Autonomous Soccer Robot

D.I.Y. Kit

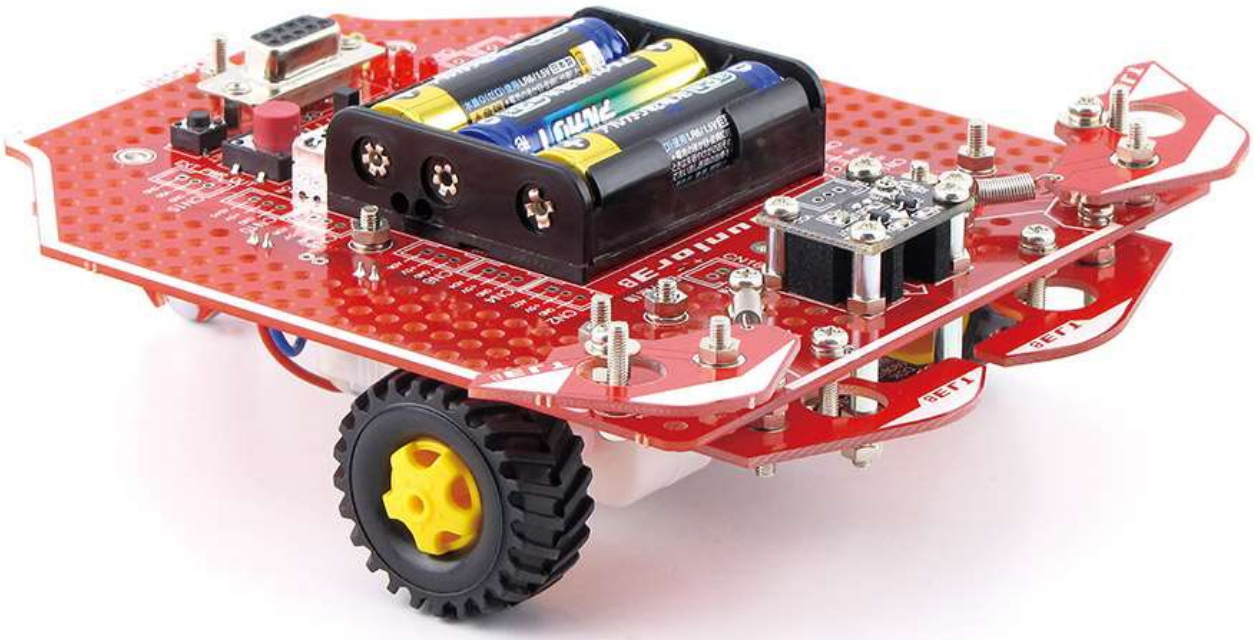
TJ3B

(Top Junior 3B)

Startup Guide:

Programming with C-Style

Ver. 20191208



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1. System Preferences

1-1. Operating Environment

C-Style works on computers with MS Windows XP, 7, 8 or 10 and more than 128 MB RAM. Installation requires about 150 MB hard disk space. 1 USB port is used.

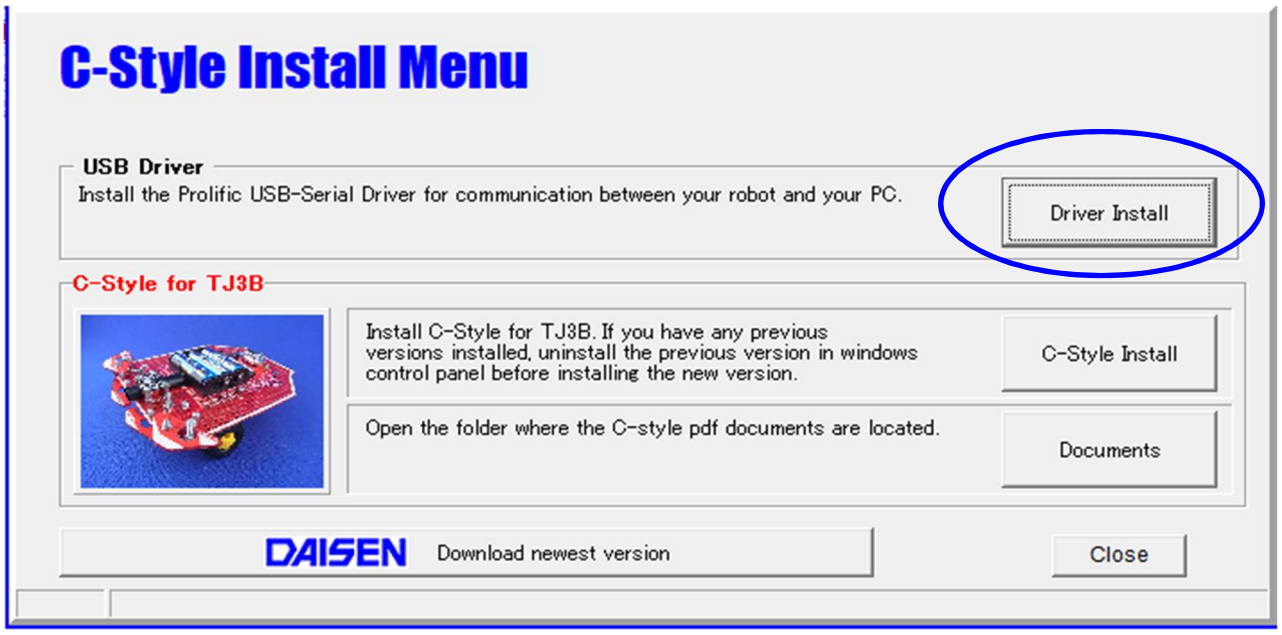
C-Style communicates through the USB to serial transfer cable (the USB to Serial Cable). It is necessary to download the driver and install the USB to Serial cable in advance.

CAUTION ! !
Do not connect the robot and the computer without installing the driver.

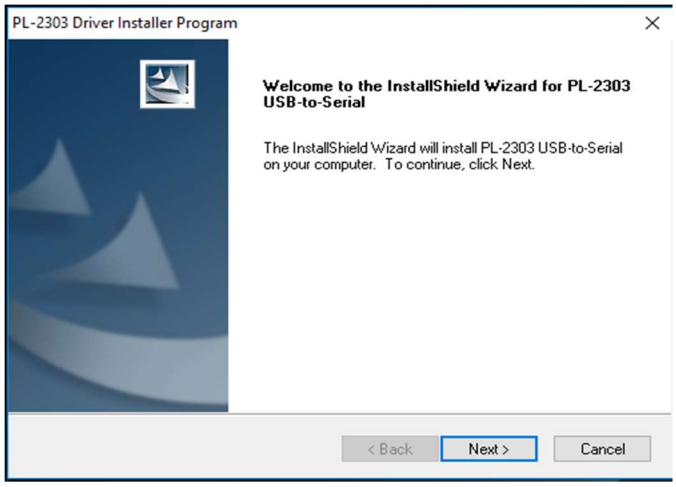
1-2. Install the USB-Serial Transfer Cable Driver

The latest version of C-Style is available from to https://www.robomov.net/download.

Extract "CStyleTJ3B-EN_V190706.zip" (or higher version number) and click "CStyleSetup.exe". First, click the "Driver Install" button on the C-Style Install Menu.



Start installing the USB-Serial Transfer Cable driver

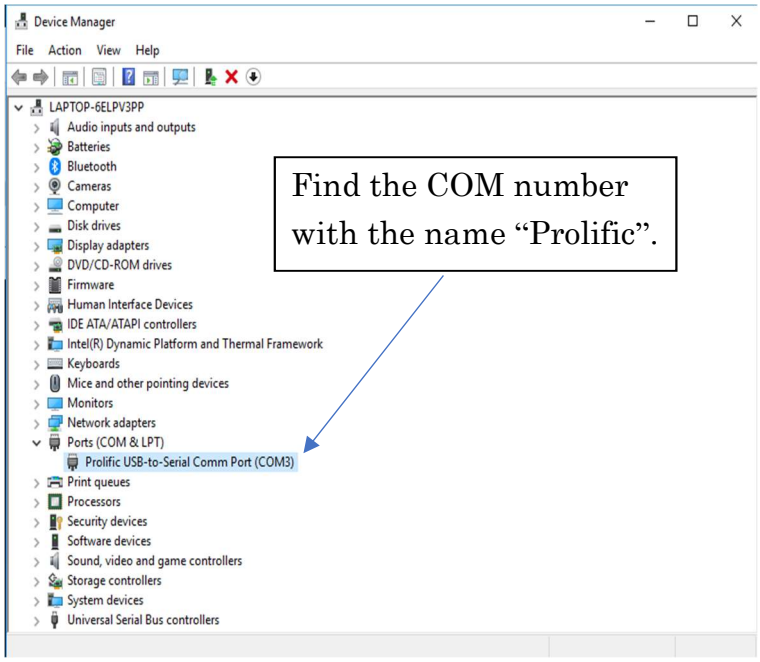


① In the confirmation dialogue, click “Yes” and wait for the Driver Install Shield Wizard to pop up.

② Click “Next” on the welcome screen, and wait for the installation to complete.

③ Click “finish”.

