1 for 29-
     bit
     DWORD accCode, accMask;
     int baudrate;
     BYTE brp, tseg1, tseg2;// Reserved
     BYTE sjw, sam;  // Reserved
     }PORT_STRUCT;
```

Members

mode: 0 means using 11-bit in CAN-ID field

1 means using 29-bit in CAN-ID field.

accCode:Acceptance Code for CAN controller.

accMask:Acceptance Mask for CAN controller.

baudrate:Baud rate setting for the CAN controller.

Value	Baudrate
0	125 Kbps
1	250 Kbps
2	500 Kbps
3	1M bps

CanPortConfig(), CanGetPortStatus(), and PORT_STATUS structure

PORT_STATUS structure define

The PORT_STATUS structure defines the status register and PORT_STRUCT of CAN port. It is used by the CanGetPortStatus() functions.

```
typedef struct _tagPORT_STATUS
{
    PORT_STRUCT port;
    PORT_REG status;
}PORT_STATUS;
Members
     port:      PORT_STRUCT data
     status:    status is the status register
     mapping of CAN controller.
typedef union _tagPORT_REG
{
                struct PORTREG_BIT bit;
                unsigned short reg;
}PORT_REG;
struct PORTREG_BIT
{
    unsigned short RxBuffer: 1;
    unsigned short DataOverrun: 1;
    unsigned short TxBuffer: 1;
```

```
        unsigned short TxEnd: 1;
        unsigned short RxStatus: 1;
        unsigned short TxStatus: 1;
        unsigned short ErrorStatus: 1;

    unsigned short BusStatus: 1;
    unsigned short reserved: 8;
    };
```

See Also

CanGetPortStatus(), and PORT_STATUS structure

CAN_PACKET structure define

The CAN_PACKET structure defines the packet format of CAN packet. It is used by the CanSendMsg(), and CanRcvMsg() functions.

```
typedef struct _tagCAN_PACKET
{
DWORD CAN_ID;
BYTE rtr;
BYTE len;
BYTE data[8]
DWORD time;
BYTE reserved
}CAN_PACKET;
```

Members

CAN_ID:	CAN ID field (32-bit unsigned integer)
rtr:	CAN RTR bit.
len:	Length of data field.
data:	Data (8 bytes maximum)
time:	Reserved for future use
reserved:	Reserved byte

See Also

CanSendMsg(), and CanRcvMsg()

DEVICENET_PACKET structure define

The DEVICENET_PACKET structure defines the packet format of DeviceNet packet. It is widely used by the DeviceNet layer functions.

```
typedef struct _tagDEVICENET_PACKET
{
BYTE Group;
BYTE MAC_ID;
BYTE HostMAC_ID;
BYTE MESSAGE_ID;
BYTE len;
BYTE data[8];
DWORD time;
BYTE reserved;
}DEVICENET_PACKET;
```

Members

Group:	Group of DeviceNet packet.
MAC_ID:	Address of destination.
HostMAC_ID:	Address of source.
MESSAGE_ID:	Message ID of DeviceNet packet.
len:	Length of data field.
data:	Data (8 bytes maximum).

See Also

SendDeviceNetPacket(), and RcvDeviceNetPacket()

3.2 CAN LAYER Functions

CAN-layer Card Initialization Functions

PM7841_Install(base, irq_chn, 0xd000)

Purpose	Get the version of driver
Prototype	C/C++

int PM7841_Install(int baseAddr, int irq_chn, int memorySpace)

Parameters	baseAddr:Base Address of PM-7841(DIP Switch)
Irq_chn:	IRQ channel (Jumpper)
MemorySpace:	Memory Mapping Range
Return Value	A signed integer
	0 : Successful
	-1: Failed
Remarks	PM7841 is PC104(ISA) CAN interface card. It will need 32-bytes I/O space and 1K memory space.
See Also	none
Usage	C/C++

