

Robust Mini Linear Servo Motor —

mightyZAP Manager

User Manual



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1 Outline

1.1 Introduction

mightyZAP Manager software can be used for servo test and parameter setting as below.

- Operation Parameter Setting –Read/Write
- Motion Test and Parameter Monitoring
- Error display
- System Reset
- Firmware Update

To operate mightyZAP manager software, user needs to purchase IR-USB01, PC USB interface to connect mightyZAP with their PC.

1.2 System Requirement

- OS : Windows XP ServicePack2 or higher/ Vista / 7(32/64bit) / 8.0 / 10(32/64bit)
- JRE(Java Runtime Environment) 1.8.0 or higher
- 800MHz (or higher) 32bit(x86) or 64bit(x64) processor
- 512MB (or higher) System memory
- 500MB (or higher) empty hard disk space

The best way to connect mightyZAP with your PC software is to use an IR-USB01 PC USB Interface (USB to TTL/RS-485 converter). You can also control software using RS-485 and TTL half duplex device from 3rd party manufacturer, but for actuator firmware update, you must have an IR-USB01.

1.3 Installation

Install software as following.

1. Download

Download mightyZAP manager software install file from www.irrobot.com (go to Digital archive menu)

2. Run Install file

Run “mightyzap managerSetup” file for installation.



3. Initial Screen

Below initial screen will be shown when running program after installation.

Splash Screen will check program status and data file as well.

If Splash Screen keeps continuing without screen change, remove install file and retry installation.

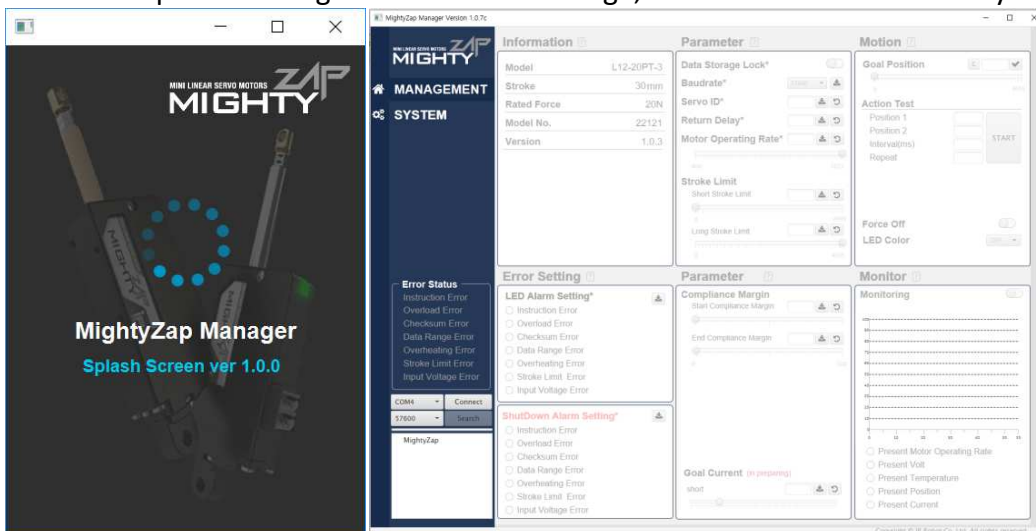


Figure 1.Splash Screen

Figure 2. Main Screen

If JRE(Java Runtime Environment) 1.8.0 is not installed in user PC, you will show below message. Then, press OK to download Java runtime Environment program.



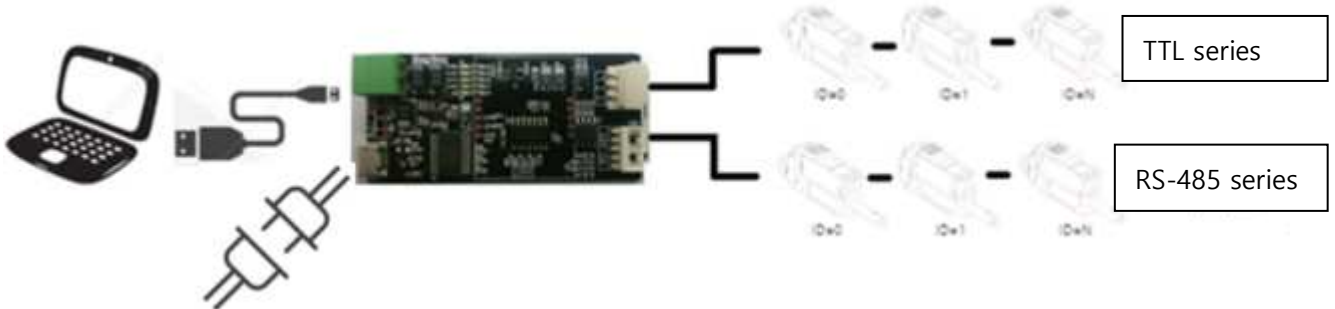
Then, install JRE program by clicking “Free Java download”.



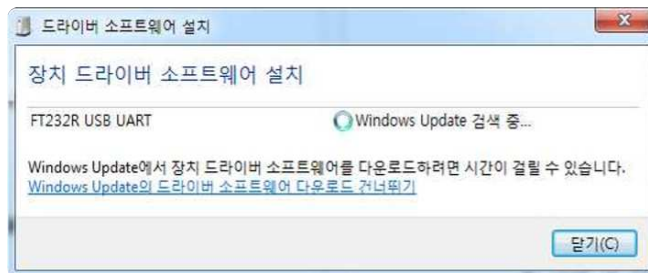
1.4 Connection and Communication Setting

※ For detailed information for IR-USB01, please refer to the chapter#3 Annex.

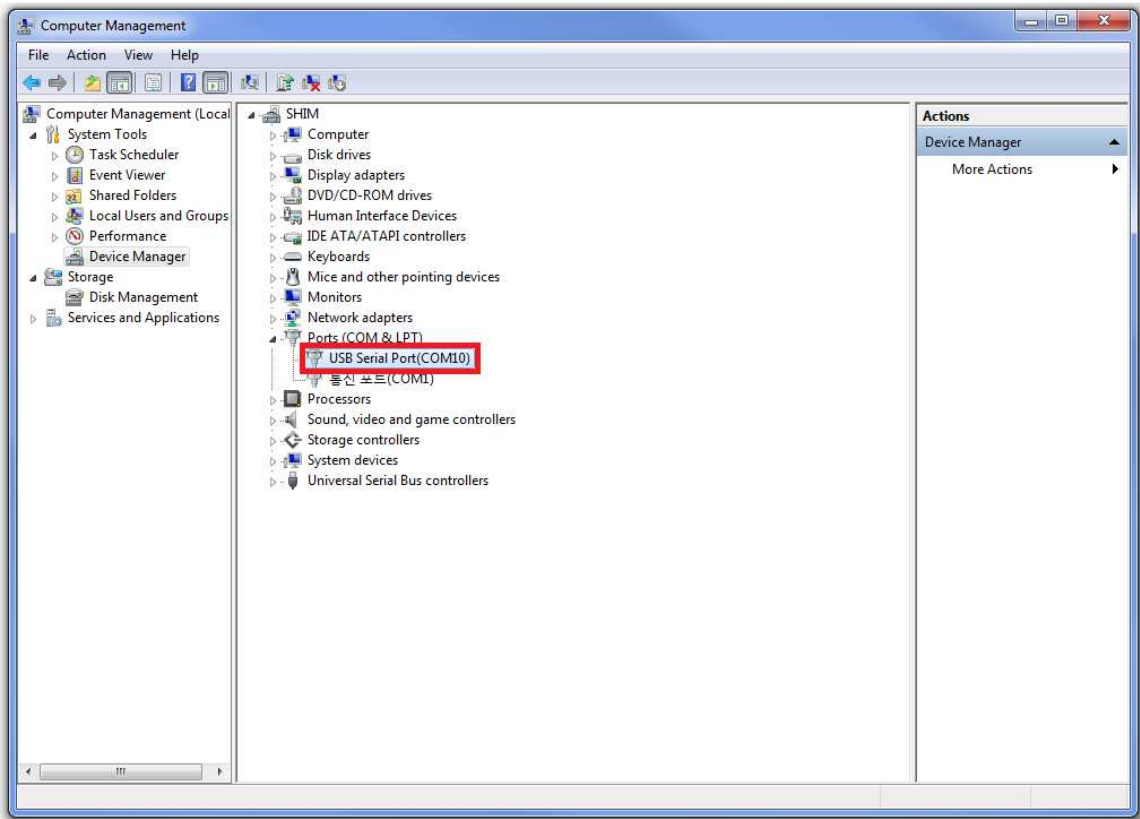
Connect servo motor with your PC using IR-USB01 PC USB interface, then supply power to IR-USB01 to secure power for servo motor. (7.4V or 12V according to servo motor’s input voltage.) Power source can be a power supply, power adapter(2~5A) or battery.



1. Driver for IR-USB01 will be automatically installed on user’s PC through internet when IR-USB01 is connected to user’s PC for the first time.



2. Check COM Port on Device manager as below.
(COM port number will be different according to PC condition. Below example shows COM10 is assigned.)



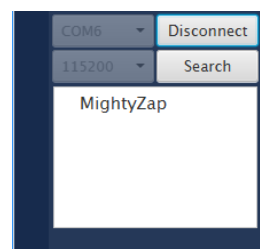
3. Set COM port and Baudrate to connect servo motor with mightyZap Manager.

