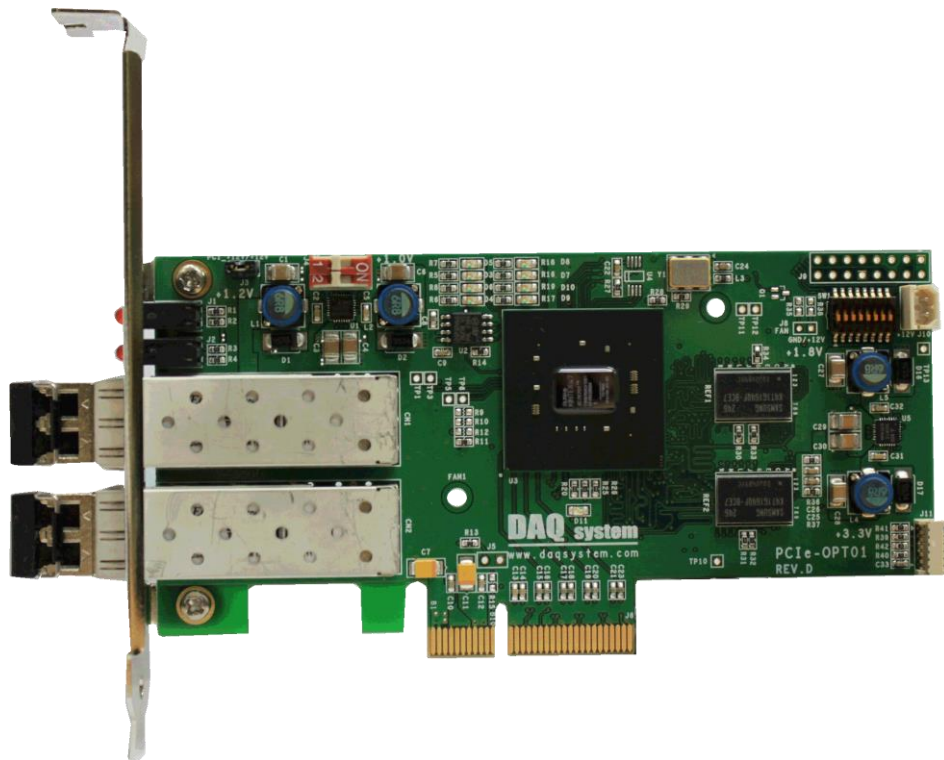


PCIe-OPT01

User Manual

Version 1.2



© 2005 DAQ SYSTEM Co., Ltd. All rights reserved.

Microsoft® is a registered trademark; Windows®, Windows NT®, Windows XP®, Windows 7®, Windows 8®, Windows 10®
All other trademarks or intellectual property mentioned herein belongs to their respective owners.

Information furnished by DAQ SYSTEM is believed to be accurate and reliable, However, no responsibility is assumed by DAQ SYSTEM for its use, nor for any infringements of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or copyrights of DAQ SYSTEM.

The information in this document is subject to change without notice and no part of this document may be copied or reproduced without the prior written consent.

Contents

1. Introduction	-----	2
1-1 Product Features	-----	3
1-2 Product Application	-----	4
 2. PCIe-OPT01 Board Description		
2-1 PCIe-OPT01 Board Layout	-----	6
2-2 SFP(Small Form Factor Pluggable)	-----	7
2-3 Optic Cable	-----	8
2-4 Connector Pin out		
2-4-1 J3 Connector	-----	11
2-4-2 J4 Switch	-----	11
2-4-3 J8 Connector	-----	11
2-4-4 J10 Connector	-----	11
 3. Installation		
4-1 Product Contents	-----	12
4-2 Installation Process	-----	12
 4. Sample Program	-----	16
4-1 Board function	-----	17
4-2 Image Frame Function	-----	18
4-3 UART Function	-----	21
4-4 Miscellaneous Function	-----	22
 Appendix		
A-1 Board Size	-----	23
A-2 Repair Regulations	-----	24
 References	-----	25

1. Introduction

PCIe-OPT01 board is used together with EMB-OPT01 and is a light receiving board that receives optical-transmission data of EMB-OPT01 board and transmits it to the host PC. In addition, the PCIe-OPT01 board is used together with the MIPI C-PHY/D-PHY receiving board MIPI-OPT06 or the MIPI D-PHY/Parallel signal receiving MIPI-OPT08 board.

It is an optical receiving board that receives optical-transmission data and transmits it to the host PC. Acquire images in real time and transfer them directly to system memory. The easy installation method and fast image transfer are the industry's.

It is the right device to meet your needs.

The sample program provided by the DQ system is provided in the form of a source so that the API provided to use the board can be tested briefly, so the user can modify it and use it. Please refer to Chapter 4 Sample Program for detailed explanation.

The PCIe-OPT01 board uses one SFP (Small Form Factor Pluggable) optical-module. The interlocking board is used together with the MIPI-OPT06 board that receives the C-PHY or D-PHY signal from the MIPI sensor or the MIPI-OPT08 board that receives the D-PHY signal or parallel signal from the MIPI sensor.

PCIe-OPT01 board can also use two SFP (Small Form Factor Pluggable) optical modules, the lower port (CN2) supports Base Camera Link Configuration, and the upper (CN1) port supports Full/Supports Medium Camera Link Configuration. It is possible to perform two Base Camera Link Configurations by dividing them into two ports.

It has a design structure that can support other interfaces (DVI, HD-SDI, MIPI, etc.) in the future by using flexible FPGA logic.

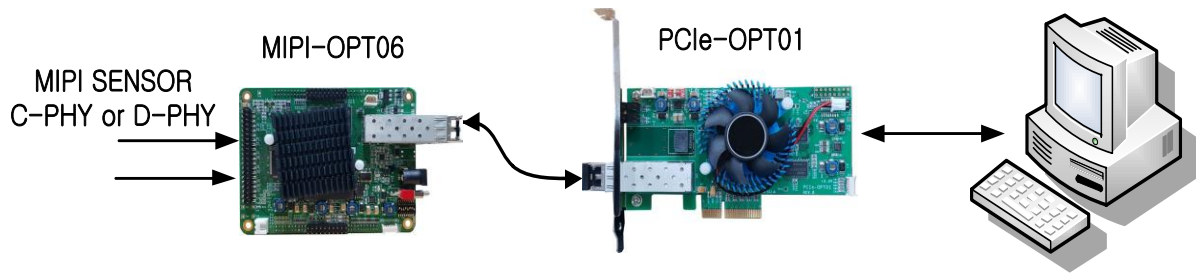
1-1 Product Features

Items	Description	Remark
Hardware		
PC Interface	PCI Express 2.0 (GEN2) x4	2.0 GByte/s
Operation Power	PC slot	
Video Interface	Fiber	Own Protocol
Feature	Companion Board	MIPI-OPT06 MIPI-OPT08 EMB-OPT01
Interface	1 or 2 Port SFP	
On-board Memory	256MB (DDR3) x2	
Communication		
Simultaneous use of boards	Max. 4	
Software		
OS	Windows 2000/XP/7/8/10 (32/64bit)	
API	Windows Client DLL API	
Development		
Support	Sample Program	VC++
Environmental conditions		
Operating temperature range	0 ~ 60°C	
Storage temperature range	-20 ~ 80°C	
Humidity range	5 ~ 95%	Non-condensing
Board size	132mm X 68mm	PCB Board Size

1-2 Product Applications

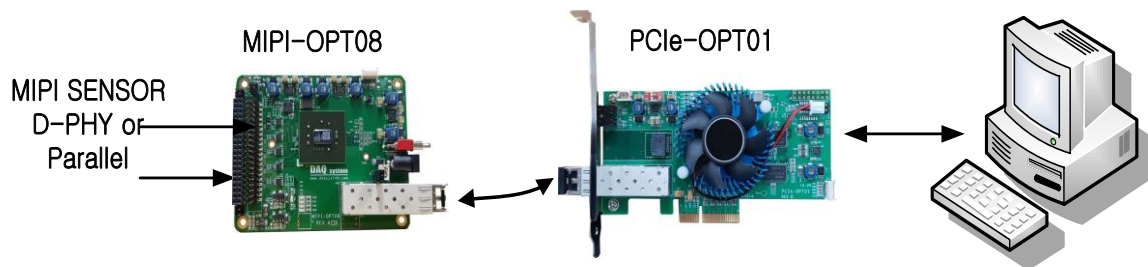
- Image recognition (Pattern, particle, etc.)

