USB-LT02

User Manual

Version 1.0

DAQ SYSTEM
Measurement & Automation

Contents

1. Introduction

1-1 Product Features

Item	Description	Remark
Hardware		
PC Interface	USB2.0 (HID I/F)	B-Type
Operating Power	+5VDC/ 500mA	USB Power
Input/Output Terminal	Terminal Block	
Input/Output Terminal No.	16 Isolated Photo Coupler Input 16 Isolated Photo MOS Relay Output	
Input Range	12~24V	Photo Coupler Input (Please contact us for less than 12V)
Output Range(Max)	Power dissipation : 500mW Load Peak Voltage : 60V Continuous Load Current : 400mA	P40~P47, P50~P53 (12 Terminals)
	Power dissipation : 500mW Load Peak Voltage : 350V Continuous Load Current : 130mA	P54~P57 (4 Terminals)
Micro-Controller	MSP430F5510	16-Bit RISC Architecture, 256Kb Flash, 4KB+2KB RAM USB2.0 Full Speed(12Mbps)
Number of boards used simultaneously		Multi board not used
Operating temperature range	0 ~ 60℃	
Storage temperature range	-20 ~ 80℃	
Humidity range	5 ~ 95%	Non-condensing
Board size	115.6mm X 91.4mm	PCB board Size
Software		
Operating	Windows 2000/XP/7 (32/64bit)	Win8 or higher not supported
API	Windows Client DLL API	
Development	Windows Application by User Custom USB Device Firmware Custom Windows Client DLL	
Support	Sample Program	VC++

1-2 Accessary

A to B USB2.0 Cable	Case (Sold Separately)

1-3 Product Applications

- -. Home Automation
- -. Factory Automation
- -. USB2.0 I/O Control and Remote Control
- -. USB2.0 Data Acquisition (Temperature, Humidity, Voltage, Current etc.)
- -. Industry Control Module
- -. Lighting Control
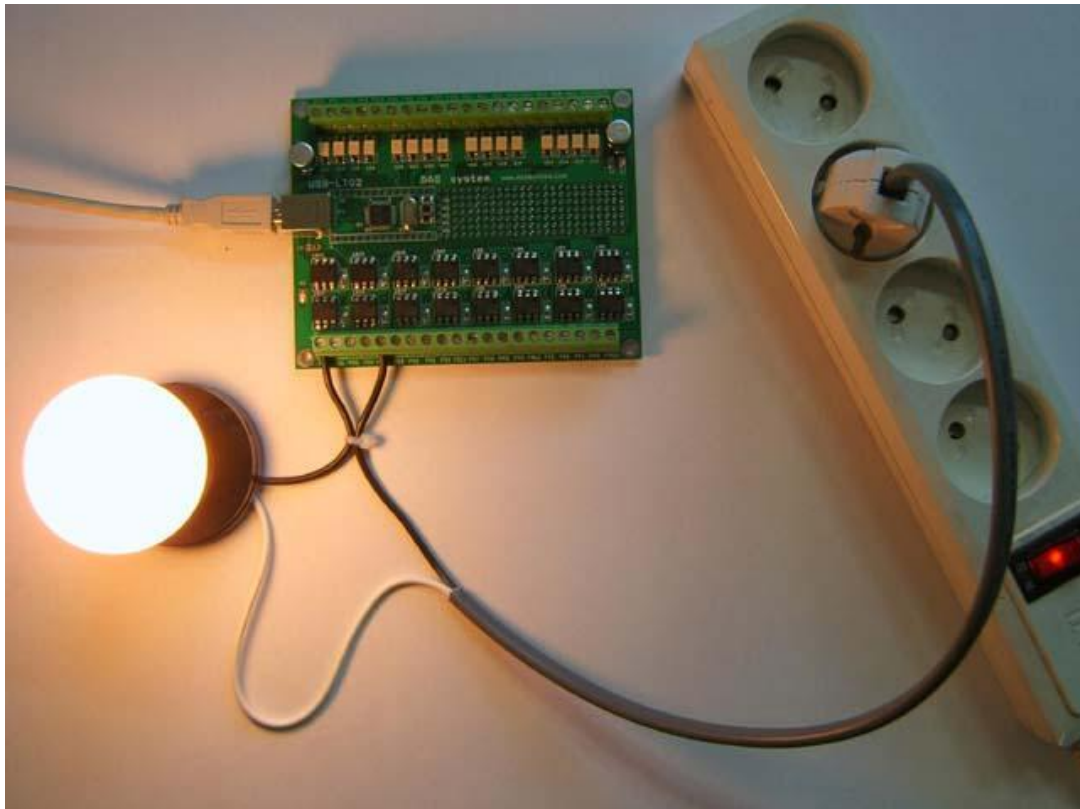
[Example of application] 220V lamp On/Off control

(Note) 1. In case of P57 to P54, the maximum AC/DC 350V can be controlled and it can be used continuously within 130mA.

2. In the case of P53 to P50 and P47 to P40, it can be controlled within the maximum AC/DC 60V and continuously It can be used within 550mA.

2. Installation

Before installation, check whether the contents of the package are abnormal.

2-1 Package Contents

- -. USB-LT02 Board
- -. USB2.0(A to B) Cable
- -. Storage device that stores manuals, sample programs, etc.

2-2 Installation Process

To install the USB-LT02 board on the PC, follow the steps below. In the case of USB, since it is a Hot Plug and Plug & Play device, there is no special consideration for installing the USB-LT02 board. Also, since USB-LT02 is connected by HID (Human Interface Device), there is no need to install a dedicated device driver.

(1) Connect USB 2.0 cable to PC.

[Figure 2-1.   PC and USB2.0 Cable Connection]

(2) Connect the other end of the USB2.0 cable connected to the PC to USB-LT02.

[Figure 2-2.   USB-LT02 Board and USB2.0 Cable Connection]

(3) When the USB2.0 cable is connected, the LED (D1) for power supply indication of the USB-LT02 board turns on.

[Figure 2-3.   USB-LT02 Power supply indication LED lights up]

(4) Check whether the connection is normally established in the following way.

