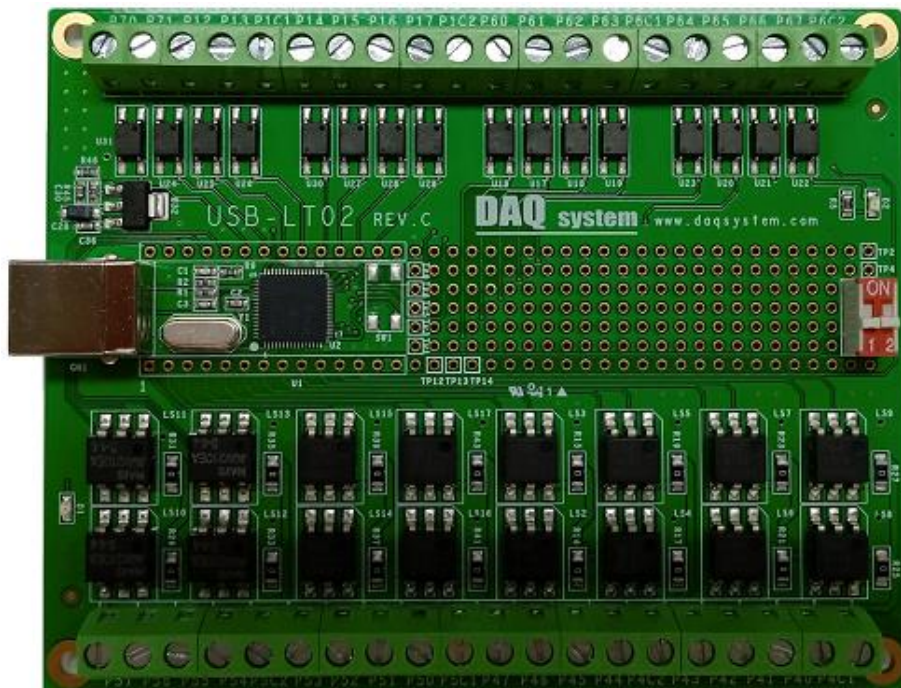


# USB-LT02\_B

## User Manual

Version 1.4



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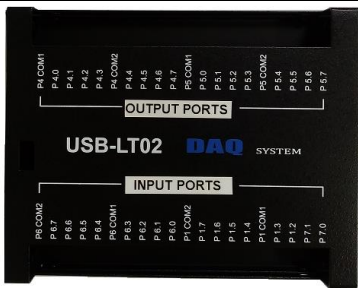
Reference	-----	24
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# 1. Introduction

