Mindman

CONTROLLER



CM20 series

User Manual

Controller Setting Software Edition

Ver. 2410

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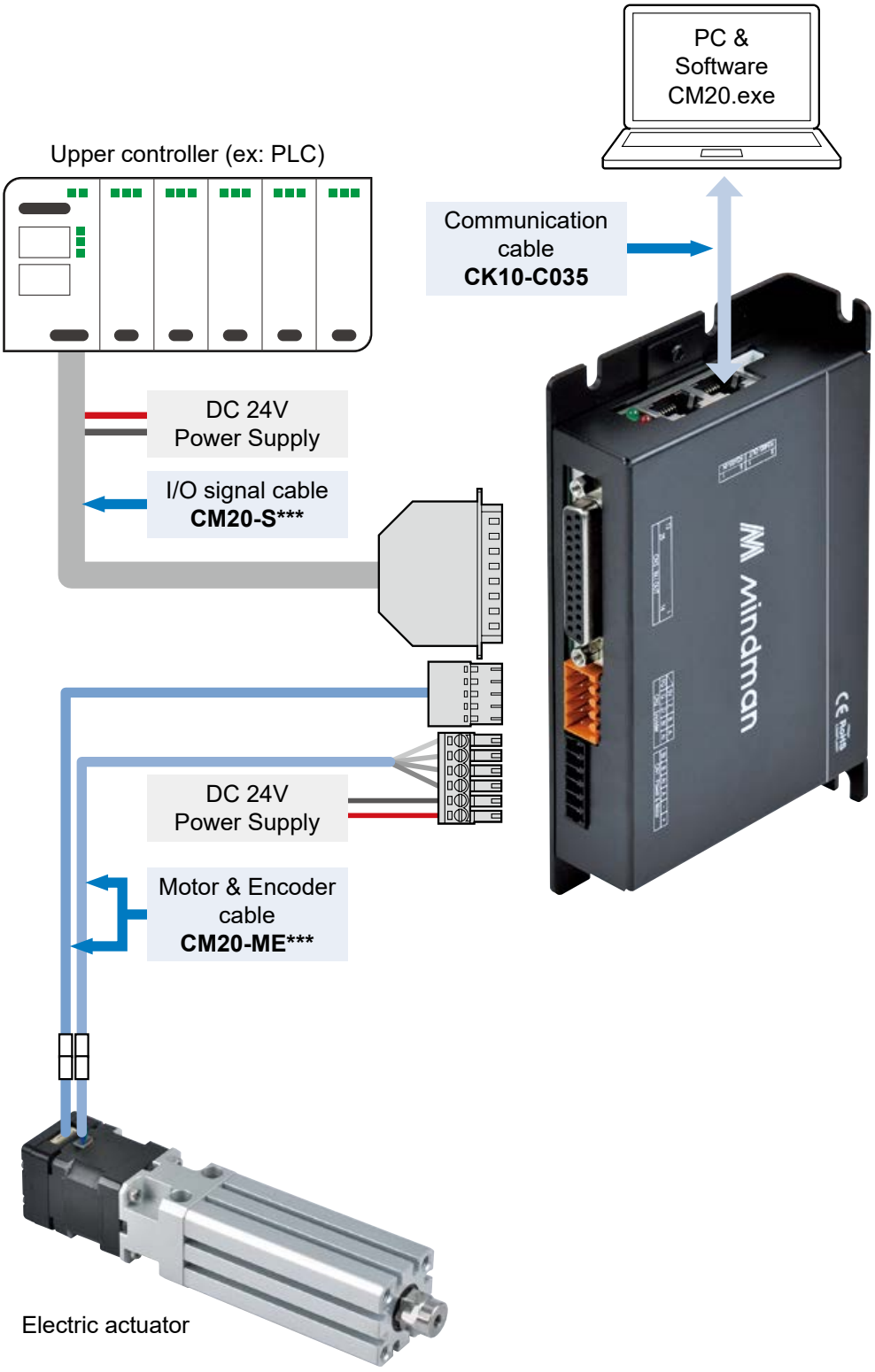
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1. Controller and Software Connection

Download software from Mindman website and install it on PC. Use the communication cable **CK10-C035** or prepared by yourself for connecting CM20 and PC.



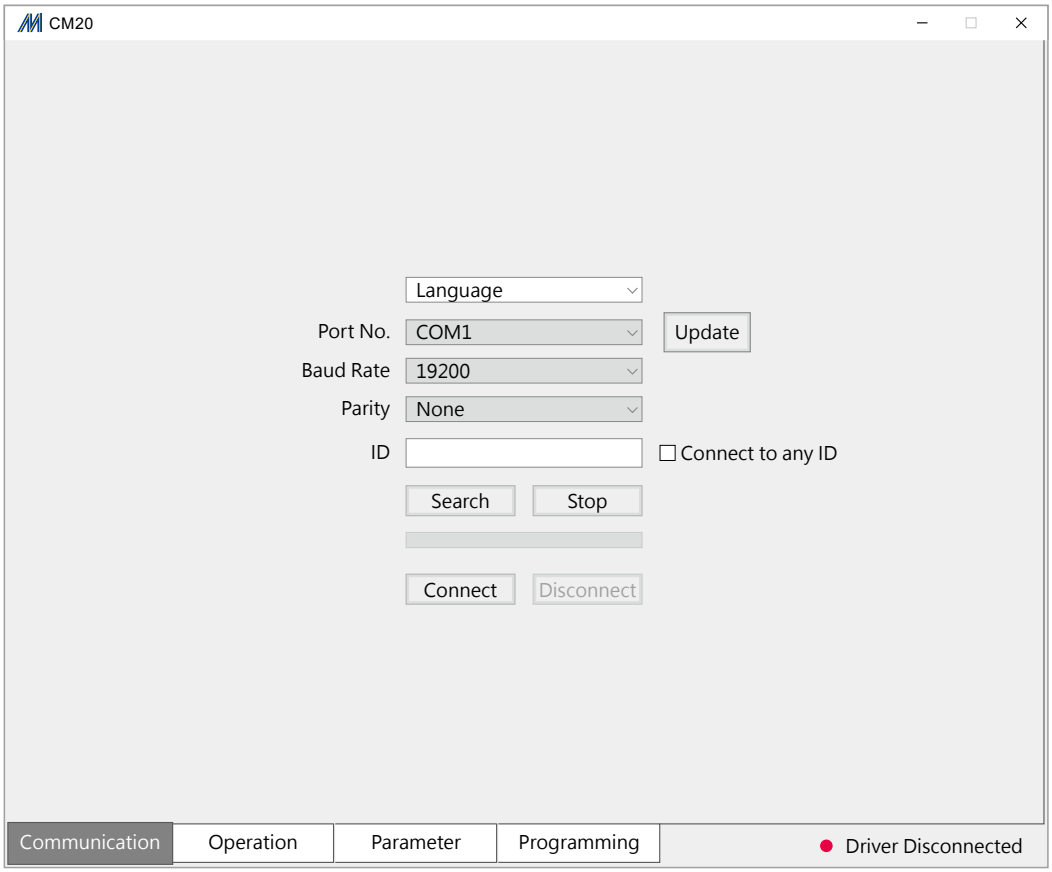
There are four function pages in CM20 software.