[Figure 1-1] shows the connection between the PCIe-OPT01 and the MIPI-OPT06 board that receives the C-PHY or D-PHY signal of the MIPI sensor. It is a board that transmits the signal received through optical transmission to the PC using the PCI Express 4x interface method. The operation of the board is controlled by the program API.



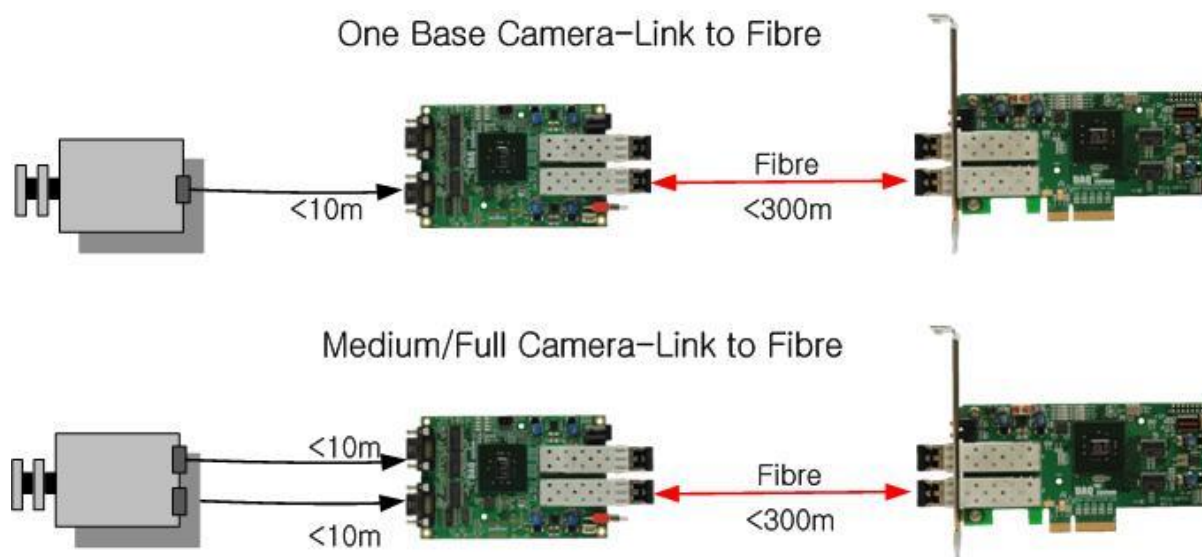
[Figure 1-1. PCIe-OPT01 & MIPI-OPT06 Usage]

[Figure 1-2] shows the connection between PCIe-OPT01 and MIPI-OPT08 board that receives D-PHY signal or parallel signal from MIPI sensor. It is a board that transmits the signal received through optical transmission to the PC using the PCI Express 4x interface method. The operation of the board is controlled by the program API.



[Figure 1-2. PCIe-OPT01 & MIPI-OPT08 Usage]

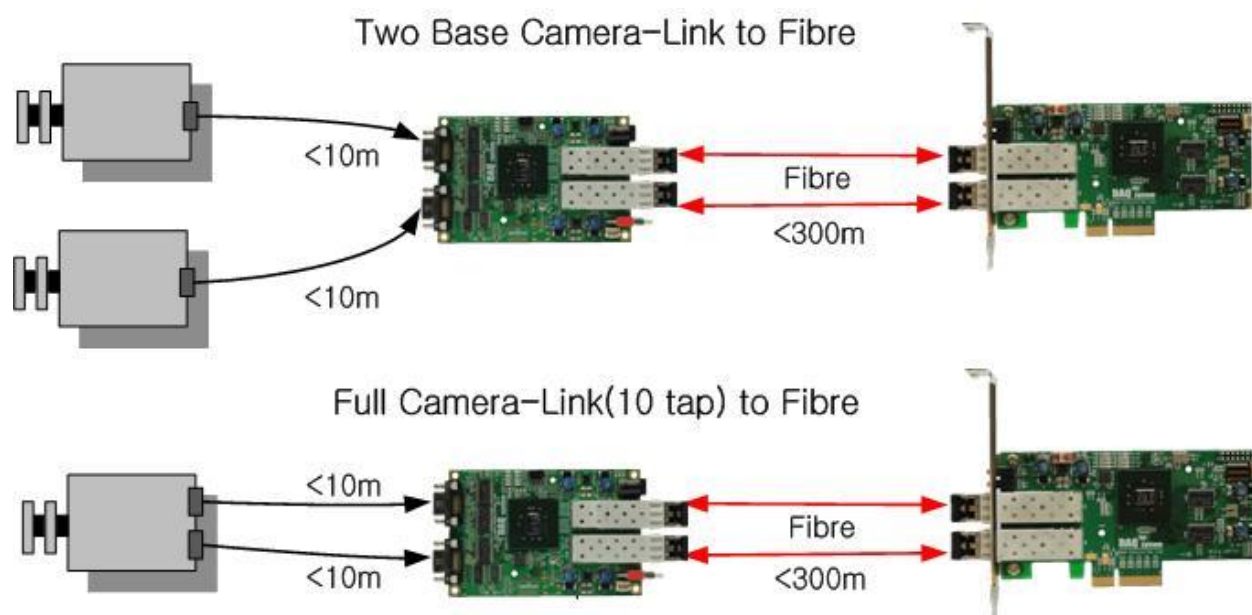
It is a board that receives image frames taken in conjunction with standard Camera-link through EMB-OPT01 board and transmits them to PC using PCI Express 4x interface method. The operation of the board is controlled by the program API, and the figure below shows the interlocking operation of the board.



[Figure 1-3. PCIe-OPT01 Board Usage]

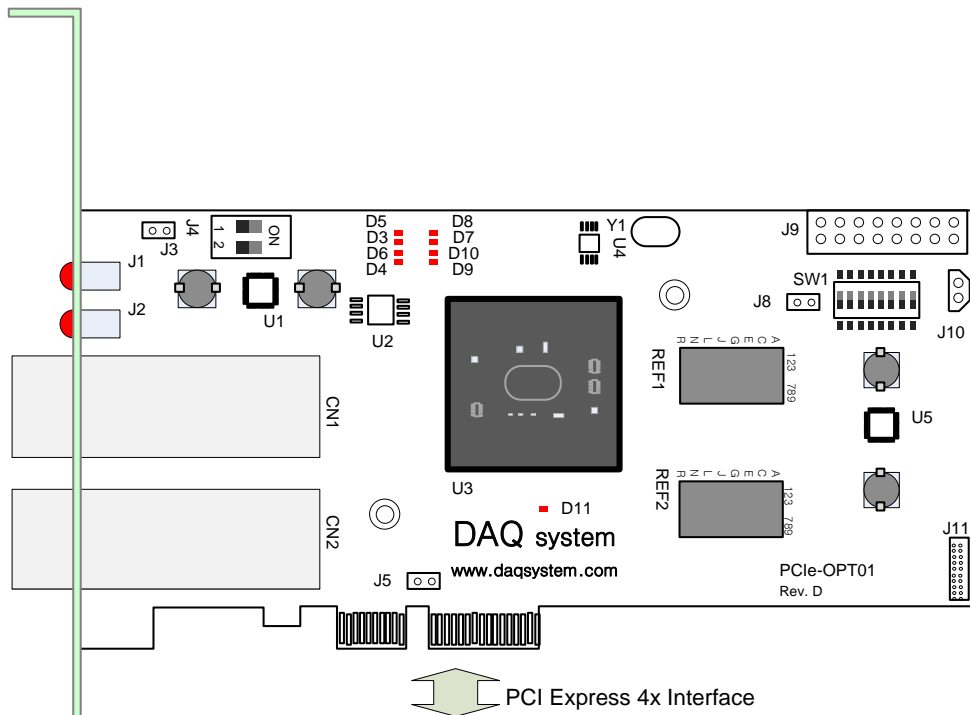
The upper SFP cage (CN1) is channel 1, and the lower SFP cage (CN2) is recognized as channel 0 in the sample program. (See Sections 2-2 and 4-1)

Note) Two Base Camera and 10Tap will be supported in the future.