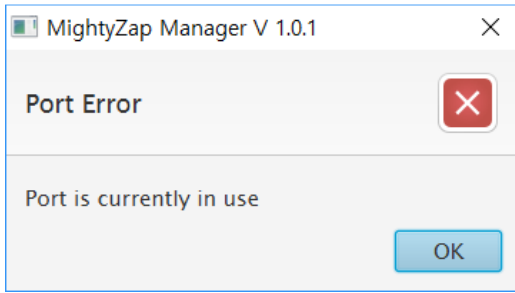
The screenshot shows the 'MIGHTY ZAP' management system interface. On the left, there is a sidebar with 'MANAGEMENT SYSTEM' and 'Error Status' (listing various error types). Below this, a dropdown menu is set to 'COM1' and a 'Connect' button is visible. In the main area, there are two panels, each with an 'Error Status' list and a configuration section. The top panel shows 'COM1' selected in a dropdown and a 'Search' button. The bottom panel shows '57600' selected in a dropdown and a 'Search' button. Red lines connect the 'COM1' dropdown in the sidebar to the 'COM1' dropdown in the top panel, and the '57600' dropdown in the sidebar to the '57600' dropdown in the bottom panel.

Select same COM port number which is shown on device manager.

Set Baudrate (Default Baudrate is 57600bps)

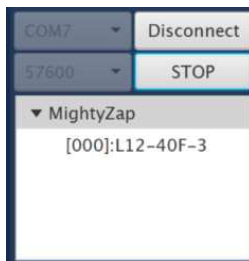
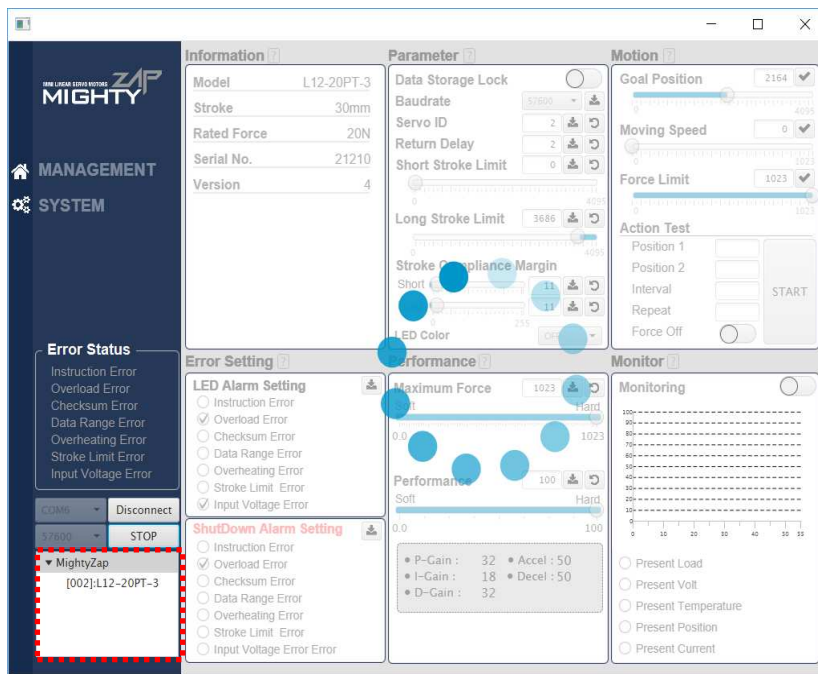
4. Click [Connect] button and the button will be changed to [Disconnect] which means that communication is connected. In case of communication failure, below message will be shown.





In case of communication failure, make sure all communication wire(USB wire between PC and IR-USB01, Servo wire between servo motor & IR-USB01 and power line to IR-USB01.) connections are okay, then retry from article#3.

- Click [Search] button to search connected servo motors. Button will be changed to [STOP] and you will see searching progress bar. As Software will always continue to search from ID0~253 before user clicks [STOP] button, user is able to click [STOP] if connected servos are already shown in the bottom window to save the time.

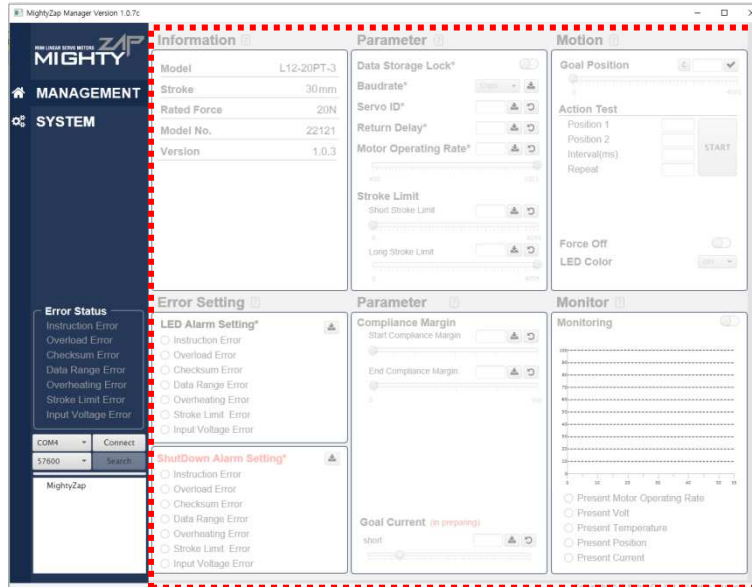


[000]:L12-20PT-3→ First three digits like [000] means servo ID and the letters(L12-40F-3) are model name of servo motor. Factory default ID is 0.

TIP : If more than 2pcs servo motors having same IDs are connected, servo motor, communication error may occur or servo motor is not detected. For multiple servo connection, assign different servo ID using mightyZAP manager software.

- Click detected servo motor after clicking [STOP] button, then concerned servo's status/control window will be shown in right widow side.

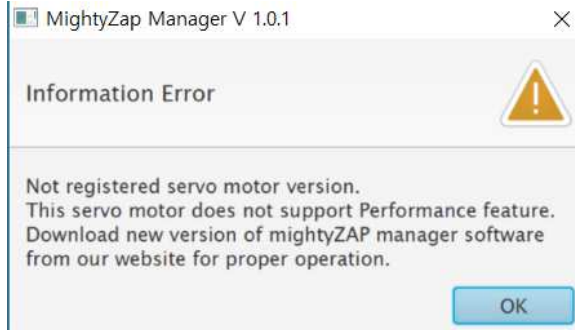




- **Servo motor with not-registered firmware** : If the firmware of user’s servo motor is not registered in the manager software, system will update it automatically. After update, system will search the servo motor automatically.



- **Servo motor with not registered model name** : For Newly released (new model name)servo motors after user download mightyZAP manager software may see below message. Most of function works except for “Performance” feature of the software. In this case, download updated mightyZAP manager software from our website or connect your PC with internet for automatic update.