## 1-1 Product Features

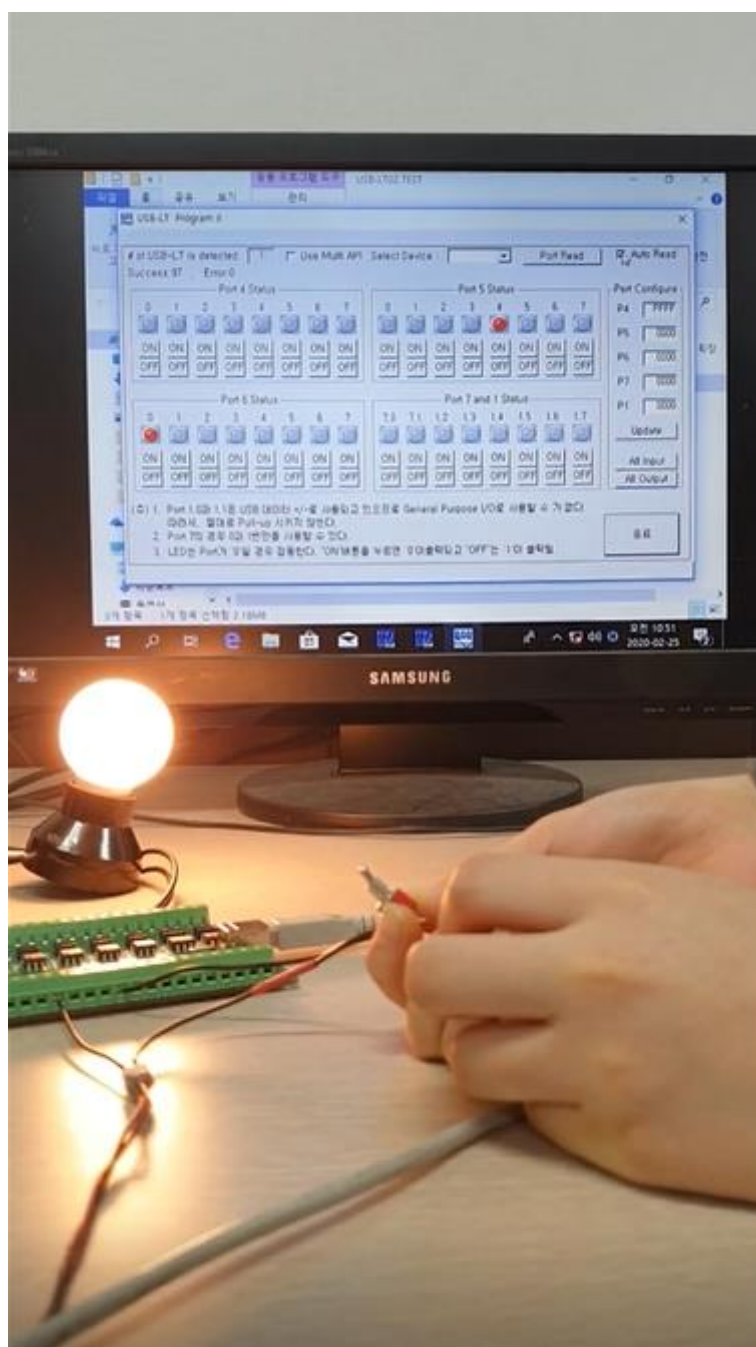
Item	Description	Remark
<b>Hardware</b>		
PC Interface	USB2.0 (HID I/F)	B-Type
Operating Power	+5VDC/ 500mA	USB Power
Input/Output Terminal	Terminal Block	
Input/Output Terminal No.	16 Isolated Photo Coupler Input 16 Isolated Photo MOS Relay Output	
Input Range	12~24V	Photo Coupler Input (Please contact 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	Max. 4	
Operating temperature range	0 ~ 60°C	
Storage temperature range	-20 ~ 80°C	
Humidity range	5 ~ 95%	Non-condensing
Board size	115.6mm X 91.4mm	PCB board Size
<b>Software</b>		
Operating	Windows 2000/XP/7/8/10 (32/64bit)	
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



[Application example] 220V lamp On/Off control

## 2. Installation

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

### 2-1 Package Contents

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

## 2-2 Installation Process

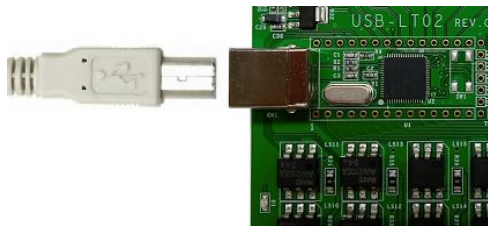
To install the USB-LT02\_B board on the PC, follow the steps below. In the case of USB, since it is a Hot Plug and Plug & Play device, there is no special consideration for installing the USB-LT02\_B board. Also, since USB-LT02\_B is connected by HID (Human Interface Device), there is no need to install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



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

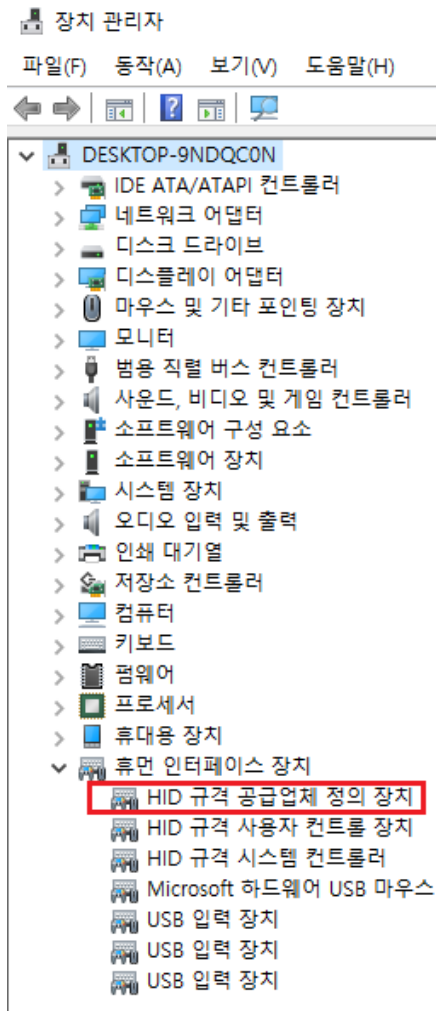
- (3) When the USB2.0 cable is connected, the LED (D1) for power supply indication of the USB-LT02\_B board turns on.