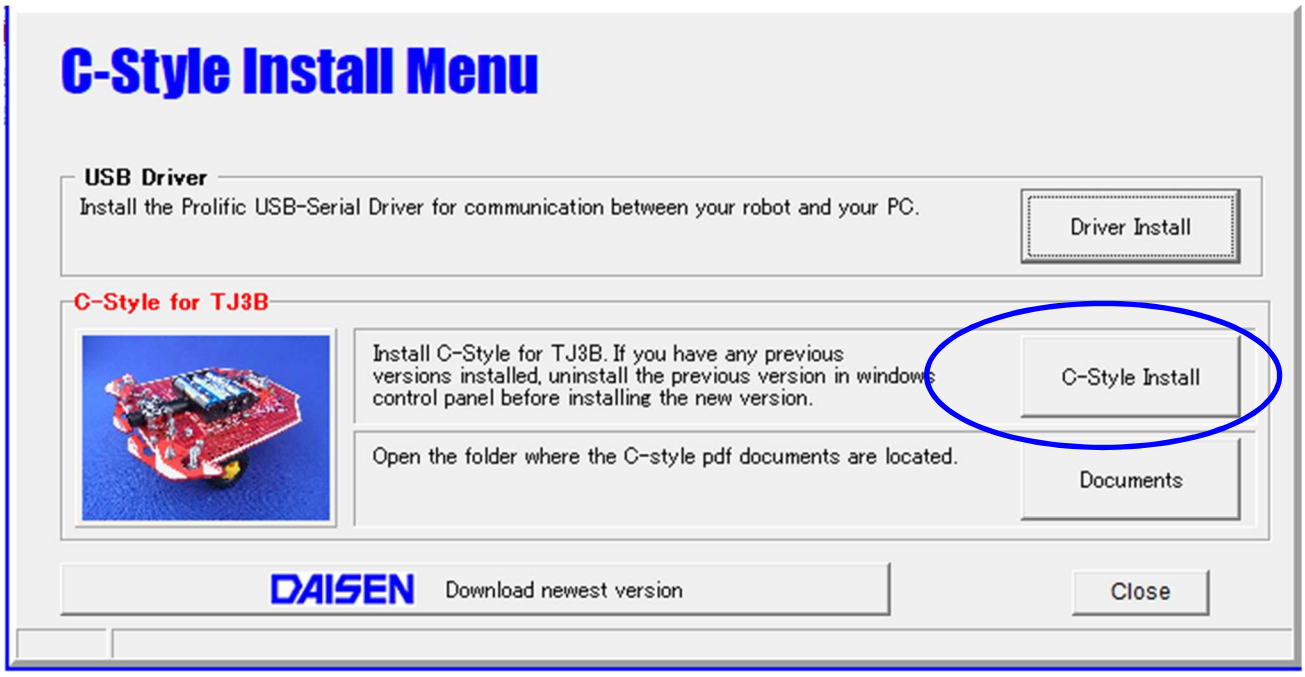
④ Plug the USB to Serial Cable into your computer.



⑤ To find the COM port number for the USB to Serial Cable, go to “Device Manager” in Windows, and click “Ports”. This USB to Serial interface chip is made by Prolific. Write down the corresponding COM port number (in the example shown as (COM3)). The COM port number needs to be set correctly in C-Style, so programs can be downloaded to the robot.

If you can see the Prolific COM port in the Windows Device Manager when the cable is plugged into the USB port, then the driver is correctly installed.

1-3. Install C-Style

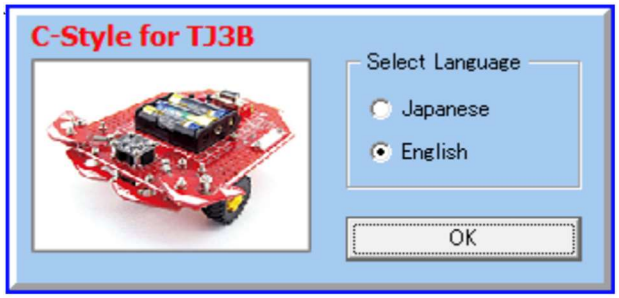


After the USB-Serial transfer cable driver is installed, click “C-Style Install”.
Then, click “Next” and follow the install shield wizard to complete.
Click “Close” to finish the installation process.

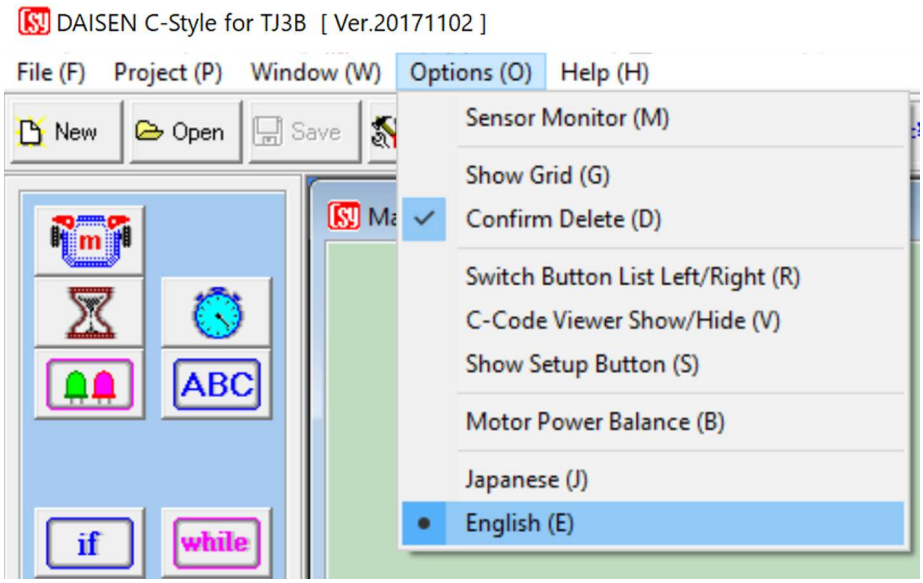
The “Documents” button opens a folder with assembly instructions and other PDF files in Japanese. **For English documents and the latest version of C-Style to download, please go to www.robomov.net**

1-4. Language Setting

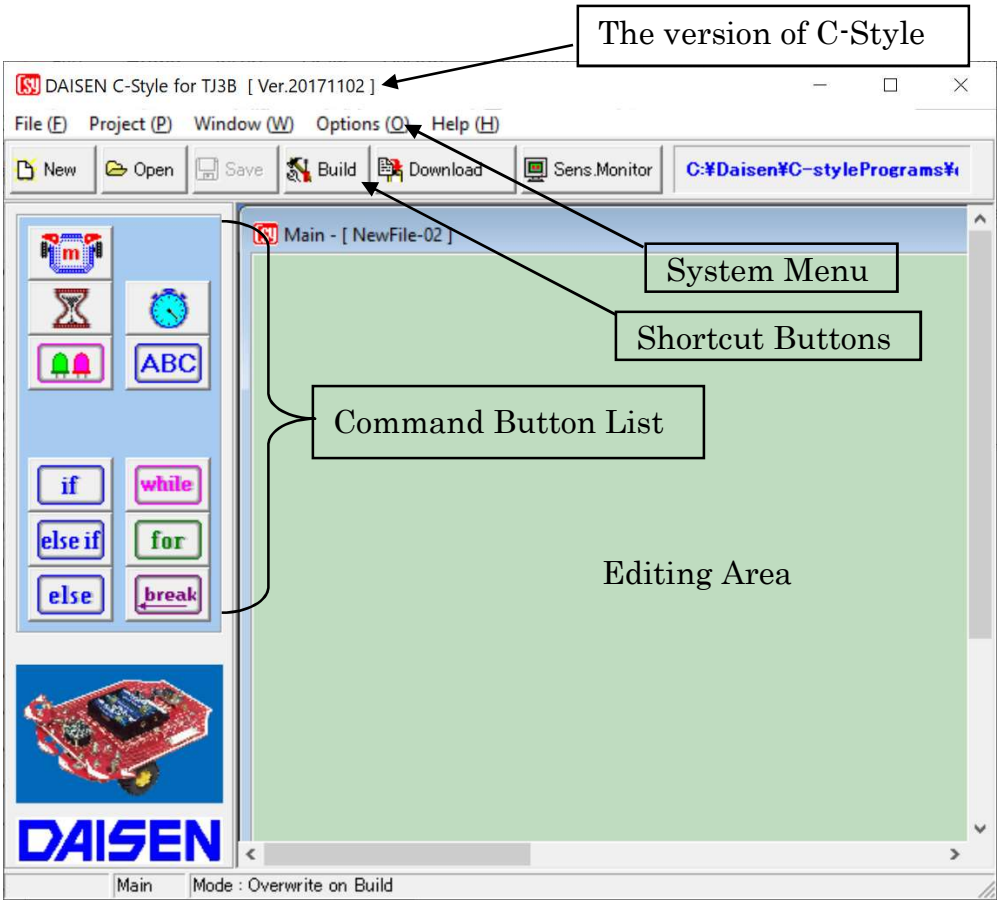
The first time you start C-Style, the language selection window pops up.
Click the language you prefer and press “OK”. C-Style will start.



You can also change the language later:
Click “Option” in the system menu and select either Japanese or English.



1-5. Startup Window



■System Menu

"File (F)" lets you open, save, print C-Style programs, or exit C-Style.
"Project (P)" lets you build, download, regulate communication between the robot, and set the build path settings.
When there are multiple sub programs, "Window (W)" lets you set how they are displayed.
The "Option (O)" menu is very important for advanced users. It lets you monitor sensors, add advanced command buttons and robot functions.
"Help (H)" shows information about the current version of C-Style, and the firmware version. It also has a link to the latest C-Style download page (Japanese). For English information, go to www.robomov.net.

