

Controller CI76



Version	2026.03_V1.0
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Technical changes may be made to improve the product without notice!

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1. Overview

CI76 is a single-actuator controller with a maximum continuous output current of 10A. It employs closed-loop control, utilizing the actuator's potentiometer or Hall effect sensor as input to achieve precise positioning.

CI76 accepts a variety of control input sources, providing users with flexible and adjustable parameters, and widely supports MOTECK's standard actuators.

2. Important Information



- (1) Only qualified personnel are allowed to carry out the mechanical and electrical installation of this product. Qualified personnel should be familiar with the mechanical or electrical installation work and have corresponding work qualifications.
- (2) Please read this manual before installing or operating the controller.
- (3) Do not perform mechanical installation while power is on. Complete the mechanical installation first, and then connect the power supply.
- (4) Installers and operators must wear personal safety protection according to the site conditions. And before starting to control the action of the actuator, it must be noted that the actuator and its connected mechanical moving parts are not blocked by other objects, and no one enters the dangerous area.
- (5) Strictly follow the information in this manual, and do not exceed the range of the specification.
- (6) Never disconnect any wires or connectors during operation or when power is applied.
- (7) When the CI76 is connected to a computer, it can provide error information that it identifies through the CI76 Setup Tool, as described on page 23, please refer to them. If any malfunction or damage is found on the control board, stop using it immediately and notify qualified personnel.



3. Precautions before Installation




- (1) Before using the CI76 for the first time, please make sure that the actuator specifications are supported. Then, use the UART to USB setup cable to connect to the PC for configuration and use the CI76 Setup Tool provided by our company to complete the electronic installation and parameter settings before connecting to the host controller to start using it.
- (2) The actuator does not have to be equipped with a physical limit switch, but the software must be set correctly on the CI76 to be connected.
- (3) Retract all actuators to the end before installation.
- (4) After connecting the actuator to the CI76, you must complete the electronic installation steps and the [Learning Function] before you can test its extension and retraction.
- (5) During a power outage to the CI76, as long as the actuator has not been replaced or moved, there is no need to relearn the stroke. If the CI76 is replaced, please follow the installation steps to reset the CI76.



4. General

4.1 Symbol description

Symbol	Description
	This symbol indicates important information, reminders, or safety warnings.

4.2 Features and Options

- Input voltage: 12~48V DC (same as actuator power output)
- Actuator power output: Same as input voltage
- Max. current: 10A
- Max. number of actuator: 1 channel
- Types of control input:
 - Analog control: Voltage (0~10V) or small current (4~20mA)
 - Digital control: RC servo
- The CI76 Setup Tool is provided, allowing users to connect to a computer using an UART to USB setup cable (sold separately) and adjust parameters such as speed, stroke limits, position accuracy, and current limits.
- Supports potentiometer or dual Hall effect sensors (NPN type only) in actuators as positioning feedback
- Supports actuators with or without stroke limit switches
- With electronic braking function, which dissipates excess electrical energy through braking resistor when the motor brakes.
- Duty cycle: 25%, max. 2 min. continuous operation in 8 min.
- Operating ambient temperature: -20°C~+55°C
- Storage ambient temperature: -40°C~+70°C
- Optional DIN rail holder (for mounting on DIN NS 32 or NS 35/7.5 rail)

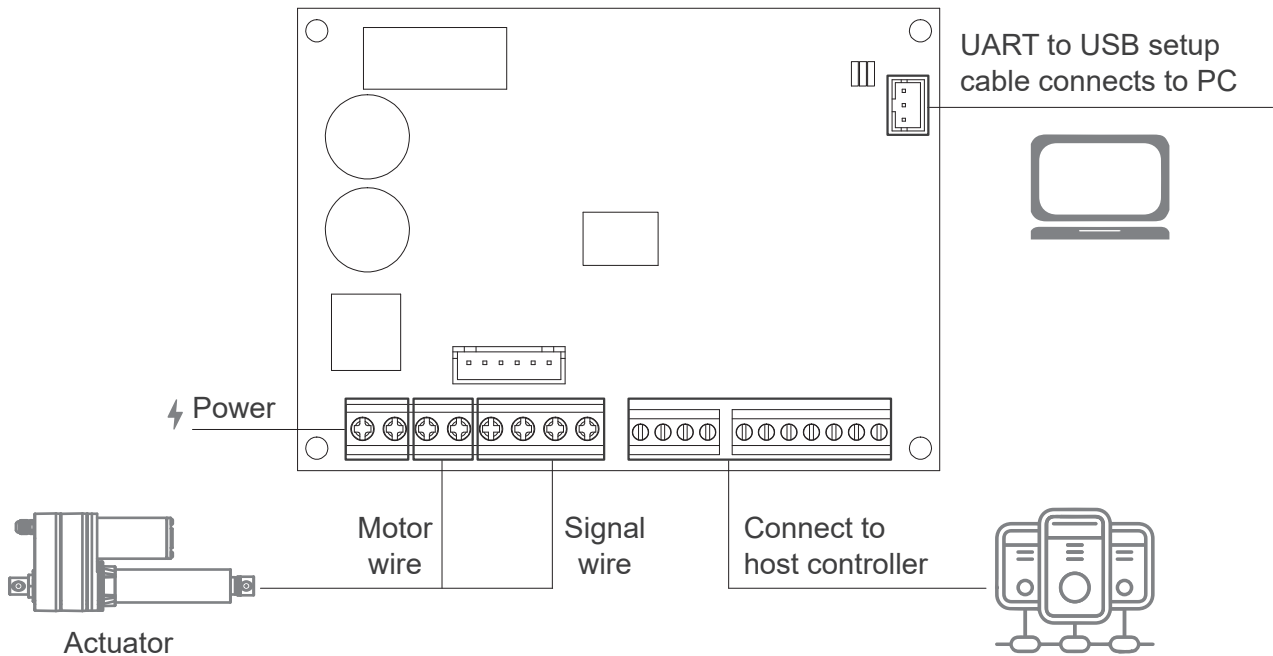
Note: For more information, please refer to CI76 Product Data Sheet on MOTECK official website.



4.3 Transport and Storage

Please use the original packaging provided by MOTECK to transport and store the controller. The temperature during transportation and storage must be between $-40^{\circ}\text{C}\sim 70^{\circ}\text{C}$ ($-40^{\circ}\text{F}\sim +158^{\circ}\text{F}$) and the cargo must be protected from collision. If you find that the packaging of the delivered goods is damaged, please check whether the controller inside are obviously damaged, and notify the transporter. If necessary, please contact the shipper or seller to discuss the disposal.