2. PCIe-OPT01 Board Description

2-1 PCIe-OPT01 Board Layout



[Figure 2-1. PCIe-OPT01 Layout]

- (1) **SFP (CN1, CN2)** : SFP (Small Form Factor Pluggable) cage.
CN1 : Channel 1, CN2 : Channel 0
- (2) **FPGA (U3)** : All functions of the board are controlled through this FPGA Logic.
- (3) **DDR Memory (REF1, REF2)** : Save image frame.
- (4) **Regulator (U1, U2, U5, U6)** : Supply the power used by the board.
- (5) There are several LEDs on the board, and the description of each is as follows.
J1(CN1) : Red : Rx signal Green : Tx Signal
J2(CN2) : Red : Rx signal (Not used in Single Port) Green : Tx Signal
D11 : Lights up when the board finishes configuration and ready for operation.
D3 ~ D10 : Test led

2-2 SFP(Small Form Factor Pluggable)

In the case of PCIe-OPT01, SFP is used as a Fiber-Transmission Transceiver device. The SFP transceiver is designed to support various optical transmissions such as SONET, Gigabit Ethernet, and Fiber Channel. It supports hot-pluggable transceiver and can be connected to network device motherboard with fiber or copper networking cable.

SFP is connected to the module that connects to the cage and connector, and there are Tx (Transceiver) and Rx (Receiver) together.



[Figure 2-2. SFP & SFP Cage]

[Table 1. CN1/CN2 SFP Connector]

No.	Name	Description	Remark
1	VeeT	Transmitter Ground	
2	TxFault	Transmitter Fault	
3	TxDisable	Transmitter Disable	
4	SDA	Serial Interface Data Line	
5	SCL	Serial Interface Clock	
6	MOD-ABS	Module Absent, connected to VeeT or VeeR	
7	RS0	Rx Rate Select Open or Low = 2.125 or 4.25 Gb/s Fibre Channel (Low Bandwidth) High = 8.5 Gb/s Fibre Channel (High Bandwidth)	
8	LOS	Loss of Signal Indication	
9	RS1	Tx Rate Select Open or Low = 2.125 or 4.25 Gb/s Fibre Channel (Low Bandwidth)	

		High = 8.5 Gb/s Fibre Channel (High Bandwidth)	
10	VeeR	Receiver Ground	
11	VeeR	Receiver Ground	
12	RD-	Receiver Data	
13	RD+	Receiver Inverted Data	
14	VeeR	Receiver Ground	
15	VccR	Receiver Power(3.3V)	
16	VccT	Transmitter Power(3.3V)	
17	VeeT	Transmitter Ground	
18	TD+	Transmitter Data	
19	TD-	Transmitter Inverted Data	
20	VeeT	Transmitter Ground	

(Note) For more information, refer to Camera Link Standard Specification.

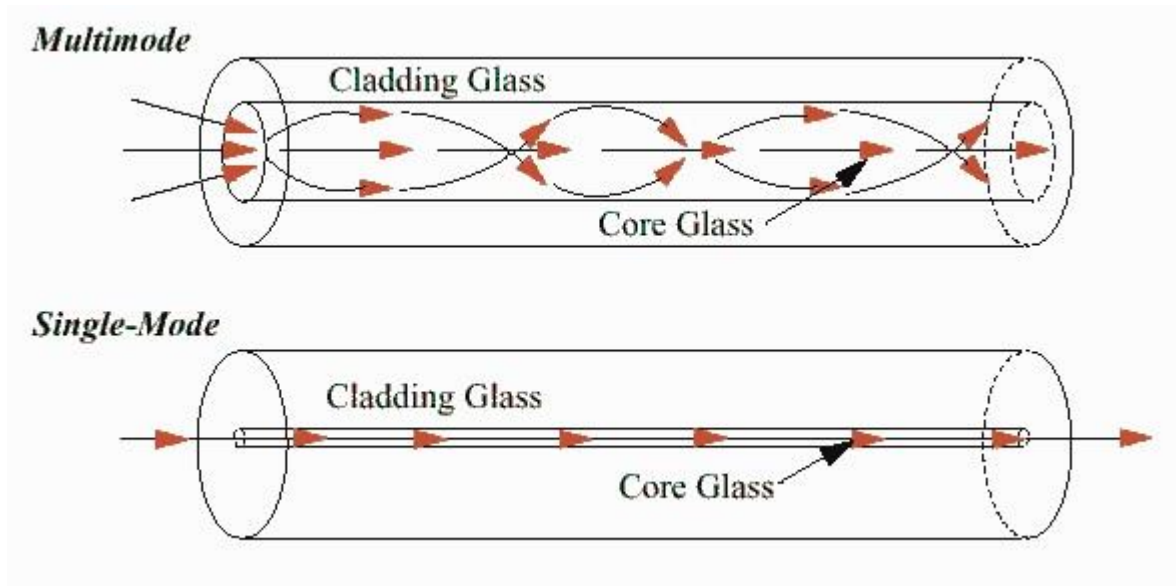
2-3 Optic Cable

An optical cable is a transmission cable made to transmit the converted laser signal to a long distance and uses two transmission modes.

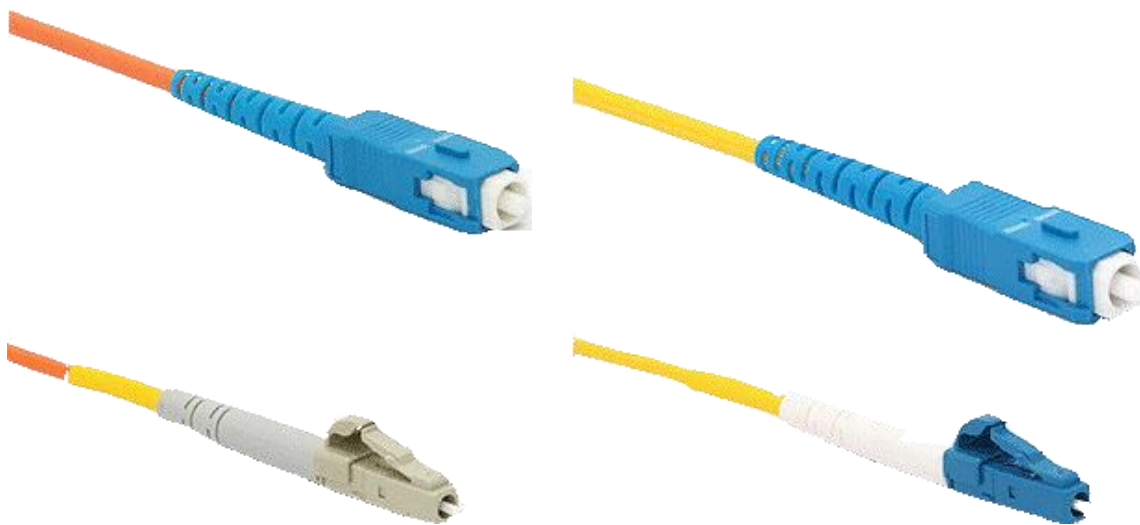
Single mode: It is used for broadband and long-distance transmission with a core diameter of about 9 μm , and relay-less transmission is possible up to about 50Km. In the case of single-mode with a small core diameter, it is difficult to transmit a large amount of information because the cable passage is narrow, but instead it can be transmitted over a long distance. The cable color is mainly yellow.