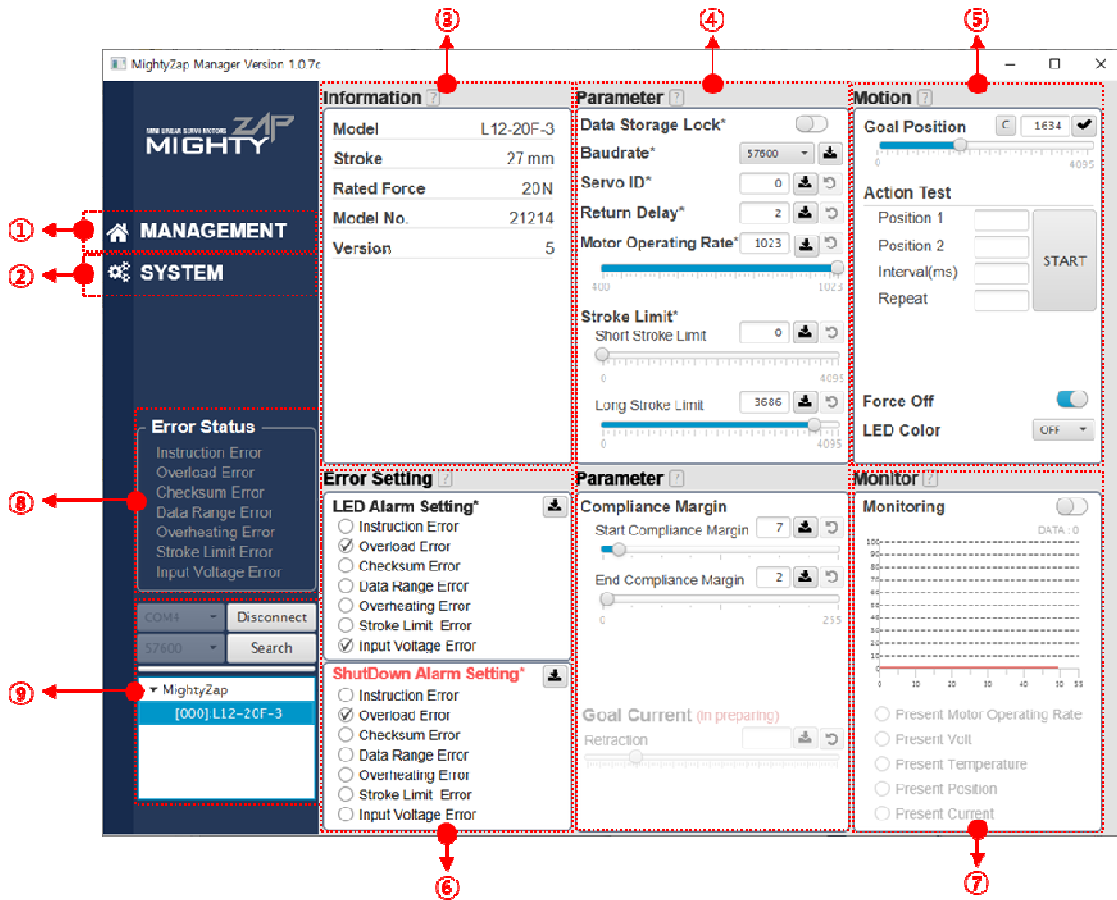


7. Click [Disconnect] button, communication with servo motor will end.

2 Description

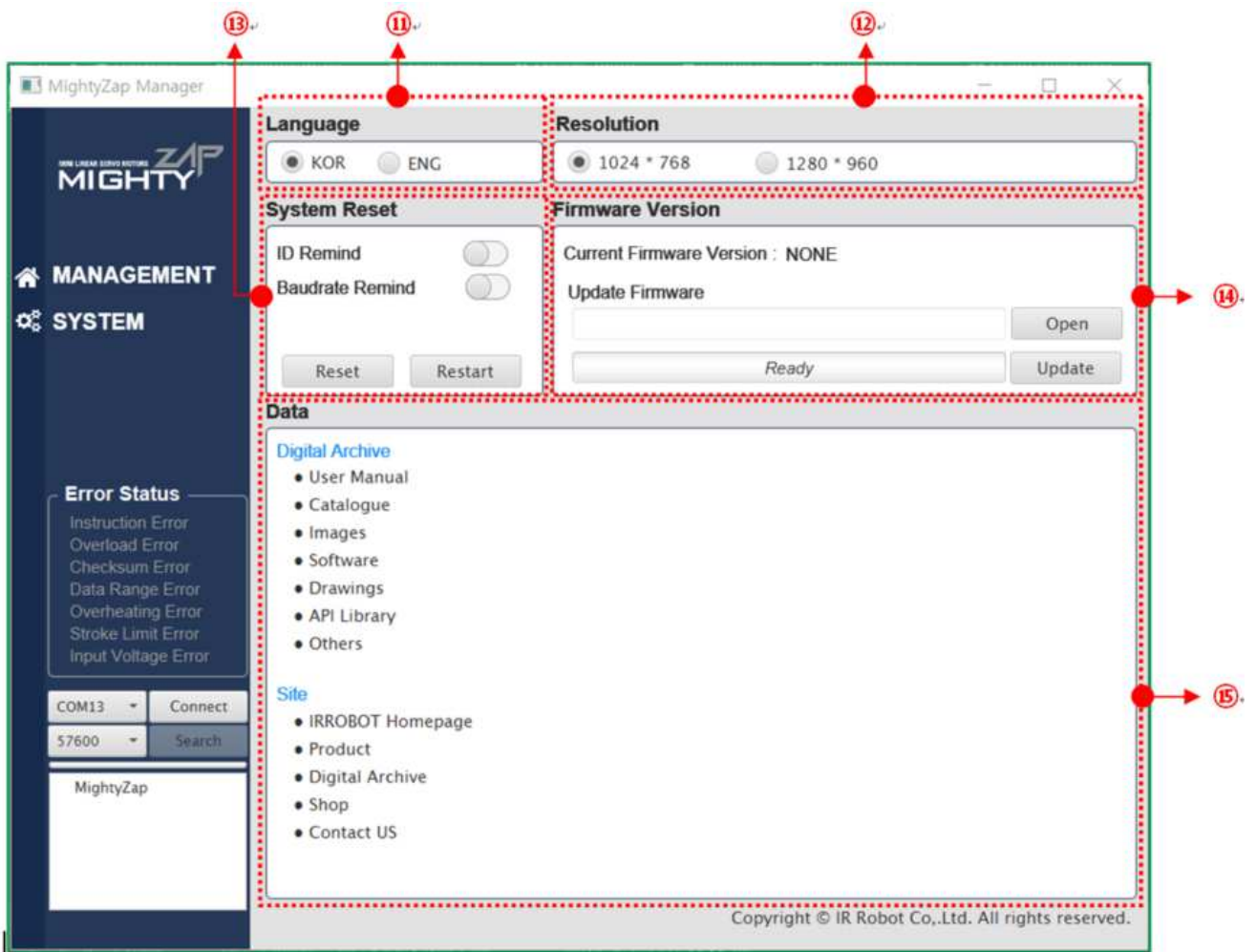
2.1 Screen Construction

- #5 Motion test parameter is volatile, so parameter will be removed when power is applied again. Other windows like #4 Parameter, #6 Error setting and #7 Performance are non-volatile parameter and saved value will be kept even after reboot.



- ① MANAGEMENT: Main Control parameter widow showing Servo Information, Parameter, Motion test, Error Setting, Performance setting and monitoring
- ② SYSTEM : Provide Servo reset, Firmware update and Language setting function.
- ③ Information: Monitoring servo information like model name, firmware version, serial number, Rated force and stroke length.
- ④ Parameter: Various control parameter setting window such as ID, Baudrate, Stroke Limit, Delay and Compliance Margin.
- ⑤ Motion : Most test window to test goal position, speed, force limit and action test.
- ⑥ Error Setting : Error LED indicator setting and Error Shutdown setting.
- ⑦ Monitor : Monitoring real-time graphs for present position, present load, present voltage and present temperature.
- ⑧ Error Status : Concerned error indicator will be activated when error occurs.







- ⑨ Connection : Search & connect communication with servo motor. Click servo motor's model name (ex-: [000]-L12-20PT-3) to see parameter status and control parameter.



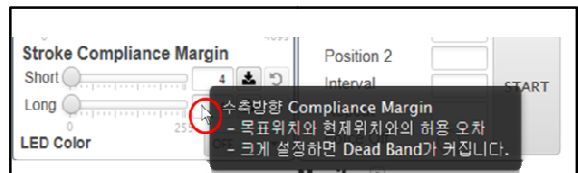
- ⑩ Language : Language setting for Tooltip and manual download.
- ⑪ Resolution : Change resolution of software. Program to be restarted when it is changed.
- ⑫ System Reset: Initializing memory data of servo motor
- ⑬ Firmware Update : Update to latest servo motor firmware.
- ⑭ Data : Provide web link information for products.

2.2 Tool Description

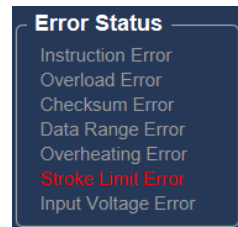
Description for each button and Tool.

1.  [Save] : Click this button to save data after putting some value or changing slide value. If data is not saved, data will be returned to previously saved data when mouse cursor moves. Previously saved data can be recalled using Undo button.
2.  [Undo] : Return to previously saved data . Upto max, 10x previous data memory and undo memory will be removed when power is applied again or communication is connected again.
3.  [Check] : Data is not saved, but send command to the servo motor.
4.  [Enable] : Enable/Disable Toggle switch. (Blue  is "Enable".)
5. [Text] : Value before save will be shown as Red text and saved value will turn to Black text. If value is out of data range, data will not be entered and return to previous value.
6.  [Slide bar] : Drag or click sidebar to change the data. Changed data will be shown as text in the text window.

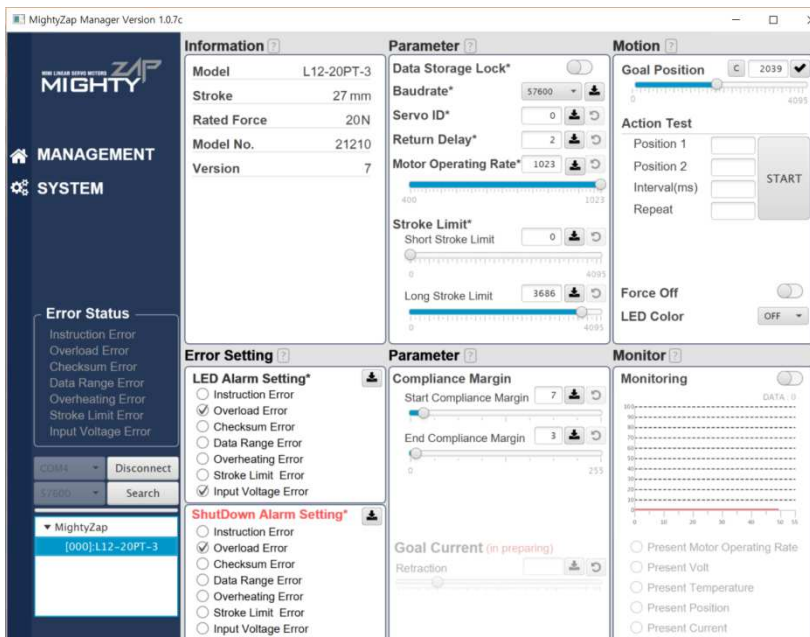
7. **Tooltip** [Tooltip] : Stay the mouse pointer at the text window for 2-3 sec, then simple explanation about concerned data will be shown as below. Language can be changed in System menu between English and Korean.



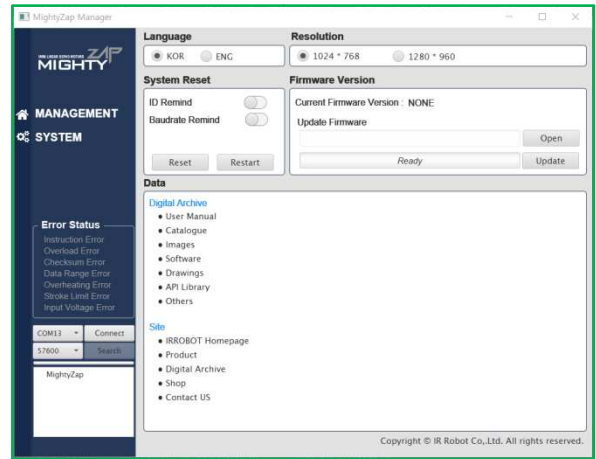
8. Error : Concerned error will be indicated with Red color as a right photo.



9. **MANAGEMENT** : Various parameter setting and monitoring window as below



10. **SYSTEM**: Servo motor Reset, Firmware Update, Language Setting function and screen will be shown as right side picture.