1	2	3	4
Communication	Operation	Parameter	Programming

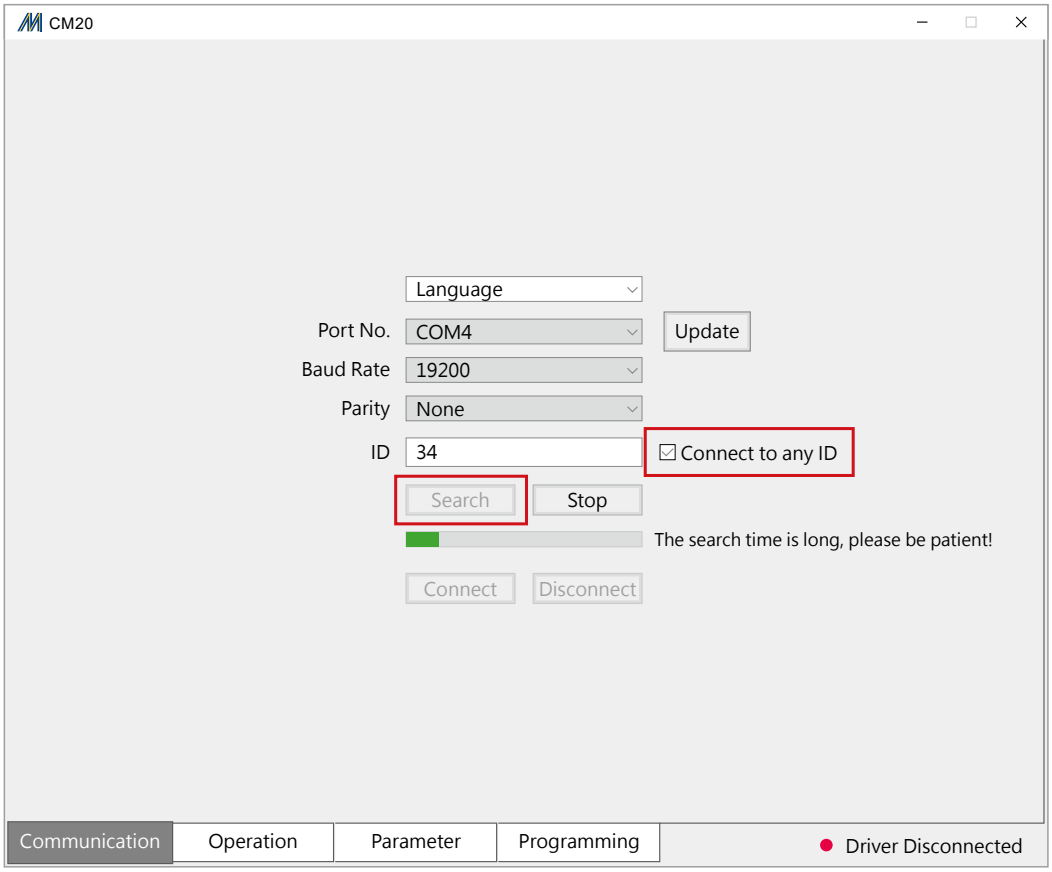
2. Communication

After starting the software, the Communication page will open first. Users can then change the settings shown below.

Interface	Description
Port No.	Select the COM port which connecting CM20.
Baud Rate	Select the baud rate, the default value is "**19200**" bits/s.
Parity	Select the parity, the default value is "**None**".
ID	Key in the CM20 ID, the default value is "**1**".



If the ID of CM20 is unknown, users can click "**Search**" and then the software will automatically find the CM20 ID. When only one CM20 is connected, users can also check "**Connect to any ID**" and then connect.