```
#include "pm7841.h"
int ret;
ret = PM7841_Install(
baseAddr,
irq_ch,
memorySpace);
```

GetDriverVersion()

Purpose	Get the version of driver
Prototype	C/C++
	WORD GetDriverVersion(void)
Parameters	none
Return Value	A 16-bit unsigned integer
	High byte is the major version
	Low byte is the major version

Remarks	Call this function to retrieve the version of current using driver. This function is for your program to get the version of library and dynamic-linked library.
See Also	none
Usage	C/C++

```
#include "pci7841.h"

WORD version = GetDriverVersion();
majorVersion = version >> 8;
minorVersion = version & 0x00FF;
```

CanOpenDriver()

Purpose	Open a specific port, and initialize driver.
Prototype	C/C++
	int CanOpenDriver(int card, int port))
Parameters	card: index of card
port:	index of port
Return Value	Return a handle for open port
	-1 if error occurs
Remarks	Call this function to open a port
	Under DOS operation system, you will receive –1 if there is not enough memory. If writing program for the Windows system. It will return -1, if you want to open a port had been opened. And you must use Can-CloseDriver() to close the port after using.
See Also	CanCloseDriver()
Usage	C/C++

```
#include "pci7841.h"
int handle = CanOpenDriver();
CanSendMsg(handle, &msg);
CanCloseDriver(handle);
```

CanCloseDriver()

Purpose	Close an opened port, and release driver.
Prototype	C/C++

int CanCloseDriver(int handle)

Parameters	handle : handle retrieve from CanOpen-Driver() Port : index of port
Return Value	Return 0 if successful -1 if error occurs
Remarks	Call this function to close a port.
See Also	CanOpenDriver()
Usage	See usage of CanOpenDriver().

CanConfigPort()

Purpose	Configure properties of a port
Prototype	C/C++ int CanConfigPort(int handle, PORT_STRUCT *ptrStruct)
Parameters	handle : handle retrieve from CanOpen-Driver() PtrStruct : a pointer of PORT_STRUCT type
Return Value	Return 0 is successful -1 if error occurs
Remarks	Configure a port that had been opened. The properties of a CAN port such as baud rate, acceptance code, acceptance mask, operate mode. After configuration is over, the port is ready to send and receive data.
See Also	PORT_STRUCT structure define
Usage	C/C++

```
#include "pci7841.h
PORT_STRUCT port_struct;
int handle = CanOpenDriver(0, 0);//Open port 0 of
     card 0
port_struct.mode = 0;//CAN2.0A (11-bit CAN id)
port_struct.accCode = 0;//This setting of
     acceptance code and
port_struct.accMask = 0x7FF; //mask enable all
     MAC_IDs input
port_struct.baudrate = 0;//125K bps
CanConfigPort(handle, &port_struct);
```

```
CanCloseDriver(handle);
```

CanDetectBaudrate()

Purpose	Perform auto-detect baud rate algorithm.
Prototype	C/C++ int CanDetectBaudrate(int handle, int miliSecs)
Parameters	handle: handle retrieve from CanOpen-Driver() MiliSecs: timeout time(ms)
Return Value	Return –1 if error occurs

Others is the baudrate

Value	Baudrate
0	125 Kbps
1	250 Kbps
2	500 Kbps
3	1 Mbps

Remarks	Call this function to detect the baud rate of a port. The function performs an algorithm to detect your baud rate. It needs that there are activities on the network. And it will return a –1 when detecting no activity on the network or time was exceeded.
See Also	none
Usage	C/C++

```
#include "pci7841.h
PORT_STRUCT port_struct;"
int handle = CanOpenDriver();
port_struct.mode = 0;//CAN2.0A (11-bit CAN id)
port_struct.accCode = 0;//This setting of
     acceptance code and
port_struct.accMask = 0x7FF;//mask enable all
     MAC_IDs input

