PCIe-FRM22

User Manual

Version 1.1

DAQ SYSTEM
Measurement & Automation

Contents

1. Introduction

PCIe-FRM22 is a multi-purpose frame grabber board that can capture high-definition video signals by receiving RGB, HDMI (High-Definition Multimedia Interface), and DVI (Digital Visual Interface) signals and transmitting them to a PC using the PCI Express 1x interface method. am.

It supports up to 1920x1200, which is higher than FULL HD, and can automatically detect and process HDMI/DVI and RGB signals.

The operation of the board is controlled by the program API, and the figure below shows the interlocking operation of the board.

CCTV
or Camera   RGB →

Terminal
or PC   HDMI →

PC

Projector
or DVI
Player   DVI →
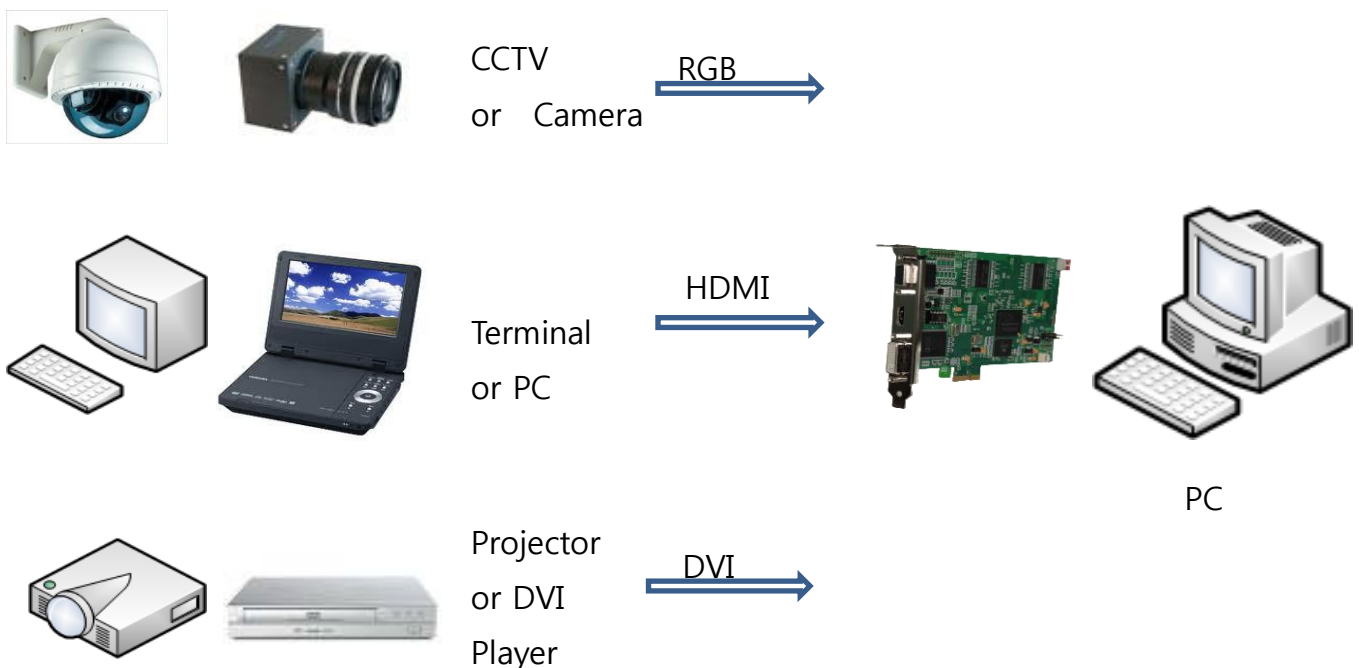
[Figure 1-1. PCIe-FRM22 Board Usage]

[Figure 1-1] shows an example of using the PCIe-FRM22 board. The PCIe-FRM22 board is connected to the PCI Express slot of the right PC, and the screens of various devices on the left can be transmitted to the RGB, HDMI or DVI ports. It can also be printed through an application program.

1-1 제품 사양

Items	Description	Remark
Hardware		
PC Interface	PCI Express x1	
Operation Power	PC Power	+3.3V (Max 1.1A) +12V (Max 1A).
Video Interface	RGB DVI (Digital Video Interface) 1.0 HDMI 1.3	Supports 525p, 625p component progressive scan formats Supports 720p, 1080i, 1080p component HD formats
Feature	Up to 1600x1200 at 60Hz MAX 1920x1200 resolution	

External I/O	4-Ch Digital In
	4-Ch Digital Out
		Digital Input :
		  Voltage Range : 9 ~ 24V
		  Current Range : 3.75mA(for 9V)
		            ~ 10mA(for 24V)
		Digital Output :
		  Voltage Range : ~ 7V
		  Current Range : within 10mA

On-board Memory	128MB DDR SDRAM	
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℃	
Storage temperature range	-20 ~ 80℃	
Humidity range	5 ~ 95%	Non-condensing
Board size	130mm X 106mm	PCB Board Size

1-2 Product Applications

- Image recognition (Pattern, particle, etc.)
- Inspection equipment (Sensor, Semiconductor, Device etc.)
- Security Solution
- Medical Image Capture
- BLU-RAY
- Game Consoles

2. PCIe-FRM22 Board Function

In the case of PCIe-FRM22, FPGA Core Logic is in charge of overall control. It receives RGB, HDMI (High-Definition Multimedia Interface), and DVI (Digital Visual Interface) signals as its main function and delivers it to the PC.