Multi mode: The core diameter is 50~100 μm , so it is often used at short distances. In the case of multimode with a large core diameter, a large amount of information can be transmitted because the passage of the cable is wide, and the color of the cable is mainly orange.

There are LC, ST, MTRJ, SC, FC, and MU types as optical connectors, but PCIe-OPT01 mainly uses multimode LC type as shown in [Figure 2-4].



[Figure 2-3. Transmission Mode]



(1) Single Mode LC Type

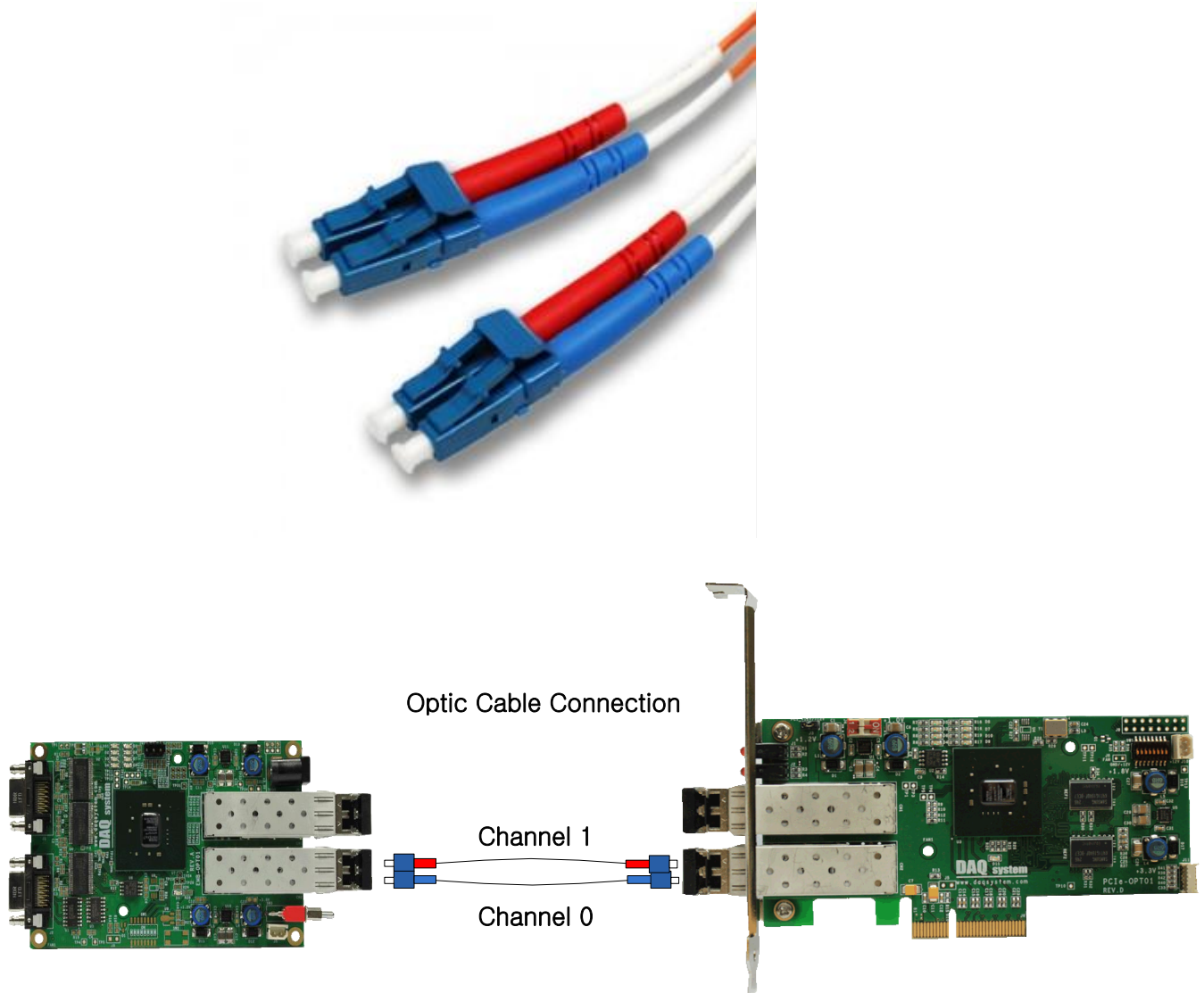
(2) Multi Mode LC Type

[Figure 2-4. Cable Type]

Note) The most important factor in the optical cable selection can be found in the communication distance. Multimode cable is the maximum transmission distance 2Km, Single-mode cable which is basically a configuration that provides cable when the transmission distance according to the type of equipment is more than the transmission distance 2Km.

Communication using light, basically use 2Core. (RX-1 CORE, TX-1 CORE)

Therefore, be careful connection when you connect the board in 2Core of fiber optic cable as shown in the following figure.



Caution) Be careful not to twist the cable when connecting it to the SFP cage.

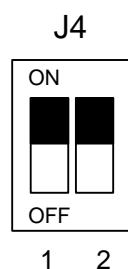
2-4 Connector Pin-out

2-4-1 J3 Connector

You can use the Express PCI power supply 12V by connecting it to the external connector (J10).

2-4-2 J4 Switch

PCIe-OPT01 board is designed to use up to 4 PCIe-OPT01 boards simultaneously in one system (PC). Each board classification can be set through the 4-pin DIP switch in the board.



[Figure 2-5. J4 switch]

[Table 2. J4 Switch]

1	2	Description
OFF	OFF	Board No. 0
ON	OFF	Board No. 1
OFF	ON	Board No. 2
ON	ON	Board No. 3

2-4-3 J8 Connector

It is a 12V FAN power connector.

2-4-4 J10 Connector

It is a 12V power supply connector.

3. Installation

3-1 Product Contents

Before installing the board, check that the contents of the package are intact.