port_struct.baudrate = CanDetectBaudrate(handle,
     1000):
        CanConfigPort(handle, &port_struct);
        CanCloseDriver(handle);
```

Visual Basic(Windows 95/98/NT)

CanRead()

Purpose	Direct read the register of PCI-7841.
Prototype	C/C++
	BYTE CanRead(int handle, int offset)
Parameters	handle : handle retrieve from CanOpen-Driver()
	offset : offset of register
Return Value	Return data read from port.
Remarks	Direct read the register of PCI-7841.
See Also	CanWrite()
Usage	none

CanWrite()

Purpose	Direct write the register of PCI-7841.
Prototype	C/C++
	void CanWrite(int handle, int offset, BYTE data)
Parameters	handle : handle retrieve from CanOpen-Driver()
	Offset : offset of register
	data : data write to the port
Return Value	none
Remarks	Call this function to directly write a register of PCI-7841
See Also	CanRead()
Usage	none

CAN-layer I/O Functions

CanEnableReceive()

Purpose	Enable receive of a CAN port.
Prototype	C/C++

	void CanEnableReceive(int handle);
Parameters	handle : handle retrieve from CanOpen-Driver()
Return Value	none
Remarks	Call this function to enable receive.
	Any packet on the network that can induce a interrupt on your computer. If that packet can pass your acceptance code and acceptance mask setting. So if your program doesn't want to be disturbed. You can call CanDisableReceive() to disable receive and CanEnableReceive() to enable receives.
See Also	CanDisableReceive()
Usage	none

CanDisableReceive()

Purpose	Disable receive of a CAN port.
Prototype	C/C++
	void CanEnableReceive(int handle);
Parameters	handle : handle retrieve from CanOpen-Driver()
Return Value	none
Remarks	Please refer the CanEnableReceive()
See Also	CanEnableReceive()
Usage	none

CanSendMsg()

Purpose	Send can packet to a port
Prototype	C/C++
	int CanSendMsg(int handle, CAN_PACKET *packet);
Parameters	handle : handle retrieve from CanOpen-Driver()
	Packet : CAN_PACKET data
Return Value	Return 0 is successful

	-1 if error occurs
Remarks	Send a message to an opened CAN port.
	Actually, this function copies the data to the sending queue. Error occurs when the port has not been opened yet or the packet is a NULL pointer. You can use the Error and Event handling functions to handle the exceptions.
See Also	CanRcvMsg()
Usage	C/C++

```
#include "pci7841.h
PORT_STRUCT port_struct;
CAN_PACKET sndPacket, rcvPacket;
int handle = CanOpenDriver(0, 0);//open the port
     0 of card 0
CanConfigPort(handle, &port_struct);
CanSendMsg(handle, &sndPacket);
if(CanRcvMsg(handle, &rcvPacket) == 0)
{
}
CanCloseDriver(handle);
```

CanRcvMsg()

Purpose	Receive a can packet from a port
Prototype	C/C++
	int CanSendMsg(int handle, CAN_PACKET *packet);
Parameters	handle : handle retrieve from CanOpen-Driver()
	Packet : CAN_PACKET data
Return Value	Return 0 is successful
	-1 if error occurs
Remarks	Receive a message from an opened CAN port.
	There are only 64-bytes FIFO under hard-ware. It can store from 3 to 21 packets. So there are memory buffer under driver. When data comes, the driver would move it from

	card to memory. It starts after your port configuration is done. This function copies the buffer to your application. So if your program has the critical section to process the data on the network. We suggest that you can call the CanClearBuffer() to clear the buffer first. Error would be happened most under the following conditions: 1. You want to access a port that has not be opened. 2. Your packet is a NULL pointer. 3. The receive buffer is empty. You can use the Status handling functions to handle the exceptions.
See Also	CanSendMsg()
Usage	See the CanSendMsg()

CAN-layer Status Functions

CanClearOverrun()

Purpose	Clear data overrun status
Prototype	C/C++ void CanClearOverrun(int handle)
Parameters	handle : handle retrieve from CanOpenDriver()
Return Value	none
Remarks	Clear the data overrun status Sometimes if your system has heavy load, and the bus is busy. The data overrun would be signalled. A Data Overrun signals, that data are lost, possibly causing inconsistencies in the system.
See Also	CanRcvMsg()
Usage	C/C++

```
#include "pci7841.h
int handle = CanOpenDriver(0, 0);//open the port
     0 of card 0
```