These functions are performed using API in PC through PCI Express 1x interface.
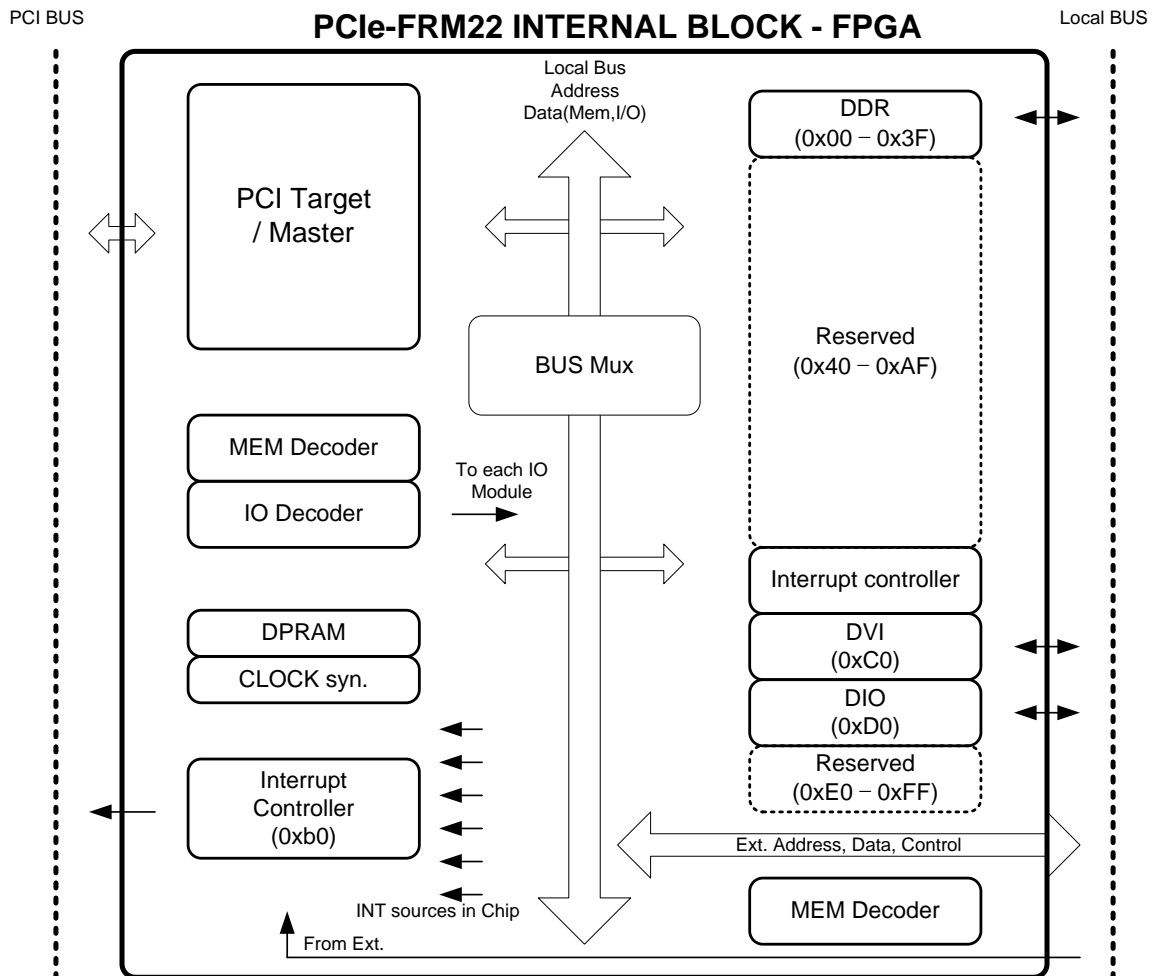
[Figure 2-1.   PCIe-FRM22 Block Diagram]

The FPGA core logic is programmed using JTAG, and the logic program is saved in FPGA Program Logic and loaded when power is applied.

3. PCIe-FRM22 Board Description

Each important board function is briefly described. For detailed function information, please refer to the parts specification.