On the My Computer -> Properties -> Device Manager screen, check if **'HID Standard Supplier Defined Device'** or **'HID Compliant Device'** appears in 'Human Interface Device'. If it appears as shown in [Figure 2-4], the installation has been completed normally.
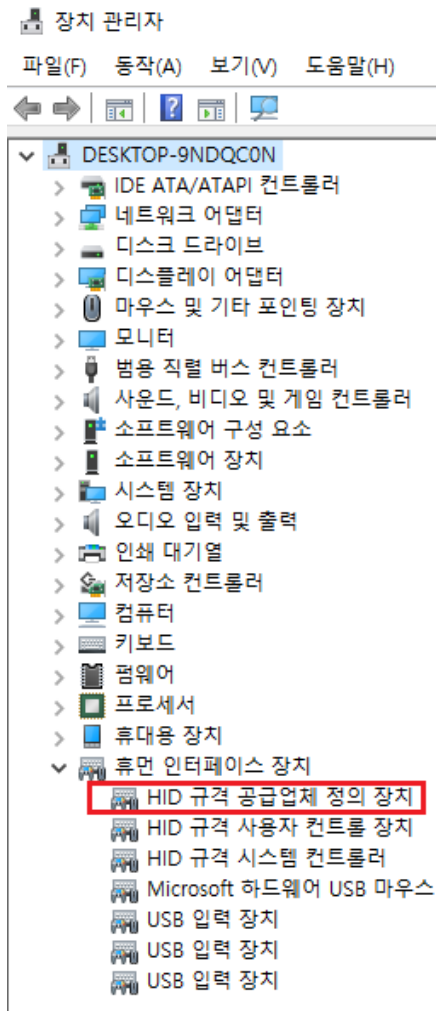
[Figure 2-4.   Check USB-LT02_B board normal connection]

3. USB-LT02 Board Description

USB-LT02 is an I/O board that allows developers who have no knowledge of USB to simply control external devices by using the provided API.

External I/O connection is made easy to connect using screw terminals, and a test point is provided on a separate universal board to test simple circuits on its own universal board. No need to use a power supply.

In particular, the I/O circuit is operated in isolation from the automation system with a port coupler and a photo MOS relay. It can be configured and used immediately as an automation control module that does not damage external equipment and its own modules.

3-1 Board Layout
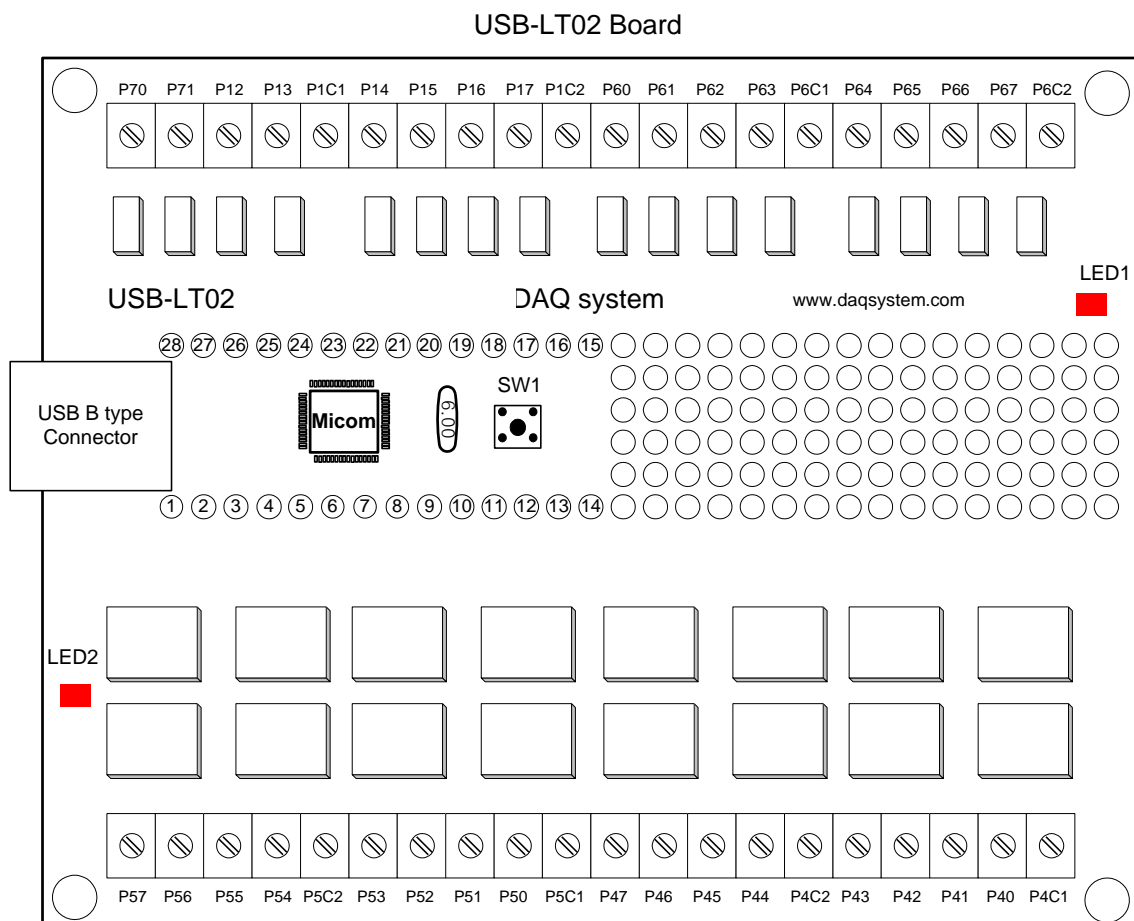
[Figure 3-1. USB-LT02 Layout]

If you look at the picture above, in the case of USB-LT02, I/O functions are easy to use, and a simple circuit can be configured on a universal board by itself. A description of each is as follows.

3-2 Board Description

Like the general 8051, it has program memory and data memory. Since the program memory area is programmed and supplied when the first board is provided as an OTP type, the user cannot reprogram it.

Therefore, if you want a separate program (in case you need faster response and dedicated application), please contact the AQ system.

16KByte

Program
Memory

256Byte
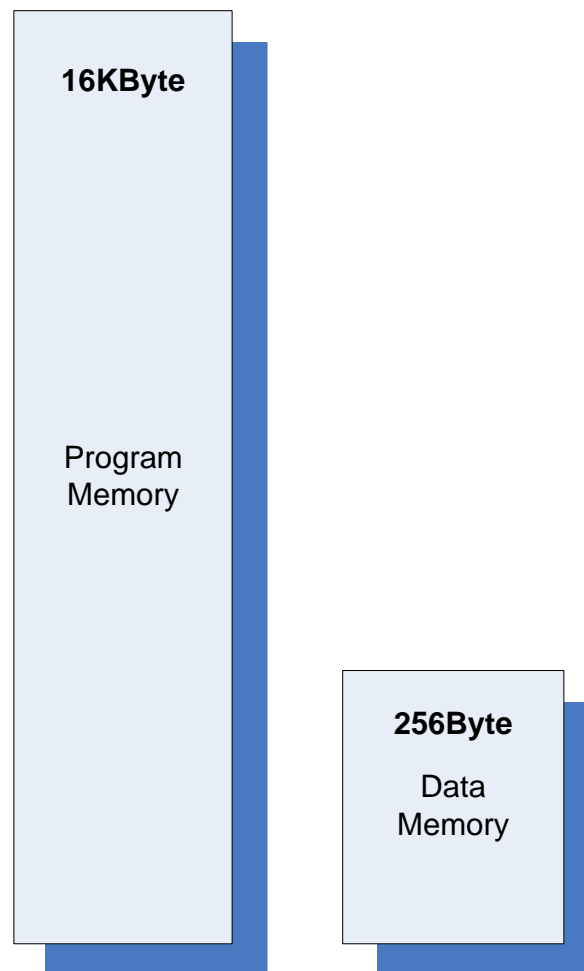
Data
Memory

[Figure 3-2. Memory Map]

3-2-1   USB2.0 B-Type Connector

Insert the A to B USB2.0 cable into this connector and connect it to the PC. Through this, power is supplied and data is transmitted and received. For USB2.0 B type connector, refer to [Figure 3-3] and [Table 3-1] below.
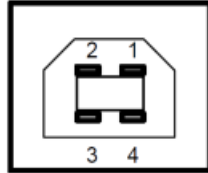

[Figure 3-3.   USB2.0 B-Type Connector]

[Table 1.   USB2.0 B-Type Pin Map]

Pin No.	Name	Description
1	VCC	USB Power +5V
2	D-	Negative Signal (Minus)
3	D+	Positive Signal (Positive)
4	GND	Power GND

3-2-2 D1 LED

When USB2.0 Port of PC and USB-LT02 are connected, USB Power(+5V) is supplied to USB-LT02 and this LED is turned on.