1. PCIe-OPT01 Board
2. CD (Driver/Manual/API/Sample Source etc.)

3-2 Installation Process

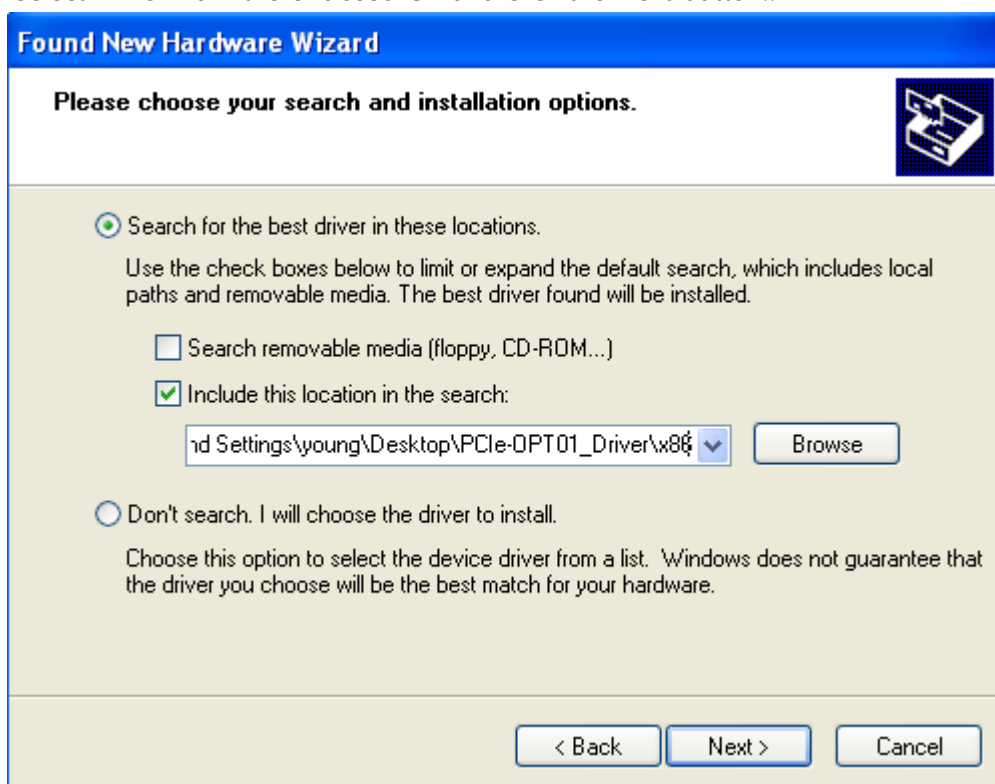
- ① Turn off the computer.
- ② Remove the computer cover according to the computer manual.
- ③ Insert the product into an empty PCI Express slot. As close to the CPU as possible.
Insert the board.
- ④ After removing the blocked part at the back of the computer case of the slot where the board is inserted,
Tighten the screws between the bracket of the board and the connection part of the case.
- ⑤ In case of multi-board, repeat from step 3.

The board environment must be Windows 2000 SP4 or higher and Windows XP SP1 or higher. First, turn off the PC's power, plug the PCIe-OPT01 board into the PCI Express Slot, and turn on the PC's power. When the "Start New Hardware Wizard" window opens as shown below, select it as shown below and click the Next button.

1. Select as below and click the Next button

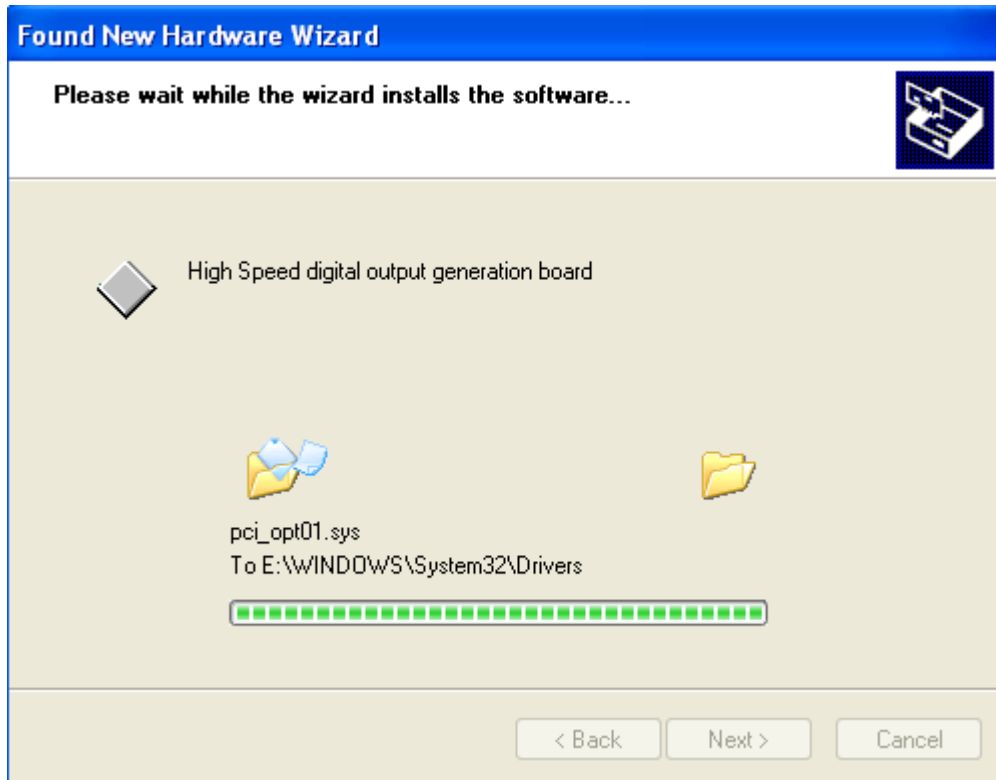


2. Select Driver from the enclosed CD and click the Next button..

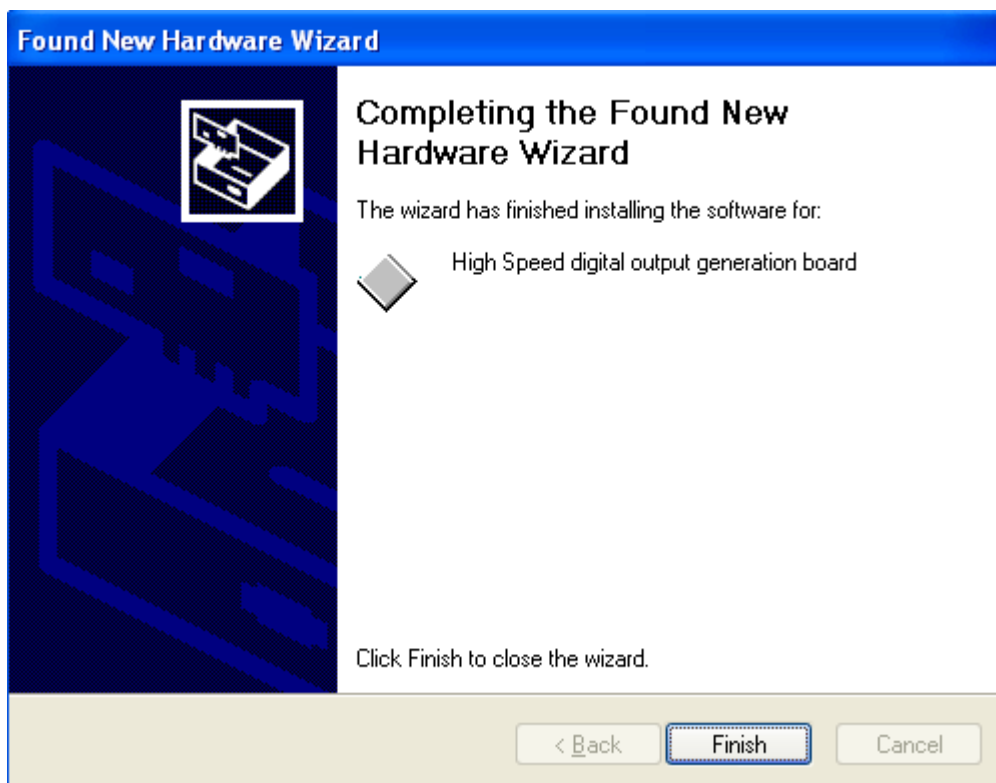


Select the folder where the drivers are located. Click "OK". Click "Next". The necessary files are "**pcie_opt01.inf**" and "**pcie_opt01.sys**" in the driver polder.