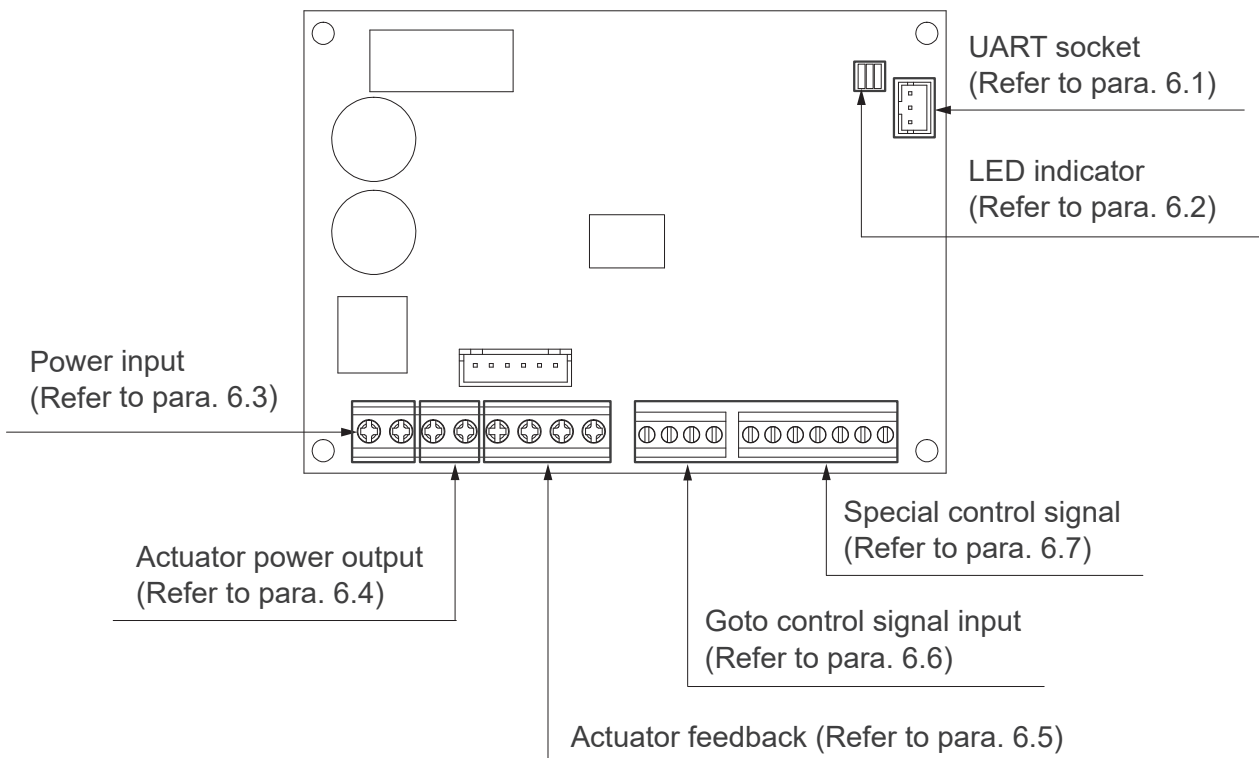
5. System Diagram



6. Hardware I/O



- Pay attention to insulation protection during installation to avoid possible risks and hazards for users to touch.
- Please confirm the actuator specification before connecting.



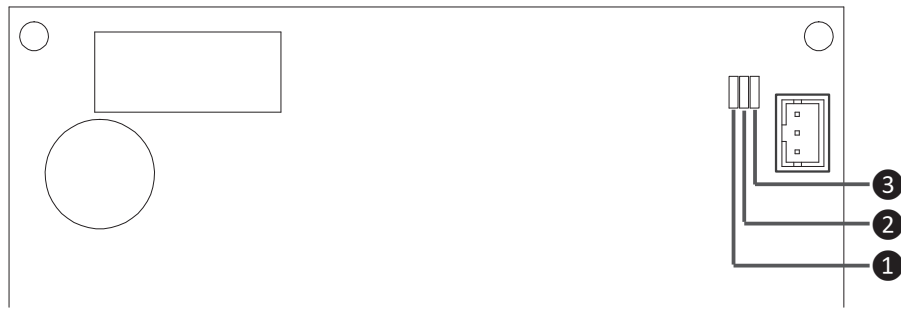
6.1 UART socket



Before using CI76 for the first time, please connect it to a PC via the UART to USB setup cable to perform setup, and use the MOTECK CI76 Setup Tool to complete the electronic installation and parameter settings (Refer to para. 8) before connecting it to the host controller to use.

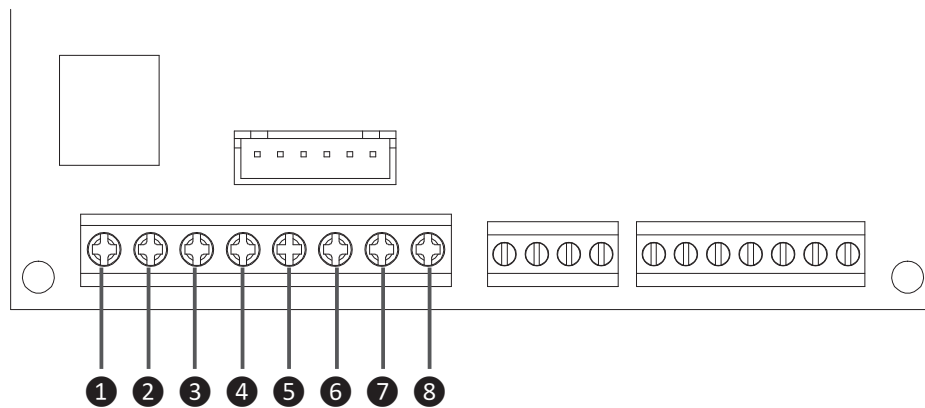
Parts	Name	Description
CN6	UART	When used with the CI76 Setup Tool, an UART to USB setup cable is required, which shall be ordered separately.





6.2 LED indicator

Pin No.	Function	Indicates behaviors
1	Short circuit protection	Red light stays on ●
	Low voltage protection	Red light flashes once ●●○
	High voltage protection	Red light flashes twice ●●●●○
	Overload current protection	Red light flashes three times ●●●●●●○
	Brake resistor overload	Red light flashes four times ●●●●●●●●○
2	Position feedback error	Orange light flashes once ●●○
	Learning error	Orange light flashes twice ●●●●○
	Control mode error	Orange light flashes three times ●●●●●●○
	Analog input mode error	Orange light flashes four times ●●●●●●●●○
3	Normal operation (enable)	Green light stays on ●
	Motor in operation	Green light flashes continuously ●●●●●●●●○



6.3 Power input

Pin No.	Name	Description
1	V+	<ul style="list-style-type: none"> - Voltage range: 10 - 50V DC. Please input the voltage value that matches the actuator's requirement. - Current range: 0 - 10A - Connect V+ to positive and connect V- to negative
2	V-	<ul style="list-style-type: none"> - The polarity of the input DC power must be fixed in accordance with the specified connection method, and the polarity cannot be switched at any time. - It is forbidden to attempt to control the speed by inputting voltage in PWM mode.

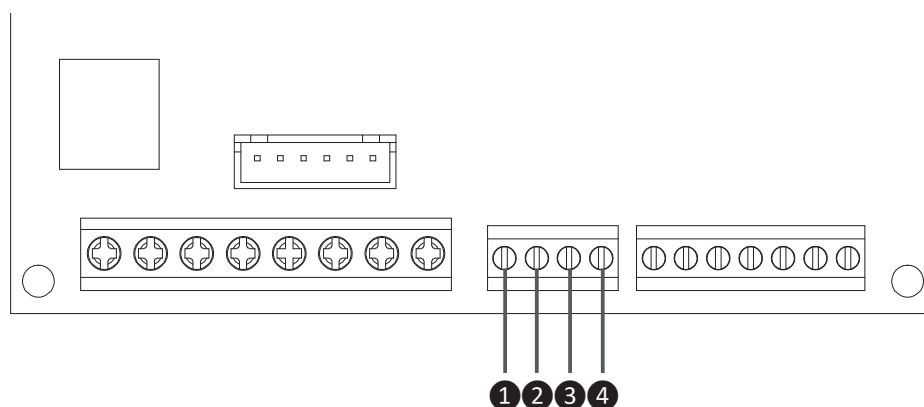
6.4 Power output for actuator

Pin No.	Name	Description
3	M+	<ul style="list-style-type: none"> - Voltage range: 10 - 50V DC - Current range: 0 - 10A
4	M-	<ul style="list-style-type: none"> - As Moteck's standard, when the power supply output M+ is positive (V+) and M- is negative (V-), the actuator extends. When the polarity is swapped, the actuator retracts.