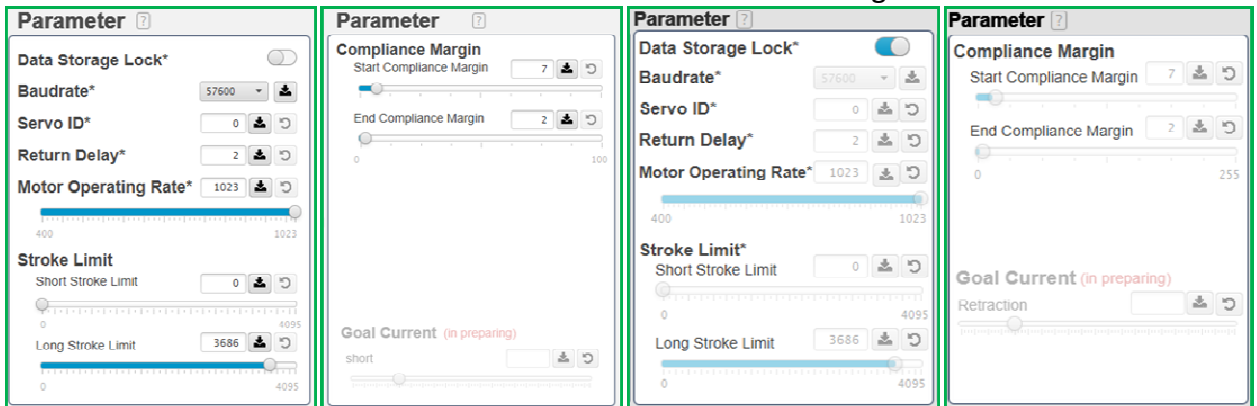


2.3 Function Description

For detailed information for function, please refer to “mightyZAP user manual”. Here you can see simple description of functions.

1. Data Storage Lock

- Data storage lock for data memory of servo motor. Memory “Write” will be locked. Parameter and Performance windows will be lock when Data Storage Lock is enabled.

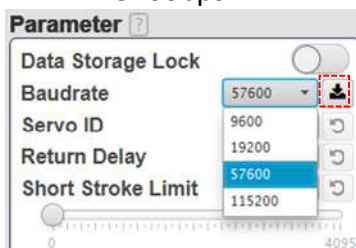


< Lock Disable Status >

< Lock Enable Status >

2. Baudrate

- Default Baudrate is 57600 bps and user may change it among 9600, 19200, 57600 and 115200bps.



3. Servo ID

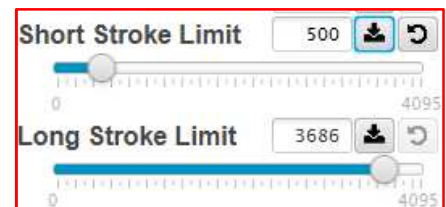
- Default Servo ID is 0 and user may change it from 0 to 254 . (0 : stand alone, 1~253 : Individual IDs, 254 : Broadcast ID) If user wants to use multiple servos with serial connection (daisy chain), user needs to assign different ID for each servo motor.

4. Return Delay

- Set Return(feedback) delay of servo motor after sending command (Range : 0 ~ 255usec).

5. Short Stroke Limit/Long Stroke Limit

- Set stroke limit for both retract(short) and extend(long) direction. (Range : 0 ~4095).
- This value can be set by both slide bar and putting digits in text window. Operating range will be shown as blue area.



6. Compliance Margin

- **Start Compliance Margin** (Range : 4 ~ 100 / recommended : 7~15)
 - Minimum margin value for the servo actuator to start position movement.
 - For example, if the compliance margin is 7 and the current position value is 400, motor start will be made when positional value between 407(400+7) and 393(400-7) is set.
 - Likewise, when the positional change occurs by more than +/-7(out of 393~407) from the present position value due to physical external pressure or electrical noise, the motor starts to run to compensate position.
 - For this reason, the larger this value means more stable operation without jittering even in the environment where the external pressure, electrical noise, or the clearance increases, but the sensitivity to drive to the desired position may be reduced. In other words, generally, increasing this value increases durability, and reducing it increases precision.
 - This value must be equal to or greater than the "End compliance margin value" described below. Setting it to a lower value may cause an error.
- **End Compliance Margin** (Range : 2~100 / recommended : 4)
 - Minimum margin value for the servo actuator to complete position movement.
 - For example, if actuator is instructed to move to a position value of 400, and assuming that it cannot physically stop at a position value of 400 exactly due to software & mechanical clearance, acceleration, etc. of the servo, End compliance margin will be a criteria to judge if the positional command has been performed properly. If this value is set to 4 and the position command value is set to 400, actuator judges that positional movement has been made properly when it reaches within 396~404 range and then stop movement.
 - If this value is increased for stable operation, you should not increase it beyond the "Start Compliance Margin" value which is described above, and if this value is decreased too much to increase the accuracy, it may bring adverse effect such as jitter.



7. Goal Position

- Goal position command (Range : 0~4095).
- Command can be made by Slide bar (real-time) or putting digits in text window (Putting digits to be applied when tick off Check button).
- button is a Center position command button.

8. Motor Operating Rate (Old "Max Force")

- Maximum Motor Operating value.[400~1023]
- 0 means force OFF and 1023 is max force. (Value less than 400 will be displaced to 400.)
- When this value is decreased (increased), motor speed and STALL force will also be decreased (increased) (**RATED Force will not be changed.**)

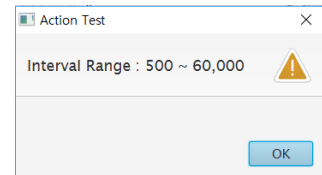
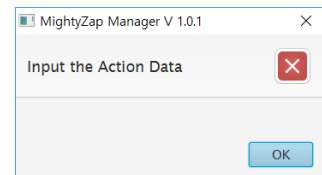
- Command can be made by Slide bar or putting digits in text window. Then, save by ticking off Check button.
- Finally, Changed value to be applied after power reboot or sending “Restart” command.

9. Action Test

- Simple action test for servo motor.
- Put all data below and click Start button to test operation.
 - Position 1 : First goal position
 - Position 2 : Second goal position
 - Interval : Interval between each goal position command (Range : 500 ~ 60,000msec, i.e, 0.5sec~1min)
 - Repeat : Repeat number for a loop action for Position1 & Position2
- The message shown right photo will be shown when all data is not entered.
- In case of interval value is less than 500 whgen Start button pressed, the message will be shown as right photo.

Action Test

Position 1	<input type="text" value="200"/>	<input type="button" value="START"/>
Position 2	<input type="text" value="4000"/>	
Interval	<input type="text" value="100"/>	
Repeat	<input type="text" value="10"/>	
Force Off	<input type="checkbox"/>	



10. Force off

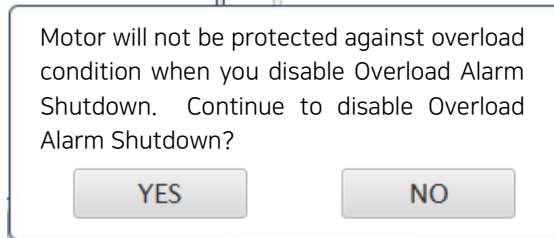
- “Force off” : After servo arrives at certain position, servo motor can hold its position only by mechanical friction. When Force off function is applied, DC motor power will be cut off while communication system is alive. Servo motor may hold its position or hold some load within self-lock force range.
- Use force off function to manage lifespan of servo motor more efficiently.
- While force off is activated, no need additional “Force On” command. Once new goal position command is applied, force off will be deactivated and servo moves.
- Refer to the Self-Lock Force specification to see allowable load which each servo motor is able to hold by mechanical friction when Force is off.
- Force off function by communication packet, refer to the mightyZAP user manual.

11. Monitor

- Various real-time information about servo motor can be shown in Monitor window.
- Measuring speed is approx. 25Hz with 40msec interval, one parameter can be displayed.
- Y axis value will be changed automatically according to each Parameter.
- Too frequent parameter change during monitoring may damage communication stability.
- Monitoring will be ceased if user moves to “System” menu.
- Monitoring parameters are as below.
 - Present Load : Real time Load amount against servo motor
 - Present Volt : Real time Input voltage
 - Present Temperature : Real time temperature of servo motor inside.
 - Present Position : Real time present position of servo motor.
 - Present Current : Real time current consumption of servo motor (Test with Motion function)

12. Error Setting

- LED Alarm Setting : LED indication setting for each error parameter
- Shutdown Alarm Setting : System shutdown setting for each error parameter.
 - LED Alarm Setting : LED will flicker when concerned Error is selcted(tick off).
 - Shutdown Alarm Setting : System will shut down when concerned error is selected to protect servo motor. Be careful for Overload alarm shutdown deactivation. If it is deactivated, servo motor will not be protected from overload condition.
- Click "Save" button to save the setting. Setting value will be shown when servo starts.
- If Overload error is disabled, below message will be shown to confirm it.



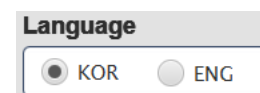
13. System Reset

- All parameter settings will be initialized.
- For reset, actuator should be standalone with no load (should not be connected with any mechanical structure)
- System reset excluding Servo ID and Baudrate is available. See the photo. Select 'ID Remind' and 'Baudrate Remind' so that current ID and Baudrate remains same as before even after reset.
- After reset, system will search the motor to find changed ID(ID#0). (same for ID remind, ID will not be changed, but motor search will be made)
- In case that baudrate is different before/after reset, connect communication again.
- Resart : Servo motor re-booting.
- When actuator is shut down due to Overload protection, actuator can be revived by Restart command.
- This command also can be used to apply "Motor operating rate" value.



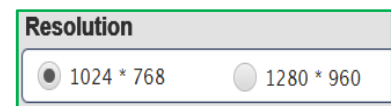
14. Language

- Language setting on the software. (including Tooltip)
- Korean or English



15. Resolution

- Resolution setting of Manager software.
- Changed setting to be maintained when restart.

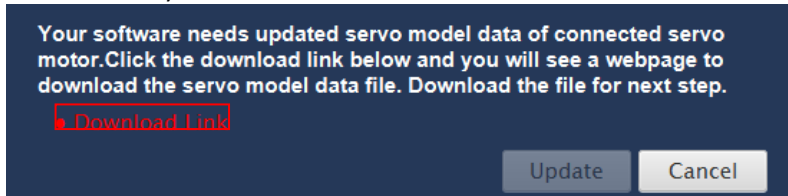


2.4. Model Data Update

This is to update model list data for new servo models. In case certain new servo model is released after user installs software, update message will be shown as new servo model data does not exist in user's software.