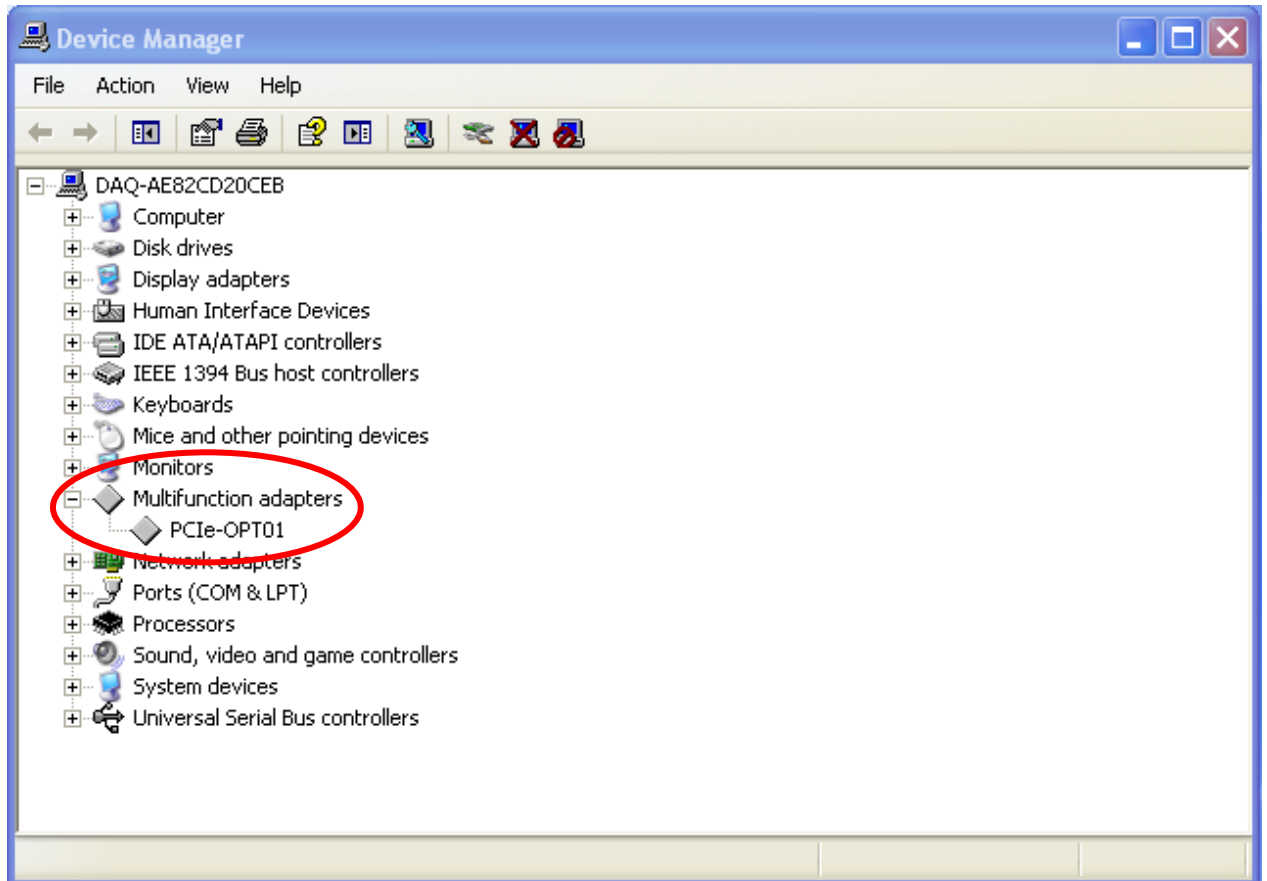
- Click the Next button. It indicates that the installation process is proceeding as shown below.



- Click the Next button.



5. When the installation is complete, check whether the driver is installed normally in the following way.
6. . In My Computer -> Properties -> Hardware -> Device Manager, check if the **Multifunction Adaptor**-> "PCIe-OPT01" is installed.
7. If it appears as shown in the figure below, the installation has been completed normally.



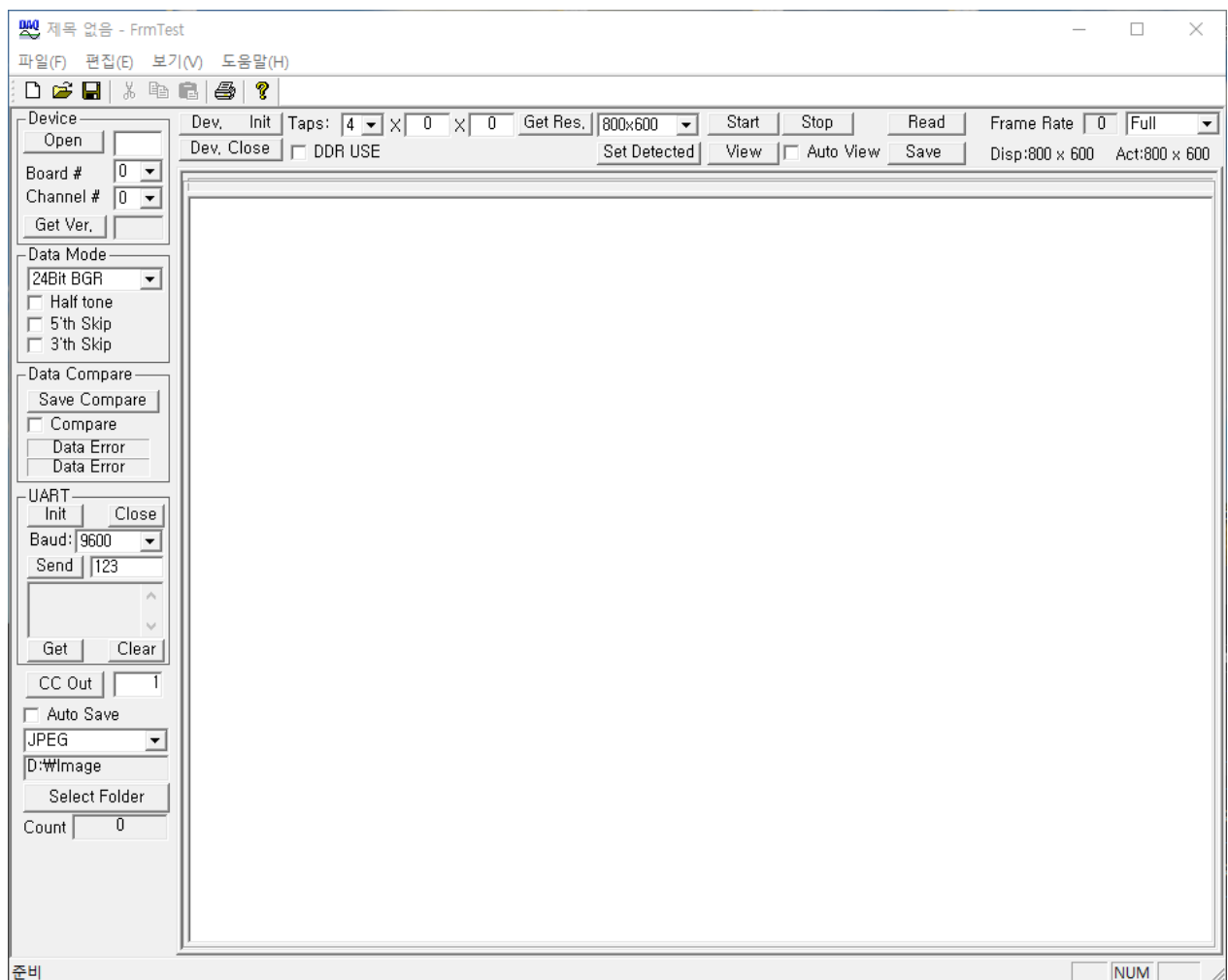
If you can see the "PCIe-OPT01" at Multifunction Adaptors, the driver installation is to have been over. (Check the red circle)

Notice : After installation, you should re-boot the system for the proper operation.

4. Sample Program

In the Exe folder of the CDROM provided with the board, a sample program "**FrameTest.exe**" is provided for easy use of the board. By displaying Frame Data as hexadecimal values, it is stored in memory or hard disk so that developers can utilize the frame data needed. In order to test the sample program, the driver of the board must be installed first.

The sample program is provided in source form so that the API provided to use the board can be tested briefly, so the user can modify it and use it.



