

PCE-D122 Series

Programming Manual

Version: V1.1 2015N15

To properly use the product, read this manual thoroughly is necessary.

Revision History

Date	Revision	Description
2015/08/18	1.0	Document Creation
2015/11/15	1.1	Add description for PCE-D132, PCE-D105, PCE-150

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Electrical safety

- To prevent electrical shock hazard, disconnect the power cable from the electrical outlet before relocating the system.
- When adding or removing devices to or from the system, ensure that the power cables for the devices are unplugged before the signal cables are connected. Disconnect all power cables from the existing system before you add a device.
- Before connecting or removing signal cables from motherboard, ensure that all power cables are unplugged.
- Seek professional assistance before using an adapter or extension card. These devices could interrupt the grounding circuit.
- Make sure that your power supply is set to the voltage available in your area.
- If the power supply is broken, contact a qualified service technician or your retailer.

Operational safety

- Please carefully read all the manuals that came with the package, before installing the new device.
- Before use ensure all cables are correctly connected and the power cables are not damaged. If you detect and damage, contact the dealer immediately.
- To avoid short circuits, keep paper clips, screws, and staples away from connectors, slots, sockets and circuitry.
- Avoid dust, humidity, and temperature extremes. Do not place the product in any area where it may become wet.
- If you encounter technical problems with the product, contact a qualified service technician or the dealer.

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1. Operational Principle

PCE-D122 series including these models, PCE-D122-SN, PCE-D132-SN, PCE-D150-SX and PCE-D105-XN are advanced-performance data acquisition cards based on PCI Express x1 bus architecture.

PCE-D122-SN is a 32/32-ch high-density isolated digital input/output card.

PCE-D132-SN is a 48/32-ch high-density isolated digital input/output card.

PCE-D150-SX is an 80-ch high-density isolated digital input card.

PCE-D105-XN is an 80-ch high-density isolated digital output card.

This chapter describes the operational principle of the PCE-D122 series. (hereinafter referred to as PCE-D122.)

1.1. System Initialization

PCE-D122 series is Plug-and-Play card. The hardware must be installed under Windows operating system first. After successful hardware initialization, Windows will allocate appropriate system resources for it, for example, IRQ and base memory address. Each individual card must be initialized respectively before its operation. The following message in Windows registry indicates that this hardware initialization is completed successfully.

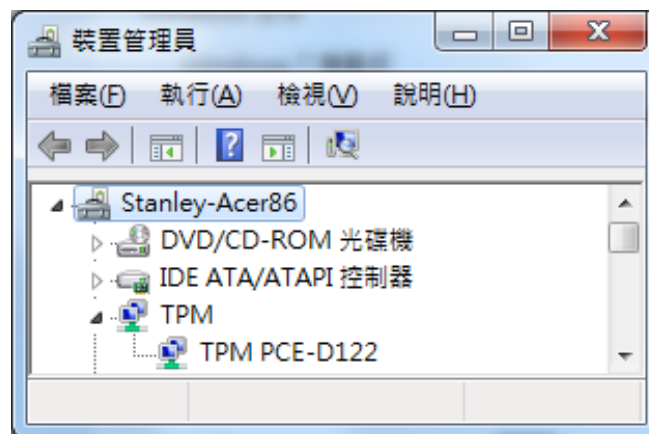


Figure 1-1: PCE-D122 Shown in Device Manager

The PCE-D122 would be fully functioned after the hardware initialization call, `_d122_open ()`.

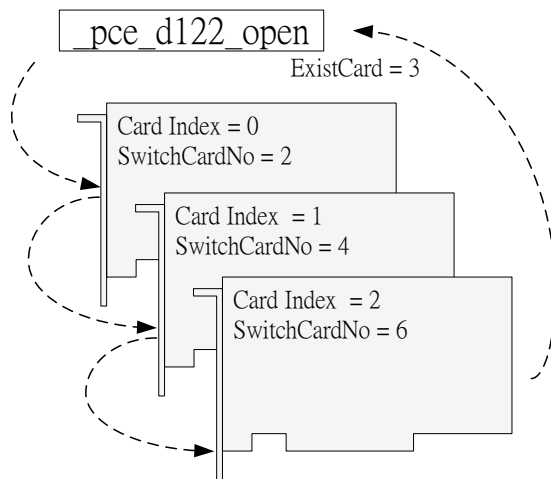


Figure 1-2: System initialization

Relative functions:

`_d122_open`, `_d122_close`

2. Hardware Initialization

Function name	Description
_d122_open	Allocate hardware resources and get the amount of the I/O card.
_d122_close	Release hardware resources
_d122_get_switch_card_num	Get the card number from the card index
_d122_check_switch_card_num	Check the existence of the PCE-D122 with a card number.
_d122_get_card_type	Get the PCE-D122 card type
_d122_get_cpld_version	

2.1. _d122_open

Description

Allocate hardware resources and get the amount of the I/O card.