1. Model data Download

When update window pops up as below, click "download link" button shown in red below. You will be guided to our website for download the latest model data. (Your PC should be connected with internet.)

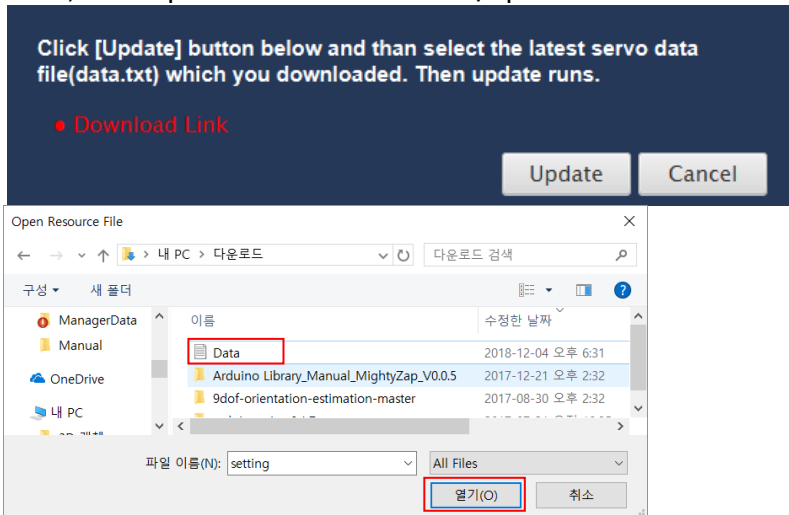


On Servo motor model data page on our website, download "Data.txt" file to your PC.



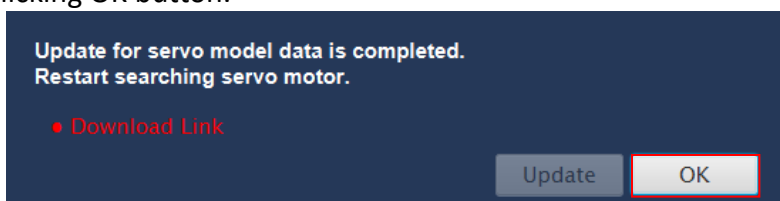
2. Model data Update

[Update] button will be activated as below after downloading servo motor model data file(Data.txt). Then, click Update button and select/open Data.txt file.



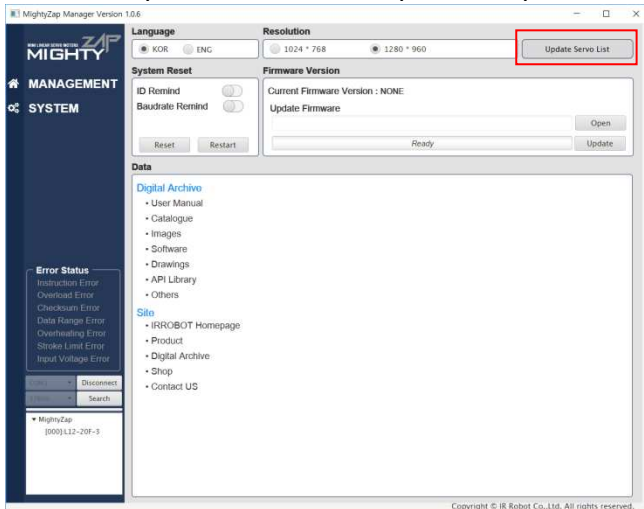
3. Servo Motor Model data Update complete

Now, [OK] button will be activated after servo model data update is completed and system will automatically start searching servo motor. Check correct model number is shown on the system by clicking OK button.



4. Manual Update (In case PC is not connected with internet)

If your PC is not connected with internet, download “Data.txt” file in another PC which is connected with internet and save it in any USB storage. Then, go to “System” menu on software, and click “Update servo list” to process update.

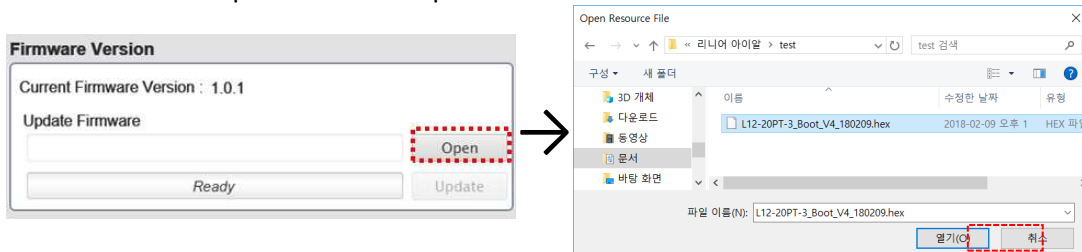


2.5. Firmware Update

Firmware of mightyZAP servo motor will be updated for further improvement. Then, user may update its firmware using mightyZAP manager software. Make sure all wirings are firmly connected and do not disconnect any wiring(power & communication) during the update process to prevent fatal error of servo motor.

1. File Open

- Download the latest firmware for concerned servo model from IR Robot website at www.irrobot.com. (Digital Archive – Linear Servo motor – Firmware)
- Click “Open” button to open search window.

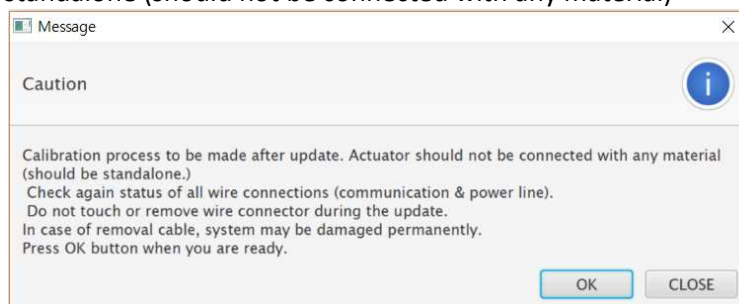
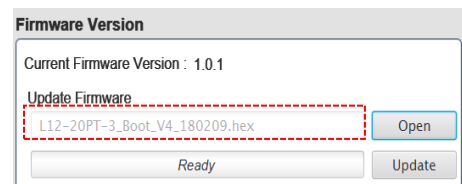


2. Hex File Select

- Open Hex file which downloaded from website. The file name will be shown in the text window.

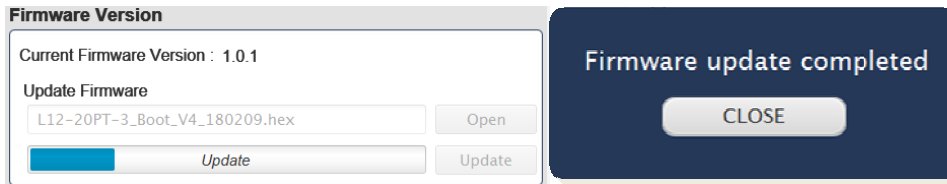
3. Update

- Click “Update” button to run update of firmware. Below window will be shown.
- Calibration process will be taken right after firmware update. So, actuator should be standalone (should not be connected with any material)



- Update will be made with progress bar shown below and Update complete message will

be shown as below.



4. Calibration

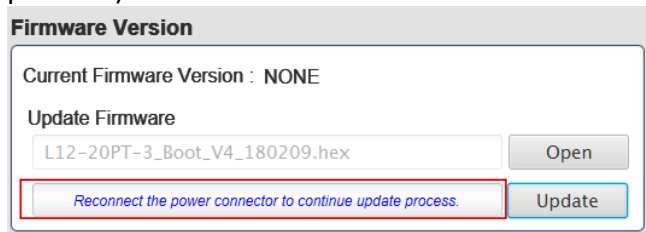
After firmware update, motor calibration will be made automatically. Actuator should not be connected with any device for proper calibration. The rod will be extended fully, then retracted to zero position, then extended to the center position. Calibration is completed.

5. Servo Motor Search (ID search)

- Search ID again as ID# will be 0 after Update. (if user update the firmware with "ID remind" function, ID# will not be changed, but ID should be searched again.)

6. In case Servo Motor Update failure

- In case Servo Motor Update is failed due to some reasons, you will see below blue text in progress bar for 10sec. (Reconnect the power connector to continue update process.)



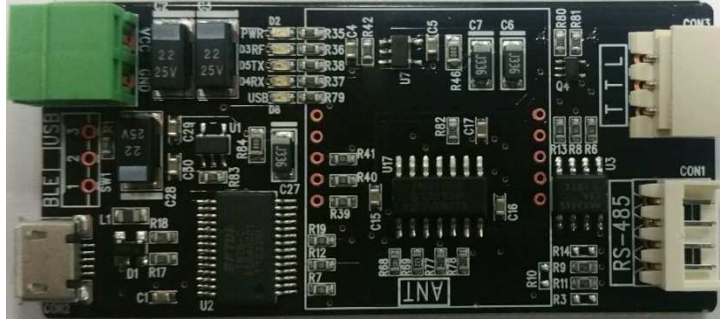
In this case, reconnect the power connector of servo motor, then update will be continued.

- If update failure still exists after reconnecting power connector, you will see failure message in progress bar as picture. In this case, please contact irsales@irrobot.com to get solution.