3-2-3   D2 LED

Lights up when all input/output terminals of the USB-LT02 board are set as output. Used in sample programs..
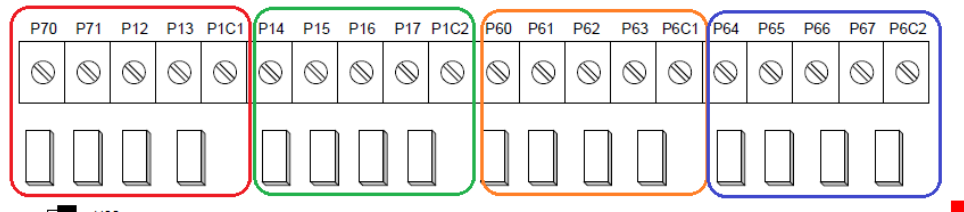
3-2-4   MICOM

It is in charge of input/output control and USB data transmission with 16-Bit Micro-Controller.

3-2-5 SW1 Switch

Press to reset the board.

3-2-6 Input Terminal

[Figure 3-4. Input Terminal]

The input terminal is a photo coupler, and the input voltage range is 12V ~ 24V. (For less than 12V, please contact us)

It is designed so that there is no power polarity, and one common terminal is used per 4 input terminals. Each input common terminal is checked in [Figure 3-5] and [Table 3-3] below.

[Table 2. Common and Input Terminal]

Common / Input	P1C1	P1C2	P6C1	P6C2
1	P70	P14	P60	P64
2	P71	P15	P61	P65
3	P12	P16	P62	P66
4	P13	P17	P63	P67

The circuit between the common terminal and the input terminal is shown in [Fig. 3-6].
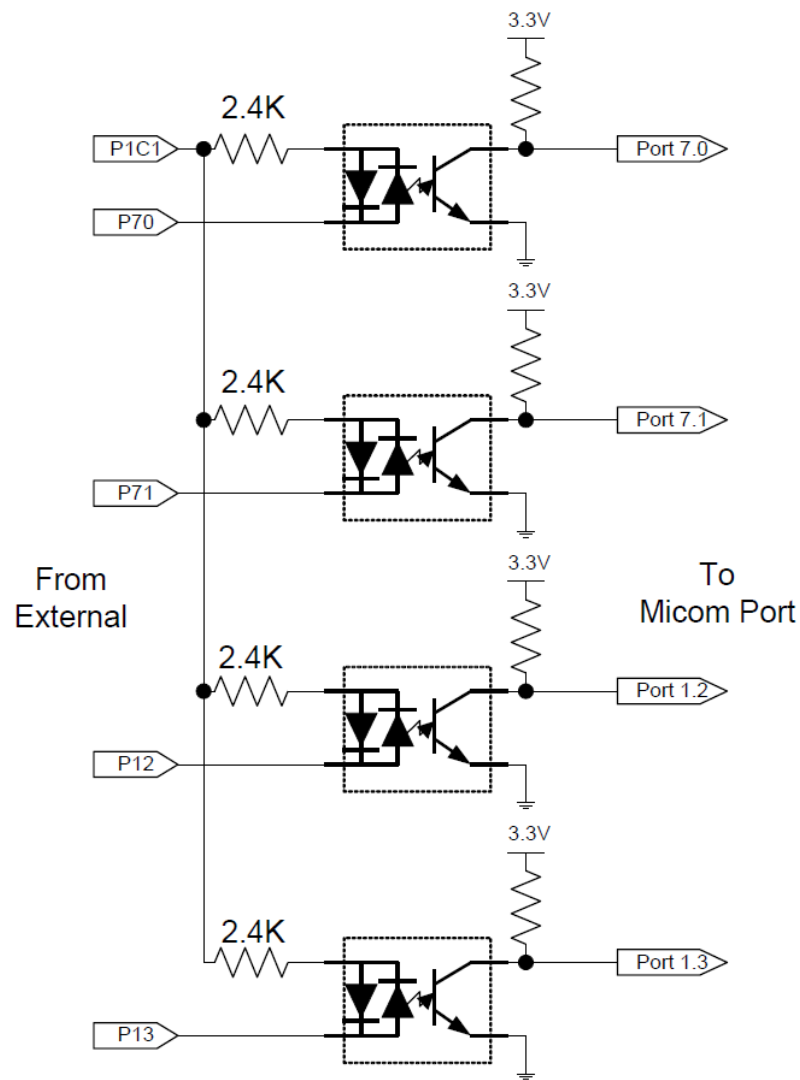
[Figure 3-5. Photo Coupler Input Circuit]

For example, if GND is connected to P1C1 (common terminal) and the voltage level of the signal input to P70 is 12V, the input of USB-LT02_B is ON. (The polarity of the input voltage is irrelevant.)
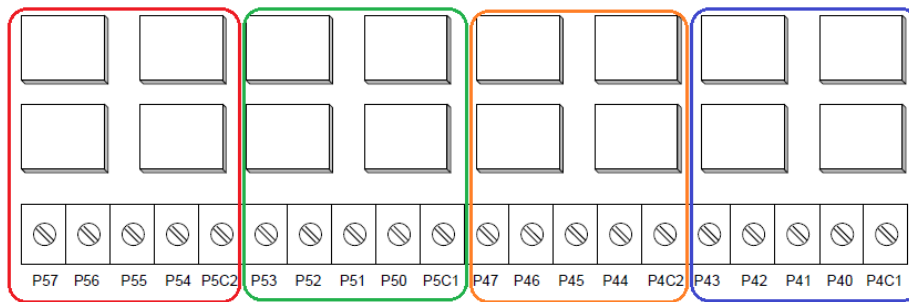
[Table 3.　Input Terminal Operation]

P70	USB-LT02_B Operation
12V	ON
GND	OFF

3-2-7 Output Terminal

[Figure 3-6. Output Terminal]

The output terminal uses a photo MOS relay, and the output control voltage range is P54, P55, P56, P57 and The maximum P5C2 terminal is 350V, and the continuous current that can flow is 130mA.

Other output terminals are up to 60V, and the current that can flow continuously is 400mA.