Syntax

I16 _d122_open (U16 *existcards)

Argument

Name	Type	Description
existcards	U16 *	Get master card count in your PC

Status Return

Function Name	Description
ERR_NoError	The function finished execution successfully.
Other	Please reference to the Appendix error table.

2.2. `_d122_close`

Description

Release hardware resources

Syntax:

```
I16 _d122_close ()
```

Argument

N/A

Status Return

Function Name	Description
ERR_NoError	The function finished execution successfully.
Other	Please reference to the Appendix error table.

2.3. _d122_get_switch_card_num

Description

Get the card number from the card index.

Syntax

I16 _d122_get_switch_card_num (U16 CardIndex, U16 *SwitchCardNo)

Argument

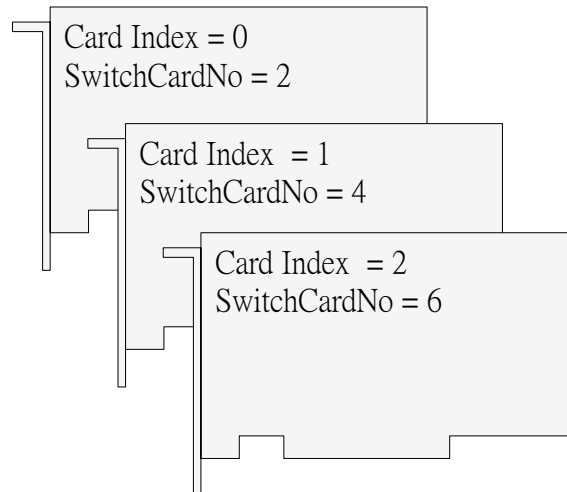
Name	Type	Description
CardIndex	U16	The number of the card index.
SwitchCardNo	U16 *	The number of the card to be checked with the rotary switch setting.

Status Return

Function Name	Description
ERR_NoError	The function finished execution successfully.
Other	Please reference to the Appendix error table.

Note.

CardIndex is auto-incrementing from 0 , and the SwitchCardNo is decision by rotary switch on I/O card. For example, there are 3 PCE-D122 I/O cards installed in PC, we can get the SwitchCardNo by API.



2.4. _d122_check_switch_card_num

Description

Check the existence of the PCE-D122 with a card number.

Syntax

I16 _d122_check_switch_card_num (U16 SwitchCardNo, U8 *IsExist)

Argument

Name	Type	Description
SwitchCardNo	U16	The number of the card to be checked with the rotary switch setting.
IsExist	U8 *	Equal to 1 if the card exists, 0 if the card does not exist.

Status Return

Function Name	Description
ERR_NoError	The function finished execution successfully.
Other	Please reference to the Appendix error table.

2.5. _d122_get_card_type

Description

Get the PCE-D122 card type.

Syntax

I16 _d122_get_card_type (U16 SwitchCardNo, U8 *CardType)

Argument

Name	Type	Description												
SwitchCardNo	U16	The rotary switch set number of the PCE-D122.												
CardType	U8 *	Card Type												
		<table border="1"> <thead> <tr> <th>Value</th> <th>Meaning</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>CARD_UNKNOWN</td> </tr> <tr> <td>1</td> <td>CARD_PCE_D122</td> </tr> <tr> <td>2</td> <td>CARD_PCE_D132</td> </tr> <tr> <td>3</td> <td>CARD_PCE_D150</td> </tr> <tr> <td>4</td> <td>CARD_PCE_D105</td> </tr> </tbody> </table>	Value	Meaning	0	CARD_UNKNOWN	1	CARD_PCE_D122	2	CARD_PCE_D132	3	CARD_PCE_D150	4	CARD_PCE_D105
		Value	Meaning											
		0	CARD_UNKNOWN											
		1	CARD_PCE_D122											
		2	CARD_PCE_D132											
3	CARD_PCE_D150													
4	CARD_PCE_D105													

Status Return

Function Name	Description
ERR_NoError	The function finished execution successfully.
Other	Please reference to the Appendix error table.

2.6. _d122_get_cpld_version

Description

Get the software version of the CPLD.

Syntax

I16 _d122_get_cpld_version (U16 SwitchCardNo, U16 *CpldVer)

Argument

Name	Type	Description
SwitchCardNo	U16	The rotary switch set number of the PCE-D122.
CpldVer	U8 *	Returns the current CPLD version.

Status Return

Function Name	Description
ERR_NoError	The function finished execution successfully.
Other	Please reference to the Appendix error table.