[Figure 4-1. Sample Program "FrameTest.exe"]

API (Application Programming Interface) is required to use the above sample program. API is provided in the form of "DLL", and import library and header file are required to compile. All files specified above are included on the supplied CDROM. In order to run the sample program normally, the API DLL (**pci_opt01.dll**) must be in the folder of the executable file or in the Windows system folder or the folder specified by the Path environment variable.

Each menu bar is described in the following. The menu bar is not mentioned here is not to use features.

(Note) Board # & Channel # selection "Device Open" click → In the "Data mode", select the format for the camera → Select camera data width after selected from "8, 16, 32, 8bi Bayer" → "Dev. Init" → "Get Res." Check the resolution → After selecting the resolution you want to see on the screen, "Set detected" click → "Auto View" check

4-1 Board Function



(1) "Device Open" button

It starts a selected board device. If the value is "0", it is unconnected or no device.

(2) "Board # :"

It selects a board number in case of the multi boards. It can select 0 ~ 4 at currently. Number of each board is separated by the switch (J10) on the board.

(3) "Channel # :"

It selects a Fiber channel numbers. If the value is "0", it is the the lower the light channel(CN2 connector). if the value "1", it is connected to the top of light channel(CN1 connector).

(4) "Get Ver." button

It shows the version of FPGA and Firmware.

4-2 Image Frame Function



(1) "Dev. Init" button

Press this button to initialize the function of receiving image frame data. It is performed only once after power is applied to the board.

(2) "Dev. Close" button

It stops a selected board device.

If use of device is finished, it is sure to close the device for other programs.

(3) "Taps : " button

It shows Taps of Camera Link.

1 : 1Byte, 2 : 2Bytes, 4 : 4Bytes, 8 : 8bit Bayer

(4) "Get Res." button

It shows the image resolution.

(5) "Set Detected" button

User can set up the resolution is 640x480, 800x600, 1024x768, 1280x720, 1280x1024, 1600x1200, 1920x1080, 1920x1200, 2048x1536, 2560x2048, 4080x2448.

Press the Set Detected button, it controls the horizontal and vertical resolution to fit the screen from the "Get Res".

(6) "Start" button

It starts the image transfer. It is a Toggle button, press again stop the image transferring.

(7) "View " button

Start the image transmission.

"Auto view" : When check this box, it displays a video.

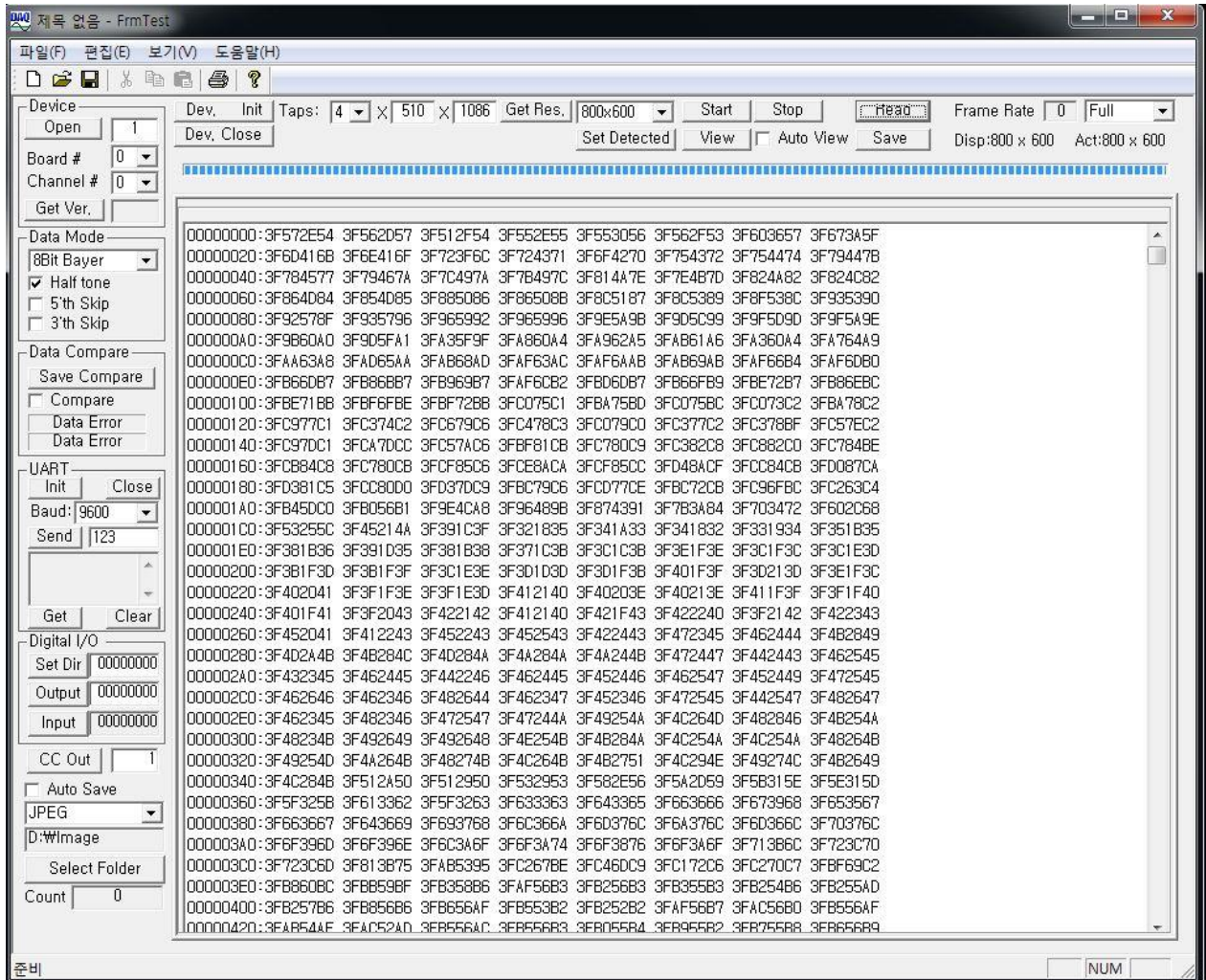
(8) "STOP" button

When press this button, it stops a frame capture.

(9) “Read” button

Press this button to read the image frame data of the board to your PC(Hex Value).

If image frame data is not saved on the board, you must wait until the end of data collection.

**(10) “Save” button**

If the box clicks, image data is stored as a binary file below the specified **D:\\$SAVE** (or user-selected folder). The bottom of “Save Count” shows number of stored frames.

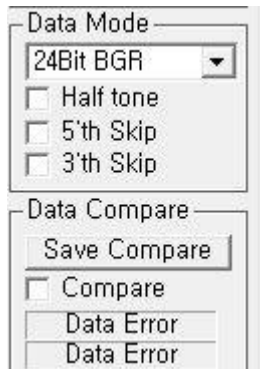
(11) “Frame rate”

It shows a frame number per second.

(12) “Full/Top Left/Top Right/Bot. Left/Bot. Right” selection

It shows the video of 800x600 resolution where you wish selected parts.