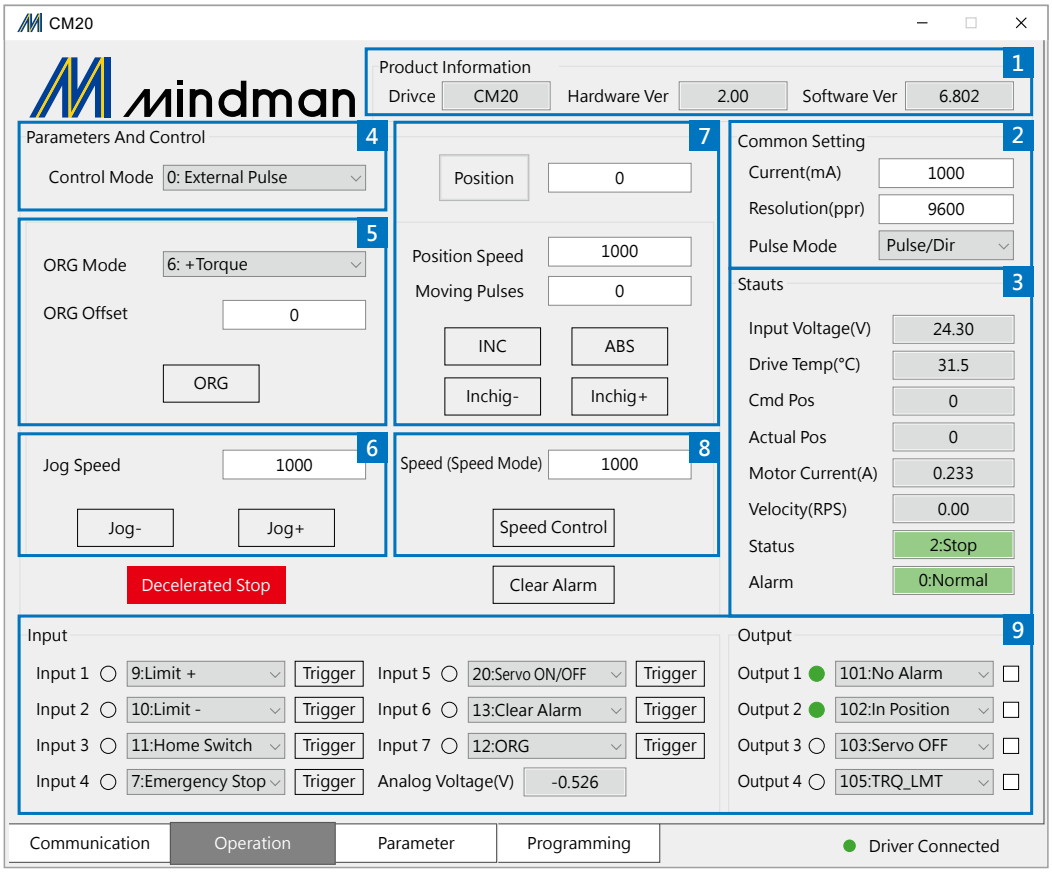
Important

- If the connected communication cable is not displayed, please go to " **Device Manager**" to confirm whether the cable is correctly identified.
  Different communication cables use different chips. Please install the corresponding driver.
- If the communication cable has been correctly identified but still cannot connect to the CM20 successfully, please confirm whether the parameters such as baud rate, parity bit and ID are set correctly, and confirm whether the RJ45 pin wiring complies with the definitions in the main user manual 2.4.3 section.

3. Operation

There are some functions in the Operation page :

No.	Interface	No.	Interface
1	Product Information	6	Jog Control
2	Common Setting	7	Position Control
3	Status	8	Speed Control
4	Control Mode	9	I/O Setting
5	ORG Return (Homing)		

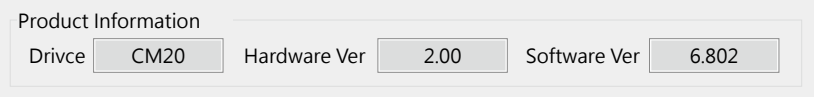


Important

- The functions about torque are only supported in firmware version 6.802 or later, and the firmware version is shown in "**Software Ver**" column in CM20 software

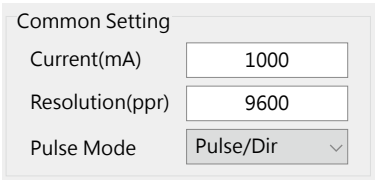
3.1 Product Information

Users can check the controller model, hardware version and software version here.



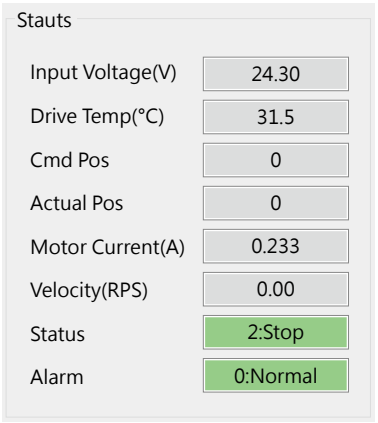
3.2 Common Setting

Motor current and encoder resolution can be set here. Users must be set them according to the manual, otherwise controller and motor may be abnormal or damaged. The motor parameter file is attached to the software installation folder. The parameters must be loaded and save to the controller before use, please refer to section 4.3.



3.3 Status

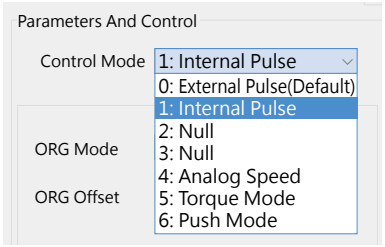
Here users can check the voltage, temperature, position, etc. If there are any alarms, users can also view the details here.



3.4 Control Mode

Control mode provides the following options:

0. External Pulse
1. Internal Pulse
2. Null
3. Null
4. Analog Speed (Not available)
5. Torque Mode
6. Push Mode (Not available)



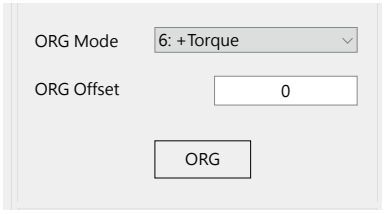
Important

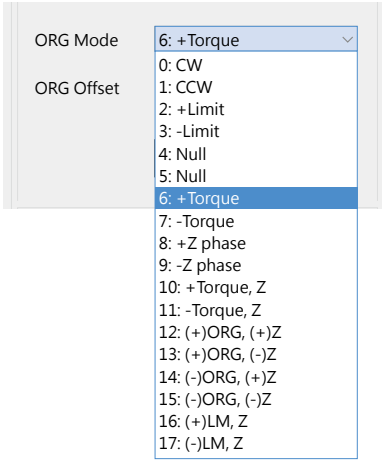
● When using software to operate, please select "1: Internal pulse".