3. Digital Input / Output Functions

Function name	Description
_d122_read_input	Get input status from all input channels.
_d122_read_output	Get input status from all output channels.
_d122_write_output	Generate output signal to all output channels.
_d122_read_input_bit	Get input status from specified BitNo input channel.
_d122_read_output_bit	Get input status from specified BitNo output channel.
_d122_write_output_bit	Generate output signal to specified BitNo output channel.
_d122_toggle_output_bit	Toggle specified BitNo output channel signal.
_d122_read_port	Get input status from specified input or output port.
_d122_write_port	Generate output signal to specified output port.

3.1. `_d122_read_input`

Description

Get input status from all input channels.

Syntax

I16 `_d122_read_input` (U16 SwitchCardNo, U8 InData[])

Argument

Name	Type	Description
SwitchCardNo	U16	The rotary switch set number of the PCE-D122.
InData[]	U8	Return the status of all the input channels.

Status Return

Function Name	Description
ERR_NoError	The function finished execution successfully.
Other	Please reference to the Appendix error table.

Note.

```
// U8 InData[]
// PCE-D122: InData[4]
// PCE-D132: InData[6]
// PCE-D150: InData[10]
// PCE-D105: NotSupported
```


3.2. _d122_read_output

Description

Get input status from all output channels.

Syntax

```
I16 _d122_read_output(U16 SwitchCardNo, U8 OutData[])
```

Argument

Name	Type	Description
SwitchCardNo	U16	The rotary switch set number of the PCE-D122.
OutData[]	U8	Return the status of all the output channels.

Status Return

Function Name	Description
ERR_NoError	The function finished execution successfully.
Other	Please reference to the Appendix error table.

Note.

```
/ U8 OutData[]
// PCE-D122: OutData[4]
// PCE-D132: OutData[4]
// PCE-D150: NotSupported
// PCE-D105: OutData[10]
```

3.3. _d122_write_output

Description

Generate output signal to all output channels.

Syntax

```
I16 _d122_write_output(U16 SwitchCardNo, U8 OutData[])
```

Argument

Name	Type	Description
SwitchCardNo	U16	The rotary switch set number of the PCE-D122.
OutData[]	U8	The output value of all channels

Status Return

Function Name	Description
ERR_NoError	The function finished execution successfully.
Other	Please reference to the Appendix error table.

Note.

```
/ U8 OutData[]
// PCE-D122: OutData[4]
// PCE-D132: OutData[4]
// PCE-D150: NotSupported
// PCE-D105: OutData[10]
```

3.4. _d122_read_input_bit

Description

Get input status from specified BitNo input channel.

Syntax

```
I16 _d122_read_input_bit(U16 SwitchCardNo, U8 InBitNo, U8 *OnOff)
```

Argument

Name	Type	Description
SwitchCardNo	U16	The rotary switch set number of the PCE-D122.
InBitNo	U8	BitNo of channel
OnOff	U8*	On_Off = 1, Status of BitNo is ON On_Off = 0, Status of BitNo is OFF

Status Return

Function Name	Description
ERR_NoError	The function finished execution successfully.
Other	Please reference to the Appendix error table.

Note.

```
// U8 InBitNo
// PCE-D122: 0 ~ 31
// PCE-D132: 0 ~ 47
// PCE-D150: 0 ~ 79
// PCE-D105: NotSupported
```

3.5. _d122_read_output_bit

Description

Get input status from specified BitNo output channel.

Syntax

I16 _d122_read_output_bit(U16 SwitchCardNo, U8 OutBitNo, U8 *OnOff)

Argument

Name	Type	Description
SwitchCardNo	U16	The rotary switch set number of the PCE-D122.
OutBitNo	U8	BitNo of channel
OnOff	U8*	On_Off = 1, Status of BitNo is ON On_Off = 0, Status of BitNo is OFF

Status Return

Function Name	Description
ERR_NoError	The function finished execution successfully.
Other	Please reference to the Appendix error table.

Note.

```
// U8 OutBitNo
// PCE-D122: 0 ~ 31
// PCE-D132: 0 ~ 31
// PCE-D150: NotSupported
// PCE-D105: 0 ~ 79
```

3.6. _d122_write_output_bit

Description

Generate output signal to specified BitNo output channel.

Syntax

```
I16 _d122_write_output_bit(U16 SwitchCardNo, U8 BitNo, U8 OnOff)
```

Argument

Name	Type	Description
SwitchCardNo	U16	The rotary switch set number of the PCE-D122.
OutBitNo	U8	BitNo of channel
OnOff	U8	On_Off = 1, Status of BitNo is ON On_Off = 0, Status of BitNo is OFF

Status Return

Function Name	Description
ERR_NoError	The function finished execution successfully.
Other	Please reference to the Appendix error table.

Note.

```
// U8 OutBitNo
// PCE-D122: 0 ~ 31
// PCE-D132: 0 ~ 31
// PCE-D150: NotSupported
// PCE-D105: 0 ~ 79
```

3.7. `_d122_toggle_output_bit`

Description

Toggle the specified BitNo output channel signal.