Like the input terminal, the common terminal of the output terminal uses one per four output terminals. Check each output common terminal in [Figure 3-6] and [Table 4] below.

[Table 4. Common and Output Terminal]

Output \ Common	P5C2	P5C1	P4C2	P4C1
1	P54	P50	P44	P40
2	P55	P51	P45	P41
3	P56	P52	P46	P42
4	P57	P53	P47	P43

The circuit between the common terminal and the output terminal is shown in [Figure 3-7].
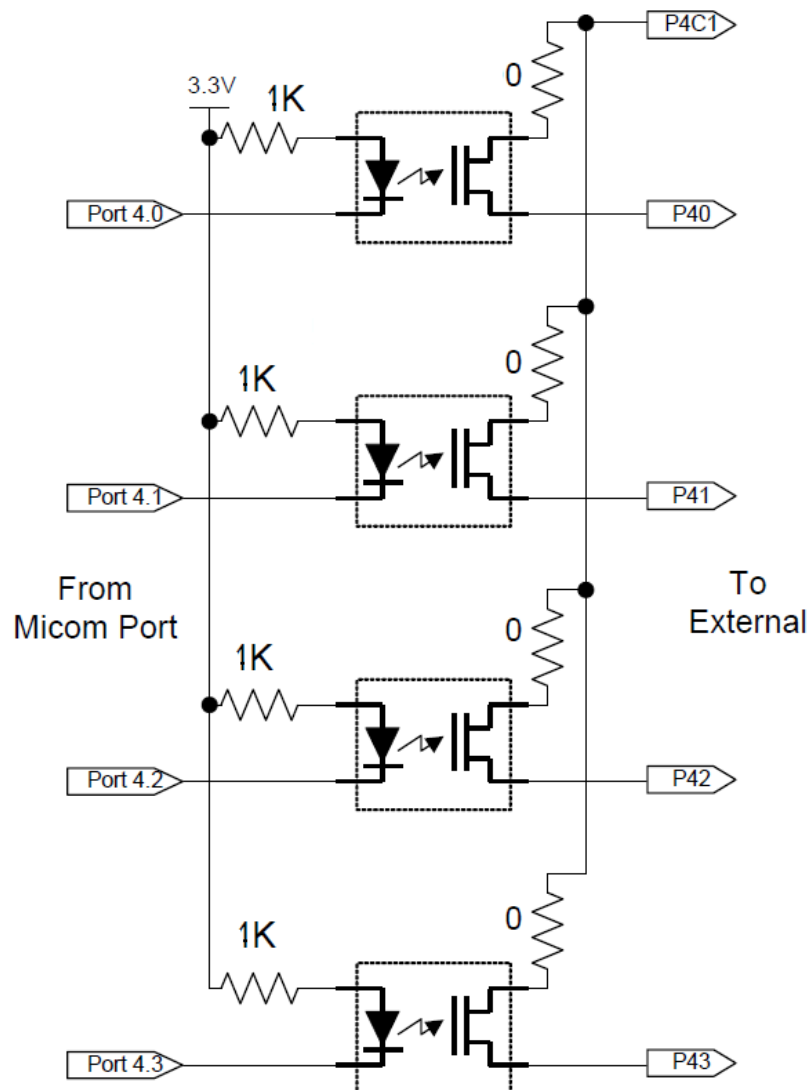
[Figure 3-7.　Photo MOS Relay Output Circuit]

For example, MICOM gives a Logic Low signal (GND) to Port4.0 to make P4C1 and P40 conduct. Therefore, the output circuit is within the voltage and current range that allows the user to control the On/Off circuit between P4C1 and P40. You can freely configure it in.

3-3   In/Out Terminal Pin Map

For pin-out of Screw Terminal Connector for external input/output connection, refer to [Table 5] below.

[Table 5.   In Out Screw Terminal Connector Pin map]

| Name	Description	Remark
P1C1	P70, P71, P12, P13 Input Common Terminal	Input Range : 12V ~ 24V See paragraph 3-2-6.
P70	Photo Coupler Input	
P71	Photo Coupler Input	
P12	Photo Coupler Input	
P13	Photo Coupler Input	
P1C2	P14, P15, P16, P17 P13 Input Common Terminal	Input Range : 12V ~ 24V See paragraph 3-2-6.
P14	Photo Coupler Input	
P15	Photo Coupler Input	
P16	Photo Coupler Input	
P17	Photo Coupler Input	
P6C1	P60, P61, P62, P63 P13 Input Common Terminal	Input Range : 12V ~ 24V See paragraph 3-2-6.
P60	Photo Coupler Input	
P61	Photo Coupler Input	
P62	Photo Coupler Input	
P63	Photo Coupler Input	
P6C2	P64, P65, P66, P67 P13 Input Common Terminal	Input Range: 12V ~ 24V See paragraph 3-2-6. ※ P67 is also connected to D2, so if P67 is set as an output terminal in the sample program and a low signal is given, D2 is configured to light.
P64	Photo Coupler Input	
P65	Photo Coupler Input	
P66	Photo Coupler Input	
P67	Photo Coupler Input	
P4C1	P40, P41, P42, P43 Output Common Terminal	Maximum Output Control Range : 60V/400mA See paragraph 3-2-7.
P40	Photo MOS Relay Output	
P41	Photo MOS Relay Output	
P42	Photo MOS Relay Output	
P43	Photo MOS Relay Output	
P4C2	P44, P45, P46, P47 Output Common Terminal	Maximum Output Control Range : 60V/400mA See paragraph 3-2-7.
P44	Photo MOS Relay Output	

P45	Photo MOS Relay Output	
P46	Photo MOS Relay Output	
P47	Photo MOS Relay Output	
P5C1	P50, P51, P52, P53 Output Common Terminal	Maximum Output Control Range : 60V/400mA See paragraph 3-2-7.
P50	Photo MOS Relay Output	
P51	Photo MOS Relay Output	
P52	Photo MOS Relay Output	
P53	Photo MOS Relay Output	
P5C2	P54, P55, P56, P57 Output Common Terminal	Maximum Output Control Range : 350V/130mA See paragraph 3-2-7.
P54	Photo MOS Relay Output	
P55	Photo MOS Relay Output	
P56	Photo MOS Relay Output	
P57	Photo MOS Relay Output	