3-1 PCIe-FRM22 Board Layout
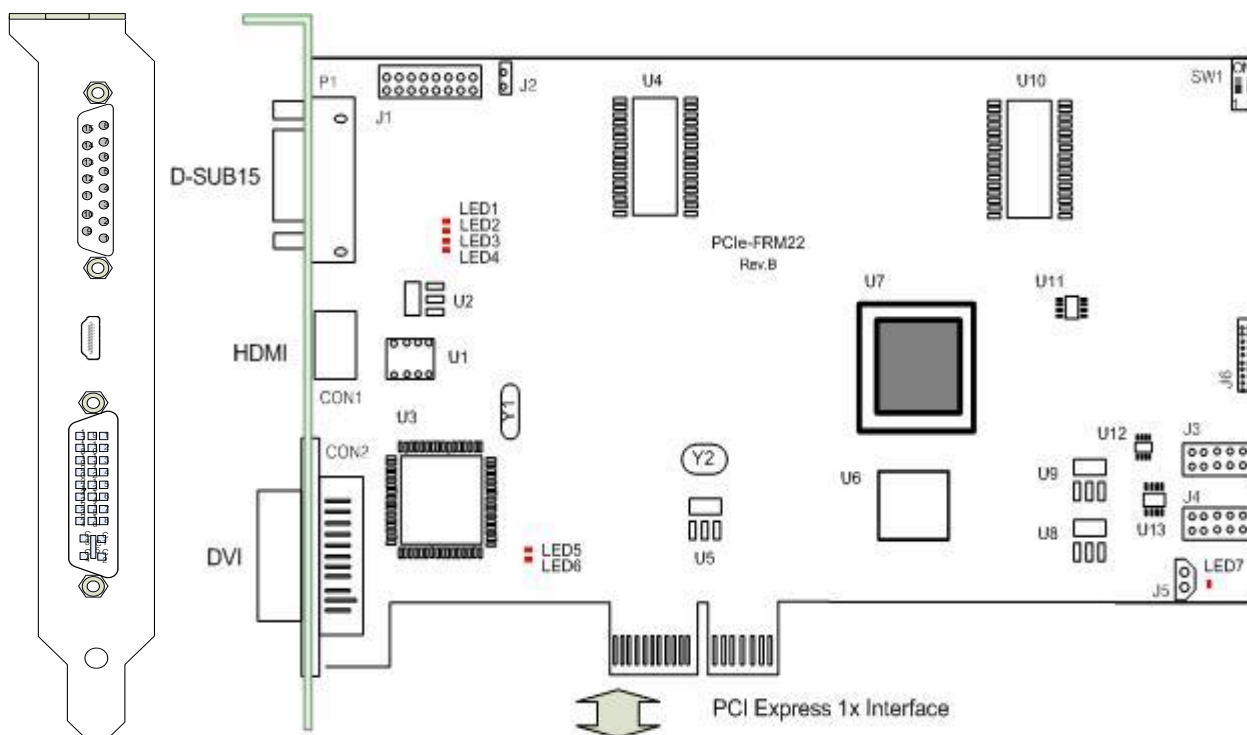
[Figure 3-1.   PCIe-FRM22 Layout]

There are seven LEDs on the board, and the description of each is as follows.

LED1 : Lights up when frame data is being transmitted (when frame data is requested)

LED2 : Lights up when frame data is being transmitted (when frame data is approved)

LED3 : Lights up when DDR memory is ready.

LED4 : Lights up when frame data is being transmitted. (When sending frame data)

LED5 : Lights up when wake-up the board.

LED6 : Lights up when the board is reset.

LED7 : Lights up when the board finishes configuration and ready for operation.

3-2 Device Features

(1) **FPGA : U7**

All of the board functions are controlled by the Logic program of the FPGA.

(2) **Video Receiver : U3**

Receives RGB, HDMI, and DVI data and transmits it to FPGA.

(3) **Regulator : U2, U5**

This block is for supplying the power to the board.

(4) **PCI Express Chipset : U6**

It is a bridge that processes PCI Express signals.

(5) **DDR Memory : U4, U102 (**64Mbyte x 2 SDRAM)

After saving data in frame units, it is transmitted to PC through FPGA.

3-3 Connector Pin-out

The connectors and jumpers used in PCIe-FRM22 will be described. The main connectors are HDMI connector CON1 for HDMI connection, DVI connector CON2 for DVI connection, and DSUB15Pin-Dip connector P1 for RGB connection.

3-3-1 RGB(DSUB-15) Connector

The DSUB-15 PIN DIP connector is an RGB signal connector and the pin map is as shown below.
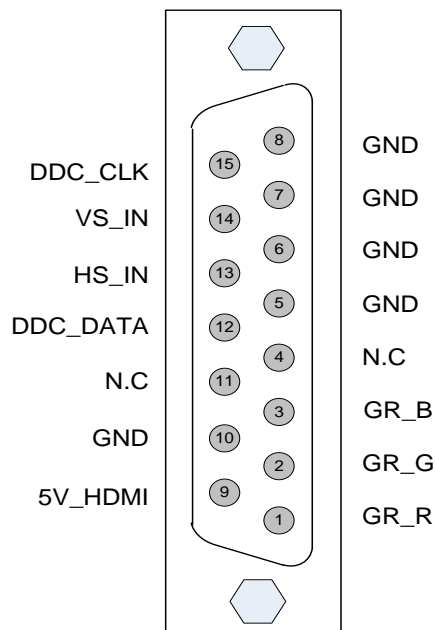
[Figure 3-2. D-SUB 15PIN pin-out]

[Table 1. D-Sub 15 Connector P1]

Pin No.	Name	Description	Remark
1	GR_R	Red Signal	
2	GR_G	Green Signal	
3	GR_B	Blue Signal	
4	N.C	No Connected	
5	GND	Ground	
6	GND	Ground	
7	GND	Ground	
8	GND	Ground	
9	5V_HDMI	+5V DC	
10	GND	Ground	
11	N.C	No Connected	