[Figure 2-3. USB-LT02\_B 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.

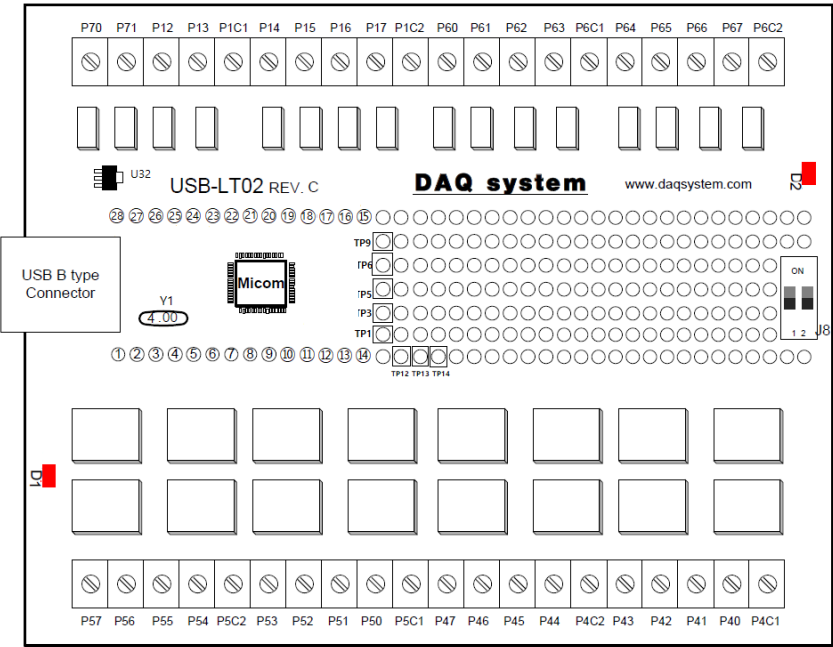


[Figure 2-4. Check USB-LT02\_B board normal connection]



### 3. USB-LT02\_B Board Description

#### 3-1 Board Layout



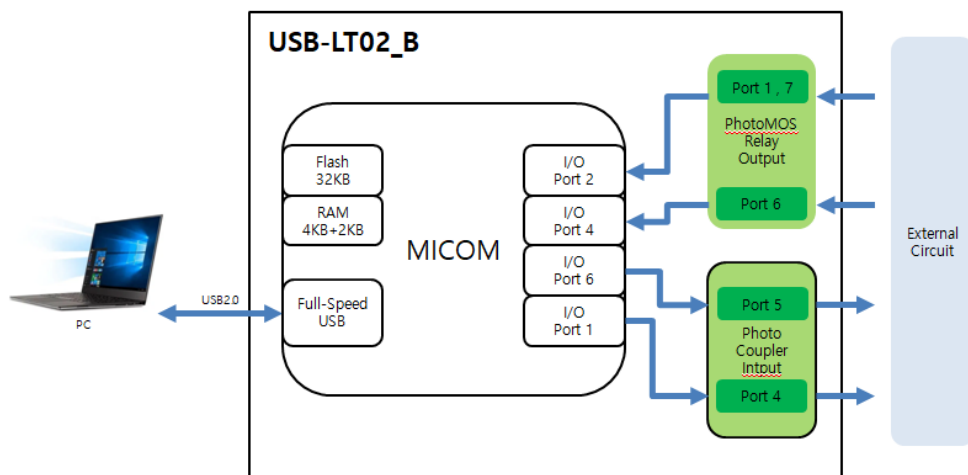
[Figure 3-1. USB-LT02\_B Layout]

### 3-2 Board Description

USB-LT02\_B is an I/O board that allows developers who do not know USB at all to simply control external devices by using the provided API.

External I/O connection can be easily connected 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.

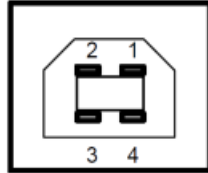
In particular, the I/O circuit is composed of a port coupler and a photo MOS relay so that it can operate in isolation from the automation system, so it can be used directly as an automation control module that does not damage external equipment or its own module..