6.5 Actuator feedback signal

Pin No.	Name	Description (Configured for Hall sensors)	Description (Configured for potentiometer)
5	HA	Hall A signal input	POT voltage value
6	HB	Hall B signal input	Not used
7	VCC	Vout	Vout(10V)
8	GND	GND	GND





6.6 Goto control signal input

Pin No.	Name	Description	Input range	Notes
①	IC	Current control input	4~20 mA	Refer to para. 6.6.1
②	VC	Voltage control input	0.5~10.0 V	Refer to para. 6.6.2
③	RC	PWM control input	1.0~2.0 ms	Refer to para. 6.6.3
④	GND	-	-	-

6.6.1 Current input mode

- Input range: 4~20mA
- Through inputting different current intensities to give target position of the actuator in linear proportion, as shown in the table below.

Input range	Actuator behaviors
<3mA	No action
3mA ~ 4mA	Retract to the software lower limit (0%)
4mA ~ 20mA	This is the normal control range. Move to the specified position after calculation
20mA ~ 21mA	Extend to the software upper limit (100%)
>21mA	No action



6.6.2 Voltage Input mode

- Input range: 0.5~10V
- Through inputting different voltage value to give target position of the actuator in linear proportion, as shown in the table below.

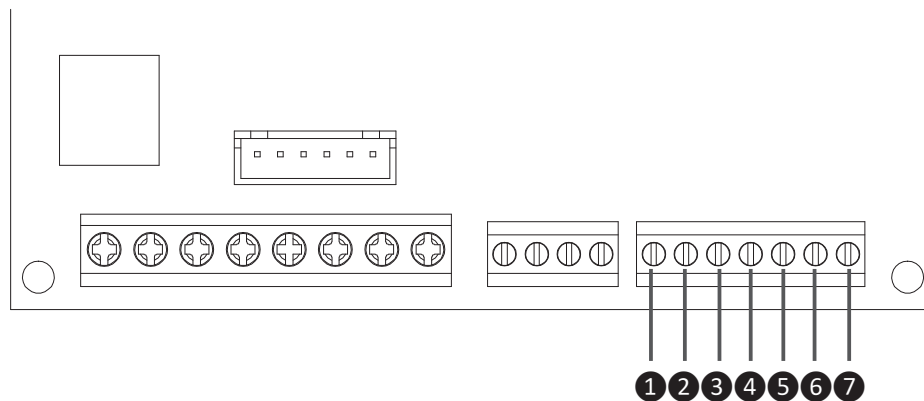
Input range	Actuator behaviors
<0.4V	No action
0.4V ~ 0.5V	Retract to the software lower limit (0%)
0.5V ~ 10.0V	This is the normal control range. Move to the specified position after calculation
10.0V ~ 10.1V	Extend to the software upper limit (100%)
>10.1V	No action

6.6.3 PWM input mode

- Input range: 1.0~2.1 ms
- Through inputting different modulated pulse width to give target position of the actuator in linear proportion, as shown in the table below.

Input range	Actuator behaviors
<0.9 ms	No action
0.9 ms ~ 1.0 ms	Retract to the software lower limit (0%)
1.0 ms ~ 2.0 ms	This is the normal control range. Move to the specified position after calculation
2.0 ms ~ 2.1 ms	Extend to the software upper limit (100%)
>2.1 ms	No action





6.7 Special control signal

Pin No.	Name	Description	I/O	Signal logic
①	POS	Position arrival	Output	Active Low
②	ALM	Alarm signal	Output	Active Low
③	EN	Enable/Disable power output	Input	Active Low
④	CLR	Clear alarm	Input	Active Low
⑤	I1	Actuator extends	Input	Active Low
⑥	I2	Actuator retracts	Input	Active Low
⑦	GND	GND	-	-

6.7.1 Position ok(POS): This indicates that the movement of the actuator has arrived in the target range, meaning the target position has been reached.

6.7.2 Alarm(ALM): When CI76 detects an error or protection is triggered, it outputs an active signal through this pin while it shuts down the power output to stop the actuator movement.

6.7.3 Enable(EN): Enables or disables the output power function for actuator. Upon receiving an Active signal, the controller enables the power output (CN2 pins 'MA' and 'MB'). Upon receiving an Inactive signal, the power output function is disabled, but this does not affect the functions of other terminals.

6.7.4 Clear(CLR): Clear the alarm error flag. The red light will turn off and the system will return to normal operation if the issue has indeed been resolved.

6.7.5 Input 1(I1): The actuator extends when the Active signal is continuously received (i.e. The pin 'MA' of the power output terminal CN2 is connected to DC+, and the pin 'MB' is connected to DC-). The Active signal must be continuously input. If the signal is ceased, the actuator will stop immediately.



6.7.6 Input 2(I2): The actuator retracts when the Active signal is continuously received (i.e. The pin 'MA' of the power output terminal CN2 is connected to DC-, and the pin 'MB' is connected to DC+). The Active signal must be continuously input. If the signal is ceased, the actuator will stop immediately.

6.7.7 GND: I/O signal grounding. It must share a common ground with the controller signal to avoid interference; do not connect it to the power supply ground.

7. Installation

7.1 Installation Steps

- (1) Do not perform mechanical installation on the actuator first. Connect the actuator to the CI76 first, and then connect the CI76 to the PC.
- (2) Connect CI76 to DC power source.
- (3) Turn the CI76 Setup Tool on your PC and confirm a successful connection with the CI76.
- (4) Complete the settings on the pages of the [Device] and [Factory] in the CI76 Setup Tool. (Refer to para. 8.1)
- (5) The stroke learning function can be performed through the CI76 hardware terminals or the UART mode on the PC Setup Tool provided by manufacturer. (Refer to para. 7.2)
- (6) Click 'Apply' to store the actuator parameters of the [Setting] page. (Refer to para. 8.2.2)
- (7) You can use the control buttons in the [Control] page of the PC Setup Tool to test the action of the actuator under no-load conditions. If feasible, connect the real host controller to test the actuator's action. (Refer to para. 8.3.3)
- (8) After confirming everything is correct, turn off CI76 and then proceed with the actual mechanical installation of the actuator.
- (9) Prepare the power supply, connect the CI76 to the host controller, and complete the remaining installation works, including mechanical and electronic aspects.
- (10) Perform a test run carefully. If necessary, reconnect the CI76 to the PC, adjust the parameters using the CI76 Setup Tool, and try again until it is accepted.



7.2 Learning Function

7.2.1 Activating Learning Mode

- Learning mode can be activated in either of the following ways:
 - (1) Hardware Trigger: While connecting the wires, activate both the "extend" and "retract" pins of the CN5 terminal (special control terminal) for approximately 2 seconds, then disconnect to enter learning mode.
 - (2) Software Trigger: Press 'START LEARN' in the [Control] page of the CI76 Setup Tool.
(Refer to para. 8.3.3)
- After startup learning mode, the CI76 will automatically learn the stroke of the actuator in the following sequence:
 - (1) First retract to the bottom (lower limit)
 - (2) Then extend to the top (upper limit)
 - (3) Finally retract to the lower limit again to complete the learning
- After completion, the controller has known the upper and lower limit positions and will keep tracking its real-time position moving.