```
    ….
    CanClearOverrun(handle);
    CanCloseDriver(handle);
```

CanClearRxBuffer()

Purpose	Clear data in the receive buffer
Prototype	C/C++
	void CanClearRxBuffer(int handle)
Parameters	handle : handle retrieve from CanOpen-Driver()
Return Value	none
Remarks	Clear the data in the receive buffer
	There are 2-type of buffer defined in the driver. First one is the FIFO in the card, the second one is the memory space inside the driver. Both of them would be cleared after using this function.
See Also	CanRcvMsg()
Usage	C/C++

```
    #include "pci7841.h
    int handle = CanOpenDriver(0, 0);//open the port
         0 of card 0
    ….
    CanClearRxBuffer(handle);
    CanCloseDriver(handle);
```

CanClearTxBuffer()

Purpose	Clear Transmit Buffer
Prototype	C/C++
	void CanClearTxBuffer(int handle)
Parameters	handle : handle retrieve from CanOpen-Driver()
Return Value	none
Remarks	Clear the data in the transmit buffer.
	Under a busy DeviceNet Network, your transmit request may not be done due to the busy in the network. The hardware will send it automatically when bus is free. The

	un-send message would be stored in the memory of the driver. The sequence of out-going message is the FIRST-IN-FIRST-OUT. According this algorithm, if your program need to send an emergency data, you can clear the transmit buffer and send it again.
See Also	CanRcvMsg()
Usage	C/C++

#include “pci7841.h

```
int handle = CanOpenDriver(0, 0);//open the port
     0 of card 0
….
CanClearTxBuffer(handle);
CanCloseDriver(handle);
```

CanGetErrorCode()

Purpose	Get the Error Code
Prototype	C/C++

BYTE CanGetErrorCode(int handle)

Parameters	handle : handle retrieve from CanOpen-Driver()
Return Value	error code Return error code is an 8-bit data

Bit	Symbol	Name	Value	Function
7	ERRC1	Error Code 1		
6	ERRC0	Error Code 0		
5	DIR	Direction	1	Rx error occurred during reception
			0	Tx error occurred during ransmission
4	SEG4	Segment 4		
3	SEG3	Segment 3		
2	SEG2	Segment 2		
1	SEG1	Segment 1		
0	SEG0	Segment 0		

Bit interpretation of ERRC1 and ERRC2

Bit ERRC1	Bit ERRC2	Function
0	0	bit error
0	1	form error
1	0	stuff error
1	1	other type of error

Bit interpretation of SEG4 to SEG 0

SEG4	SEG3	SEG2	SEG1	SEG0	Function
0	0	0	1	1	start of frame
0	0	0	1	0	ID.28 to ID.21
0	0	1	1	0	ID.20 to ID.18
0	0	1	0	0	bit SRTR
0	0	1	0	1	bit IDE
0	0	1	1	1	ID.17 to ID.13
0	1	1	1	1	ID.12 to ID.5
0	1	1	1	0	ID.4 to ID.0
0	1	1	0	0	RTR bit
0	1	1	0	1	reserved bit 1
0	1	0	0	1	reserved bit 0
0	1	0	1	1	Data length code
0	1	0	1	0	Data field
0	1	0	0	0	CRC sequence
1	1	0	0	0	CRC delimiter
1	1	0	0	1	acknowledge slot
1	1	0	1	0	end of frame
1	0	0	1	0	intermission
1	0	0	0	1	active error flag
1	0	1	1	0	passive error flag
1	0	0	1	1	tolerate dominant bits
1	0	1	1	1	error delimiter
1	1	1	0	0	overload flag

Remarks	Get the information about the type and location of errors on the bus. When a bus error occurs, if your program installed the call-back function or error-handling event. The error-bit position would be captured into the card. The value would be fixed in the card until your program read it back.
See Also	CanGetErrorWarningLimit(), CanSetErrorWarningLimit()
Usage	C/C++

```
#include "pci7841.h
int handle = CanOpenDriver(0, 0);//open the port
     0 of card 0
….
BYTE data = CanGetErrorCode();
CanCloseDriver(handle);
```

CanSetErrorWarningLimit()

Purpose	Set the Error Warning Limit
Prototype	C/C++ void CanSetErrorWarningLimit(int handle, BYTE value)
Parameters	handle : handle retrieve from CanOpenDriver() Value : Error Warning Limit
Return Value	none
Remarks	Set the error warning limit. If your program has installed the error warning event or callback function. The error warning will be signaled after the value of error counter passing the limit you set.
See Also	CanGetErrorWarningLimit()
Usage	C/C++