[Figure 3-2. USB-LT02\_B Block Diagram]]

### 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.



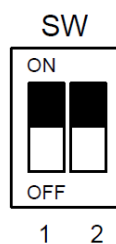
[Figure 3-3. USB2.0 B-Type Connector]

[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 J8 Switch

The USB-LT02\_B board is designed to use up to 4 USB-LT02\_B boards simultaneously in one system (PC). The division of each board can be set through the dip switch (J8) in the board. This is to set the board ID. However, when using Single Mode, set the board number to 0.



[Figure 3-4. Dip Switch]

[Table 2. Board ID setting Table]

SW1	SW2	Board ID
OFF	OFF	0
ON	OFF	1
OFF	ON	2
ON	ON	3

### 3-2-3 D1 LED

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

### 3-2-4 D2 LED

Lights up when all input/output terminals of the USB-LT-2\_B board are set as output. Used in sample programs.

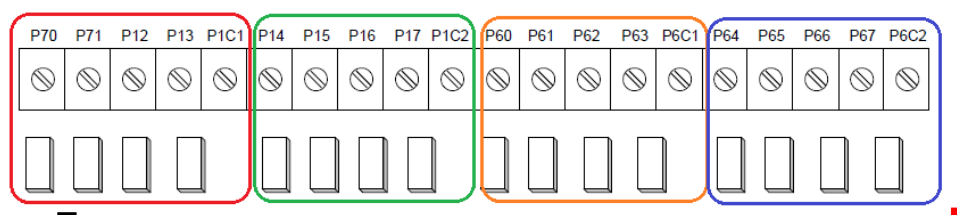
### 3-2-5 MICOM

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

### 3-2-6 U32

It is a 3.3V output regulator.

### 3-2-7 Input Terminal



[Figure 3-5. Input Terminal]

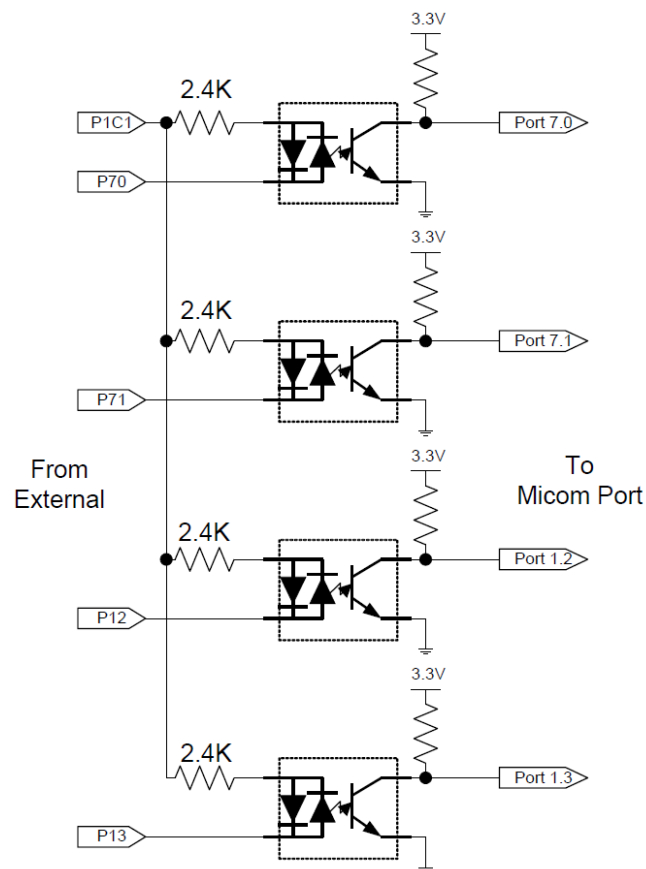
The input terminal is a photo coupler, and the input voltage range is 12V ~ 24V. (For less than 12V, please contact us)

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 3. 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].



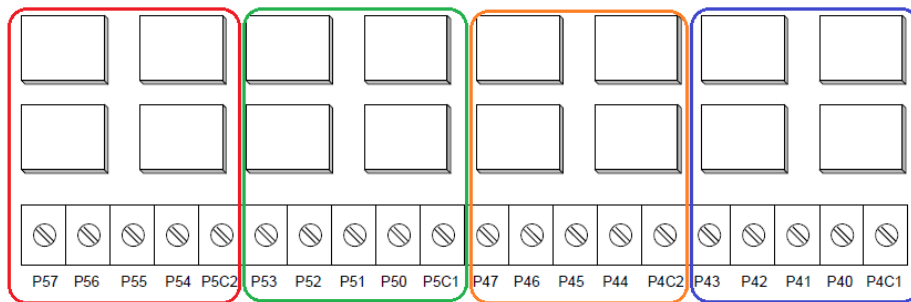
[Figure 3-6. Photo Coupler Input Circuit]

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 4. Input Terminal Operation]

P70	USB-LT02_B Operation
12V	ON
GND	OFF

### 3-2-8 Output Terminal



[Figure 3-7. Output Terminal]

The output terminal uses a photoMOS 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.