7.2.2 Abort Learning

- During the learning process, learning will be interrupted and an error message will be displayed if any of the following occurs:
 - (1) Any "input mode" is triggered (such as analog input, or UART commands).
 - (2) Either "extend" or "retract" pins of the CN5 terminal (special control terminal) is triggered.
 - (3) Press 'STOP LEARN' in the [Control] page of the CI76 Setup Tool.
- When the system detects an anomaly (current, voltage, or feedback anomaly...etc.), the orange light will flash twice, and the error status will show a red light of "Learning failure" on the [Control] page of the CI76 Setup Tool.



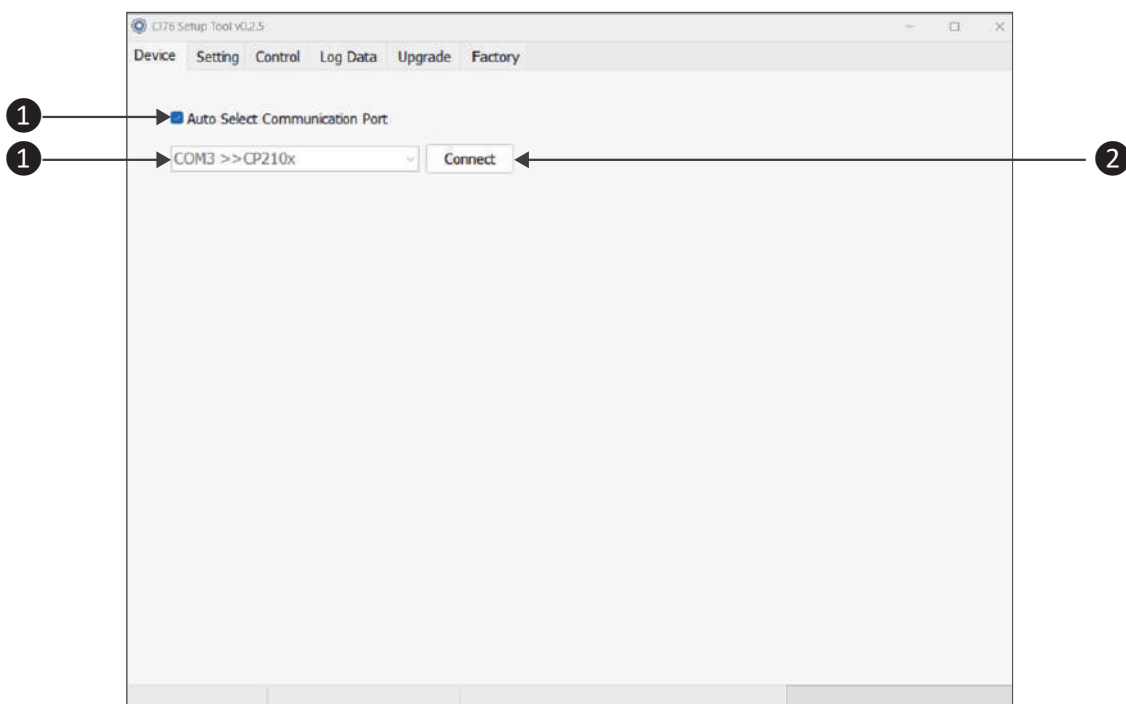
8. CI76 Setup Tool

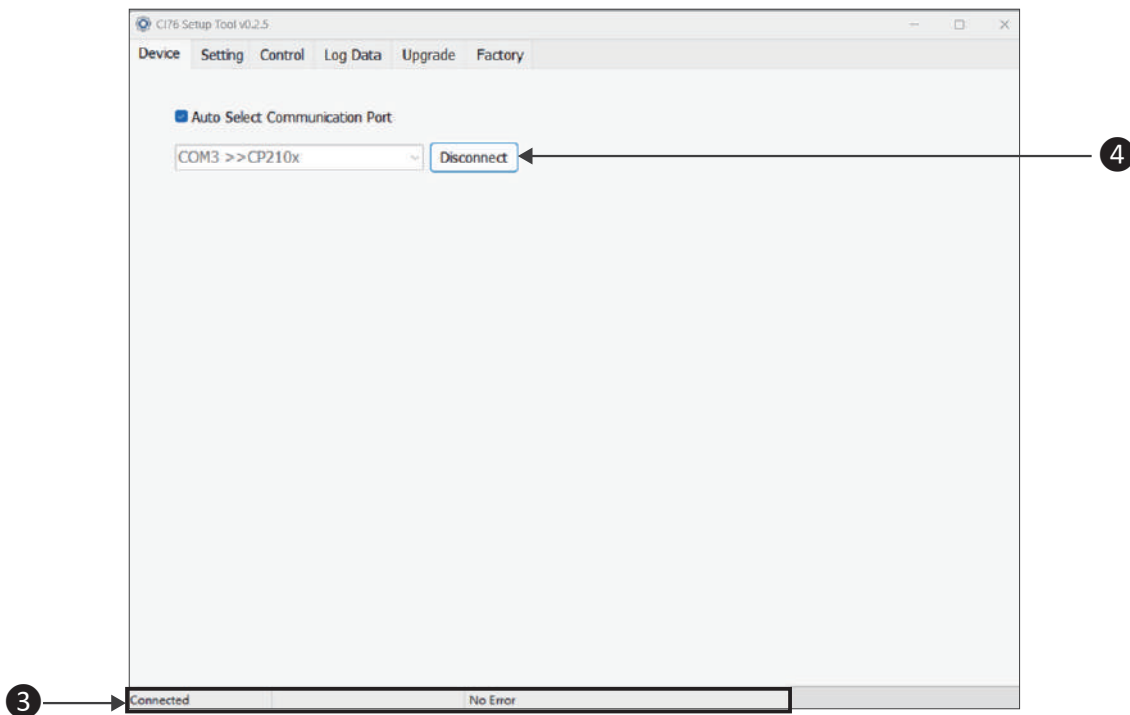
CI76 Setup Tool is an application tool that runs on the Windows platform of computer. It is used to set the parameters of CI76 and can be used to control the action of the actuator.