3.5 ORG Return (Homing)

ORG mode provides the following options:

0. CW
1. CCW
2. +Limit
3. -Limit
4. Null
5. Null
6. +Torque
7. -Torque
8. +Z phase
9. -Z phase
10.+Torque, Z
11. -Torque, Z
12.+ORG, +Z
13.+ORG, -Z
14. -ORG, +Z
15. -ORG, -Z
16.+Limit, Z
17. -Limit, Z





3.6 Jog Control

Pressing and holding the button, it will move at "**Jog Speed**" and does not stop until releasing the button.

Unit: 0.01 RPS (Revolutions per Second)



3.7 Position Control

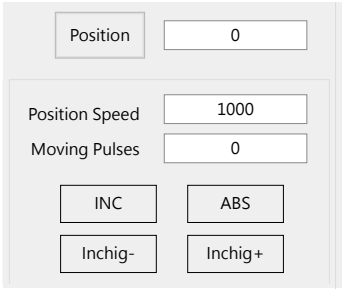
A. Position : Set the current position to a specified value.

B. Position Speed : Unit: 0.01 RPS (Revolutions per Second)

C. INC : Move incrementally based on the current position, "Moving Pulses" and "Position Speed".

D. ABS : Move absolutely to the position "Moving Pulses". The moving speed is the set value of "Position Speed".

E. Inching +/- : Move incrementally based on current position +/- "Moving Pulses" and "Position Speed"

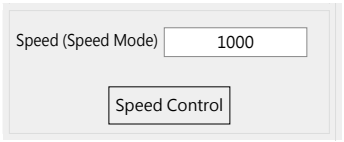


Important

- When using "**Inching +/-**", if the "**Moving Pulses**" is a negative value, be aware that "**A negative times a negative is a positive**".

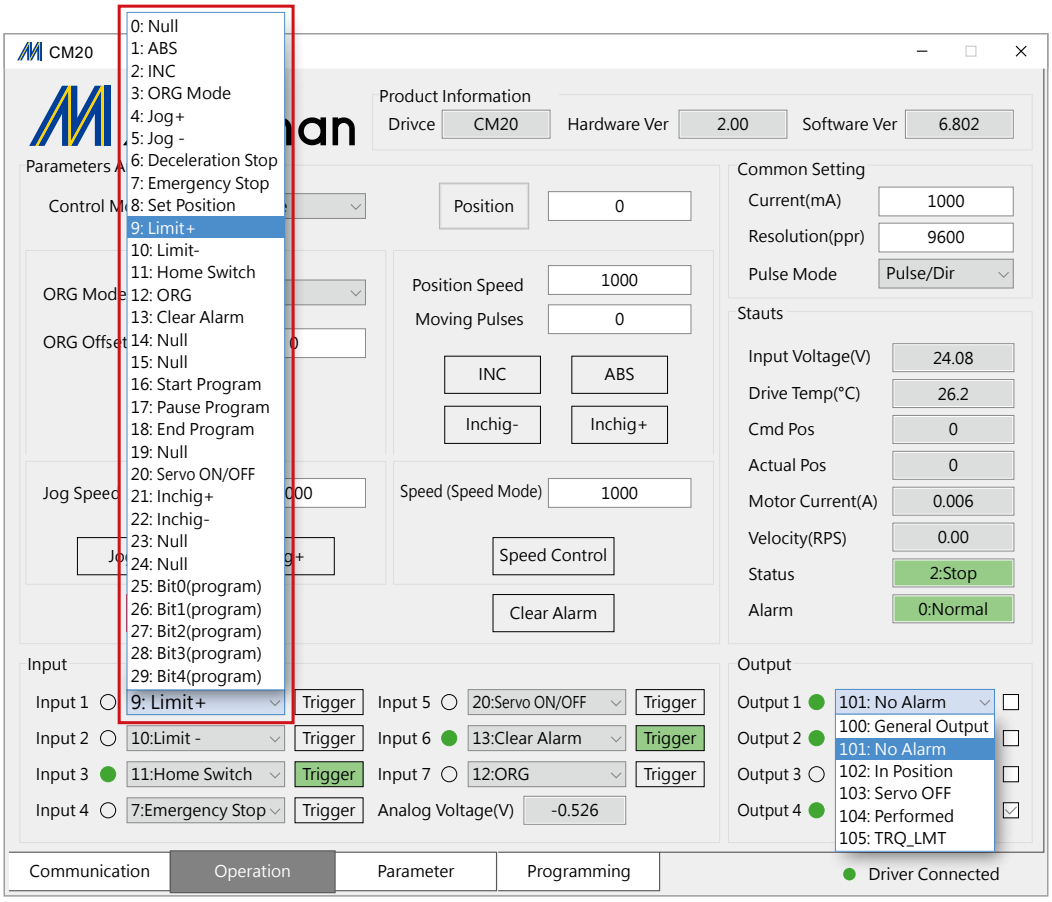
3.8 Speed Control

Clicking the button will move at "**Speed (Speed Mode)**" and will not stop until "**Decelerated Stop**" is pressed. The positive and negative value will change the direction of movement. Unit: 0.01 RPS

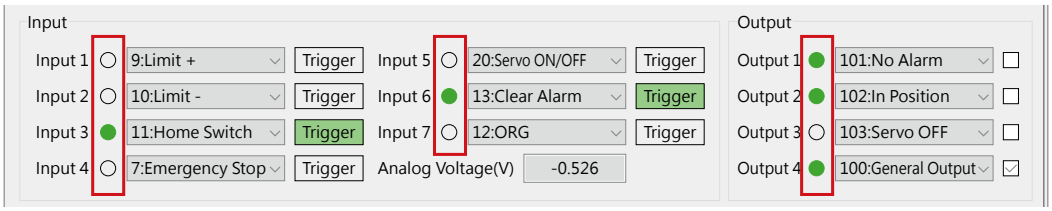


3.9 I/O Setting

A. I/O function assignment : The setting of Input and Output on Operation page is temporary. If users want to save the I/O function assignment in CM20, must config at Parameter page and click "**Save to ROM**".