3 Annex(IR-USB01 Installation)

Overview



[IR-USB01]

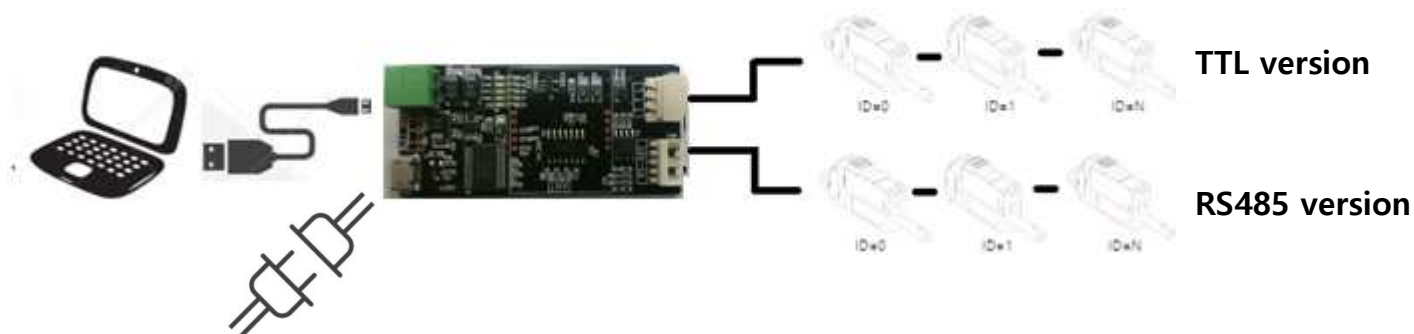
IR-USB01 is an USB interface which connects mightyZAP linear servo motor and user's PC via USB port for various setting of servo motor. Input power needs to be supplied via power socket (Input power should be same as the input voltage of servo motor) and it supports TTL and RS-485 protocol. As standard accessory, the wire harness for TTL/PWM(3pin connector) and RS-485(4pinconnector) protocol are included in the package.

- Memory Setting
- Parameter Setting - Reading & Writing
- Error Indicator
- System Reset
- Firmware Update

※ NOTE : IR-USB01 does NOT include USB cable for PC connection. Any USB Micro B-type(Standard 5pin) cable(for Android smart phone) can be used without problem.

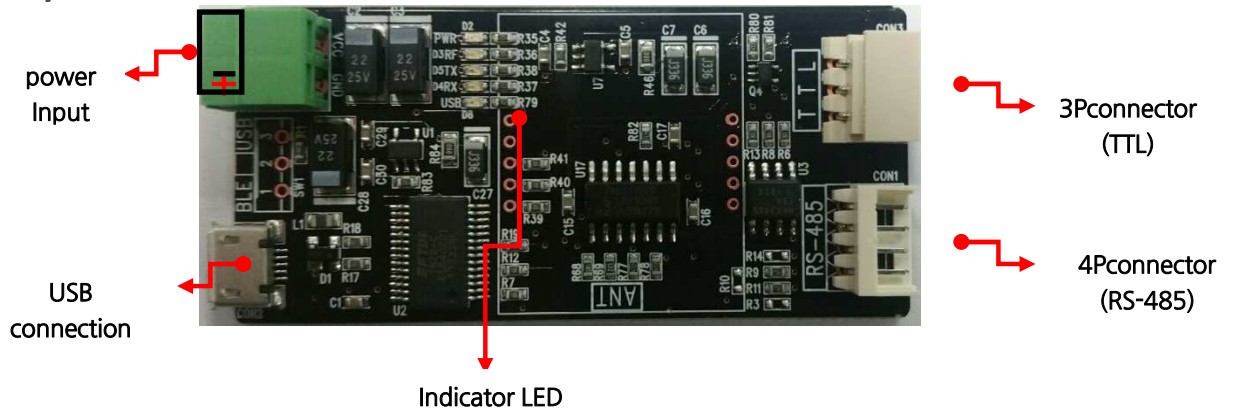
Specification

- Size : 29.5 X 64 X 11mm
- Input power : 7.4V(L7series, D7series) , 12V (L12series, D12series)
- Servo connection port : RS-485(F version connection), TTL(PT version connection)
- PC communication interface : USB Micro B-type(Android standard 5pin)
- Communication speed : 57600bps(default)
- Operating software : mightyZAP Servo Manager



※ To use PT series(TTL/PWM) and F series(RS-485) at the same time together, different ID setting is required.

Board Layout



Part name	Descriptions
Indicator LED	USB connection status, Power status, TXD(data writing) & RXD(data reading) status
Power Input	7.4V or 12V input
3P connector	For PT series (TTL communication) mightyZAP
4P connector	For F series (RS-485 communication) mightyZAP
USB communication	PC USB connection via Micro B-type(standard 5pin) cable



Caution

Proper Power Input!

- Make sure polarity (+/-) when connect the power (see the back side of PCB). Improper polarity connection brings damage of product.
- Make sure to apply correct input voltage corresponding the voltage user's servo.(7.4V or 12V)

PIN Map

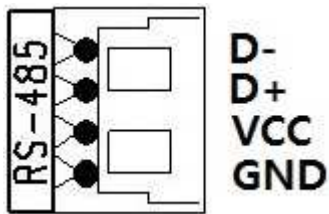
Below picture shows the pin map of connectors. There are two different pins according to servo motor's communication protocol. (For TTL/PWM, 3pin connector. For RS-485, 4pin connector is included)

[3Pins Cable Connector PIN Figure]



3Pins connector - for TTL	
GND	Servo Power -
VCC	Servo Power +
SIGNAL	Servo data communication(Half duplex)

[4Pins Cable Connector PIN Figure]



4Pins connector – RS485	
D-	RS-485 communication Data (-)
D+	RS-485 communication Data (+)
VCC	Servo Power (+)
GND	Servo Power (-)

How to Supply Power to IR-USB01

IR-USB01's power input voltages are 7.4V or 12.1V, so user needs to put proper voltage to the servo according to user's servo input voltage. For 7.4V version mightyZAP, put 7.4V input power to IR-USB01 and for 12.1V version of mightyZAP, put 12.1V input power to IR-USB01. This means that user CANNOT use different voltage versions of mightyZAP at the same time through IR-USB01.



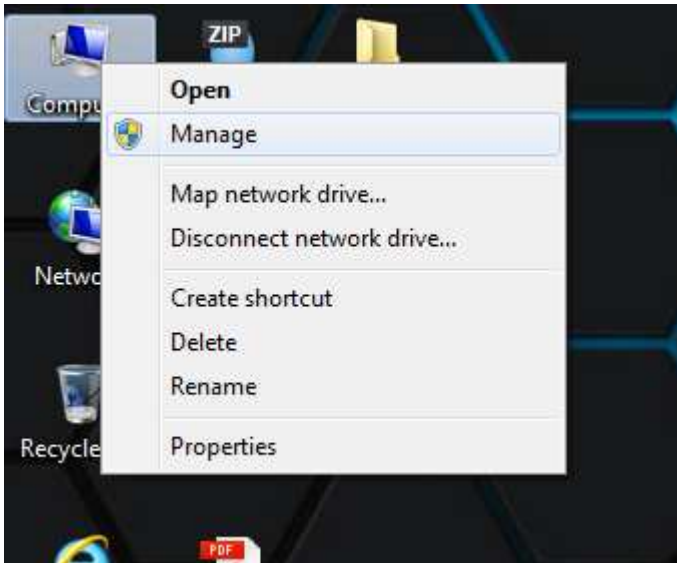
Caution Proper Power Input!

- Make sure polarity (+/-) when connect the power (see the back side of PCB). Improper polarity connection brings damage of product.
- Make sure to apply correct input voltage corresponding the voltage user's servo.(7.4V or 12V)

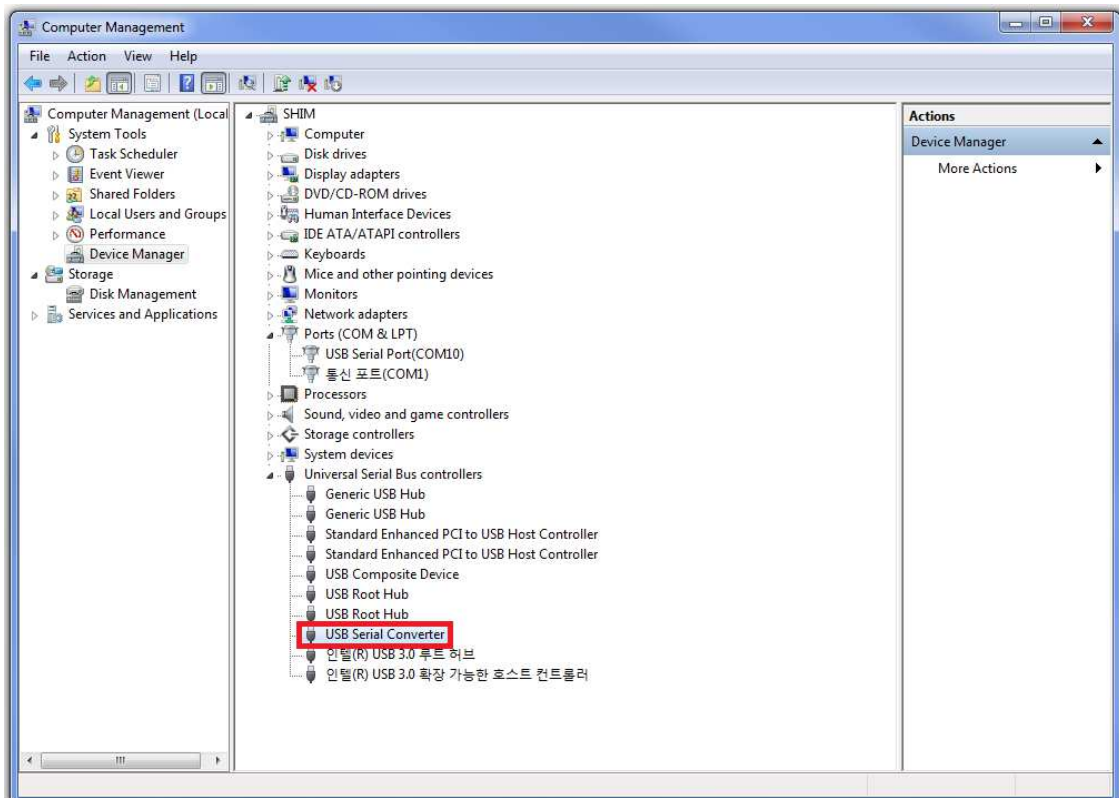
How to install Driver for IR-USB01

The driver of IR-USB01(FTDI Driver) will be installed automatically when IR-USB01 is connected with PC via USB. To check if IR-USB01 driver is installed properly in user's PC, follow below process. (Just in case that driver is not installed automatically, user may follow "Manual installation" process in next chapter.)