8.1 Basic setting

8.1.1 Automatic configuration

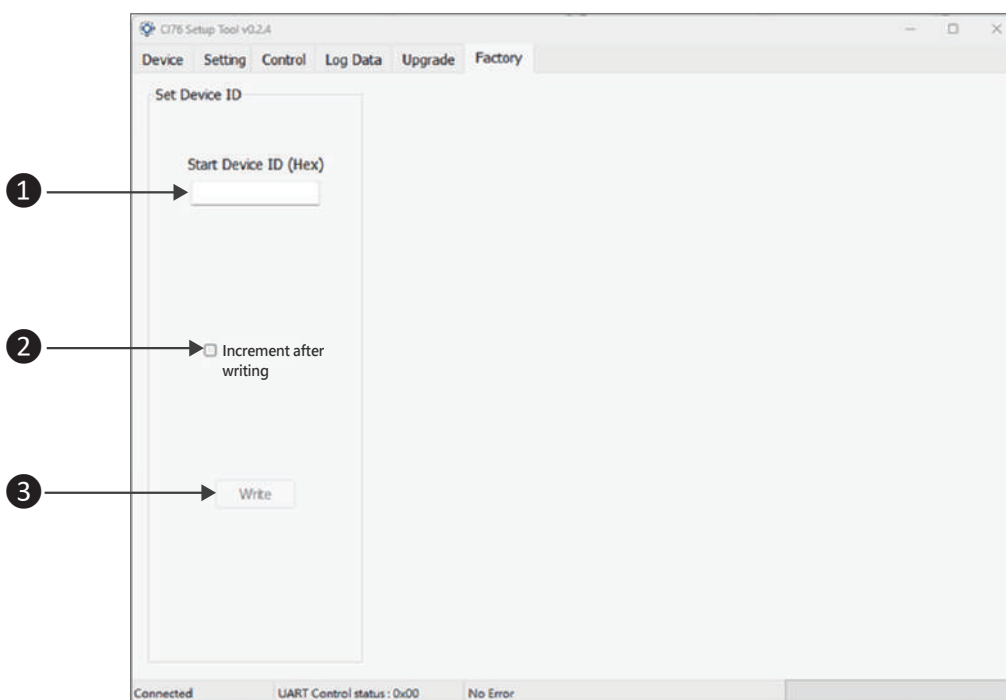
- (1) On your PC, open the CI76 Setup Tool and go to the [Device] page. After checking "Auto Select Communication Port," it will automatically search for currently plugged ports, or users can select from the drop-down COM list.
- (2) Press 'Connect' to connect to the selected port.
- (3) If the status bar displays "Connected" and "No Error", the connection is successful.
- (4) Press 'Disconnect' will terminate the connection.





8.1.2 Set device ID

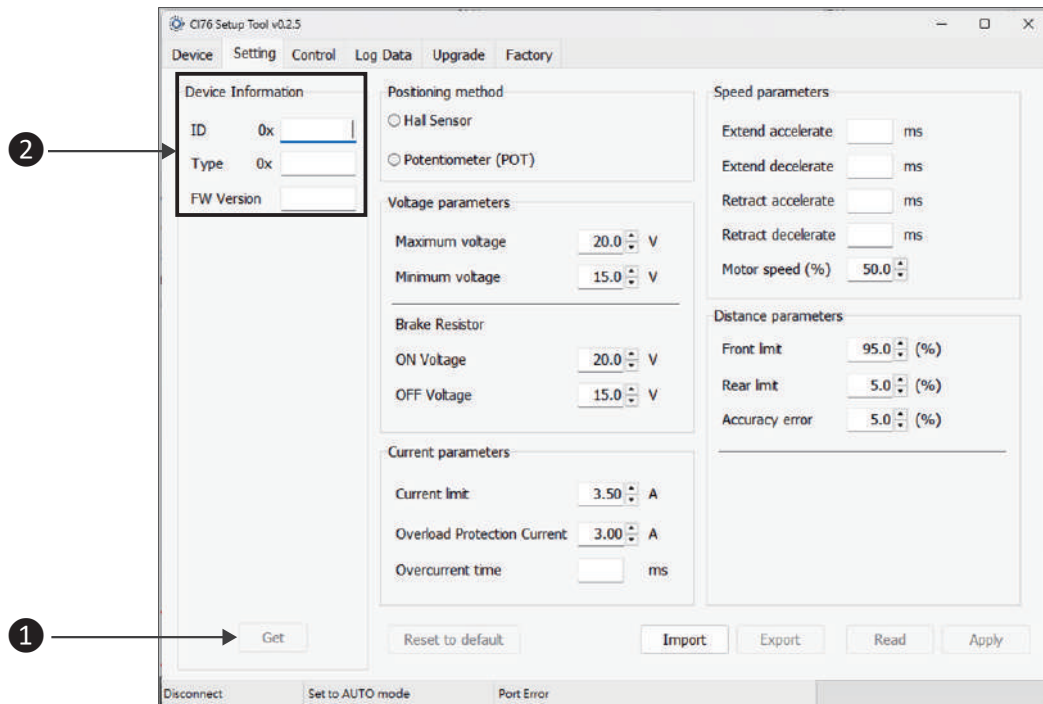
- (1) The ID is used to identify which linear actuator or system this CI76 is paired with, facilitating subsequent maintenance and parameter file management for users, not mandatory. After entering the [Factory] page, you can set a 32-bit ID in the Start Device ID (Hex) field. The input data is 8-bit hexadecimal alphanumeric characters.
- (2) When configuring more than one CI76 device, if "Increment after writing" is checked, the device ID value will automatically increment. For example, the device ID starts from 0x0001 for the first CI76, then it will automatically change to 0x0002 for the second, 0x0003 for the third, and so on.
- (3) Press 'Write' to confirm writing in CI76. The set ID can be viewed in the [Device] page.



8.2 Parameter management function

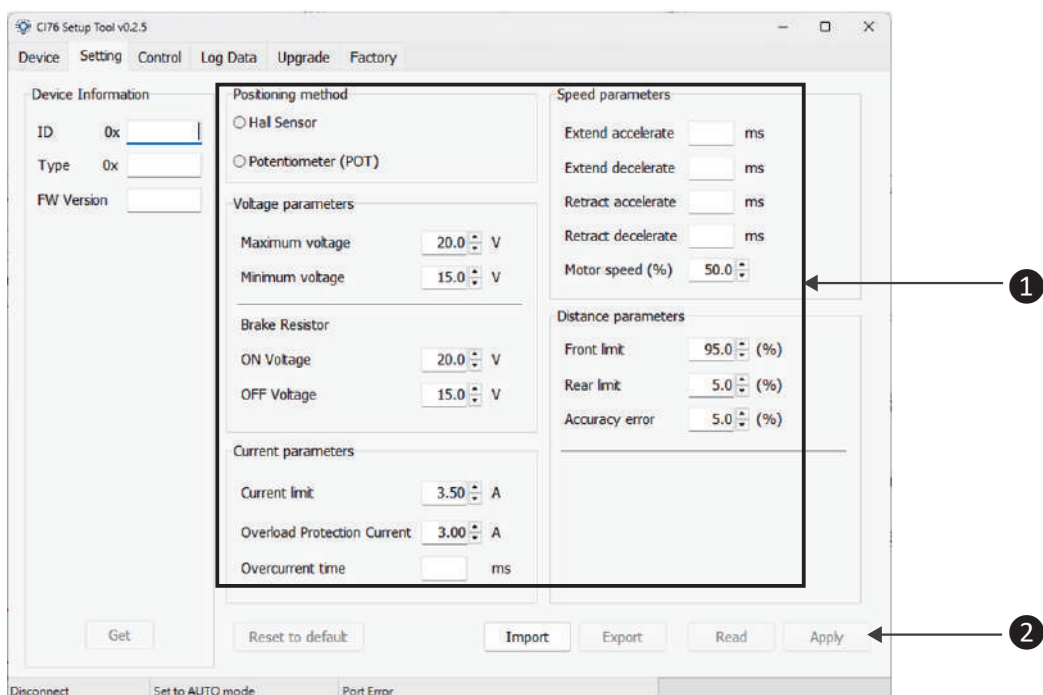
8.2.1 Get device version

In the Device Information field of the [Setting] page, press 'Get' to retrieve the device's ID, Type, and firmware version.



8.2.2 Set actuator parameters

Enter the parameters under each field in the [Setting] page, and then click 'Apply' to write them in.