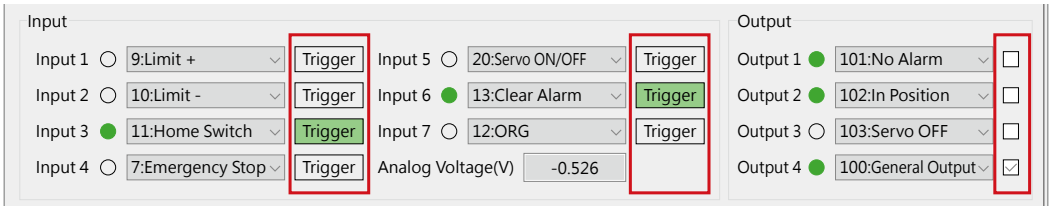
B. I/O Status : Users can identify whether the I/O is triggered by the green indicator; it turns green when triggered.



C. Simulate I/O triggered :

Input : Users can simulate signals by clicking the "**Trigger**" button. Do not use the simulation function when there are wires connected to the I/O, as it may cause the controller to malfunction or the software to behave abnormally.

Output : Only when the output assigned as "**General Output**", the signal can be simulated through the "Check Box". Do not use the simulation function when the output is assigned to another function, as it may cause the controller to malfunction or the software to behave abnormally.



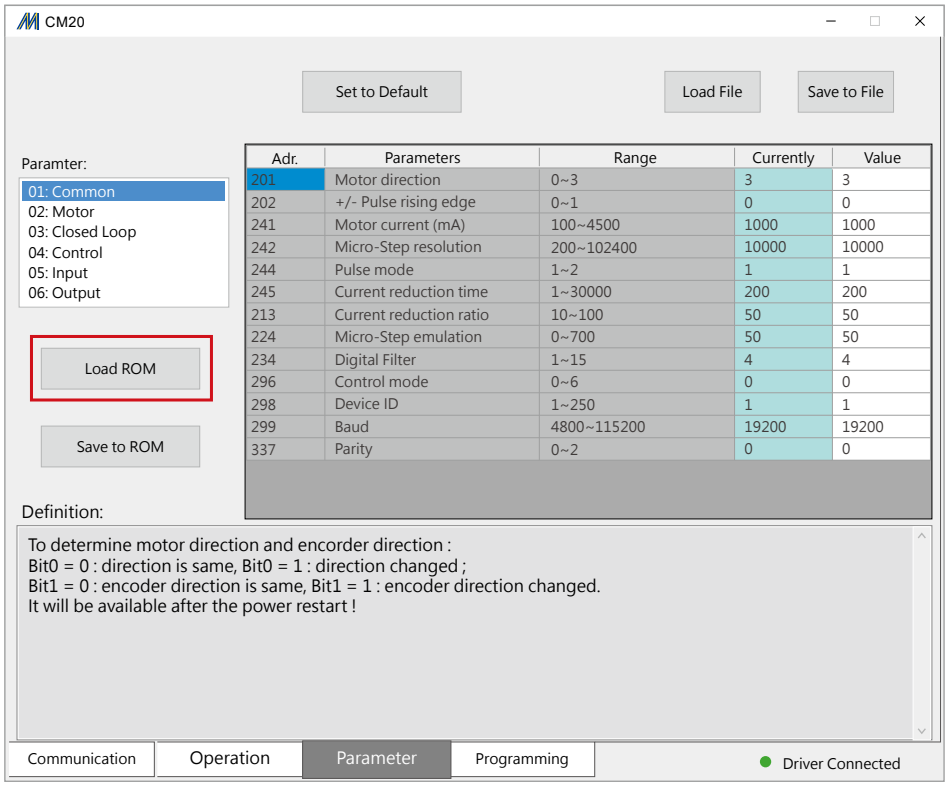
Warning

- Do not use the simulation function when there are wires connected to the I/O, as it may cause the controller to malfunction or the software to behave abnormally.