12	DDC_DATA	I2C Data	
13	HS_IN	Horizontal Sync	
14	VS_IN	Vertical Sync	
15	DDC_CLK	I2C Clock	

3-3-2 HDMI Connector

The HDMI connector is an HDMI signal connector, and the pin map is as shown below.
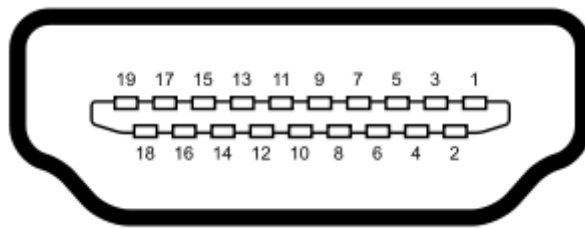
[Figure 3-3.   HDMI pin-out]

[Table 2.   HDMI Connector CON1]

Pin No.	Name	Description	Remark
1	H_RX2+	TMDS Data2+	
2	GND	Green Signal	
3	H_RX2-	TMDS Data2-	
4	H_RX1+	TMDS Data1+	
5	GND	Ground	
6	H_RX1-	TMDS Data1-	
7	H_RX0+	TMDS Data0+	
8	GND	Ground	
9	H_RX0-	TMDS Data0-	
10	H_RXC+	TMDS Clock+	
11	GND	No Connected	
12	H_RXC-	TMDS Clock-	
13	HDMI_CEC	CEC	
14	N.C	No Connected	
15	DDC_CLK	I2C Clock	
16	DDC_DATA	I2C Data	
17	GND	Ground	
18	5V_HDMI	+5V DC	
19	5V_HDMI	+5V DC	

3-3-3 DVI Connector

[Figure 3-4] below shows the pin map of the DVI connector on the board. All pin specifications are input/output based on the DVI standard, so please refer to the DVI standard document for details.
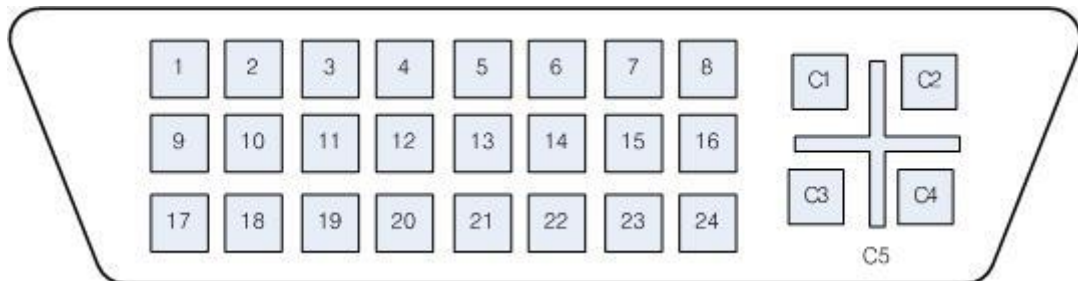
[Figure 3-4. PCIe-FRM22 CN2 Connector Pin-out]

[Table 3. CN2 DVI Connector]

Pin #	Signal	Description
1	TMDS Data2-	Digital Red- (Link 1)
2	TMDS Data2+	Digital Red+ (Link 1)
3	TMDS Data2/4 Shield-	
4	TMDS Data4-	Digital Green- (Link 2)
5	TMDS Data4+	Digital Green+ (Link 2)
6	DDC Clock	Display Data Sync Clock
7	DDC Data	Display data channel (Display Information – Vendor/Product Identification EDID structure version Display media/features color, timing standard timing identification)
8	Analog V sync	Analog Vertical Sync
9	TMDS Data1-	Digital Green- (Link 1)
10	TMDS Data1+	Digital Green+ (Link 1)
11	TMDS Data1/3 Shield	
12	TMDS Data3-	Digital Blue- (Link 2)
13	TMDS Data3+	Digital Blue+ (Link 2)
14	+5V Power	Power for monitor standby
15	GND	Pin 14 and regression for synchronization
16	Hot Plug Detect	
17	TMDS Data0-	Digital Blue- (Link 1)
18	TMDS Data0+	Digital Blue+ (Link 1)

19	**TMDS Data0/5 Shield**	
20	**TMDS Data5-**	Digital Red- (Link 2)
21	**TMDS Data5+**	Digital Red+ (Link 2)
22	**TMDS Clock Shield**	
23	**TMDS Clock+**	Digital Clock+ (Link 1 & 2)
24	**TMDS Clock-**	Digital Clock- (Link 1 & 2)
C1	**Analog Red**	Analog Red (Disabled)
C2	**Analog Green**	Analog Green (Disabled)
C3	**Analog Blue**	Analog Blue (Disabled)
C4	**Analog H sync**	Analog Horizontal Sync (Disabled)
C5	**Analog Ground**	R, G, B signal regression (Disabled)

3-3-4 J1 Connector

On the PCIe-FRM22 board, 4 digital inputs and 4 digital outputs isolated by photo-couplers can be used through the J1 connector. The circuit is as follows.