- **Positioning method:** Select the correct feedback way according to the actuator specifications.
- **Voltage parameters:** 0 ~ 50 V
- **Brake Resistor:** 0 ~ 50 V, The 'ON Voltage' must be greater than the 'OFF Voltage'.
- **Current parameters:**
 - Current limit: Valid 0 ~ 10A.
 - Overload Protection Current: Valid 0 ~ 10A
 - Overcurrent time: Valid 0 ~ 5000ms
- **Speed parameters:**
 - Extend accelerate: Valid 0 ~ 5000ms
 - Extend decelerate: Valid 0 ~ 5000ms
 - Retract accelerate: Valid 0 ~ 5000ms
 - Retract decelerate: Valid 0 ~ 5000ms
 - Motor speed: Valid 50 ~100 %
- **Distance parameters:**
 - Front limit: Valid 70 ~ 100 %
 - Rear limit: Valid 0 ~ 30 %
 - Accuracy error: Valid 0 ~ 20 %
- **Apply:** Write the modified parameters to the controller firmware and make them take effect immediately.

8.2.3 Restore to default value parameters

Press "Reset to default" to restore the controller parameters to their factory default values.

8.2.4 Import parameters

Click "Import" to open the file selection window and load the parameter configuration file from PC.



- When Import is executed, the parameters are only loaded into the temporary values of the CI76 Setup Tool; the parameters of the CI76 controller itself have not yet been actually updated.
- Therefore, if you have imported or manually modified any parameter, please be sure to press 'Apply' again to ensure that the new settings are fully written to the controller so that they will take effect and remain after power off.

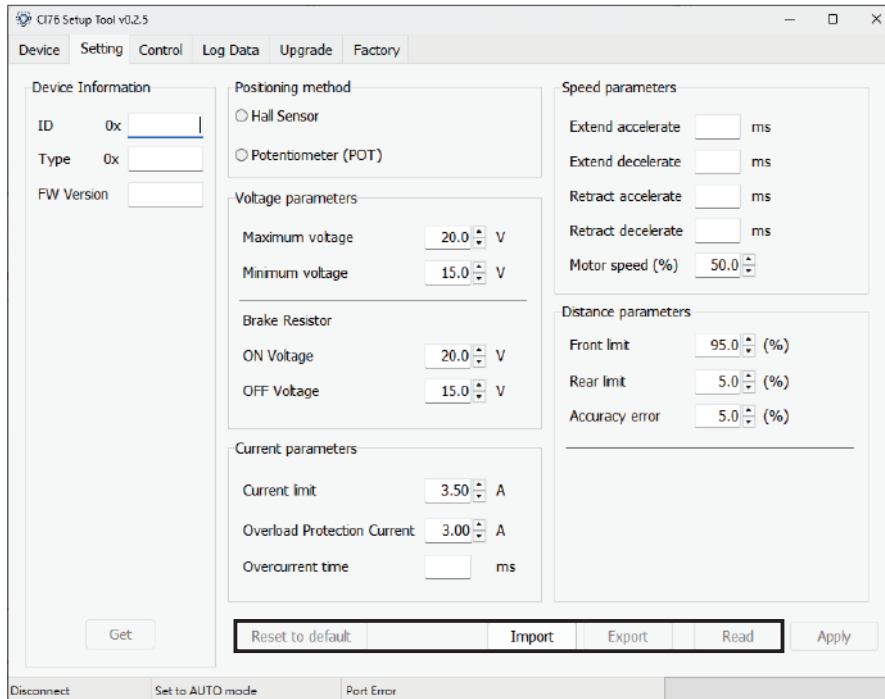
8.2.5 Export parameters

Press 'Export' to output and save the current controller parameters as a configuration file.



8.2.6 Read firmware parameters

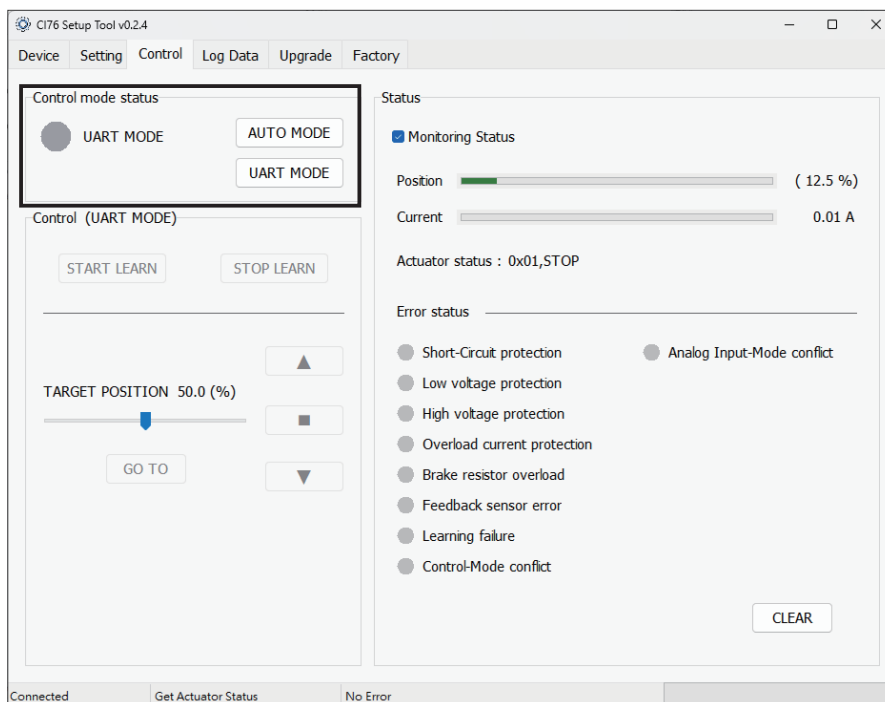
Press 'Read' to read the current parameter values from the CI76 controller firmware.



8.3 Control function

8.3.1 Select control mode

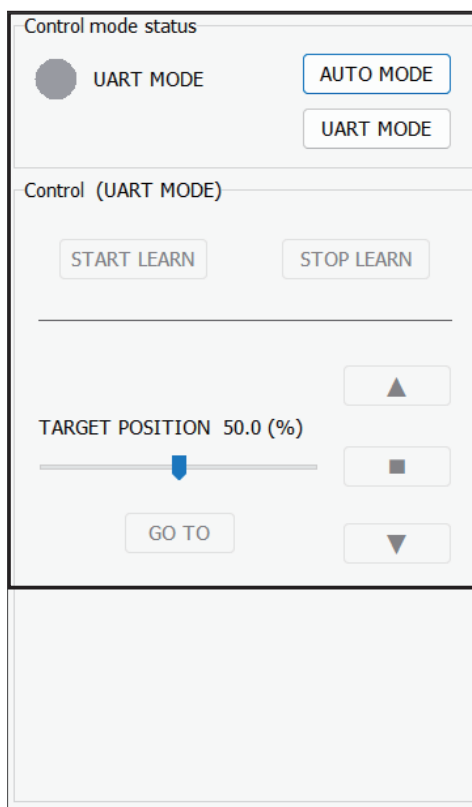
Under the [Control] page of the CI76 Setup Tool, you can switch between two control modes: AUTO MODE and UART MODE.