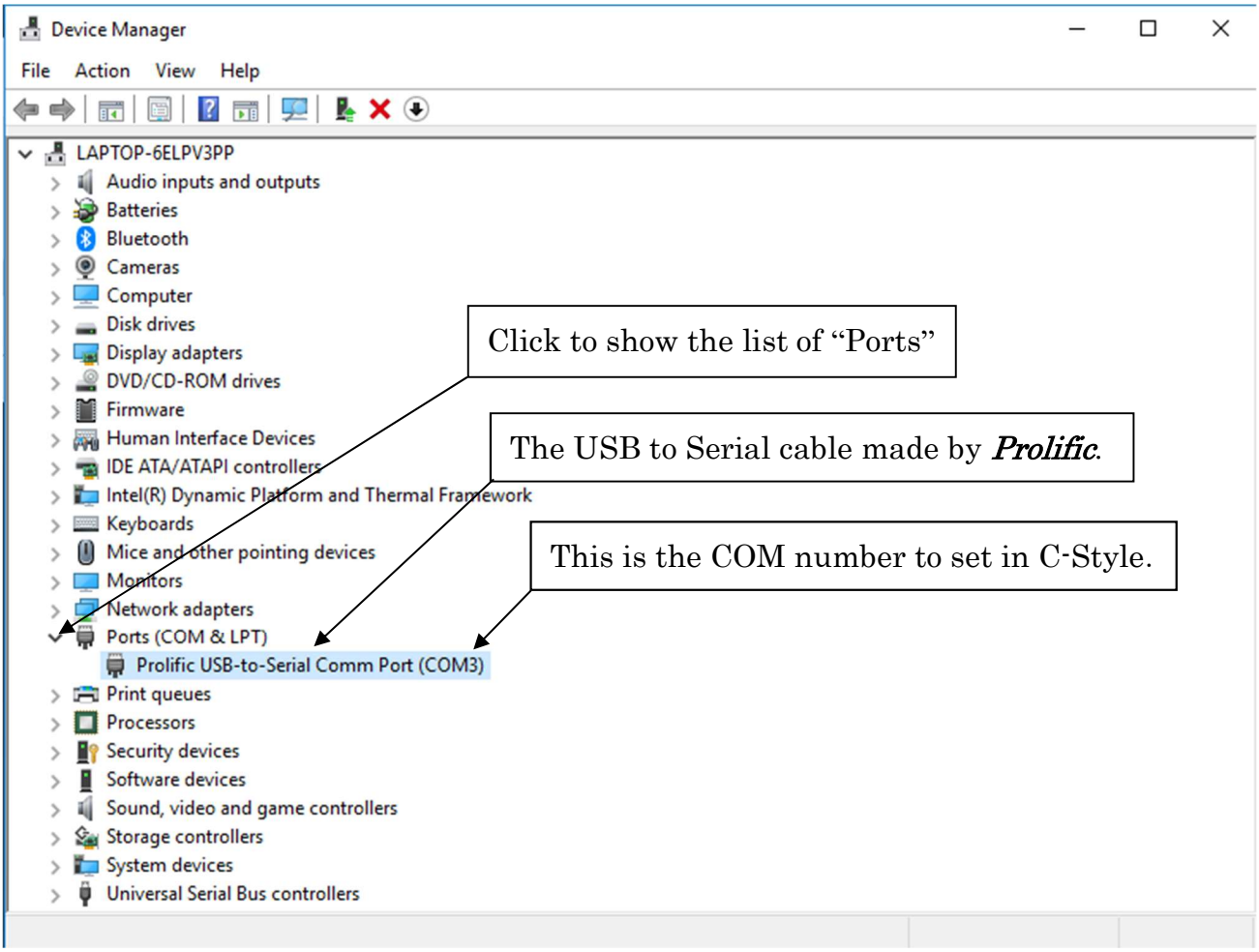
■Shortcut Buttons

The most commonly used functions can also be executed through the shortcut buttons. It is the same as executing the actions from the System Menu.

1-6. Communication Settings

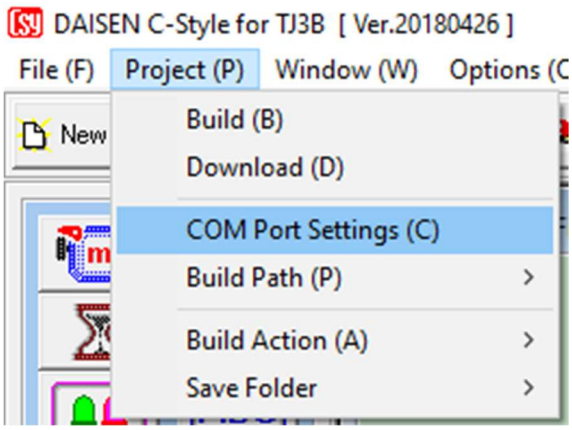
Usually, the communication setting is correctly set by the program. Skip this section.
This communication setting should be adjusted when the computer fails to communicate with the robot, such as failing to download.

① Before configuring the settings, plug the USB to Serial cable into the robot and turn it on.
② Go to "Device Manager" in Windows and click "Ports (COM & LPT)"



③ As shown above, find "Prolific USB-to-Serial Comm Port (COMxx)". The COM Port could have different numbers.

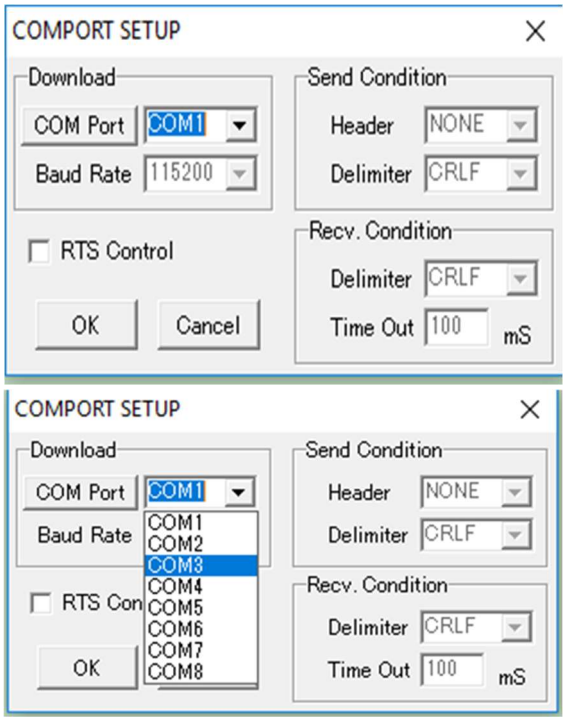
④ In C-Style, select “Project” in the System Menu and click “COM Port Settings (C)”



⑤ When the COMPORT SETUP dialog appears, click the pulldown menu and select the COM port number determined in step 3 above.

In order to select COM9 ~ COM99, click the “COM Port” button to enter the COM number

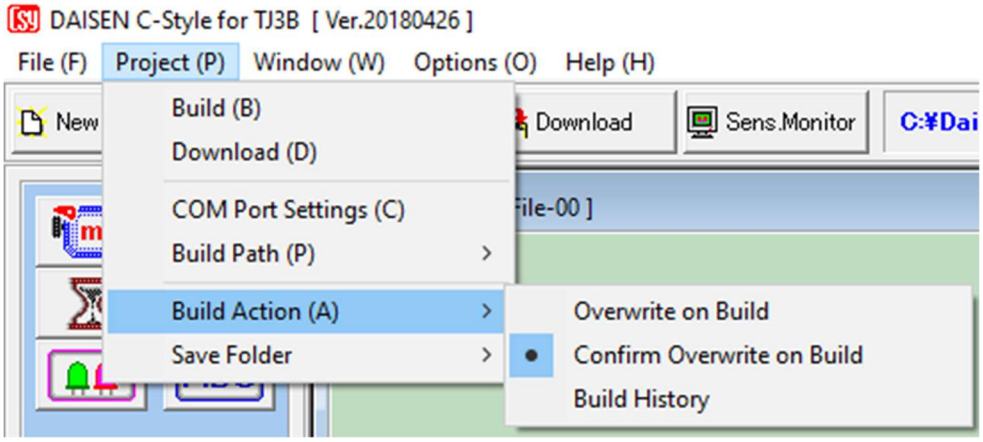
⑥ Click “OK” to finish.
The setting is saved, so you do not need to do this step every time you use the robot.



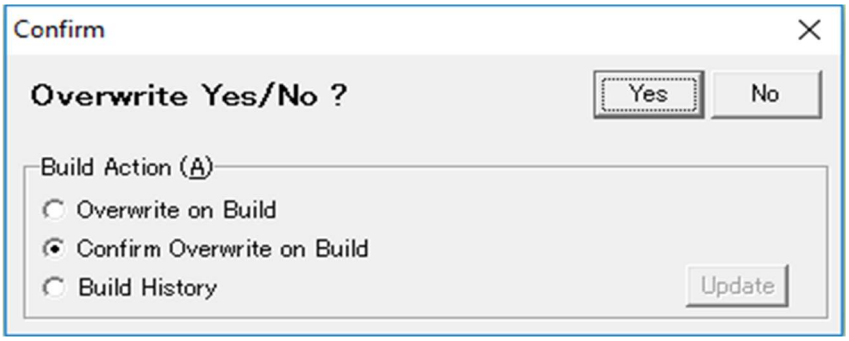
Setting the COM port number in C-Style

1-7. Building your Machine Code Program for the Robot

When “Build (B)” is clicked without saving the program, a confirmation message will pop up how to save your program. There are 3 options. Click “Project (P)” and “Build Action (A)” to show them.



The default setting for saving is “Confirm Overwrite on Build”. Therefore, the following confirmation dialogue pops up when you select “Build (B)”



Click “Yes” on the confirmation dialogue. Your new C-Style program will overwrite and replace the previous version, and the dialogue moves on to the “Build (B)” screen. When “No” is selected, it does not move on to the “Build (B)” screen.
In case you do not want to overwrite your program, select “Build History”. This mode will save your program with date, time and build number every time you click “Build”.