```
#include "pci7841.h
int handle = CanOpenDriver(0, 0);//open the port
     0 of card 0
….
```

```
CanSetErrorWarning(handle, 96);
CanCloseDriver(handle);
```

CanGetErrorWarningLimit()

Purpose	Get the Error Warning Limit
Prototype	C/C++
	BYTE CanGetErrorWarningLimit(int handle)
	Visual Basic(Windows 95/98/NT)
Parameters	handle : handle retrieve from CanOpenDriver()
Return Value	0-255 (Error warning limit value)
Remarks	Get the error warning limit
See Also	CanSetErrorWarningLimit()
Usage	C/C++

```
#include "pci7841.h
int handle = CanOpenDriver(0, 0);//open the port
     0 of card 0
….
BYTE limit = CanClearOverrun(handle);
CanCloseDriver(handle);
```

CanGetRxErrorCount()

Purpose	Get the current value of the receive error counter
Prototype	C/C++
	BYTE CanGetRxErrorCount(int handle)
Parameters	handle : handle retrieve from CanOpenDriver()
Return Value	value
Remarks	This function reflects the current of the receive error counter. After hardware reset happened, the value returned would be initialized to 0. If a bus-off event occurs, the returned value would be 0.
See Also	CanRcvMsg()
Usage	C/C++

```
#include "pci7841.h
int handle = CanOpenDriver(0, 0);//open the port
     0 of card 0
….
BYTE error_count = CanGetRxErrorCount();
CanCloseDriver(handle);
```

CanGetTxErrorCount()

Purpose	Get the current value of the transmit error counter
Prototype	C/C++ BYTE CanGetTxErrorCount(int handle)
Parameters	handle : handle retrieve from CanOpen-Driver()
Return Value	value
Remarks	This function reflects the current of the transmit error counter. After hardware reset happened, the value would set to 127. A bus-off event occurs when the value reaches 255. You can call the CanSetTxEr-rorCount() to set the value from 0 to 254 to clear the bus-off event.
See Also	CanRcvMsg()
Usage	C/C++

```
#include "pci7841.h
int handle = CanOpenDriver(0, 0);//open the port
     0 of card 0
….
BYTE error_count = CanGetTxErrorCount(handle);
CanCloseDriver(handle);
```

CanSetTxErrorCount()

Purpose	Set the current value of the transmit error counter
Prototype	C/C++ void CanSetTxErrorCount(int handle, BYTE value)

Parameters	handle : handle retrieve from CanOpen-Driver() value : a byte value
Return Value	None
Remarks	This function set the current of the transmit error counter. Please see the remark of CanGetTxError-Count().
See Also	CanRcvMsg()
Usage	C/C++

```
#include "pci7841.h
int handle = CanOpenDriver(0, 0);//open the port
      0 of card 0
….
CanSetTxErrorCount(handle, 0);
CanCloseDriver(handle);
```

CanGetPortStatus()

Purpose	Get Port Status
Prototype	C/C++ int CanGetPortStatus(int handle, PORT_STATUS *PortStatus)
Parameters	handle : handle retrieve from CanOpen-Driver() PortStatus : Pointer of PORT_STATUS structure
Return Value	No Error: 0 Error: -1
Remarks	Get Port Status(See the structure define for detailed description)
See Also	
Usage	C/C++

```
#include "pci7841.h
PORT_STATUS  port_status;
int handle = CanOpenDriver(0, 0);// open the port
      0 of card 0
CanGetPortStatus(&port_status);
CanClearOverrun();
```

```
CanCloseDriver(handle);
```

CanGetLedStatus()

Purpose	Get the LED status of cPCI-7841 and PM-7841
Prototype	C/C++ BYTE CanGetLedStatus (int card, int index);
Parameters	card : card number Index : index of LED
Return Value	status of Led

Value	Function
0	Led Off
1	Led On

Remarks	Get the status of Led This function supports the cPCI-7841 and PM-7841.
See Also	CanSetLEDStatus()
Usage	C/C++