4. Parameter

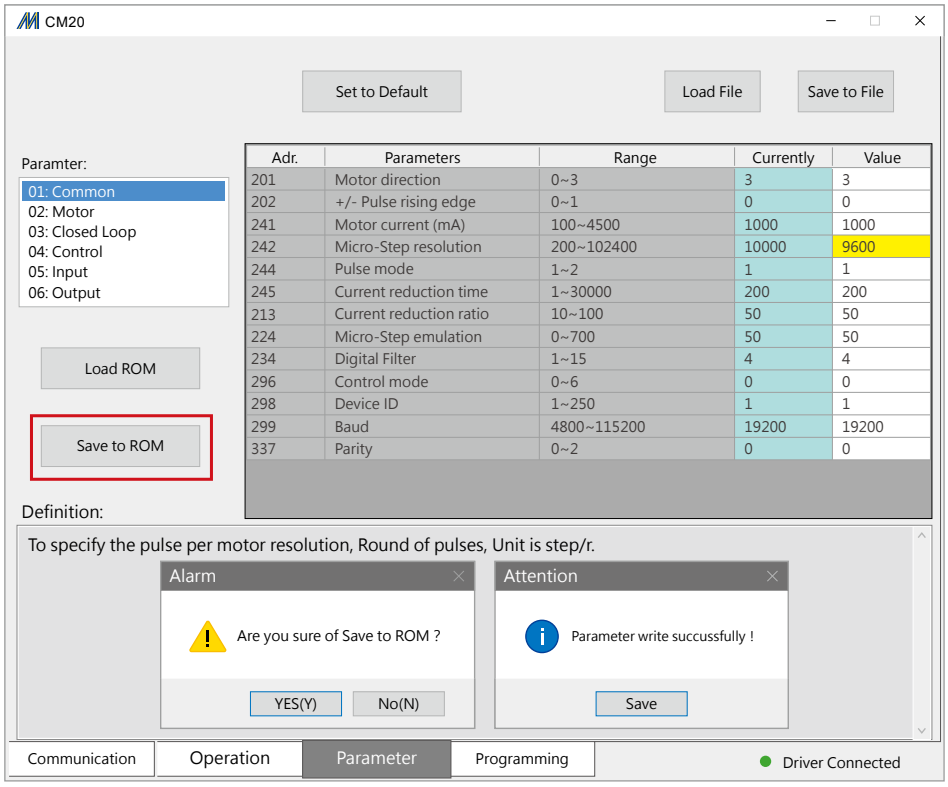
4.1 Load from ROM

When the software starts, it loads parameters from ROM. If users are unsure whether the load was successful, click '**Load ROM**' again.



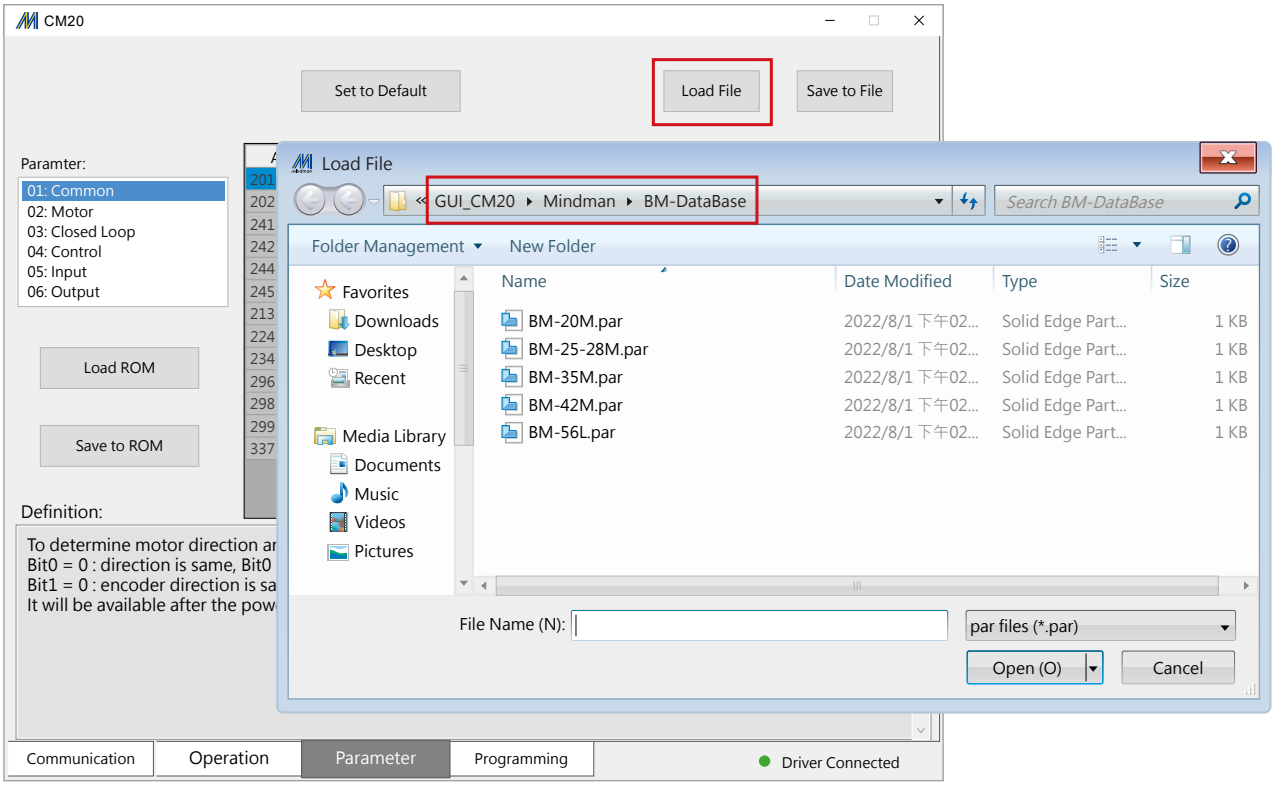
4.2 Modify and Save to ROM

Modify parameters in the value column, which will be highlighted in yellow. Click "**Save to ROM**" to write the changes. After writing, "**Load ROM**" again to confirm the modification.
Some changes may require a controller restart to take effect.



4.3 Load Parameter File and Motor Parameter

Users can use "**Load File**" to load parameter files from the computer into the software. After loading the parameters, click "**Save to ROM**" and restart the controller. When the CM20 controller is used with motors of different sizes, the parameters have different setting values, so the corresponding parameter files can be found in the software installation folder.