2. Check your Robot

2-1. Check Motors and Sensors.

An operation check program is in the robot as a default program. Therefore, you can check the robot's movement.

① Check the direction of the batteries and Turn on the robot.

② Check that the green LED is blinking and press the red Start button. If it does not blink, make sure once again that the direction of the batteries is correct and that the robot is assembled correctly.

③ The operation check program is "***forward***", "***back***", "***left turn***", "***right turn***", "***counterclockwise arc***", "***clockwise arc***" and "***stop***". If the robot does not move in this order, try to change the motor connector between FRONT DRIVA and REAR DRIVE. If the robot still does not move correctly, replace the batteries and check if the robot was assembled correctly.

④ After the robot stops, the LED lights GRN、RED1、RED2、RED3 are programmed for a sensor check as follows:
LED GRN turns on when the ball sensor is >30%. (Ball sensor means the infrared light sensor)
LED RED1 turns on when the line sensor is >30% （Line sensor means the red light reflection sensor）
LED RED2 turns on when the left touch sensor is >50%.
LED RED3 turns on when the right touch sensor is >50%.
LED RED2 and RED3 turns on at the same time when the center touch sensors are >50%.

⑤ Pressing the red Start button to repeat from ②.

2-2. How to Run the Operation Check Program.

Initially, the operation check program can be activated with the robot's red Start button, as it is saved in the user program area. Once another program is downloaded to the robot, it overwrites the user program area. However, the operation check program can still be run as follows:

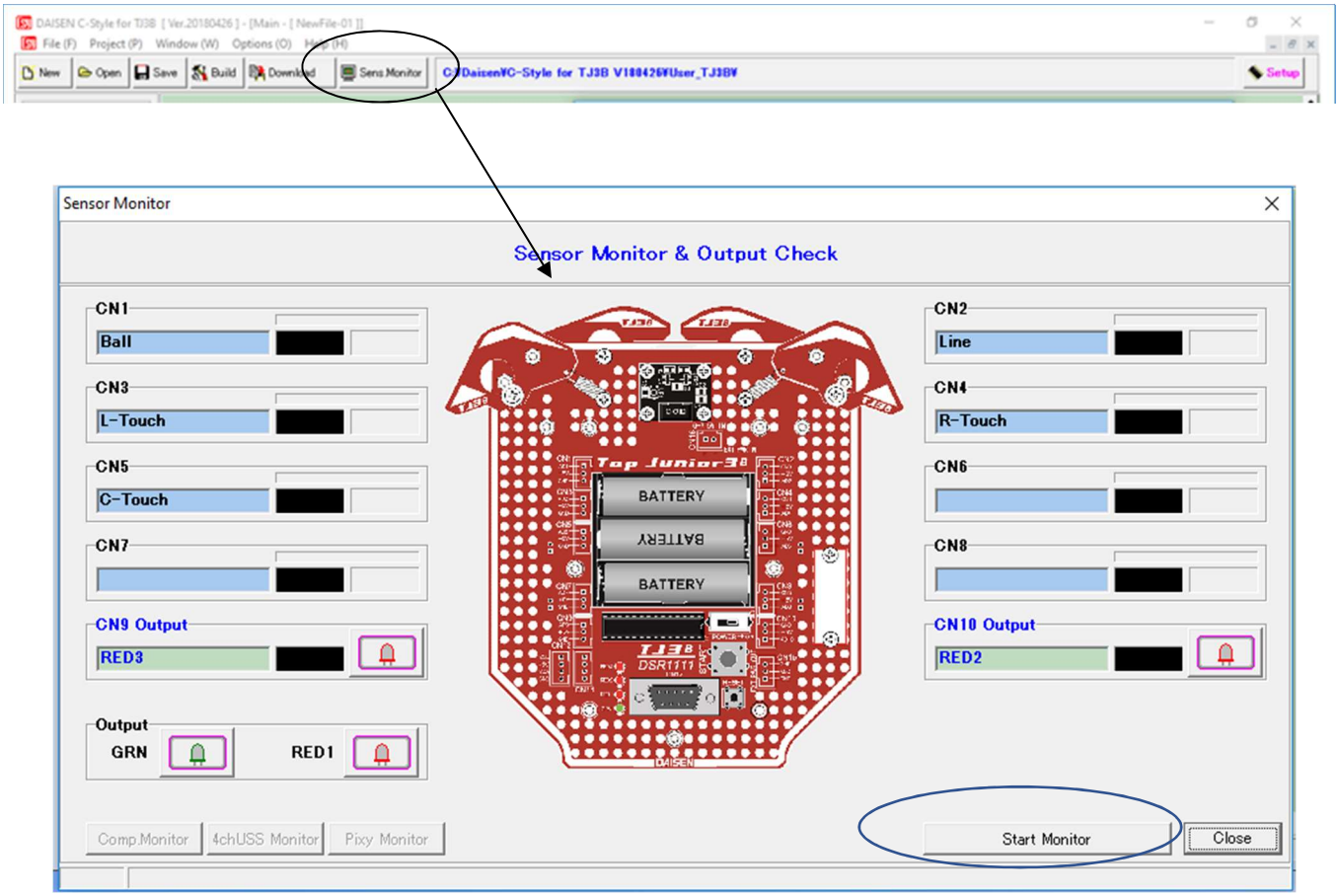
① While pressing the red Start button, turn on the black Power switch
② Keep pressing the red Start button for more than 2 seconds
③ When the green LED blinks quickly, release the start button. Now the sensor program is working, and the sensors can be checked using the LEDs (Section 2-1 ④)
④ Upon pressing the red Start button, the robot moves forward, back, left turn, right turn, anticlockwise turn, clockwise turn and stop, then returns to the sensor check program.
⑤ To exit the check program and return to the custom program downloaded previously, press the reset button or flip the Power switch off and on. Note that the green LED now blinks slowly.

If your program does not work as expected, run the operation check as above. If the robot works correctly under the operation check program, there might be something wrong with your custom program.

2-3. Sensor Monitor

In this section, you learn to check whether each sensor on your robot is working correctly.

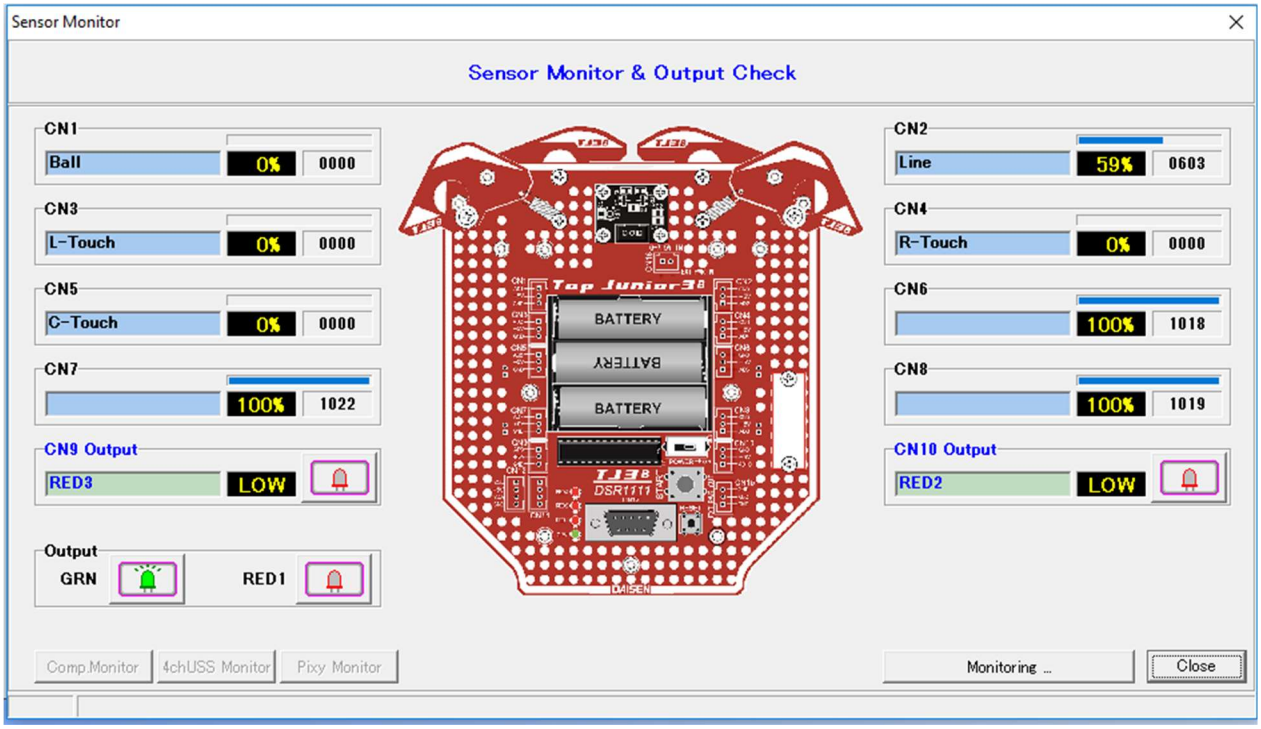
① Plug the USB to Serial cable to the robot and turn on the robot. (Do not press the red Start button.)
② In C-Style, click the “Sens. Monitor” button.



The sensor monitor above is not yet receiving sensor signals from the robot.

③ Click “Start Monitor”, and the signals received from the robot’s sensors are displayed in real time.

Secret tip for advanced programmers: You can display the raw data stream from the robot by double-clicking on the title field, “Sensor Monitor & Output Check”



If assembled according to the instructions, CN1 (Ball), CN2 (Line), CN3 (L-Touch), CN4 (R-Touch), CN5 (C-Touch) have meaningful values. CN6～CN8 are for additional sensors. Numbers shown for unconnected sensors are not meaningful. CN9 and CN10 are connected to LEDs RED2 RED3.