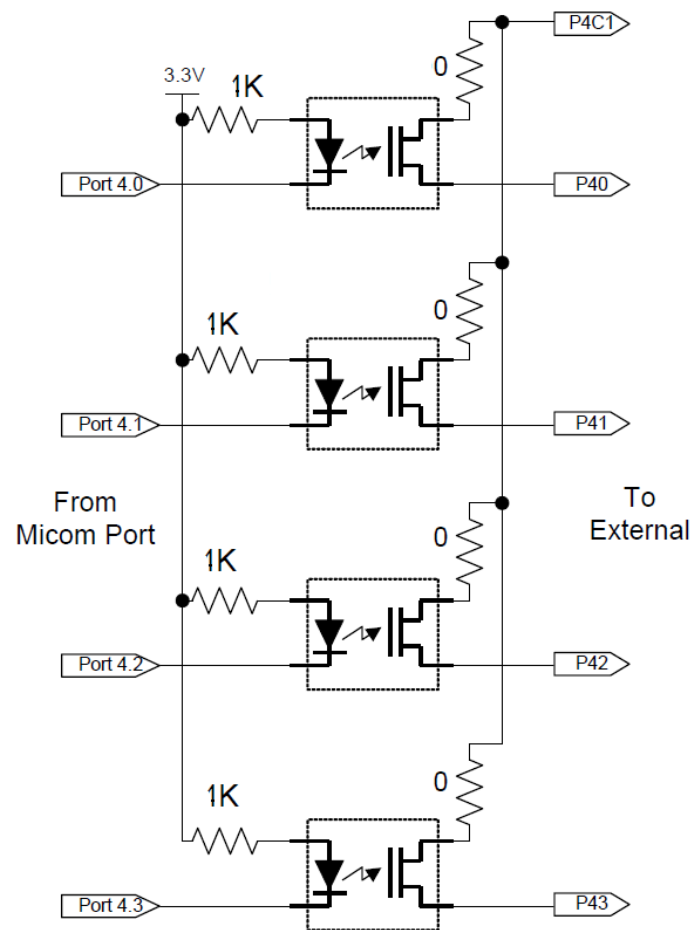
Other output terminals are up to 60V, and the current that can flow continuously is 400mA.

Like the input terminal, the common terminal of the output terminal uses one per four output terminals. Check each output common terminal in [Figure 3-7] and [Table 5] below.

[Table 5. 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 3-8].



[Figure 3-8. 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 6] below.

[Table 6. In Out Screw Terminal Connector Pin map]

Name	Description	Remark
P1C1	P70, P71, P12, P13 Input Common Terminal	Input Range : 12V ~ 24V See paragraph 3-2-7.
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 3-2-7.
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 3-2-7.
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 3-2-7. ※ 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 3-2-8.
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 3-2-8.
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 3-2-8.
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 3-2-8.
P54	Photo MOS Relay Output	
P55	Photo MOS Relay Output	
P56	Photo MOS Relay Output	
P57	Photo MOS Relay Output	