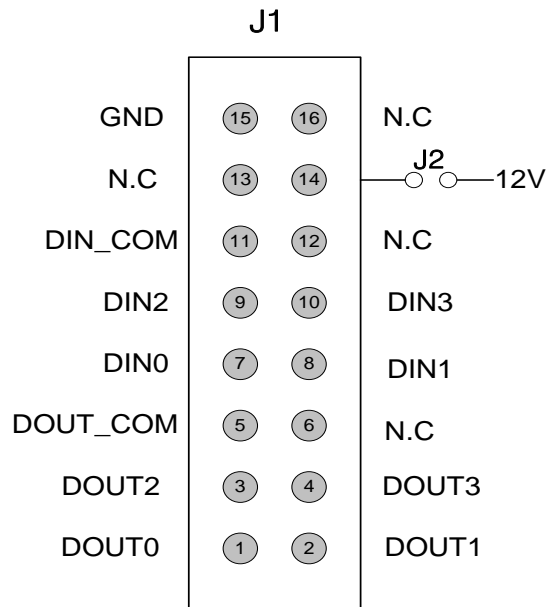

< Photo coupler input>

<Photo coupler output>
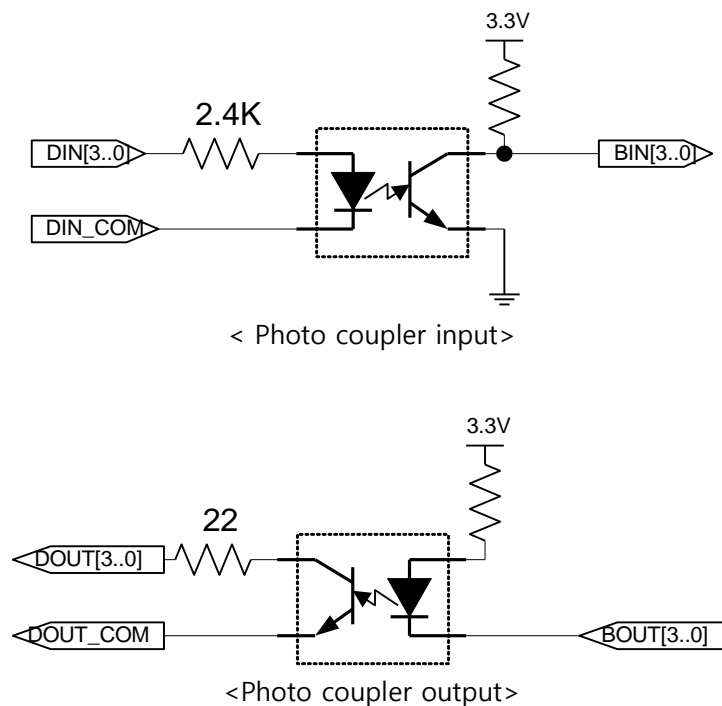
[Figure 3-5. Photo-coupler In/Out Circuit]

For input, using a resistance of 2.4K ohm, about 5mA for 12V input and about 10mA for 24V input will flow. Available input voltage is within 9V to 24V.

The output uses a 22 ohm resistor to limit the maximum output current. Output current should be used within 10mA.

In special circumstances, the R value is adjusted and used to operate according to the above description. The pin map of the connector is shown in the figure below.

J1

GND	15 16	N.C
N.C	13 14	J2 —12V
DIN_COM	11 12	N.C
DIN2	9 10	DIN3
DIN0	7 8	DIN1
DOUT_COM	5 6	N.C
DOUT2	3 4	DOUT3
DOUT0	1 2	DOUT1

[Figure 3-6.   16PIN Connector pin-out]

[Table 4.   J1 16Pin Male Header Connector]

| Pin No.	Name	Description	Remark
1	DOUT0	Output 0	
2	DOUT1	Output 1	
3	DOUT2	Output 2	
4	DOUT3	Output 3	
5	DOUT_COM	Output Common	
6	N.C	No Connected	
7	DIN0	Input 0	
8	DIN1	Input 1	
9	DIN2	Input 2	
10	DIN3	Input 3	
11	DIN_COM	Input Common	
12	N.C	No Connected	
13	N.C	No Connected	
14	12V	12V	
15	GND	Ground	
16	N.C	No Connected	

3-3-5 J4 Connector

J4 is a JTAG (Joint Test Action Group) connector and is used to update the FPGA program on the board. Do not use when operating the board normally.

3-3-6 J5 Connector

It is a 3.3V external DC power connector. This is the power used when installing the FPGA and is not normally used.

3-3-7 SW1 Switch

The PCIe-FRM22 board is designed so that up to four PCIe-FRM22 boards can be used simultaneously in one system (PC). Each board classification can be set through the 4-pin DIP switch (SW1) in the board.
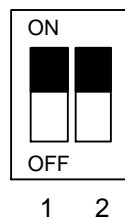
[Figure 3-7. SW1 Switch (Top View)]

[Table 5. SW1 Switch PIN-OUT]

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

4. Installation

4-1 Product Contents

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

1. PCIe-FRM21 Board
2. CD (Drivers/Manual/API/Sample source etc.)
   - Document Folder : Manual and Catalog
   - Driver Folder   : pcie_frm22.sys pcie-frm22.inf
   - Readme Folder   :
   - Sample Folder   : Sample Application and DLL
   - TestApp Folder   : FrmTest.exe, FrmView.exe

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. If possible, insert the boards in the order closest to the CPU.
④ After removing the blocked part at the back of the computer case in the slot where the board is inserted, tightly fasten 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.