The ball sensor shows the strength of the pulsed infrared signal emitted by the Robocup Junior infrared ball.
The line sensor measures the reflectivity of the surface under the robot.
The touch sensors show 100% when engaged (touching something), and 0% when not engaged.

Make sure the readings of each sensor are responsive. Otherwise, check the assembly and all electrical contacts once again.
Write the name of any additional sensors in the blue field.

The sensor readings in the picture above are shown in two formats, in % (yellow font) and as raw 10-bit A/D Converter values (black font, 0～1023).
When a sensor value is assigned to a variable, the raw value is used. Therefore, about ten times the % value will be assigned to the variable. The exact calculation is as follows: When you assig a sensor value of 30% to a variable, given 1023 x 30 / 100 = 306.9, the variable will actually be assigned the number 306 or 307.

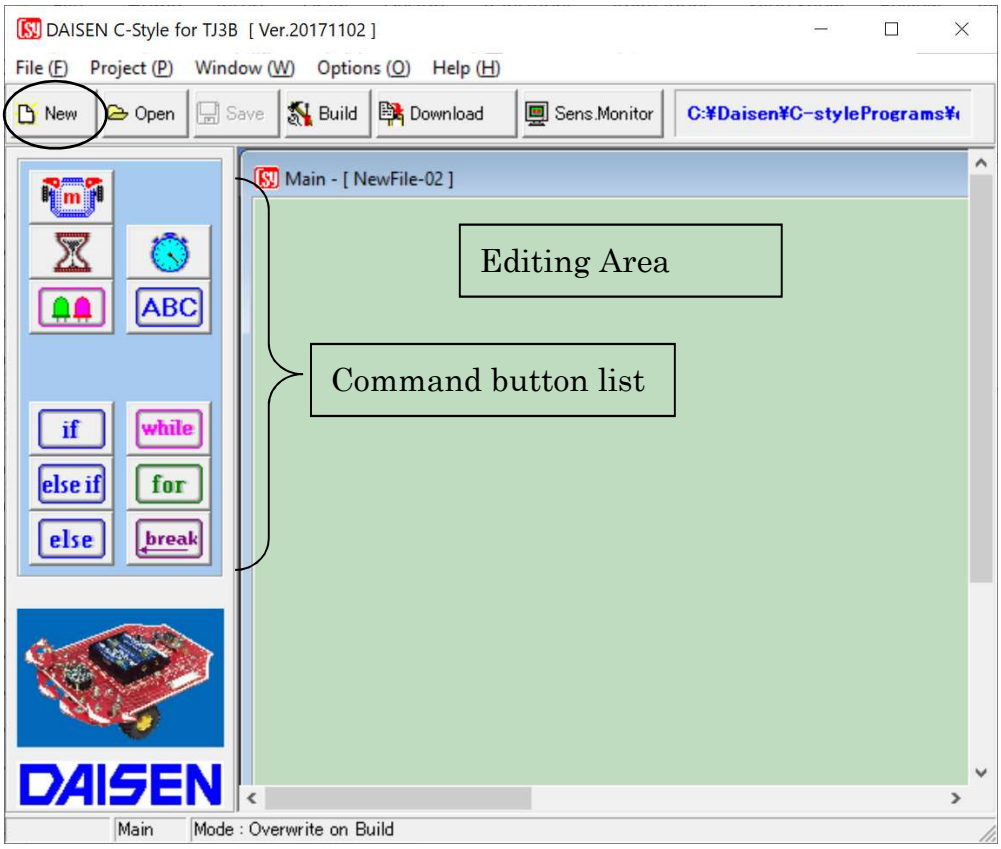
3. Let's Program the Robot!

Five steps are needed to program your robot:

(1) Edit the program; (2) save the program; (3) build; (4) download (5) run the robot

Let's make a simple C-Style program: Move forward for 1 second and stop.

3-1. Getting Ready



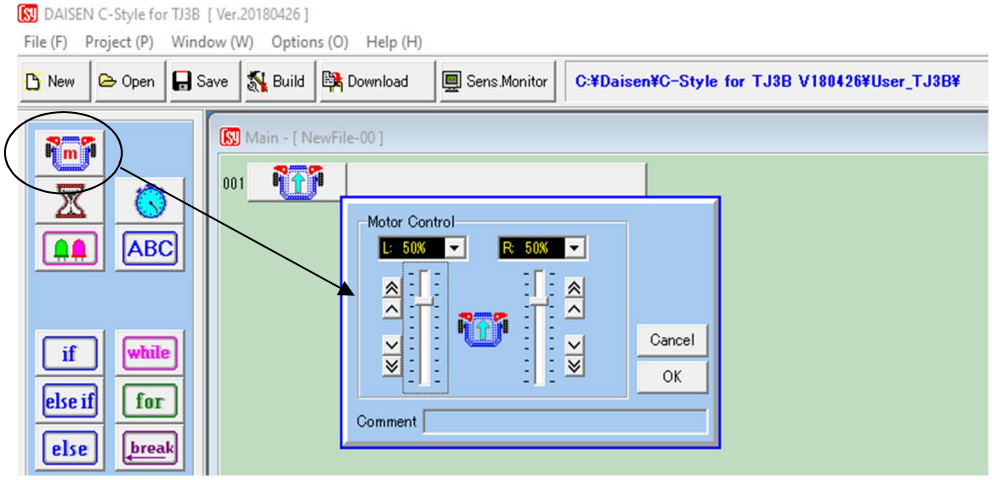
Click "New" to start a new program.

Click the command button you wish to use in the command button list, then move the mouse pointer to the Editing Area and click again.
C-Style does not use drag and drop, most operations are done with a single click.

3-2. Programming your Robot

■ Edit the program

A. Place the motor button.

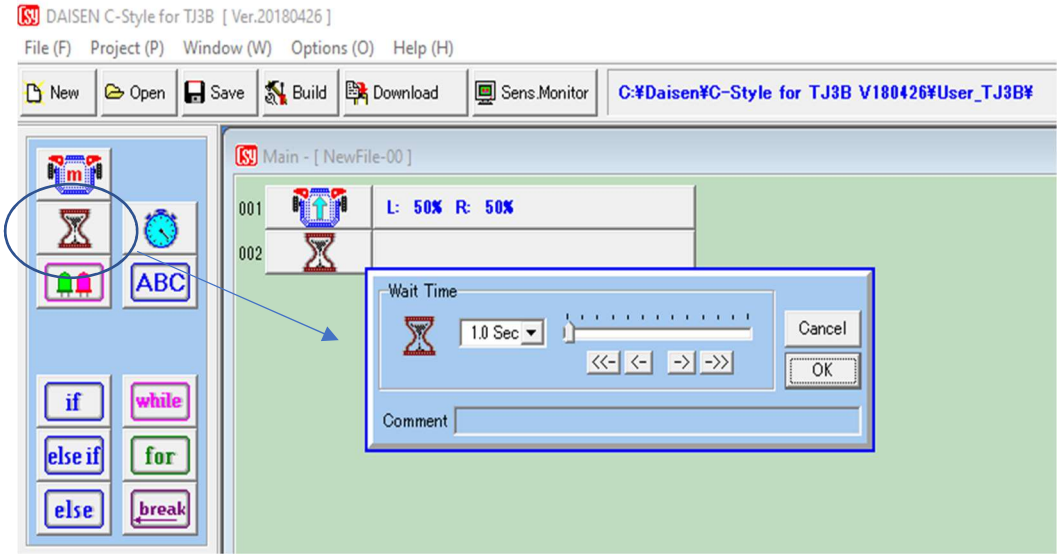


① Click  in the command button list. This command controls the motors' speed.

② Click again in the Editing Area to place the command button in the first line. The motor speed setting window pops up.

③ Click "OK" to accept the motors' setting to move forward at 50% speed.

B. Place the "Wait Time" button.

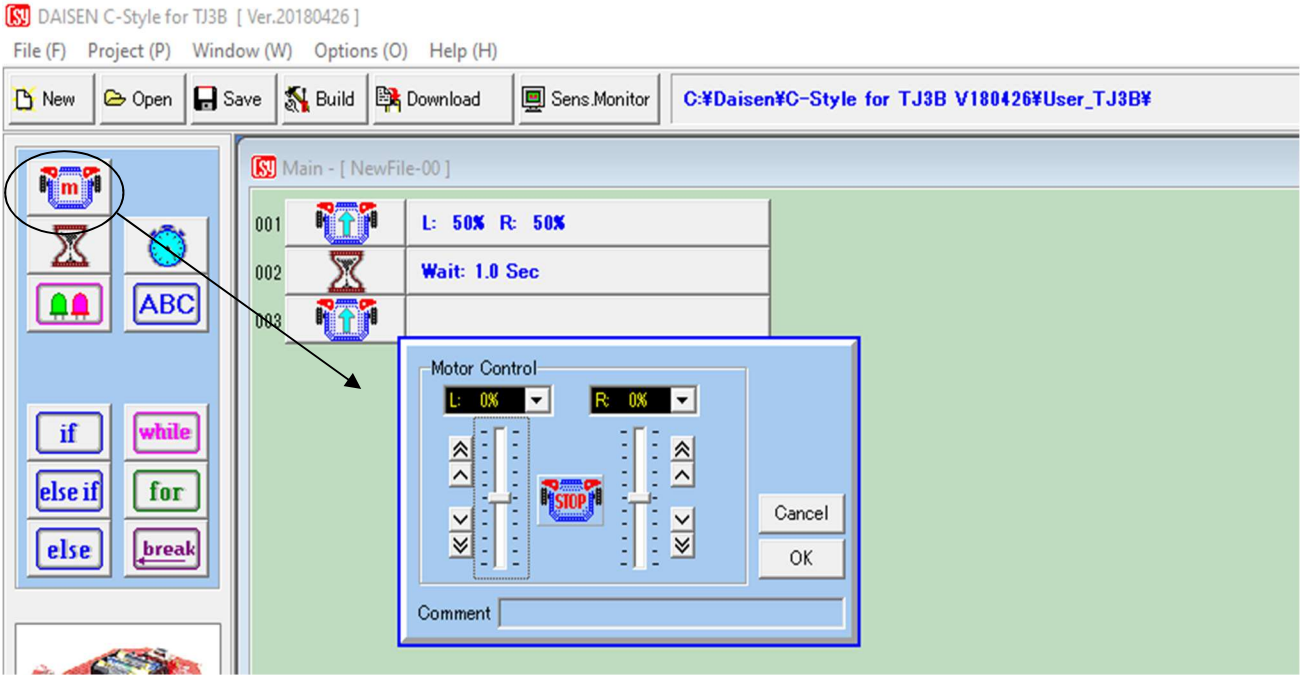


① Select  in the command button list. This command is called "Wait Time" and causes the program to wait before processing the next command (the motors will keep moving)