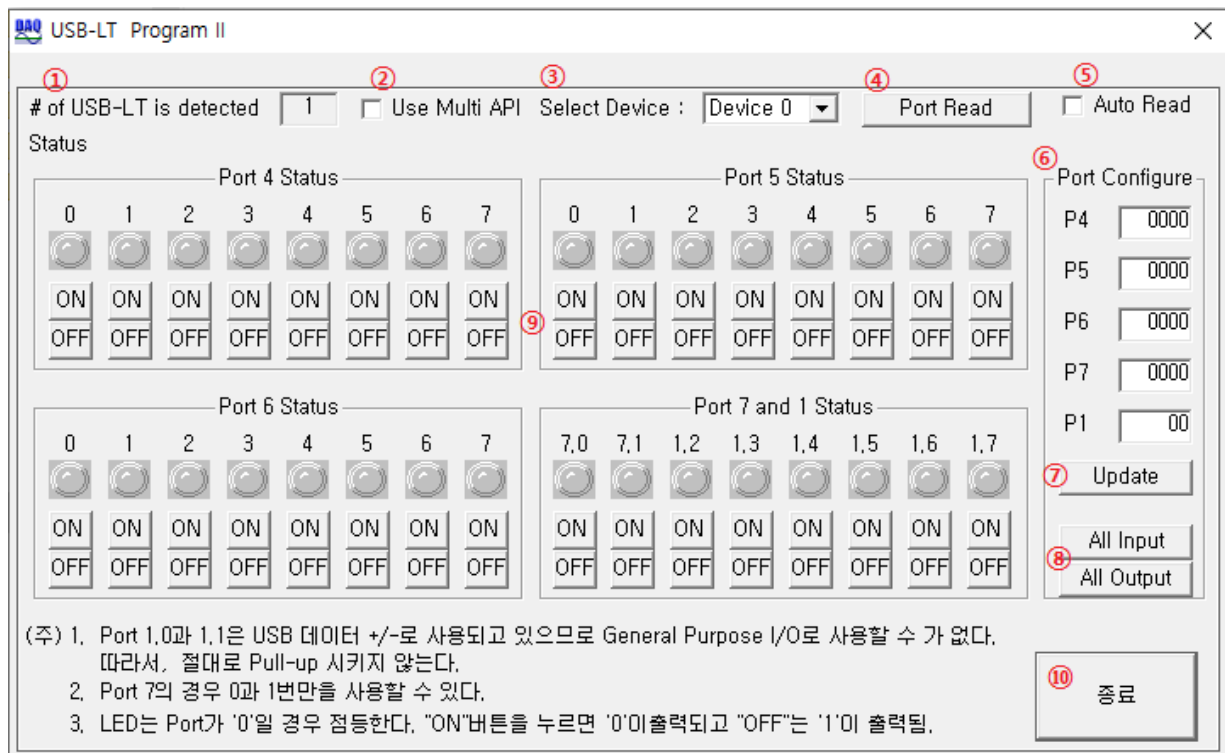
## 4. Sample Program

A sample program is provided along with USB-LT02\_B for easy use of USB-LT02\_B. Since the USB HID Device uses the operating system's own driver, 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 simply by judging the presence or absence of a board abnormality, setting each terminal as an input or output. The sample program connects USB-LT02\_B to a PC and executes Usb\_Napp.exe, and the following screen appears.

In order to use the sample program, 'Usb\_NApi.dll' and 'Usb\_NApi.lib' files are required, and all these files and files for compilation are also provided.

(Refer to the provided Storage Device and [www.daqsystem.com](http://www.daqsystem.com))



[Figure 4-1. Sample Program Execution Screen]

① # of USB-LT is detected

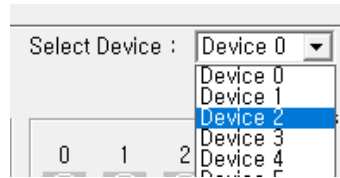
Displays the number of recognized USB-LT02\_B boards.

② Use Multi API

If you click the check box ( ☐ ), you can use up to 4 USB-LT02\_Bs.

### ③ Select Device

When using more than one USB-LT02\_B, select the ID of the USB-LT02\_B board to check the status or change the setting in the sample program. Device 0 to Device 3 are possible. For example, if you want to select USB-LT02\_B with board ID 2, you can select 'Device 2' from the Combo Box list as shown in [Figure 4-2] below.

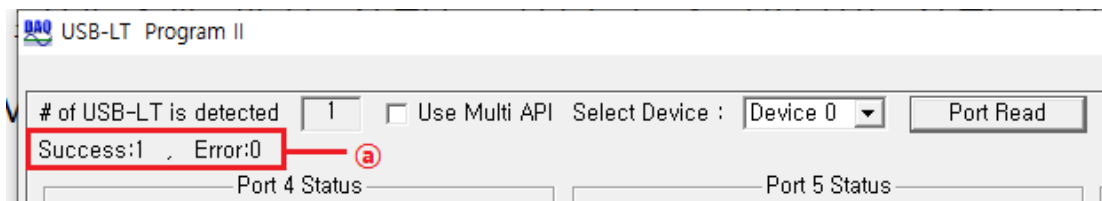


[Figure 4-2. Board ID Selection]

For board ID setting, refer to (2) of 3-2.

### ④ Port Read

It reads the value of each port at once and outputs it to the APP. In other words, after clicking the Port Read button once, the value of each terminal is read and the success or failure is indicated as shown in ① of [Figure 4-3].