8.3.2 AUTO MODE

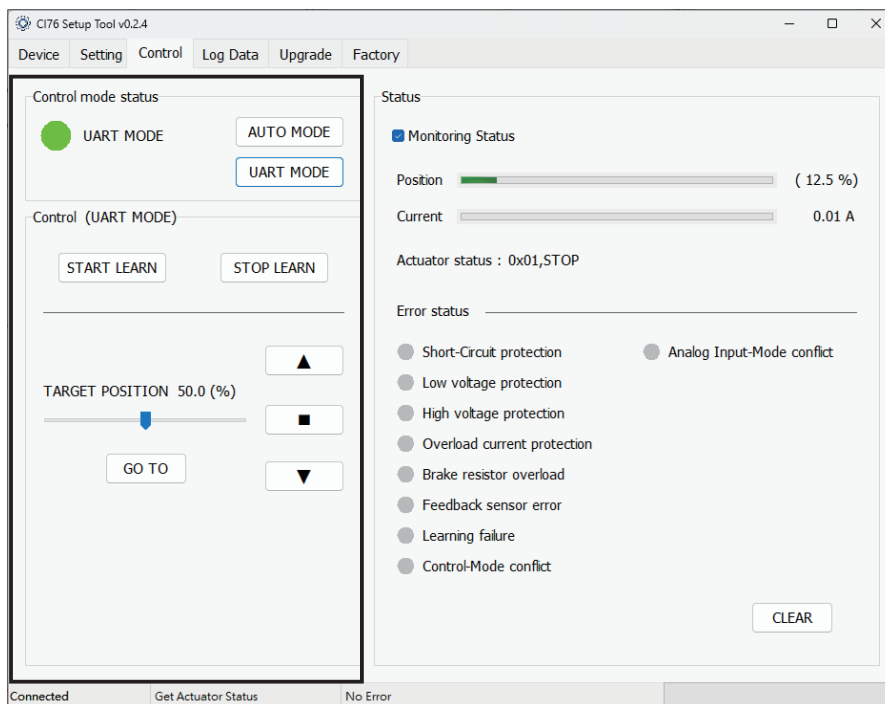
Press 'AUTO MODE' to switch to automatic mode. The system will automatically detect the source of control input including forward/backward signal from CN5 terminal, or three modes of GOTO signal from CN4 terminal.

At this time, the Control (UART MODE) control panel area below will be disabled (displayed as gray and unclickable), but communication with the PC can still continue through the UART terminal.



8.3.3 UART MODE

Pressing 'UART MODE' activates the mandatory UART control mode. The green light on the left indicates that it is enabled. It can only accept control communication input from the CI76 Setup Tool via the UART terminal. At this time, the functions of the Control (UART MODE) control panel are operable, as explained below.

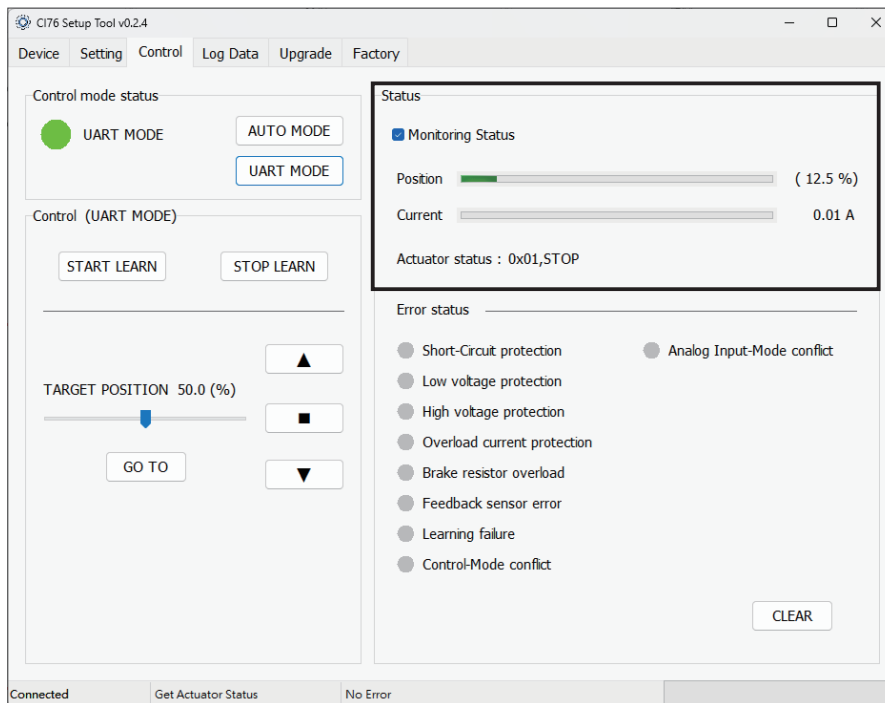


- **START LEARN:** Press this button to activate the learning function, CI76 starts learning procedure. (refer to para. 7.2).
- **STOP LEARN:** Press this button to abort the learning function, immediately stop learning and stay at the current position, and send a learning failure signal.
- **TARGET POSITION:** The position is expressed as a percentage (%). After adjusting the slider to the target position, press 'GO TO' to move the actuator to the specified position.
- **▲ Button:** Press this button once to perform the "extend" action, and the actuator will continue moving to the upper limit position. This function is equivalent to pressing and holding the "up" button on an analog hand control.
- **■ Button:** Press this button once to stop movement, that is, interrupt and stay at the current position.
- **▼ Button:** Pressing this button once performs a "retract" action, and the actuator will continue moving to the lower limit position. This is equivalent to pressing and holding the "down" button on an analog hand control.



8.3.4 Real-time status display of the actuator

Check the "Monitoring Status" box to display the real-time position and current of the actuator, as well as the actuator status code.



• Actuator status:

Code	Status Description
0x01	Stop
0x02	Extending
0x03	Retracting
0x04	At Target position
0x05	Learning
0x06	At the position of Front limit
0x07	At the position of Rear limit

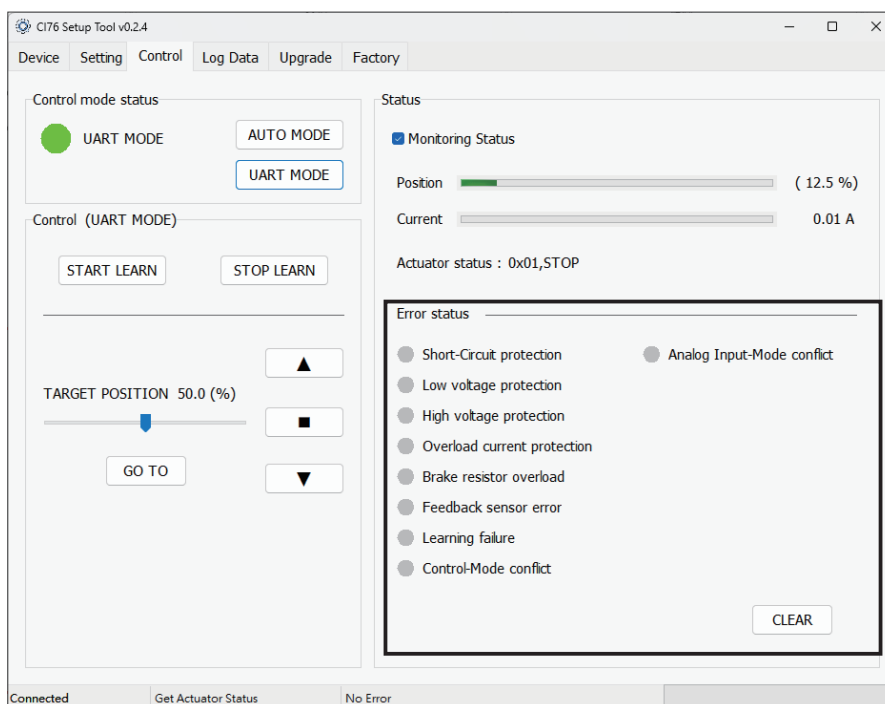


If you switch pages and then return to the Control page, you need to select the checkbox again to restore real-time status monitoring.