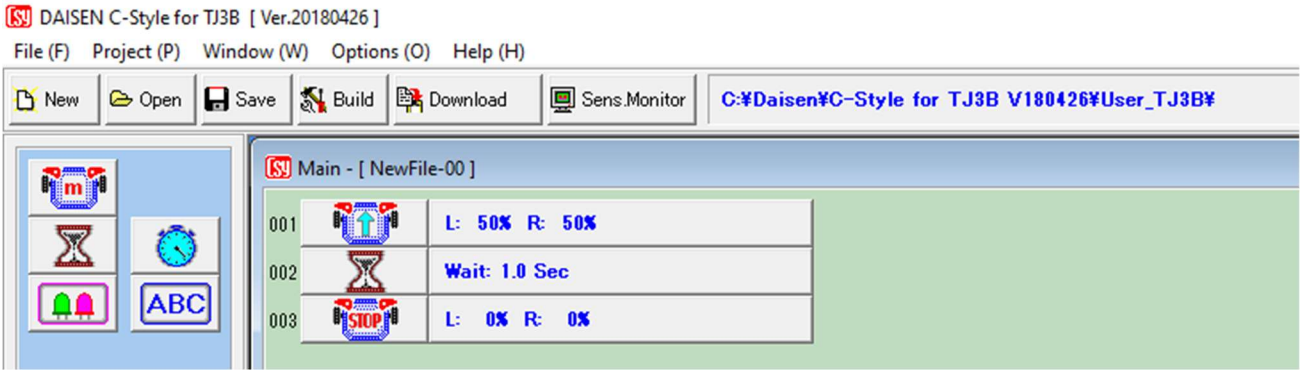
② Click in the Editing Area below the program.

③ The Wait Time setting window pops up.
④ Click “OK” to accept 1 second, which is already shown.

C. Place the Motor Stop Button



① Click  once again in the command button list.
② Click again in the Editing Area to place the motor button in the third line.
③ In the motor speed setting window, click the icon repeatedly until it becomes  and then Click “OK”.

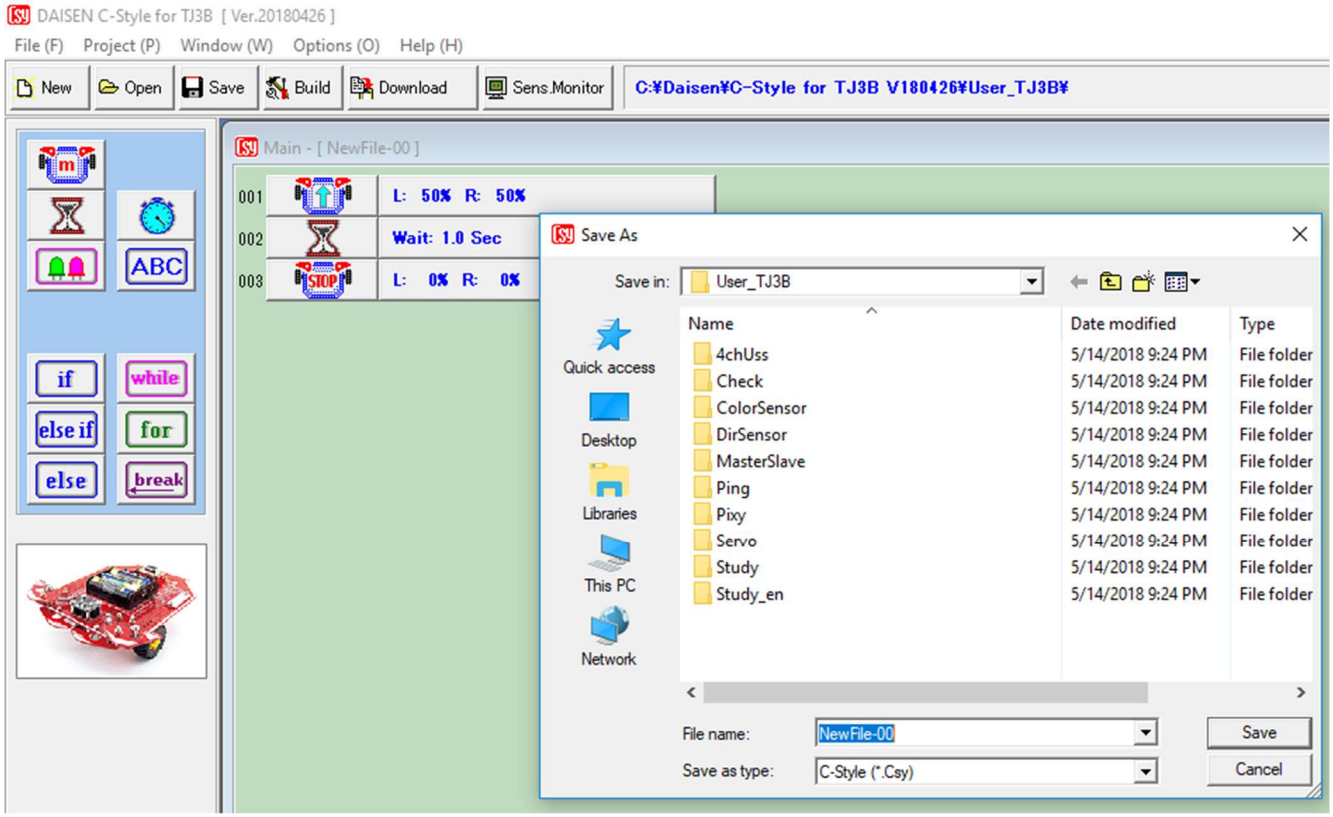


Sample program to move the robot forward for 1 second and stop.

This completes our program to move the robot forward for one second.
The next step is to “Build” the completed program. Since this program was newly made, C-Style will ask you to save your program first when the Build button is pressed. In the save

dialogue, write the name and set the path to save your program. After saving, C-Style will Build and Download your program automatically. (If you pressed “Save” and saved your program, Build and Download will not run automatically, so you need to click and do so.

■ Save the program



① Click “Save” to show a dialog to enter the file name and location of your program. With a new program, this screen also pops up when the Build button was clicked.

② You can save the program to your favorite place. This picture shows that the program is saved in the folder “User_TJ3B” in C-Style folder. Note that in this folder ”User_TJ3B”, there are several sample programs. Especially, in the folder ”Study”, there are many basic programs