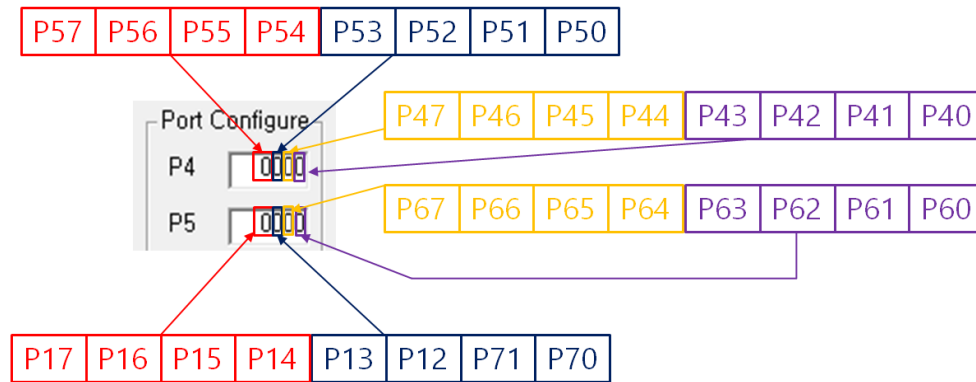
[Figure 4-3. Port Read Results]

### ⑤ Auto Read

When the check box ( ☐ ) is clicked, it changes to ☒ and the value of each port is read continuously and output to the APP. Whenever part ① of [Fig. 4-3] reads the values of each port, the number of Success increases, and each time it fails, the number of Error increases.

### ⑥ Port Configure

After entering the Port Configure value, you must click the '⑦ Update' button to complete the setting. In order to check output ON/OFF status of each port or LED lamp status when input/output setting is completed, 'V' should be marked in the check box of '⑤ Auto Read'. Refer to the figures below for matching of each port and Port Configure value.



[Figure 4-4. Matching of Port Configure value and input/output terminals]

The table below matches the output terminal with the Port Configure value, taking the output as an example for understanding.

[Table 7. Example of Port Configure Value and I/O Terminal Matching]

단자명	P50	P51	P52	P53	P54	P55	P56	P57	P40	P41	P42	P43	P44	P45	P46	P47
P4 <input type="text" value="FFFF"/>	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
P4 <input type="text" value="2010"/>	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0
P4 <input type="text" value="4120"/>	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0
매칭 Port Status(램프)	Port 5 Status								Port 4 Status							
	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

For the lighting and blinking status of LED lamps, refer to '⑨ On/OFF Button and LED Lamp.

※ **Ignore P6, P7, P1 in the Port Configure window.**

#### ⑦ Update

Update the Port Configure value..

#### ⑧ All Input / All Output

-. Clicking the All Input button sets all ports of MICOM as inputs. At this time, the value of the Port Configure window appears as follows..

Port Configure	
P4	0000
P5	0000
P6	0000
P7	0000
P1	00

[Figure 4-5. Port Configure value when clicking All Input button]

However, since USB-LT02\_B uses only Port6, Port7 and 1 as input, the input setting of Port4 and Port5 is meaningless. Also, the values displayed in the Port Configure window are only valid for P4 and P5. For details of Port Configure, refer to ⑥.





- When the All Output button is clicked, all ports of MICOM are set as output. At this time, the value of the Port Configure window appears as follows.

Port Configure	
P4	FFFF
P5	FFFF
P6	FFFF
P7	FFFF
P1	FC

[Figure 4-6. Port Configure value when the All Output button is clicked]

However, since USB-LT02\_B uses only Port4 and Port5 as output, the output setting of Port6, Port7 and 1 is meaningless. Also, the values displayed in the Port Configure window are only valid for P4 and P5. For details of Port Configure, refer to ⑥.

#### ⑨ On/OFF Button and LED Lamp

When each terminal (Port) is set as output, if you click the ON button () () , the common output terminal and the output terminal are closed, and if you click the OFF button () () , the common output terminal and the output terminal are opened. At this time, LED lamps also light up when you click the ON button, and flicker when you click the OFF button.

However, the status of the LED lamp can be checked immediately whenever the ON/OFF button is clicked if the check box of '⑤ Auto Read' is marked with 'V' sign.