```
#include "pci7841.h
int handle = CanOpenDriver(0, 0);//open the port
     0 of card 0
….
BYTE flag = CanGetLedStatus(0, 0);;
CanCloseDriver(handle);
```

CanSetLedStatus()

Purpose	Set the Led Status of cPCI-7841
Prototype	C/C++ void CanSetLedStatus(int card, int index, int flashMode);
Parameters	card : card number Index : index of Led

flashMode :

Value	Function

0	Led Off
1	Led On

Return Value	none
Remarks	Set Led status of cPCI-7841 and PM-7841 This function supports the cPCI-7841 and PM-7841
See Also	CanRcvMsg()
Usage	C/C++

```
#include "pci7841.h
int handle = CanOpenDriver(0, 0);//open the port
        0 of card 0
….
CanSetLedStatus(0, 0, 2);//Set Led to flash
CanCloseDriver(handle);
```

CanGetRcvCnt()

Purpose	Get the how many message in the FIFO
Prototype	C/C++ int _stdcall CanGetRcvCnt(int handle)
Parameters	handle : handle retrieve from CanOpen-Driver()
Return Value	value indicates the left unread messages in the FIFO.
Remarks	Get the unread message count in the FIFO. Because the interrupt would be very busy while CAN bus is busy. There is possibility to lost the event in Windows system. A way to solve to this problem is to call this function at free time while program running. You also can call this function to make sure that receiving FIFO is empty.
See Also	CanGetReceiveEvent()
Usage	C/C++

```
#include "pci7841.h
int handle = CanOpenDriver(0, 0);//open the port
        0 of card 0
…..
int count = CanGetRcvCnt(handle);.
```

Error and Event Handling Functions

When the exception occurs, your program may need to take some algorithm to recover the problem. The following functions are operation-system depended functions. You should care about the restriction in the operation-system.

DOS Environment

CanInstallCallBack()

Purpose	Install callback function of event under DOS environment
Prototype	C/C++ (DOS) void far*CanInstallCallBack(int handle, int index, void (far* proc)());
Parameters	handle : handle retrieve from CanOpenDriver() Index : event type

Index	Type
2	Error Warning
3	Data Overrun
4	Wake Up
5	Error Passive
6	Arbitration Lost
7	Bus Error

void (far *proc)() : Call-back function

The suggested prototype of the call-back function is like void (far ErrorWarning)();

Return Value	Previous call back function (NULL when there is no Call back installed)
Remarks	Install the call-back function for event handling In normal state, all hardware interrupt of cPCI/PCI-7841 wouldn't be set except receive and transmit interrupt. After calling the CanInstallCallBack(), the corresponding interrupt would be activated. The interrupt

occurs when the event happened. It will not be disabled until using CanRemoveCallBack() or a hardware reset.

Actually, the call-back function is a part of ISR. You need to care about the DOS reentrance problem, and returns as soon as possible to preventing the lost of data.

See Also	CanRemoveCallBack()
Usage	C/C++(DOS)

```
#include "pci7841.h
void (far ErrorWarning)();
int handle = CanOpenDriver(0, 0);
//    open the port 0 of card 0
…
//    Installs the ErrorWarning handling event and
      stores the previous one.
void (far *backup) = CanInstallCallBack(0, 2,
      ErrorWarning);
CanRemoveCallBack(0, 2, NULL);//Remove the call-
      back function
CanCloseDriver(handle);
```

CanRemoveCallBack()

Purpose	Remove the callback function of event under DOS environment
Prototype	C/C++(DOS) int CanRemoveCallBack(int handle, int index, void (far* proc)());
Parameters	handle : handle retrieve from CanOpenDriver() Index : event type

Index	Type
2	Error Warning
3	Data Overrun
4	Wake Up
5	Error Passive
6	Arbitration Lost

7	Bus Error

void (far *proc)() : Previous call-back function

Return Value: Return 0 is successful

-1 if error occurs

Remarks: Install the call-back function for event handling

In normal state, all hardware interrupt of cPCI/PCI-7841 wouldn't be set except receive and transmit interrupt. After calling the CanInstallCallBack(), the corresponding interrupt would be activated. The interrupt occurs when the event happened. It will not be disabled until using CanRemoveCallBack() or a hardware reset.

Actually, the call-back function is a part of ISR. You need to care about the DOS reentrance problem, and returns as soon as possible to preventing the lost of data.

See Also: CanRemoveCallBack()

Usage: C/C++ (DOS)