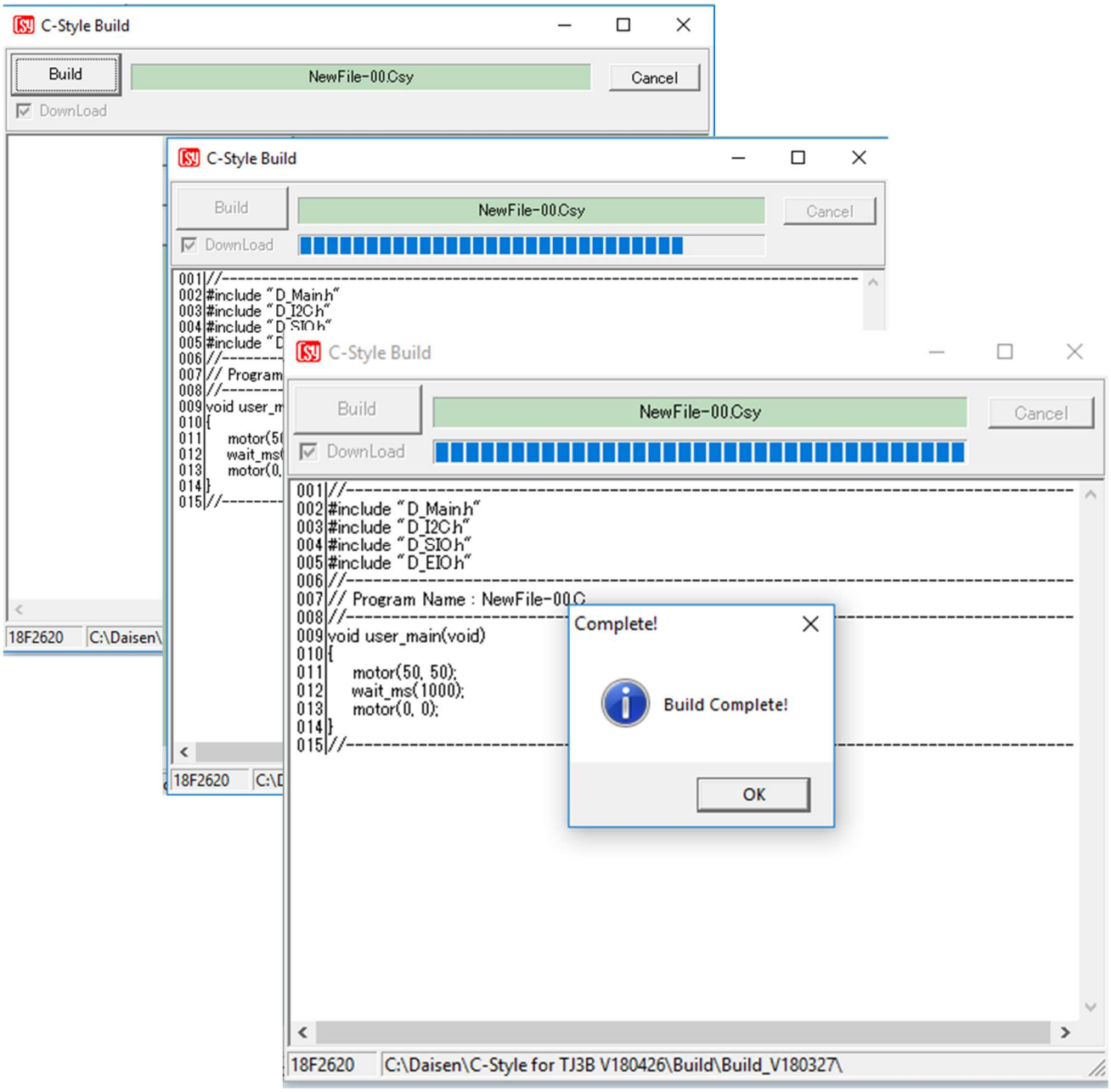
③ Symbols “/”, “&”, “%” etc. cannot be used in a file name.

④ If there is a file with the same name, a confirmation dialog pops up whether to overwrite it or not, when the save button was pressed. Click “Yes” to overwrite it, or “No” to go back to change the file name.

⑤ “NewFile-00.Csy” will be automatically set as the file name. We recommend that you give a meaningful name to important program files you make.

■ Build the program

Press “Build” to show Build window.



① “Building” your program will translate the code from C-Style into C code and then into the machine language (hex code) which the robot can understand.

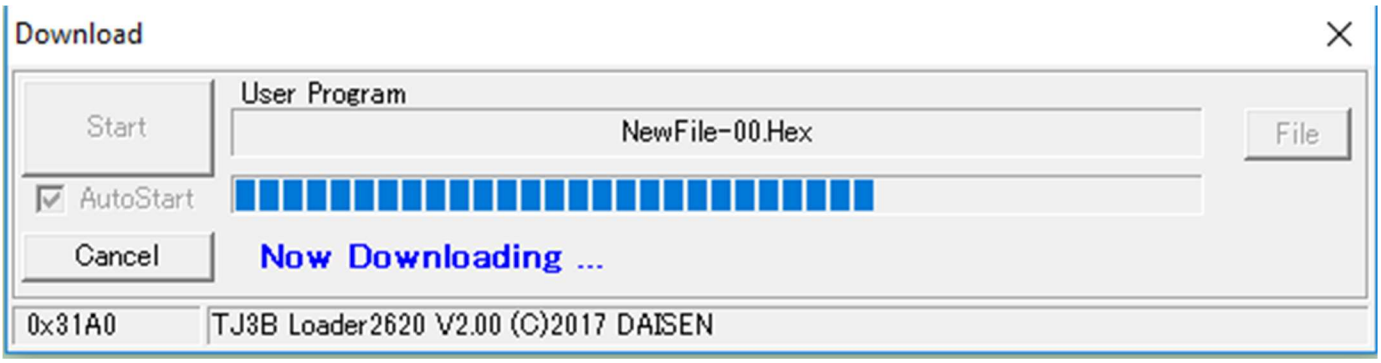
② When “Build” is completed, connect the USB to Serial cable to the robot and turn it on. Then click “OK”.

■ Download the program

Next, we need to send machine code to the robot's memory.
Click "OK" in the "Build Complete" window and the "Download" window appears.

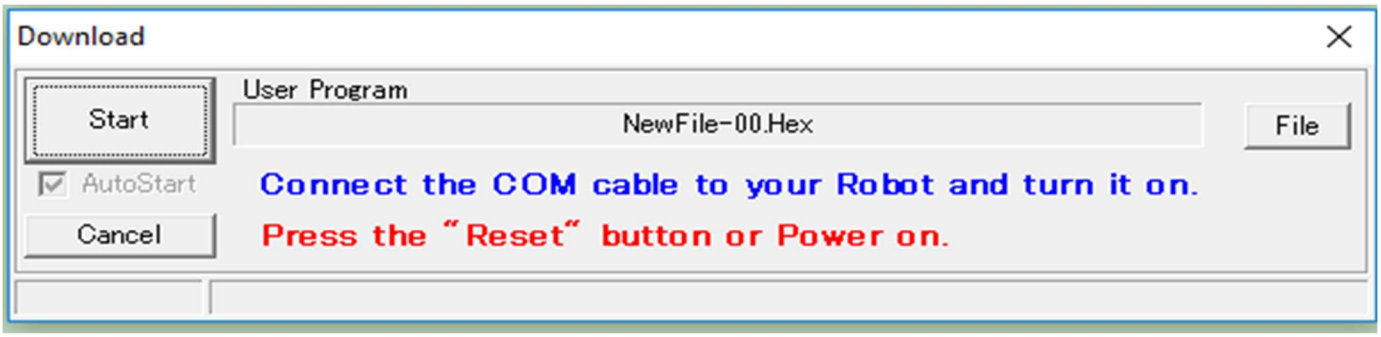
Click "Start" in the Download window.

Downloading starts. On the robot, the LEDs should blink rapidly.



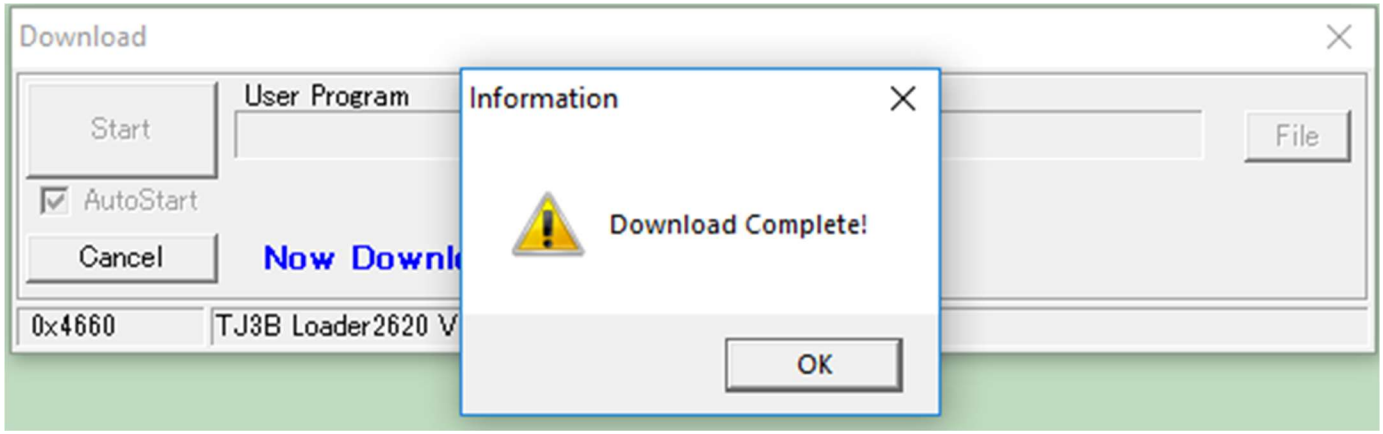
Do not touch the cable or the robot while downloading, any poor contact could cause failure of the file transfer.

If the cable is not connected at this point, or the robot is not turned on, the following message pops up.



If the cable is connected and the COM port number is correctly set, downloading starts. If downloading does not start, please go back to step “Build” with the cable connected and the robot turned on.