[Figure 4-7. LED lamp turns on when ON button is clicked]



[Figure 4-8. LED lamp blinks when OFF button is clicked]

For example, if you click ON button 0 of Port4, P4C1 Port and P40 Port are connected to each other, and if you click OFF button, P4C1 Port and P40 Port are in Open state with the connection turned off. In case of USB-LT02\_B, only Port4 and Port5 are used as outputs, so the ON/OFF button operation for Port6, Port7 and 1 is meaningless.

When each port is set as an input and an input that can operate the photocoupler comes in, the LED lamps of Port6, Port7 and 1 are turned on. Since USB-LT02\_B uses only Port6, Port7 and 1 as inputs, changes in the state of the LED lamps of Port4 and Port5 are meaningless when all ports are set as inputs.

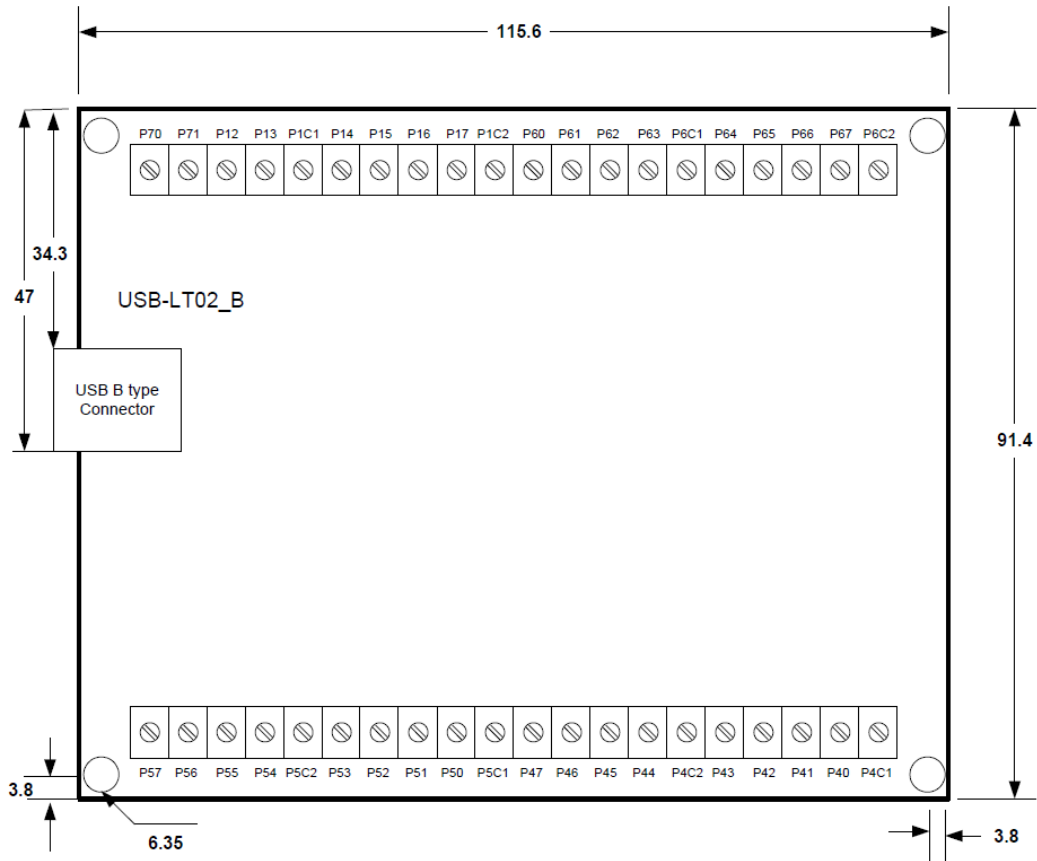
#### ⑩ Exit button

Sample program is terminated by clicking with the sample program end button.

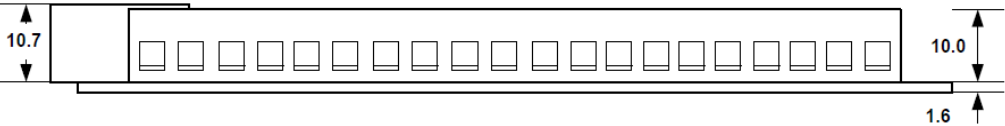
# Appendix

## A-1 Board Size

The external dimensions of the board are as follows.



[Figure A-1. USB-LT02\_B Plane View]



[Figure A-2. USB-LT02\_B Front 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](http://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\_B API VER1.3  
-- DAQ system

# MEMO

## Contact Point

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

Email : [postmaster@daqsystem.com](mailto:postmaster@daqsystem.com)