```
#include "pci7841.h
void (far ErrorWarning)();
int handle = CanOpenDriver(0, 0);//open the port
      0 of card 0
…
//    Installs the ErrorWarning handling event and
      stores the previous one.
void (far *backup) = CanInstallCallBack(0, 2,
      ErrorWarning);
CanRemoveCallBack(0, 2, NULL);//Remove the call-
      back function
```

CanCloseDriver(handle);
Windows 95/98 Environment

CanGetReceiveEvent()

Purpose	Install the event under Windows 95/98/NT system
Prototype	C/C++ (Windows 95/98/NT) void CanGetReceiveEvent(int handle, HANDLE *hevent);
Parameters	handle : handle retrieve from CanOpen-Driver() Heven : HANDLE point for receive event
Return Value	none
Remarks	Retrieve receive notify event Under Windows 95/98/NT environment, your program can wait the input message by waiting an event. You can refer to following program to use this function. But the CAN system is a heavy-load system. Under the full speed(of course, it depends on your system), the hardware receives the message faster than the event occurs. Under this condition, the event could be combined by OS. So the total count of event may be less than actually receive. You can call the CanGetRcvCnt() to retrieve the unread message in the driver's FIFO.
See Also	CanGetRcvCnt()
Usage	C/C++ (Windows 95/98/NT)

```
#include "pci7841.h
HANDLE recvEvent0;

int handle = CanOpenDriver(0, 0);
//   open the port 0 of card 0
int count1;
CanGetReceiveEvent(handle,  rcvEvent0);
if(WaitForSingleObject(rcvEvent0, INFINITE)
== WAIT_OBJECT_0)
{
```

```
//    You need not to call ResetEvent()…..
err=CanRcvMsg(handle,&rcvMsg[0]
[rcvPatterns[0]]);
rcvPatterns[0]++;
}
cout1 = CanGetRcvCnt(handle[0]);
//    To retrieve number of unread
//    in the FIFO
```

CanInstallEvent()

Purpose	Install the event under Windows 95/98/NT system
Prototype	C/C++ (Windows 95/98/NT) int CanInstallEvent(int handle, int index, HANDLE hEvent);
Parameters	handle : handle retrieve from CanOpen-Driver() Index : event type

Index	Type
2	Error Warning
3	Data Overrun
4	Wake Up
5	Error Passive
6	Arbitration Lost
7	Bus Error

	HEvent : HANDLE created from Cre-ateEvent()(Win32 SDK)
Return Value	Return 0 is successful -1 if error occurs
Remarks	Install the notify event Unlike the Dos environment, there is only one error handling function under Windows 95/98/NT environment. First you need to create an event object, and send it to the DLL. The DLL would make a registry in the kernel and pass it to the VxD(SYS in NT

system). You can’t release the event object you created, because it was attached to the VxD. The VxD would release the event object when you installed another event. One way to disable the event handling is that you install another event which handle is NULL (ex: CanInstallEvent(handle, index, NULL)). And you can create a thread to handle the error event.

See Also	CanRemoveCallBack(),CanInstallCall-Back()
Usage	C/C++ (Windows 95/98/NT)

```
#include “pci7841.h
int handle = CanOpenDriver(0, 0);
//    open the port 0 of card 0
…
//    Installs the ErrorWarning handling event and
      stores the previous one.
HANDLE hEvent = CreateEvent(NULL, FALSE, TRUE,
      “ErrorWarning”);
CanInstallEvent(0, 2, hEvent);
//..create a thread ….
      Thread function
      WaitForSingleObject(hEvent, INFINITE);
ResetEvent(hEvent);
//    Event handling
```

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