Syntax

I16 `_d122_toggle_output_bit`(U16 SwitchCardNo, U8 BitNo)

Argument

Name	Type	Description
SwitchCardNo	U16	The rotary switch set number of the PCE-D122.
OutBitNo	U8	BitNo of channel

Status Return

Function Name	Description
ERR_NoError	The function finished execution successfully.
Other	Please reference to the Appendix error table.

Note.

```
// U8 OutBitNo
//   PCE-D122: 0 ~ 31
//   PCE-D132: 0 ~ 31
//   PCE-D150: NotSupported
//   PCE-D105: 0 ~ 79
```

3.8. _d122_read_port

Description

Get input status from specified input or output port.

Syntax

I16 _d122_read_port(U16 SwitchCardNo, U8 PortNo, U8 *Value)

Argument

Name	Type	Description
SwitchCardNo	U16	The rotary switch set number of the PCE-D122.
PortNo	U8	Port No 0 ~ 7
Value	U8*	Return the status of the specified input or output port.

Status Return

Function Name	Description
ERR_NoError	The function finished execution successfully.
Other	Please reference to the Appendix error table.

Note.

```
// U8 PortNo
// PCE-D122: 0 ~ 7
// PCE-D132: 0 ~ 9
// PCE-D150: 0 ~ 9
// PCE-D105: 0 ~ 9
//
//      D122      D132      D150      D105
// Port0:  DI[ 0.. 7]  DI[ 0.. 7]  DI[ 0.. 7]  DO[ 0.. 7]
// Port1:  DI[ 8..15]  DI[ 8..15]  DI[ 8..15]  DO[ 8..15]
// Port2:  DI[16..23]  DI[16..23]  DI[16..23]  DO[16..23]
// Port3:  DI[24..31]  DI[24..31]  DI[24..31]  DO[24..31]
// Port4:  DO[ 0.. 7]  DI[32..39]  DI[32..39]  DO[32..39]
// Port5:  DO[ 8..15]  DI[40..47]  DI[40..47]  DO[40..47]
// Port6:  DO[16..23]  DO[ 0.. 7]  DI[48..55]  DO[48..55]
// Port7:  DO[24..31]  DO[ 8..15]  DI[56..63]  DO[56..63]
// Port8:                DO[16..23]  DI[64..71]  DO[64..71]
// Port9:                DO[24..31]  DI[72..79]  DI[72..79]
```

3.9. _d122_write_port

Description

Generate output signal to specified output port.

Syntax

I16 _d122_write_port(U16 SwitchCardNo, U8 PortNo, U8 Value)

Argument

Name	Type	Description
SwitchCardNo	U16	The rotary switch set number of the PCE-D122.
PortNo	U8	Port No 4 ~ 7
Value	U8	Set the status of the specified output port.

Status Return

Function Name	Description
ERR_NoError	The function finished execution successfully.
Other	Please reference to the Appendix error table.

Note.

```
// U8 PortNo
// PCE-D122: 0 ~ 7
// PCE-D132: 0 ~ 9
// PCE-D150: 0 ~ 9
// PCE-D105: 0 ~ 9
//
//      D122      D132      D150      D105
// Port0: DI[ 0.. 7]  DI[ 0.. 7]  DI[ 0.. 7]  DO[ 0.. 7]
// Port1: DI[ 8..15]  DI[ 8..15]  DI[ 8..15]  DO[ 8..15]
// Port2: DI[16..23]  DI[16..23]  DI[16..23]  DO[16..23]
// Port3: DI[24..31]  DI[24..31]  DI[24..31]  DO[24..31]
// Port4: DO[ 0.. 7]  DI[32..39]  DI[32..39]  DO[32..39]
// Port5: DO[ 8..15]  DI[40..47]  DI[40..47]  DO[40..47]
// Port6: DO[16..23]  DO[ 0.. 7]  DI[48..55]  DO[48..55]
// Port7: DO[24..31]  DO[ 8..15]  DI[56..63]  DO[56..63]
// Port8:              DO[16..23]  DI[64..71]  DO[64..71]
// Port9:              DO[24..31]  DI[72..79]  DI[72..79]
```


4. Appendix A – Error Codes

ERR_NoError	0
ERR_InvalidSwitchCardNumber	-1
ERR_SwitchCardNumberRepeated	-2
ERR_MapMemoryFailed	-3
ERR_CardNotExist	-4
ERR_InvalidBoardID	-5
ERR_InvalidParameter1	-6
ERR_InvalidParameter2	-7
ERR_InvalidParameter3	-8
ERR_InvalidParameter4	-9
ERR_InvalidParameter5	-10
ERR_InvalidParameter6	-11
ERR_InvalidParameter7	-12
ERR_InvalidParameter8	-13
ERR_InvalidParameter9	-14
D122ERR_NotSupported	-15