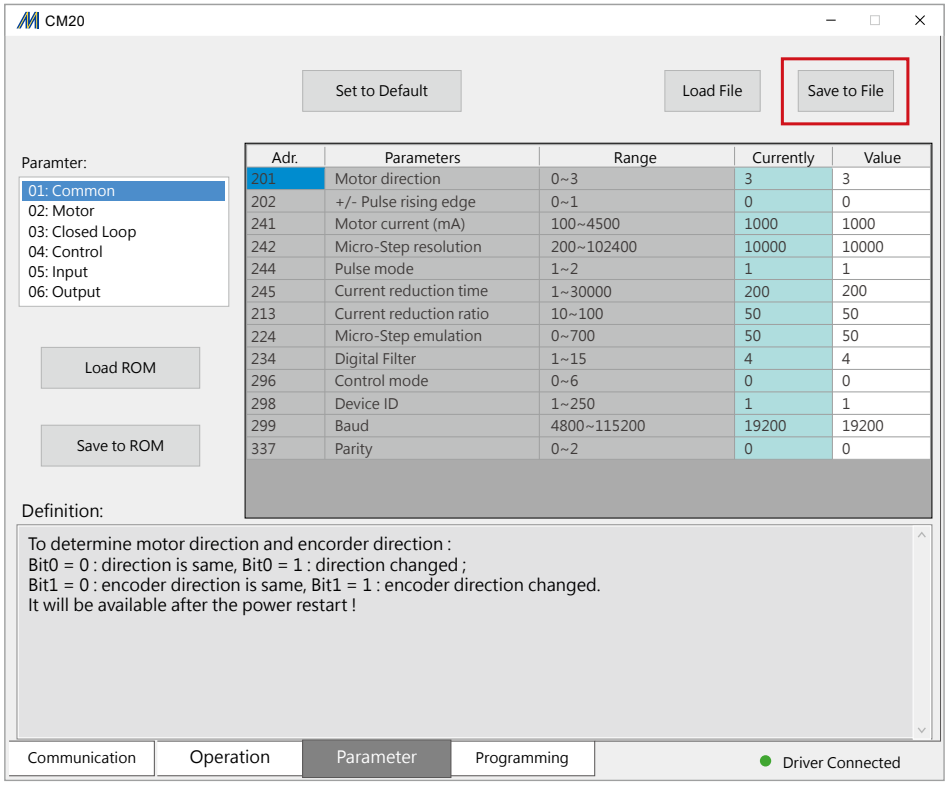


Warning

- Before connecting the motor, please confirm that the motor parameters in the controller match those of the currently connected motor, or reload and save the correct motor parameters to ROM. Do not connect the motor while the controller is live.
- If incorrect motor parameter files are loaded and saved into the controller, they may cause malfunctions, abnormal alarms, or even damage to the motor and controller.

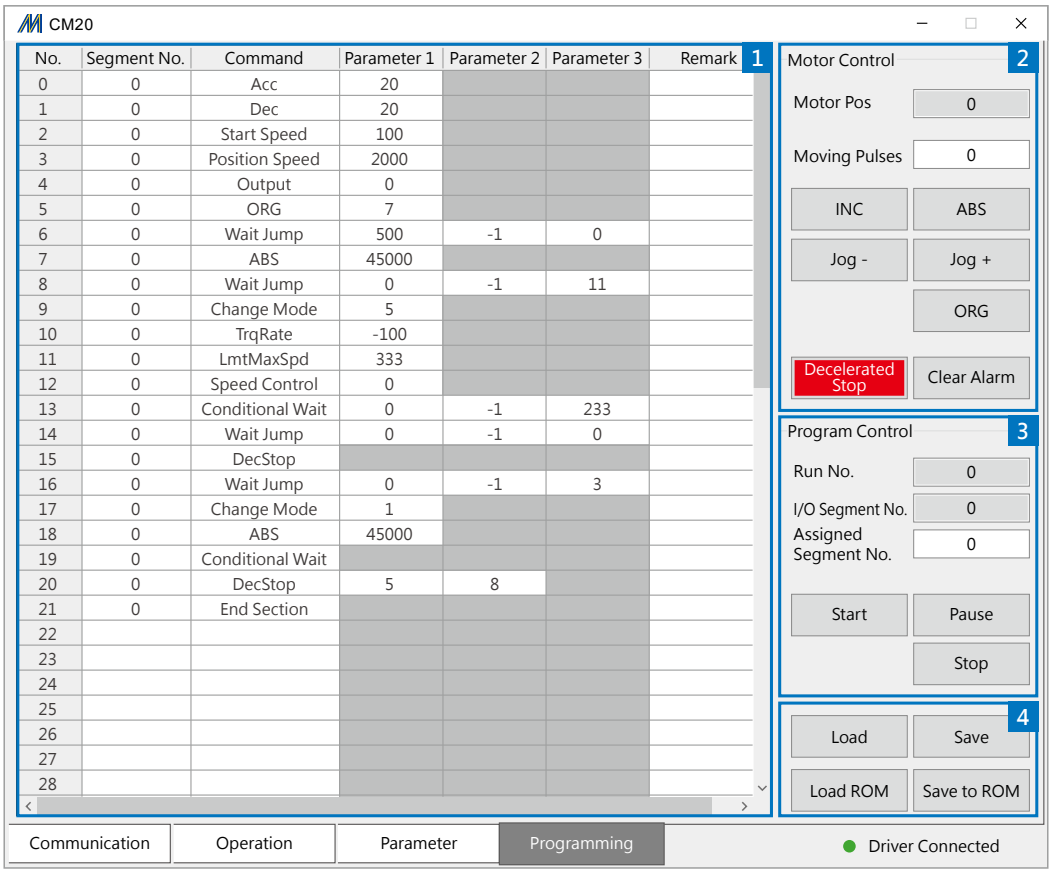
4.4 Save Parameter to File

If you need to save modified parameters, you can use the "**Save to File**" function to save them to your computer for future use.