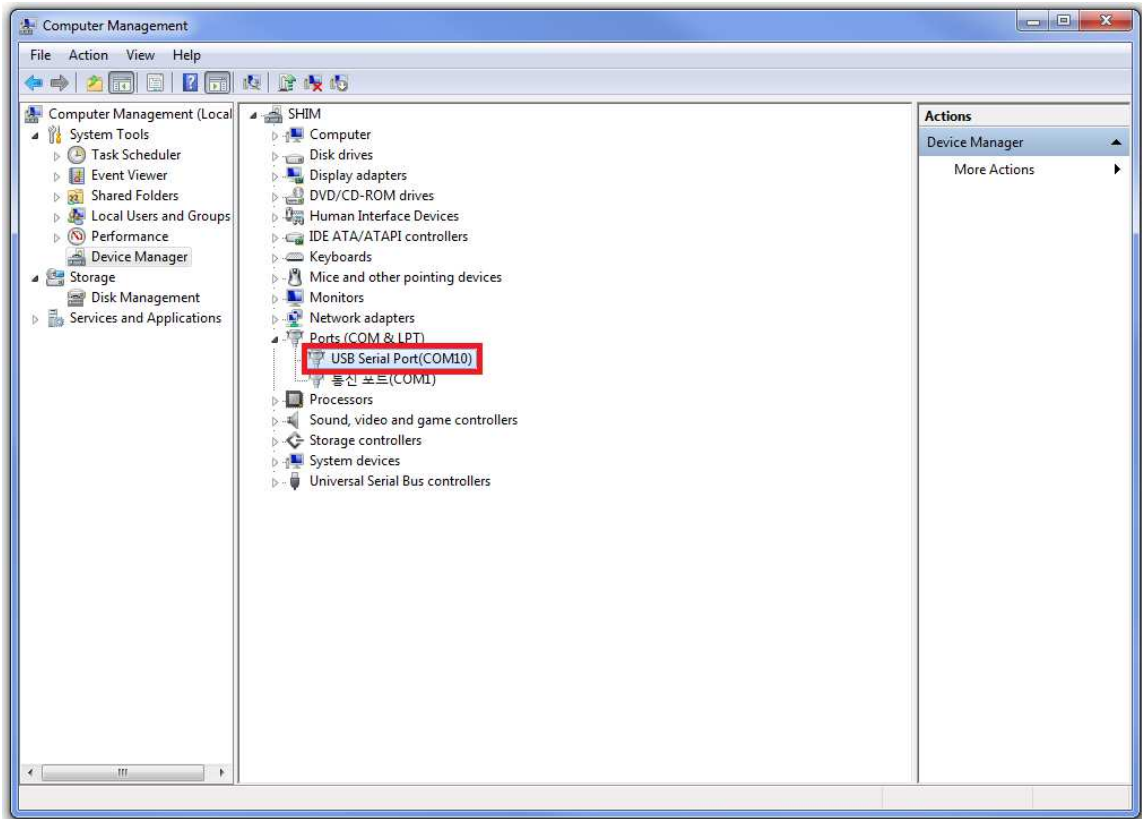
1. Connect IR-USB01 with PC using USB. (Micro B-type(standard 5pin) cable)
2. "Right click" of mouse on "My Computer" icon. Then, select "Manage" menu on popup menu.



3. Check if "USB Serial Converter" exists in "Universal Serial Bus controller" menu.



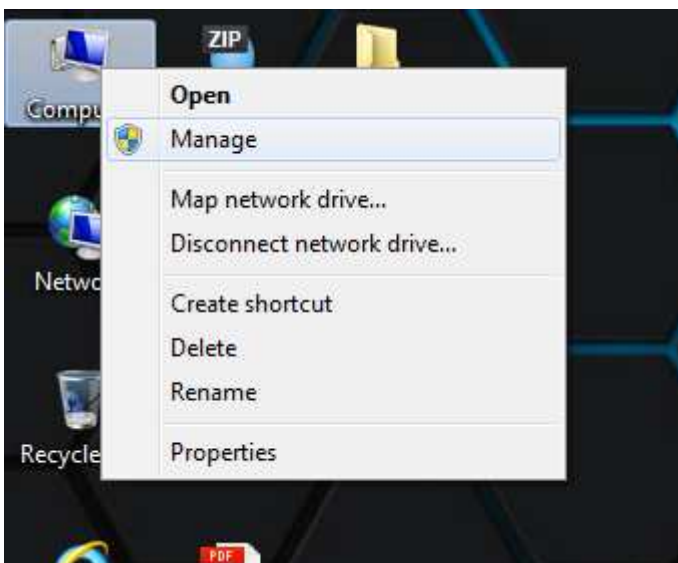
- See "Port(COM & LPT)" menu and check "USB Serial Port(COMXX)" is assigned for IR-USB01. If user disconnect IR-USB001, this COM port will disappear. (COM port number may be different for each computer.)



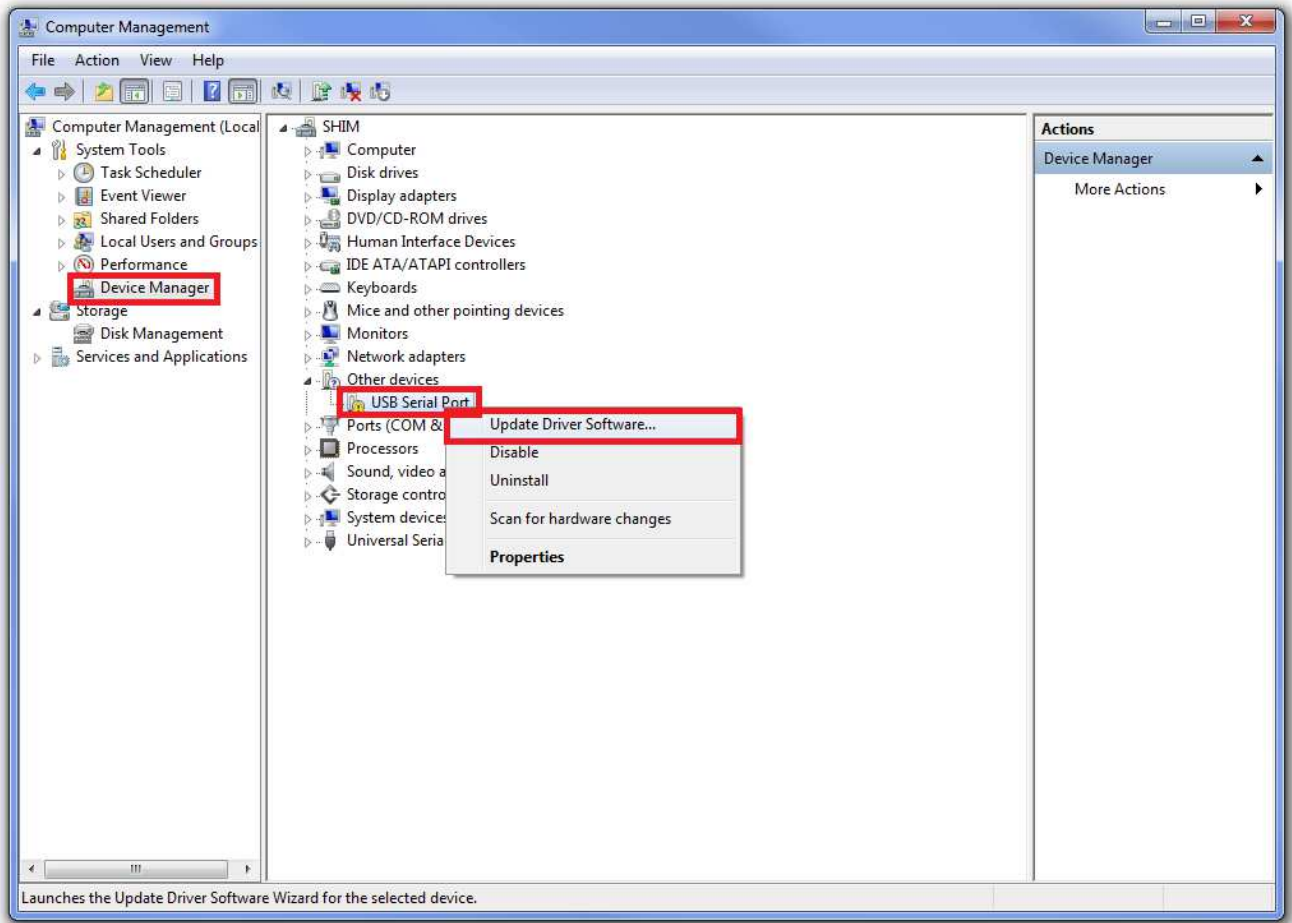
Manual Installation for Driver

Follow below process if driver is not installed automatically.

- "Right click" of mouse on "My Computer" icon. Then, select "Manage" menu on popup menu.