4-2 Installation Process

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-FRM22 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 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.
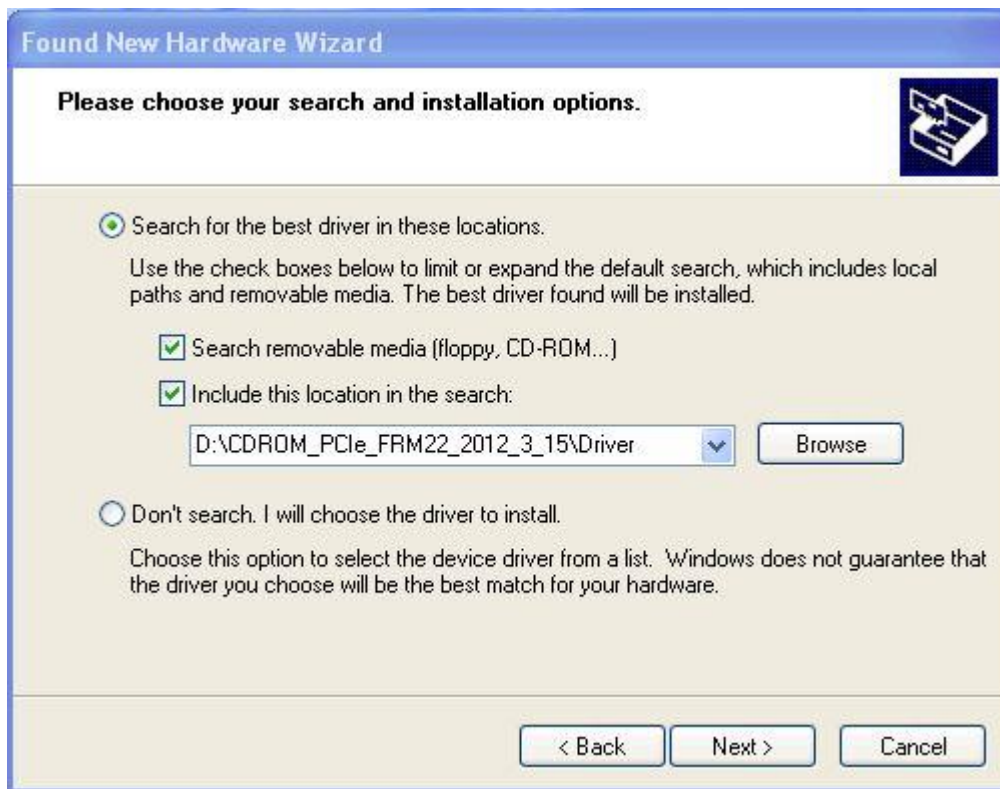
3. Click the Next button. It indicates that the installation process is proceeding as shown below.
    The driver folder contains **"pcie_frm22.inf"** and **"pcie_frm22.sys"** files required for driver
    installation. Click Next to install the driver files.

4. When the installation is completed normally, it is shown in the figure below.

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 Adapter -> "PCIe-FRM22"** is installed.

7. If it appears as shown in the figure below, the installation has been completed normally.
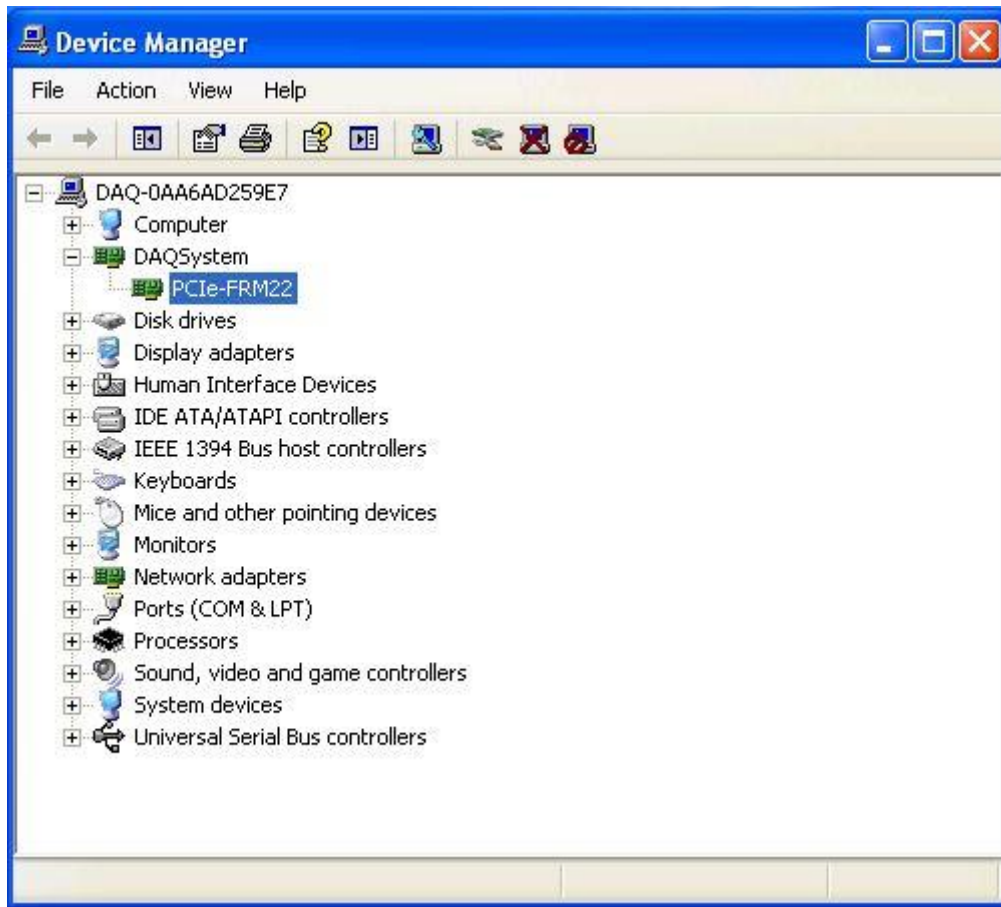
If you can see the "PCIe-FRM22" at Multifunction Adaptors, the driver installation is to have been over.