(Note) The output must be used within the specified voltage and current, otherwise the product may be damaged.
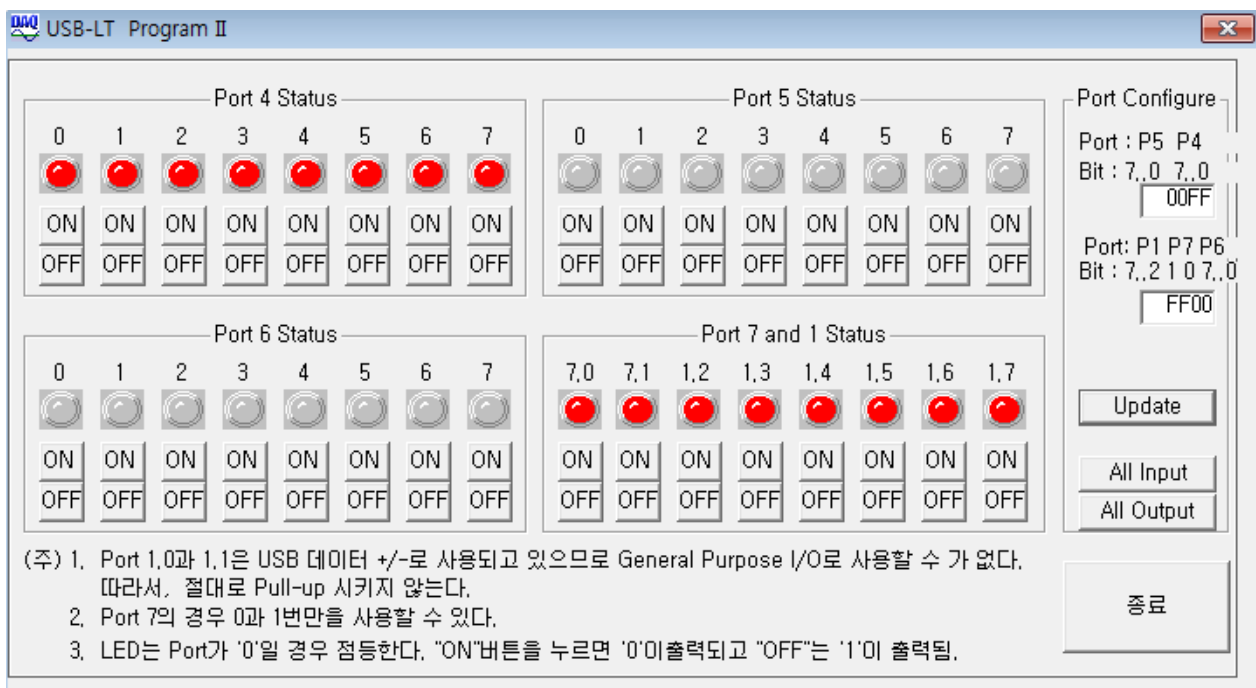
4. Sample Program

The CDROM provided with the board provides a sample program for use so that the board can be used easily. Since the USB HID device uses the driver of the operating system itself, there is no need to install a separate driver program.

There are two sample programs provided. The first is a program that can determine whether or not the board is operating abnormally, and the other is a program that can set input/output for each port and control each output.
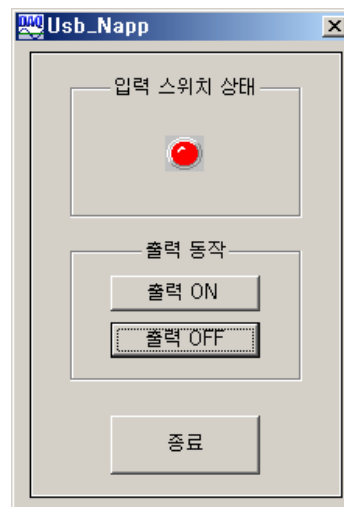
[Figure 4-1. Sample Program 1]

[Figure 4-2. Sample Program 2]

(1) Port Configure --- Set input and output mode of each port.
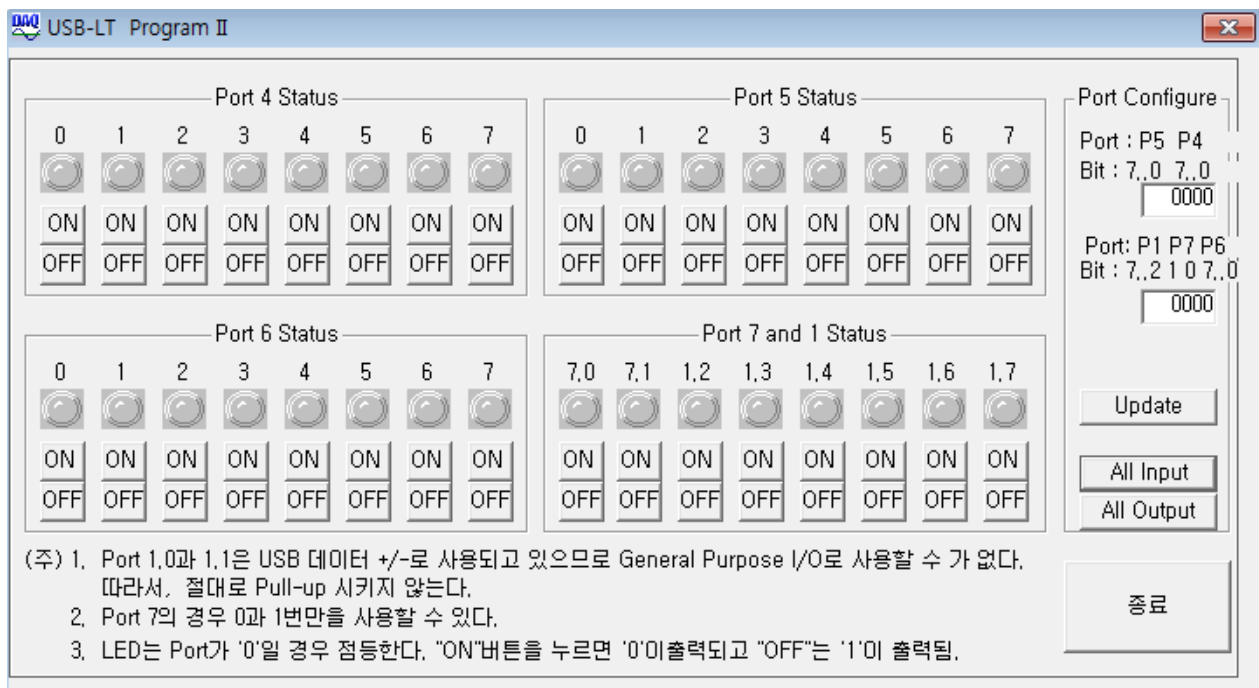
Port : P5..P4   (Low Byte :   P4)

(Upper Byte :   P5)

Port : P1 P7 P6   (Low Byte: P6)

(Upper Byte: P7 and P1)

(2) Update --- Update the Port Configure value.