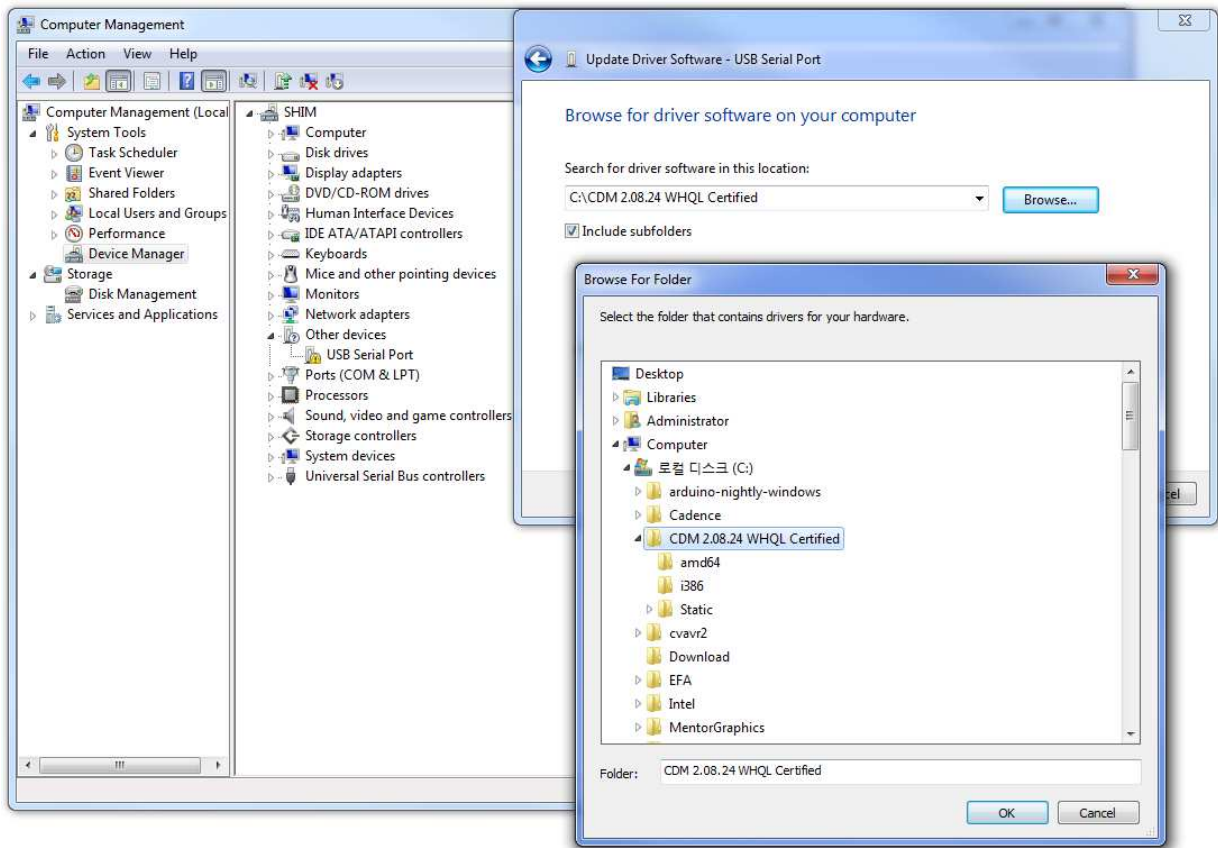
2. Connect IR-USB01 with PC. Then, see "Other devices" menu on Device manager and select USB-SERIAL PORT. By Right clicking of USB-SERIAL PORT, select "Update Driver Software" menu.



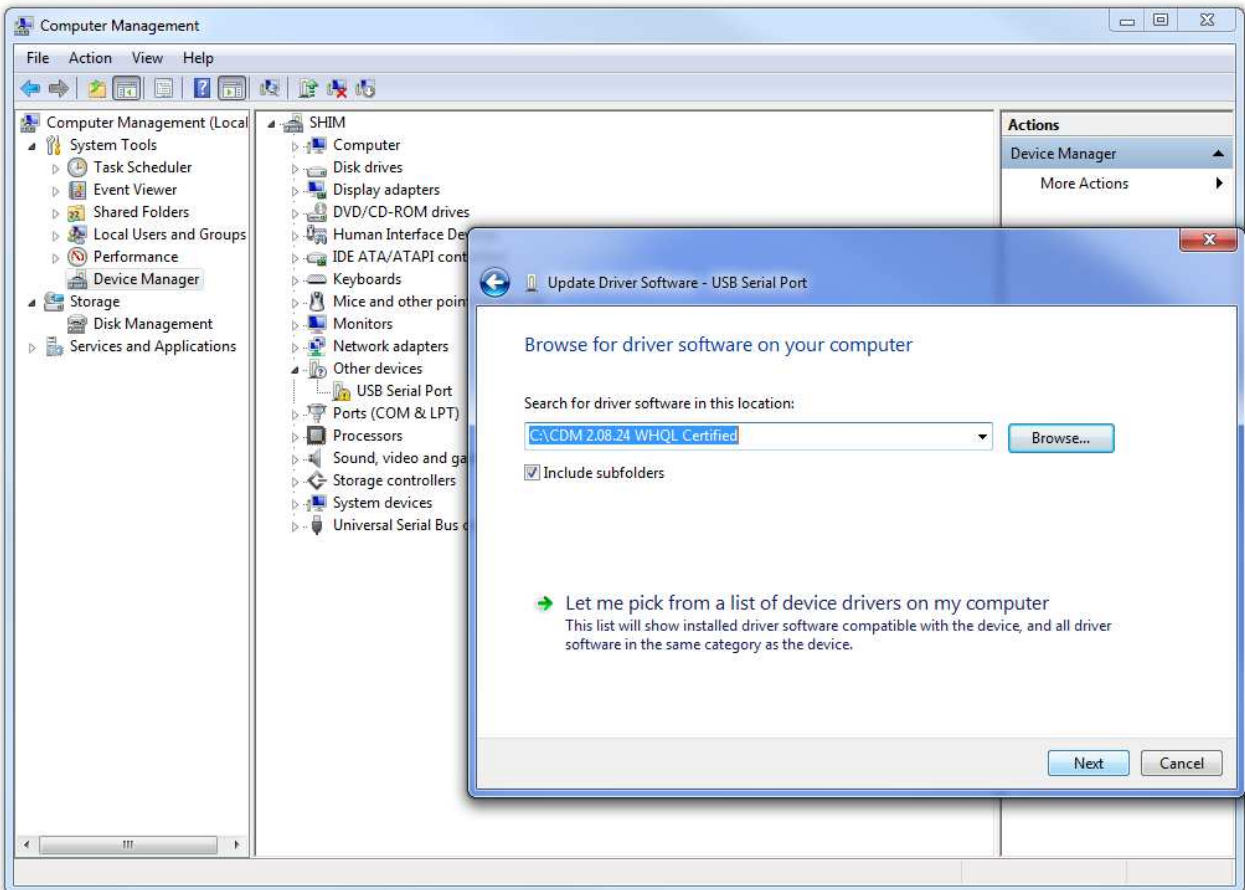
3. Visit FTDI Driver download page at <http://www.ftdichip.com/Drivers/VCP.htm> to get a driver for each Windows version.

[Windows 32bit Driver](#) / [Windows 64bit Driver](#)

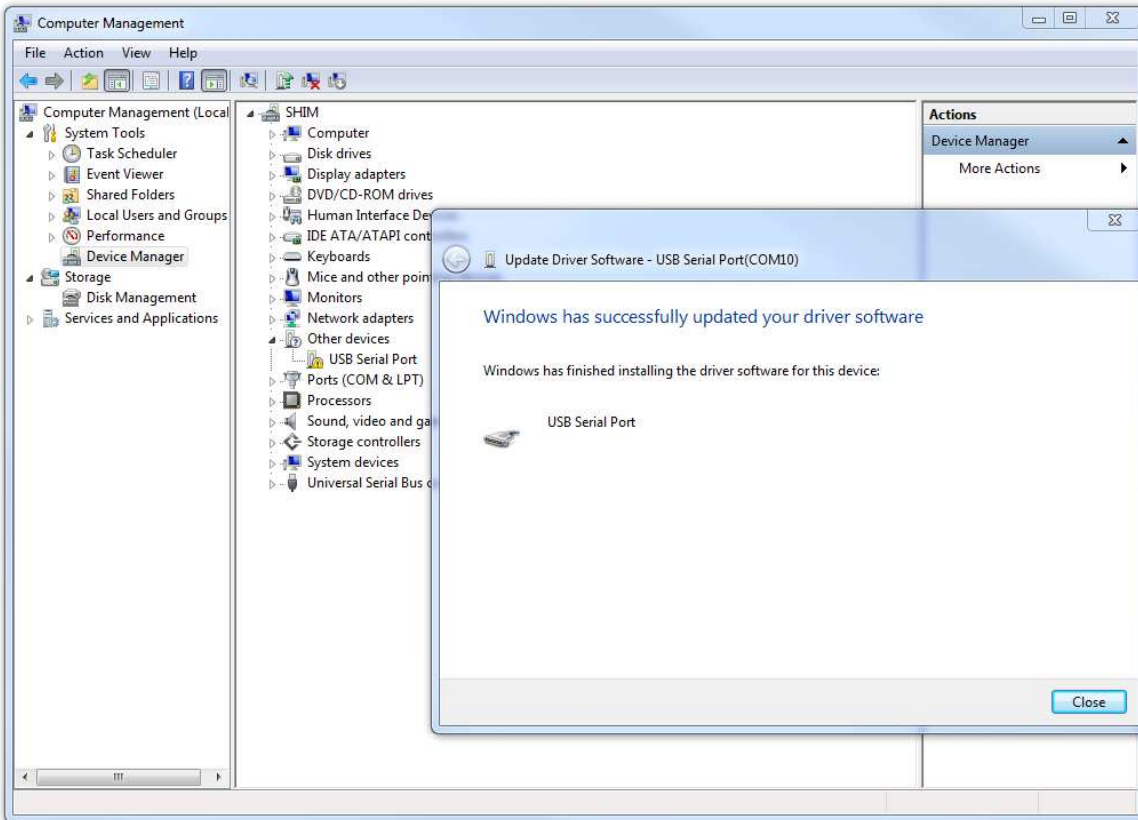
4. Assign the location of driver.



5. Click "Next" button for installation.



6. USB Serial Converter , USB Serial Port drivers are successfully installed.



End.