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

5. Sample Program

In the Exe folder of the CDROM provided with the board, a sample program "FrmTest.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 5-1. Sample Program "FrmTest.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 for compilation.

All files specified above are included on the supplied CDROM. In order to run the sample program normally, the API DLL **(PCI-FRM21.DLL)** must be located in the folder of the executable file or in the Windows system folder or the folder specified by the Path environment variable.

The description of each menu bar is as follows. The menu bar not described here is an unused function.

(1) "**Resolution" button**

User can set up the resolution (640x480, 800x600, 1024x768, 1280x720, 1280x1024, 1600x1200, 1920x1080, 1920x1200, 2048xx1536, 2560x2048, 1600x1200RGB, 1920x1200RGB).

** If you select other resolution, you re-press this button.

(2) **View Resolution**

It is a current window resolution. (800 x 600 is basic setting)

(3) **"Get Frame Size" button**

It is a Frame size according to **"Input Select"** resolution.

In case of RGB, it cannot be matched with an input mode because of analog characteristics.

(4) **"Device 0" button**

Board number selection (Device 0 ~ Device3).

(5) **"Device 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.

(6) **"Start" button**

Press this button to begin to save image data.

(7) **"FRAME Read"**

Press this button to read the image frame data of the board to your PC. If image frame data is not saved on the board, you must wait until the end of data collection.

(8) **"Save Data"**

Press this button to begin to save image data(binary type) at PC.

(9) **"Close Device"**

Press this button to finish usage of the board and terminate the program.