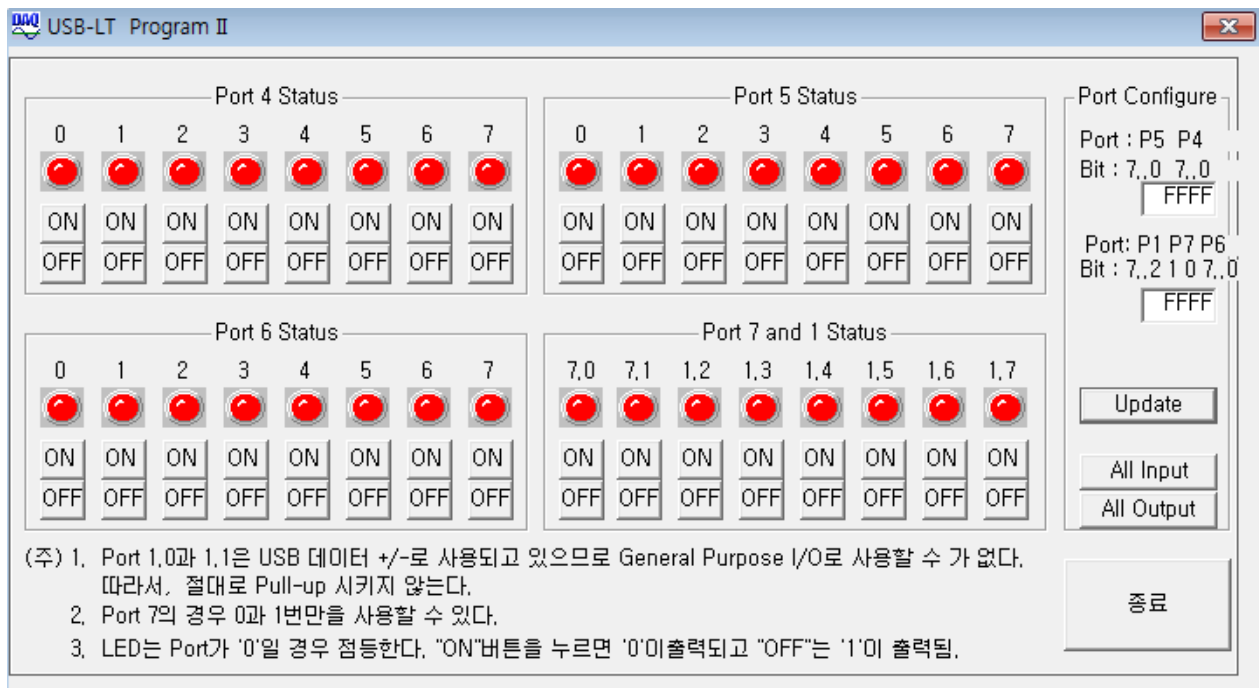(3) All Input --- All ports of MICOM are used as input.

However, the input of the photo coupler can only be applied to the corresponding pin.
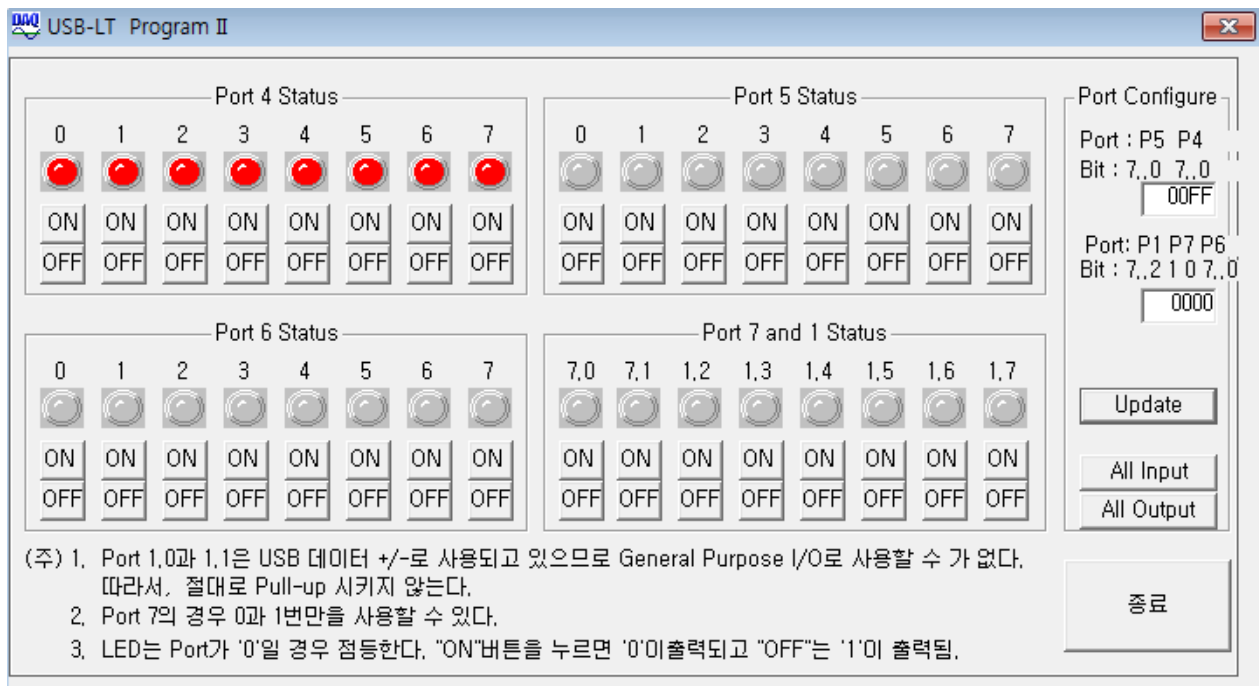
(Port 6, Port7, Port1)

[Figure 4-3.   All Input]

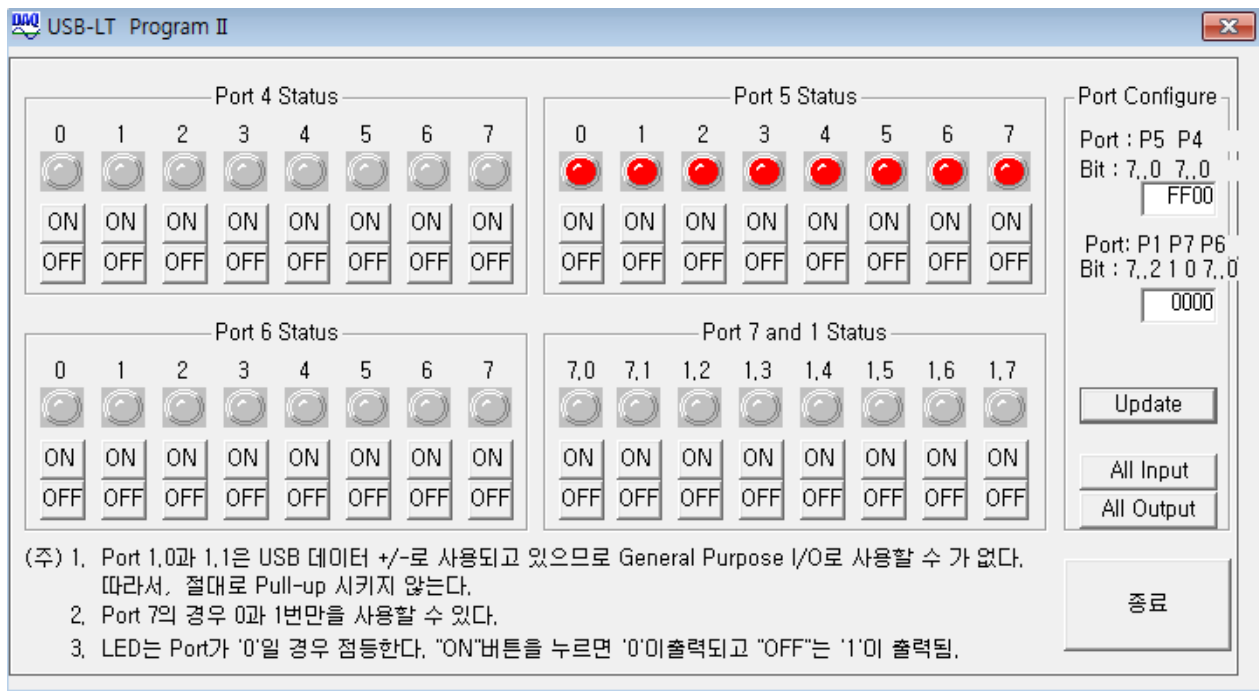All Output --- All ports of MICOM are used as output.