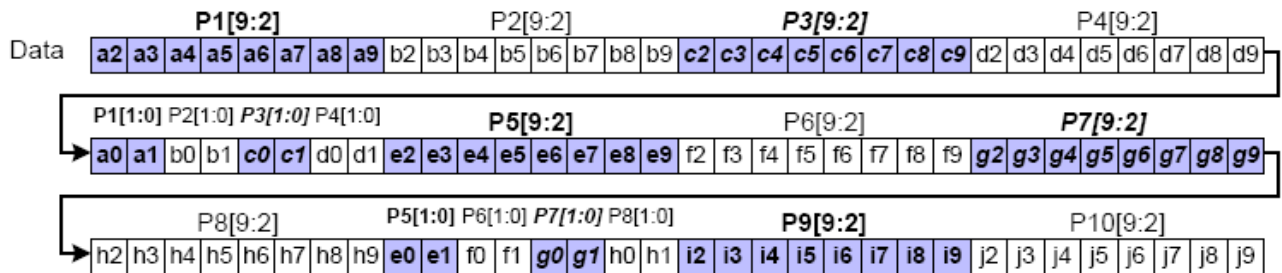
(13) "Data Mode" Selection



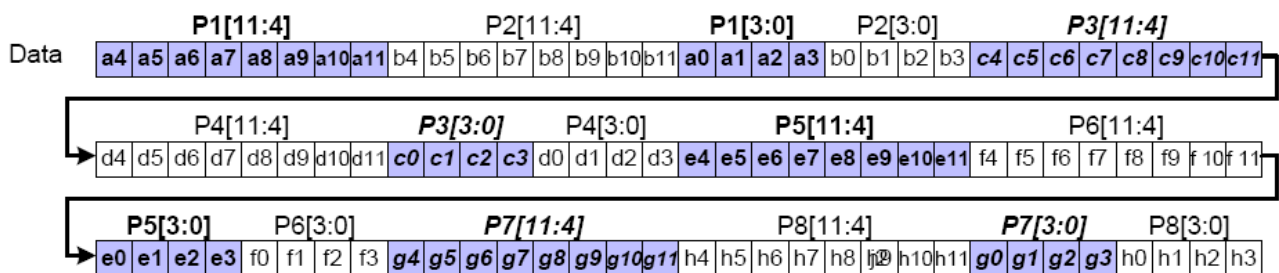
Video Data Mode can be selected from 8bit, 16bit YUV, 24Bit BGR, 8Bit Bayer, and 10Bit Bayer.

"Half tone" : Select Half tone mode.

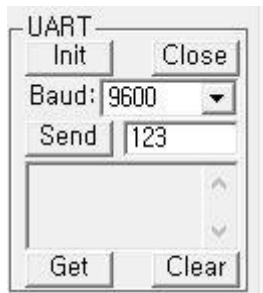
"5'th Skip" : Skip the 5th byte on selection. For example, if the input data is a 10-bit Bayer, 8 bits are stored in the 5th byte, each of which is 1 bit except for RGB and 3 bytes and 1 byte. When the Bayer is processed and displayed on the screen, the 5th byte is not needed, so it is used to remove it.



"3'th Skip" : Skip the 3rd byte on selection.



4-3 UART Function



(1) "Init" selection

Initialize the UART.

(2) "Close" button

Close the UART.

(3) "Baud" selection

Select the Baud Rate (9600, 19200, 38400, 57600, 115200 Baud Rate).

(57600,115200 is currently not supported.)

(4) "Send" button

Send a UART data written next to the field.

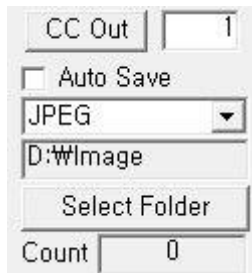
(5) "Get" button

Get the data from UART buffer.

(6) "Clear" button

Clear the UART Receiver buffer.

4-4 Miscellaneous Function



(1) "CC Out" button

You can select a CC(camera control) signal among CC1 ~ CC4.

(2) "Auto Save"

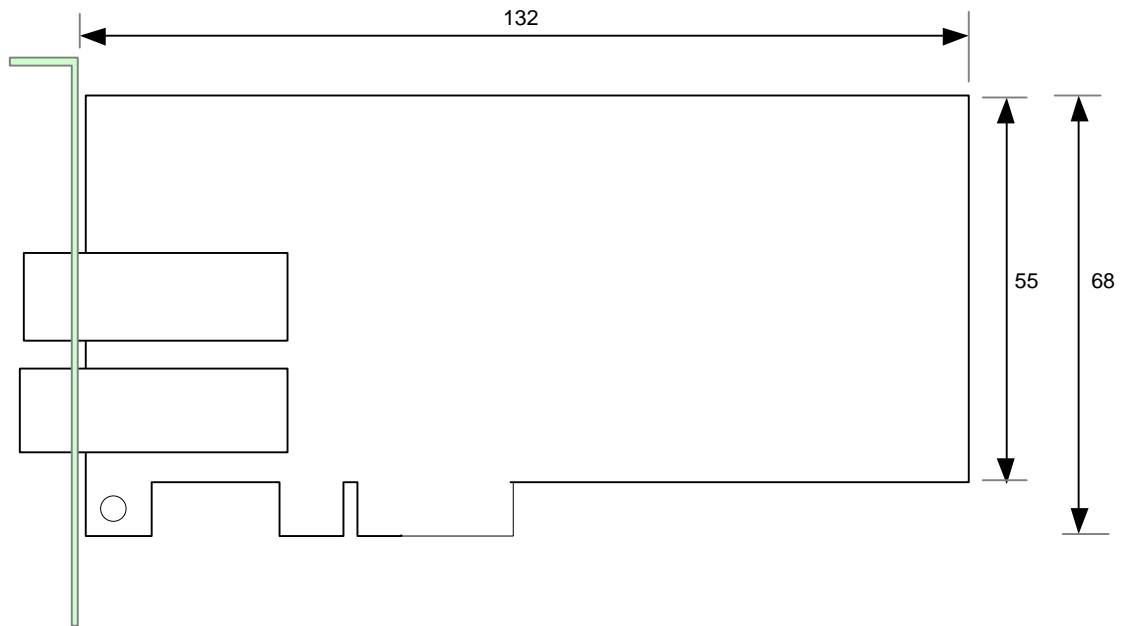
If the box clicks, image data is stored as a BMP or JPEG file below the specified **D:\Image** (or user-selected folder). It does not means the original frame save. Saving speed is different depending on the BMP/JPEG structure, PC performance or OS(32/64bit). Count # shows the number of stored frames.

Appendix

A-1 Board Size

The external sizes of the board are as follows.

For detailed dimensions, please contact the person in charge.



A-2 Repair Regulations

Thank you for purchasing a DAQ SYSTEM product. Please refer to the following regarding Customer Service regulated by DAQ SYSTEM.

- (1) Read the user manual and follow the instructions before using the DAQ SYSTEM product.
- (2) When returning the product to be repaired, please write down the symptoms of the failure and send it to the head office.
- (3) All DAQ SYSTEM products have a 1-year warranty.
 - . Warranty period counts from the date the product is shipped from DAQ SYSTEM.
 - . Peripherals and third-party products not manufactured by DAQ SYSTEM are covered by the manufacturer's warranty.
 - . If you need repairs, please contact the Contact Point below..
- (4) Even during the warranty period, repairs are charged in the following cases..
 - ① Failure or damage caused by use without following the user's manual
 - ② Failure or damage caused by customer's negligence during product transportation after purchase
 - ③ Failure or damage caused by natural phenomena such as fire, earthquake, flood, lightning, pollution, or power supply exceeding the recommended range
 - ④ Failure or damage caused by inappropriate storage environment (e.g. high temperature, high humidity, volatile chemicals, etc.)
 - ⑤ Breakdown or damage due to unreasonable repair or modification
 - ⑥ Products whose serial number has been changed or removed intentionally
 - ⑦ If DAQ SYSTEM determines that it is the customer's fault for other reasons
- (5) Shipping costs for returning the repaired product to DAQ SYSTEM are the responsibility of the customer.
- (6) The manufacturer is not responsible for any problems caused by misuse, regardless of our warranty terms.

References

1. PCI Local Bus Specification Revision2.1
-- PCI Special Interest Group
2. How to install PCI DAQ Board
-- DAQ system
3. AN201 How to build application using API
-- DAQ system
4. AN312 PCIe-OPT01 API Programming
-- DAQ system

MEMO

Contact Point

Web sit : <https://www.daqsystem.com>

Email : postmaster@daqsystem.com