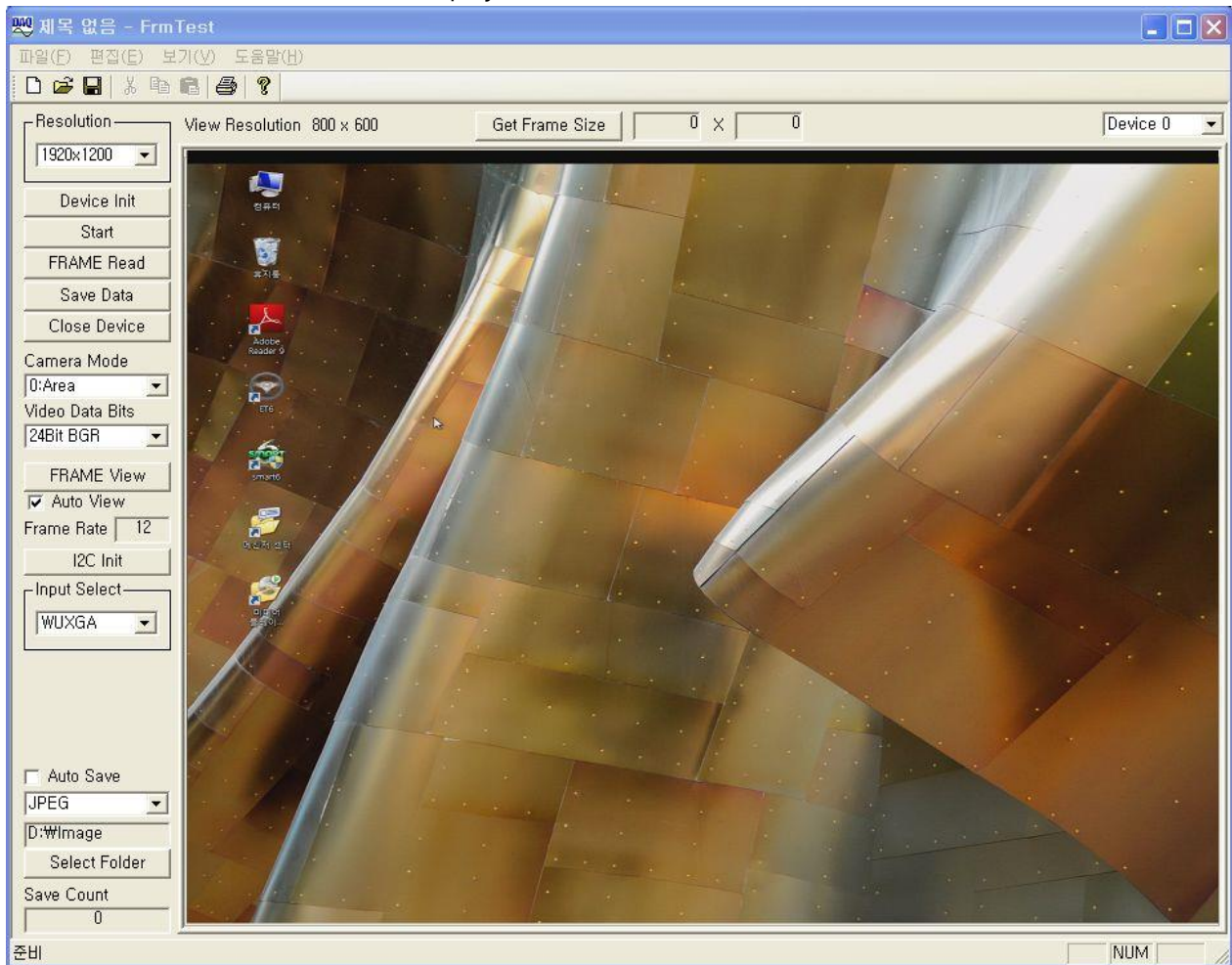(10) **"Video Data Bits" button**

It selects input data bits (8Bit, 16Bit YUV, 24Bit BGR).

(11) **"Frame View" button**

When press this button, it displays a freeze-frame.

(12) **"Auto View" click**

When check this box, it displays a video.

(13) **"I2C Init" button**

It used to save Video Input Mode as below **"Input Select"** .

(14) **"Input Select"**

It selects a Video Input Mode.

Yon can select HDMI, DVI and RGB (600x400, 800x600, 1024x720,

1024x768, 1280x720, 1280x768, 1280x960, 1280x1024, 1400x1050, 1600x1200,

1920x1200). The SW_Reset is a software reset, it perform if normal operation does not work.

(15) **"Auto Save" button**

When check this box, it save a file by BMP or JPEG format each 30 frames per 1 second until un-check this box.
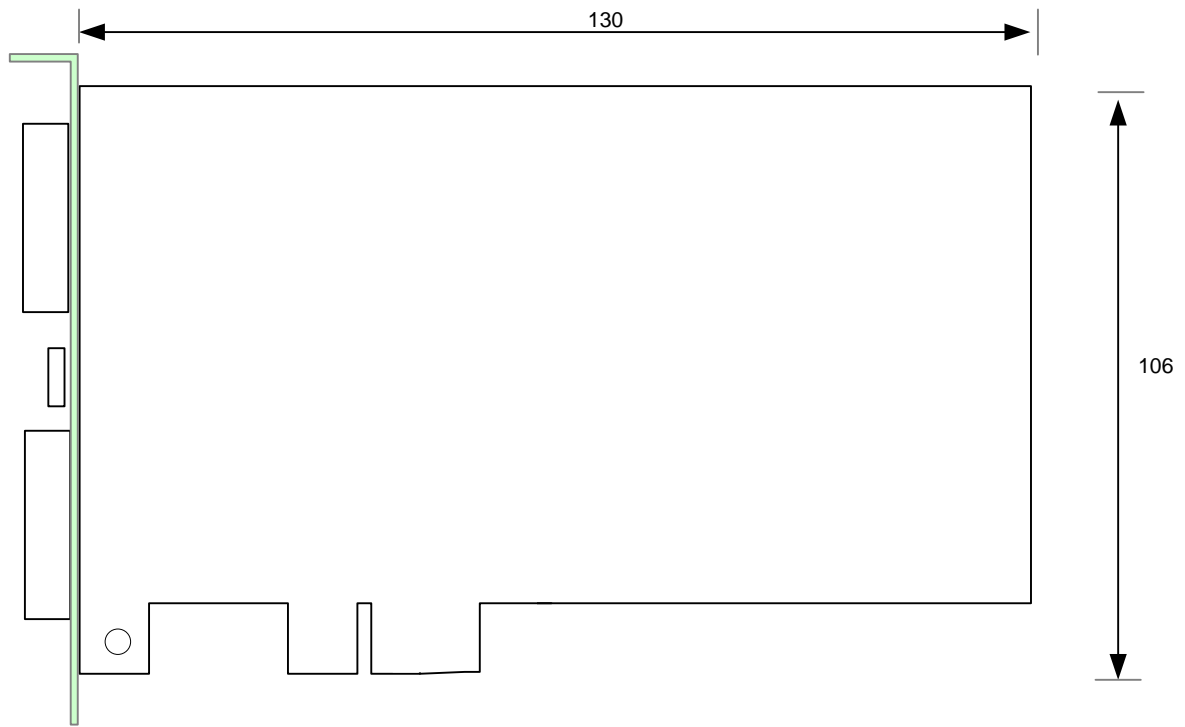
(16) **"Select Folder" button**

It selects a folder for saving. It set "D:₩Image" folder basically.

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-FRM22 API Programming

-- DAQ system

MEMO

Contact Point

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