5. Programming

No.	Interface	Description
1	Editor	① Up to 64 lines (No.0~63) can be written. ② "Segment No." will automatically increase by 1 after command "End section". ③ Select needed motion in column "Command". ④ According to each "Command", set the required parameters.
2	Motor Control	Perform simple position control of the motor
3	Program Control	You can specify the section to be executed and control the program by starting, pausing, or stopping it.
4	Program Management	① Programs can be stored as files. ② Load the saved file. ③ Read program from the controller ROM. ④ Save program into the controller ROM.



5.1 Program Example for Position Control

- For "Parameter 2" of the "Wait Jump" and "ConditionWait" commands, when the value is set to -1, the next line of the program will be executed after the condition is met. If the value is set between 0 and 63, the specified line will be executed. These functions cannot span across program "Segment No.". "Parameter 3" of the "Wait Jump" command must be converted from decimal to binary.
- For example, decimal "11" is converted to binary "1011". The highest bit represents the status of the pin: "0" means the input is "Off" and "1" means the input is "On". The last 3 bits represent the pin position: "001" corresponds to "Input1," "010" to "Input2," and "011" to "Input3.

No.	Segment No.	Command	Parameter			Note
			1	2	3	
0	0	Acc	20			Unit: rps^2
1	0	Dec	20			Unit: rps^2
2	0	Start Speed	100			Unit: 0.01 rps
3	0	Output	0			All "Output" Off
4	0	ORG	8			ORG mode: 8: + Z Phase
5	0	End Section				
6	1	Acc	20			Unit: rps^2
7	1	Dec	20			Unit: rps^2
8	1	Start Speed	100			Unit: 0.01 rps
9	1	Position Speed	1000			Unit: 0.01 rps
10	1	ABS	5000			Unit: pulse(s)
11	1	Wait Jump	2000	-1		After 2000 ms, execute the next line.
12	1	Position Speed	20			Unit: 0.01 rps
13	1	INC	-5000			Negative values indicate the opposite direction.
14	1	Wait Jump	2000	-1		
15	1	Loop	2	10		Go back to No.10, and execute the loop 2 times
16	1	Output	9			9(D)=1001(B); Out1, Out4 On
17	1	Position Speed	100			Unit: 0.01 rps
18	1	Set Position	-1000			Set current position as -1000
19	1	Wait Jump	0	-1	11	11(D)=1011(B); Wait for Input3 On
20	1	Speed Control	-300			Reverse at 3 rps.
21	1	Wait Jump	0	-1	3	3(D)=0011(B); Wait for Input3 Off
22	1	DecStop				
23	1	Wait Jump	100	9		After 100 ms, execute No.9.
24	1	End Section				

5.2 Program Example for Torque Control

- For "Parameter 2" of the "Wait Jump" and "ConditionWait" commands, when the value is set to -1, the next line of the program will be executed after the condition is met. If the value is set between 0 and 63, the specified line will be executed. These functions cannot span across program "Segment No.".
- "Parameter 3" of the "Wait Jump" command must be converted from decimal to binary. For example, decimal "11" is converted to binary "1011". The highest bit represents the status of the pin: "0" means the input is "Off" and "1" means the input is "On". The last 3 bits represent the pin position: "001" corresponds to "Input1," "010" to "Input2," and "011" to "Input3.

No.	Segment No.	Command	Parameter			Note
			1	2	3	
0	0	Acc	20			Unit: rps^2
1	0	Dec	20			Unit: rps^2
2	0	Start Speed	100			Unit: 0.01 rps
3	0	Position Speed	2000			Unit: 0.01 rps
4	0	Output	0			All "Output" Off
5	0	ORG	7			ORG mode: 7 : -Torque
6	0	Wait Jump	500	-1		After 500 ms, execute the next line.
7	0	ABS	45000			Unit: pulse(s)
8	0	Wait Jump	0	-1	11	11(D)=1011(B); Wait for Input3 On
9	0	Change Mode	5			Change control mode: 5:Torque Mode
10	0	TrqRate	-100			CW and 100% motor current
11	0	LmtMaxSpd	333			Unit: 0.01 rps
12	0	Speed Control	0			Torque mode execute.
13	0	ConditionWait	0	-1	233	After reaching TrqRate, execute the next line.
14	0	Wait Jump	500	-1	0	After 500 ms, execute the next line.
15	0	DecStop				
16	0	Wait Jump	0	-1	3	3(D)=0011(B); Wait for Input3 Off
17	0	Change Mode	1			Change control mode: 1:Internal Pulse
18	0	ABS	45000			Unit: pulse(s)
19	0	DecStop				
20	0	Loop	5	8		Go back to No.8, and execute the loop 8 times
21	0	End Section				

Appendix

Closed Loop Gain Adjustment

Please adjust the appropriate gain parameters in the following step :

Step	Description
1	The controller is disconnected to the motor, turn on the controller and start the software.
2	Complete the "motor specification parameter setting".
3	Set "217 Motor Control" to 0 for the open loop mode. Set "258 position error" according to the application. Turn off the controller after saving the parameters.
4	Connect the controller, motor and the encoder, and then turn on the controller.
5	Use the internal pulse mode to perform the JOG test, observe the motor running direction, command position, and actual position, and modify the "201 Motor Direction" parameter to "2" or "3" according to the required motor running direction. After the modification, set "217 Motor Control" to 1, which is closed-loop mode, and then save the parameters and restart the controller .
6	Observe the state of the motor or mechanism, and adjust the rigidity of the motor by the Kp parameter. The larger the Kp parameter value, the stronger the rigidity. When the encoder resolution is higher, the Kp parameter should be adjusted appropriately. Generally speaking, "251 Velocity Loop Kp" and "255 Position Loop Kp" will be adjusted at the same time. It can improve overshoot and vibration problems by tuning Kd value appropriately

If the motor still cannot run appropriately after adjusting above parameters, or the performance cannot achieve the requirements, please consult technical support.