• Error status code description:

- When "Monitoring Status" is checked, the real-time error status will be shown in the Error status section. Matching errors will be indicated by red lights on the CI76 Setup Tool screen.



Error status	Status Description
Short-Circuit Protection	Motor short circuit occurred.
Under-Voltage Protection	The system voltage is lower than the limit.
Over-Voltage Protection	The system voltage is exceeding the limit.
Overload / Over-Current Protection	When the motor or actuator is activated, the current and time exceed the protection parameters.
Brake over duty	The accumulated time of braking mechanism in a certain short time exceeds the upper limit of the firmware settings.
Feedback Sensor Error	No actuator position signal detected.
Learning Failure	The learning process for actuator was interrupted (due to manual stopping or other errors).



Error status	Status Description
Control-Mode Conflict	When multiple control modes are detected to be active simultaneously (e.g., UART, I1 and I2, PWM). The system only allows one control mode at a time.
Analog Input-Mode Conflict	More than one valid analog input mode (0–10V, 4–20mA, RC Servo) are detected. The system only allows one control mode.

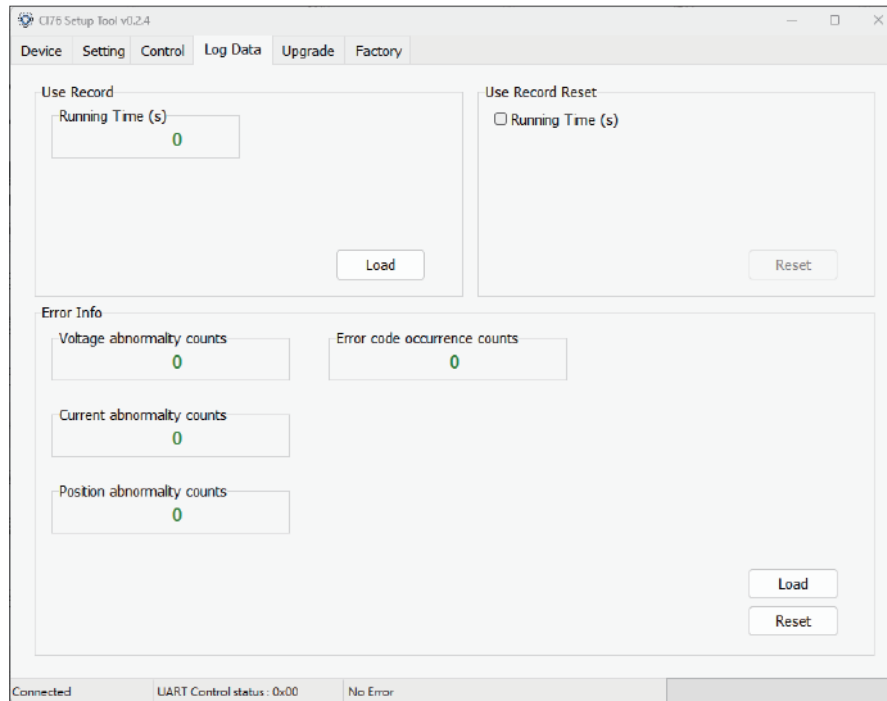
- Error status can be viewed not only through the CI76 Setup Tool but also through the LED indicators on the CI76 hardware. Please refer to para. 6.2 LED Indicator.
- CLEAR: Press 'CLEAR' to reset the error status. If the abnormal condition is resolved, all red lights will clear. If the abnormality persists, the red lights will remain on.



- Before executing the CLEAR function, the actual fault must be eliminated first.
- If the abnormality persists, the red light will remain on.

8.4 Data access function

On the [Log Data] page, you can get the cumulative time the actuator was used and the statistics of the number of various errors.



8.4.1 Record actuator usage time: Press 'Load' in the 'Use Record' section, and the Running Time(s) cell will display the cumulative usage time of the actuator. This will continue to be calculated even if the actuator is released.

8.4.2 Clear actuator usage time: In the 'Use Record Reset' section, check Running Time(s), then press 'Reset' to clear the cumulative usage time of the actuator to zero.

8.4.3 Total number of error codes: Press 'Load' in the 'Error Info' section to read the occurrence count of all error codes, including the following four types.

- Voltage abnormality counts
- Current abnormality counts
- Position abnormality counts
- Error code occurrence counts

8.4.4 Reset data

Pressing 'Reset' in the 'Error Info' section resets the occurrence count of all error codes to zero, including individual items and the total.

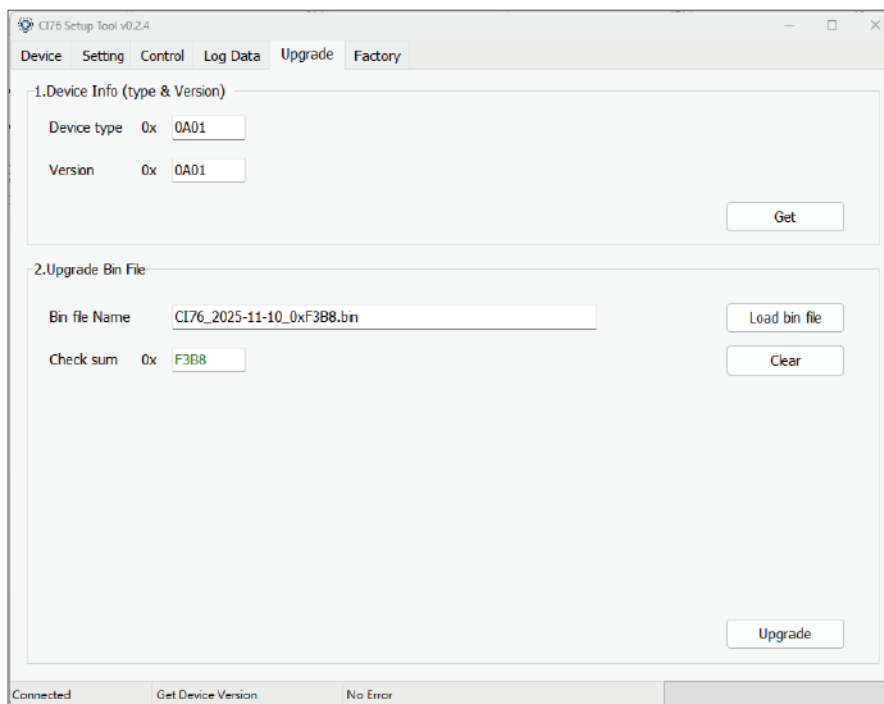


8.5 Update firmware version

On the [Upgrade] page, you can read the CI76 firmware version and execute the update.

8.5.1 Read version

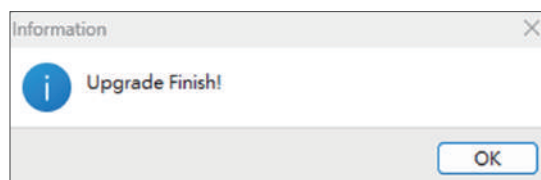
In section 1. Device Info (type&Version), press 'Get' to read CI76 firmware information.



8.5.2 Updated version

In section 2. Upgrade Bin File, follow these steps to update the firmware version.

- (1) After clicking "Load bin file", a pop-up window will appear. Select the .Bin file, then enter "Check sum", and then click "Upgrade" to update.
- (2) Once the "Upgrade Finish!" window pops up, click "OK" to indicate that the update was successful.



- (3) Pressing 'Clear' will clear the contents of the Bin file Name and Check sum cells, restoring them to blank.



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