[Figure 4-4.   All Output]

However, the operation of the photo MOS relay is possible only for the corresponding pin. (Port 4, Port5)

[Figure 4-5.   Port 4 Output]

[Figure 4-6.   Port 5 Output]

(4) Each port's "on" and "off" switches are used in Output mode and control "High" and "Low".

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.

A sample program is provided with the USB-LT02 to facilitate the use of the USB-LT02. Since the USB HID Device uses the driver of the operating system itself, there is no need to install a separate driver program.

The provided sample program is a program that can check the operation of each terminal by simply judging whether the board is faulty or not, and setting each terminal as an input or output. For the sample program, after connecting USB-LT02 to the PC, run Usb_Napp.exe and the following screen will appear.

In order to use the sample program, 'Usb_NApi.dll' and 'Usb_NApi.lib' files are required, and these files and files for compilation are all provided. (See provided Storage Device and www.daqsystem.com)

5. Test

5-1 Input Test

A functional test to learn whether the board is abnormal and how to use it will be conducted in this chapter. The test is executed using the **"sample1.exe"** program in the Exe folder of the CDROM on the PC where the USB-LT02 board is installed.

The App and App0 folders of the CDROM contain the executable files and source files of sample1 and sample2, so the executable files are used for testing, and the provided sample source files can be modified and used by the user to implement the necessary functions.
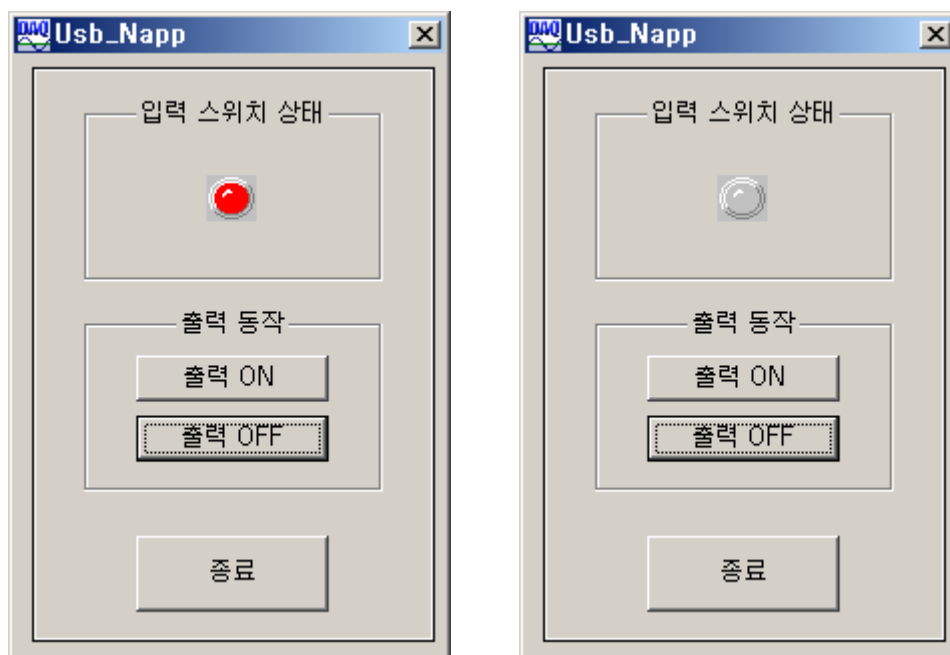

[Figure 5-1. Sample1.exe]

In the picture above, the LED is on on the left and the LED is off on the right. It turns on when there is an input of bit 1 of port 6, and turns off when there is no input.

That is, it turns on when power between 5V and 12V is supplied between P61 and P6C1, and turns off when power is not supplied. At this time, bit 1 of port 6 is set as input in the above program and used.

5-2 Output Test

(1) You can check the output function by turning on/off the LED on the board.
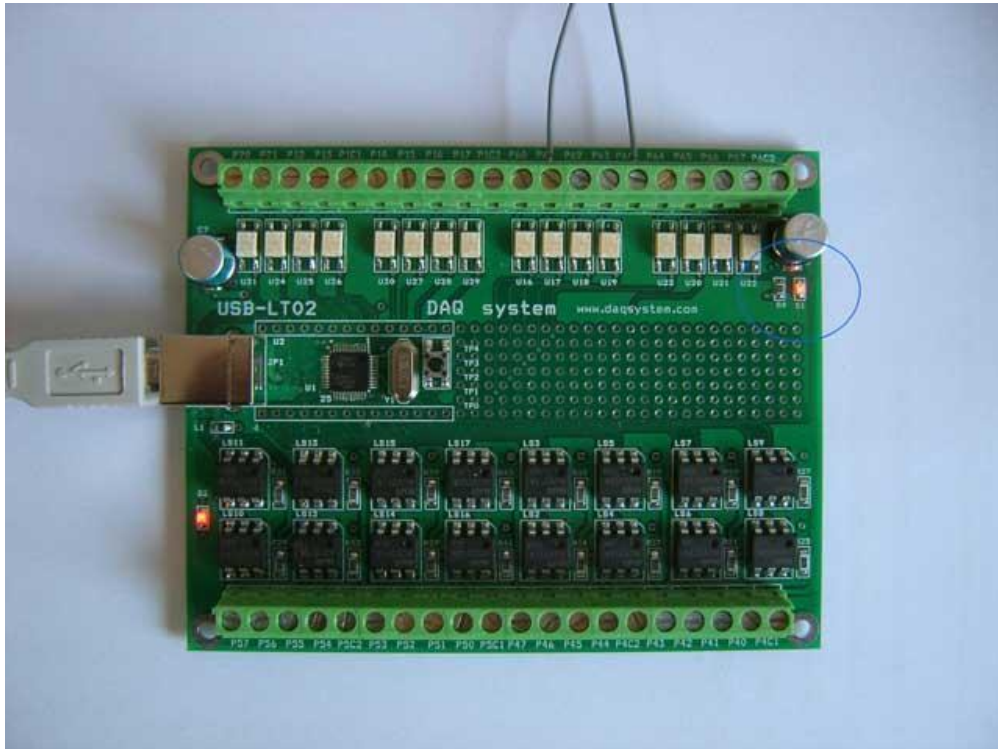

[Figure 5-2. LED On/Off]

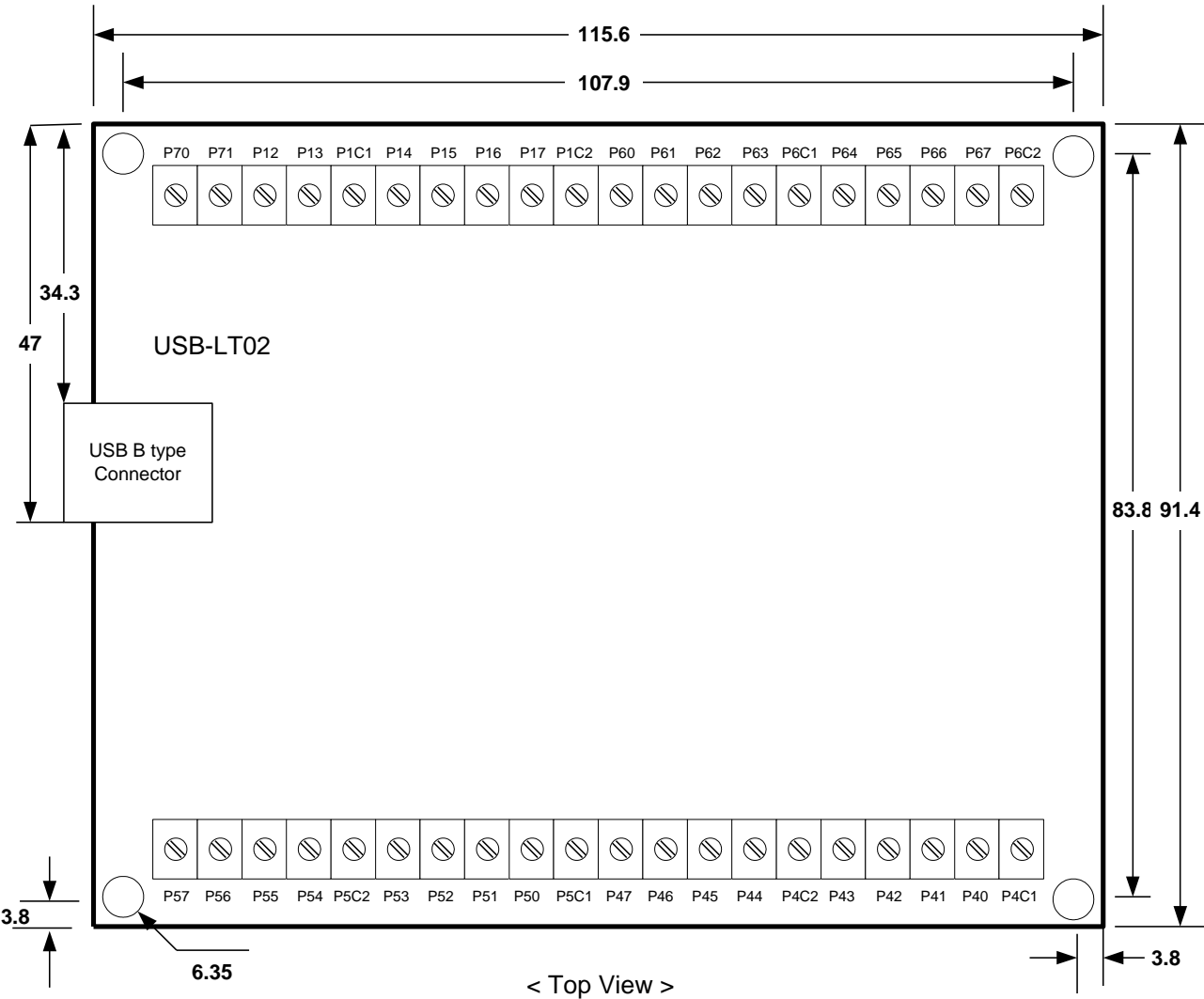In the picture above, you can see that the LED is on. It turns on when the output of bit 7 of port 6 is "0", and turns off when it is "1".

You can test by pressing the output (ON/OFF) button in the Sample1 program.

Appendix

A-1　Board Size

The external dimensions of the board are as follows. For more detailed dimensions, please ask the person in charge.

< Top View >

< Right Side View >
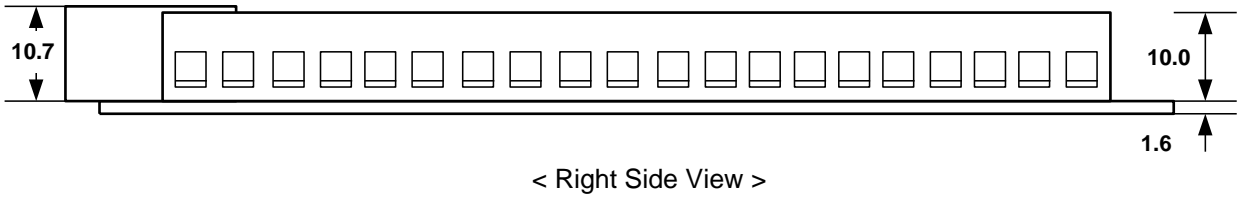
A-2 Repair Regulations

Thank you for purchasing DAQ SYSTEM's product. Please refer to the following regarding Customer Service stipulated by DAQ SYSTEM.

(1) Please read the user's manual and follow the instructions before using the DAQ SYSTEM product.

(2) When returning the product to be repaired, please send it to the head office with the symptoms of the malfunction as well.

(3) All DAQ SYSTEM products have a one-year warranty.
   -. The warranty period is counted 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 repair is required, please contact the contact points below.

(4) Even during the free repair warranty period, paid repairs are made in the following cases.
   ① Failure or damage caused by not following the user's manual
   ② Failure or damage caused by customer negligence during product transportation after purchase
   ③ Natural phenomena such as fire, earthquake, flood, lightning, pollution, etc. or power supply exceeding the recommended range malfunction or damage
   ④ Failures caused by inappropriate storage environment (eg, high temperature, high humidity, volatile chemicals, etc.) damaged
   ⑤ Failure or damage due to unreasonable repair or modification
   ⑥ Products whose serial number has been changed or intentionally removed
   ⑦ In the event that DAQ SYSTEM determines that it is the customer's negligence for other reasons

(5) The customer must bear the shipping cost of returning the repaired product to DAQ SYSTEM.

(6) The manufacturer is not responsible for any problems caused by incorrect use regardless of our warranty provisions.

References

1. USB 2.0 System Architecture

    -- Don Anderson, USB SIG(www.usb.org)

2. Universal Serial Bus Specification

    -- Compaq/Intel/Microsoft/NEC, MindShare Inc. (Addison Wesley)

3. USB-LT User's manual

    -- DAQ system

4. AN201 How to build application using APIs

    -- DAQ system

5. AN342 USB-LT02 API VER1.0

    -- DAQ system

<u>MEMO</u>

Contact Point

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