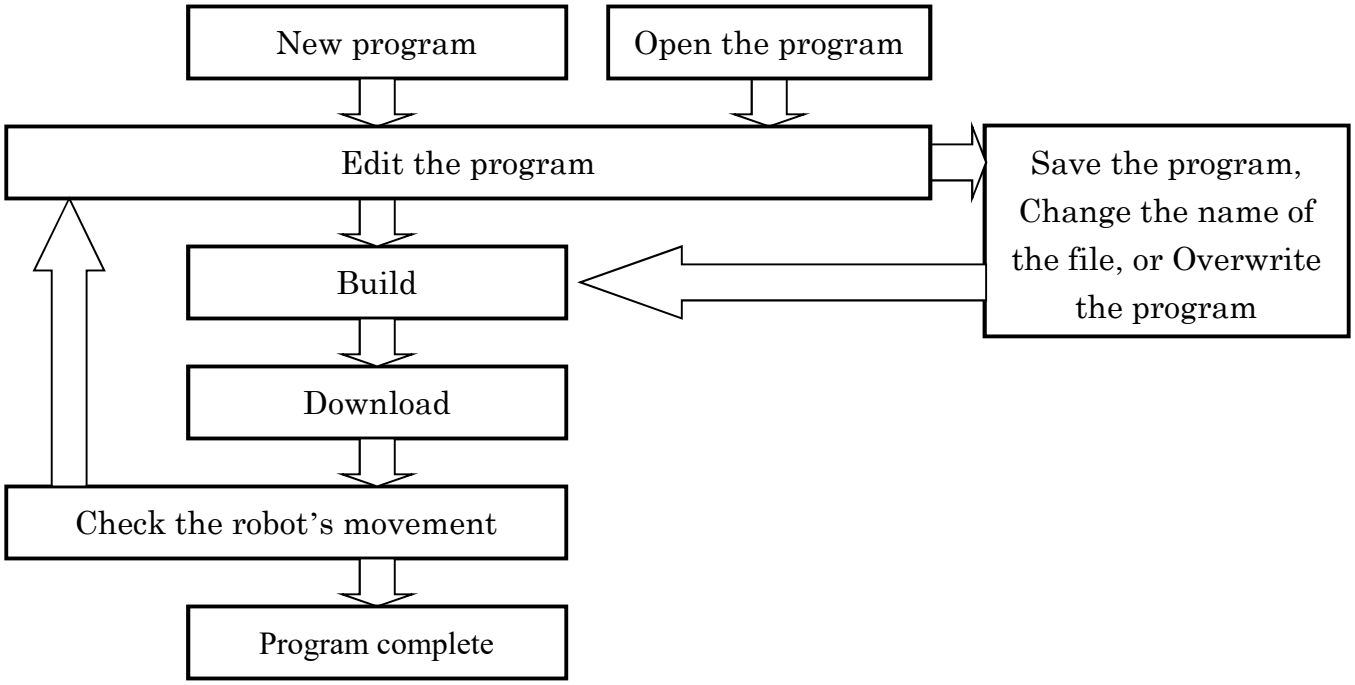
■ **Run the Robot**



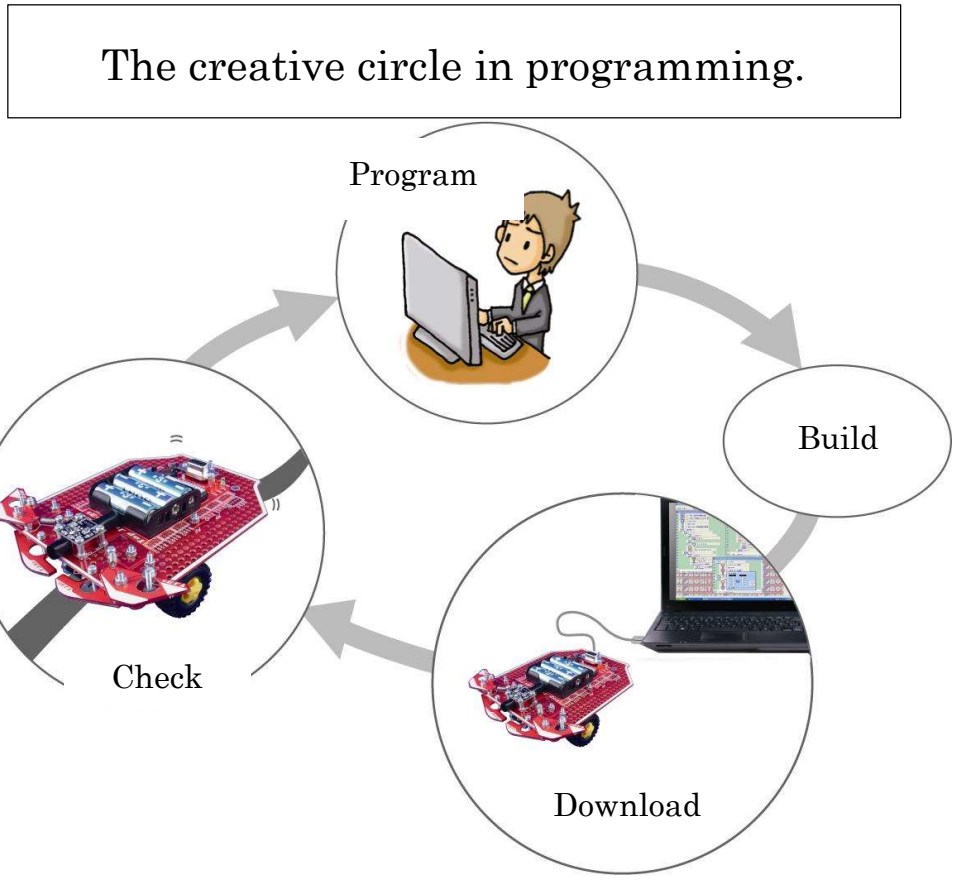
① Click “OK” when the dialog “Download complete” pops up. Unplug the cable.
② To start the robot, check if the robot’s green LED is blinking. If so, press the red “Start” button.
The robot starts to move as instructed by your program.
③ After the program ends, press the “Start” button again to run the program again.

Only one user program can be saved by the robot. Downloading a new program overwrites the old one.

3-3. Summary of Operation

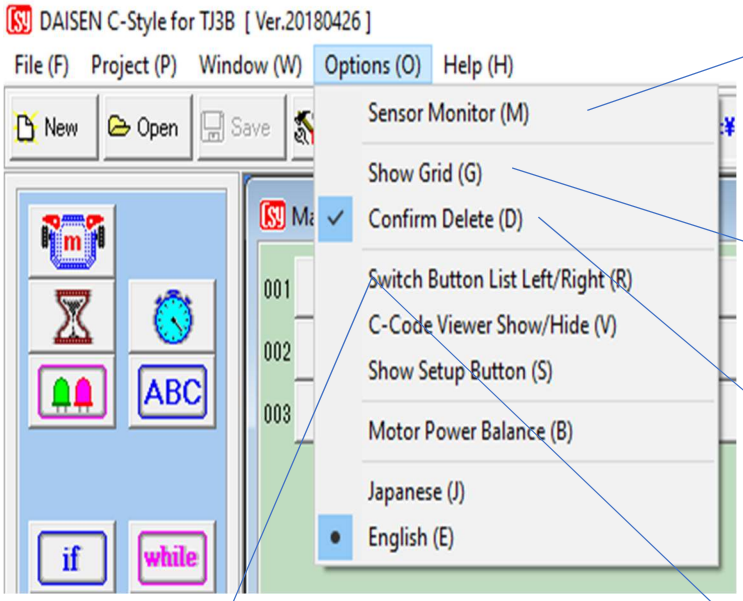


Step by Step. design and test your program. It is important to improve your program repeatedly. Good Luck!



4. Option Menu

The “Option” dropdown in the System Menu Bar provides several helpful functions.

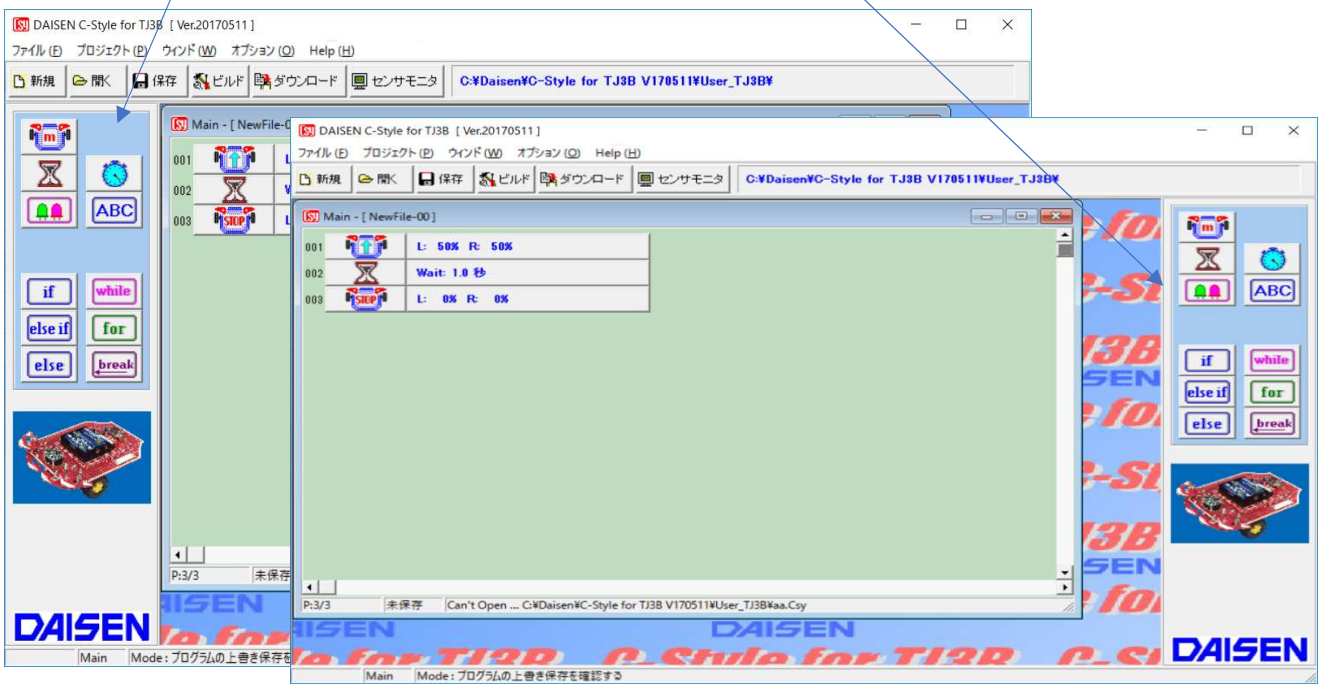


“Sensor Monitor” function is the same as “Sensor Monitor” button in the speed button list (Section 2.3)

“Show Grid” displays vertical dotted line in the Editing Area to make it easier to program.

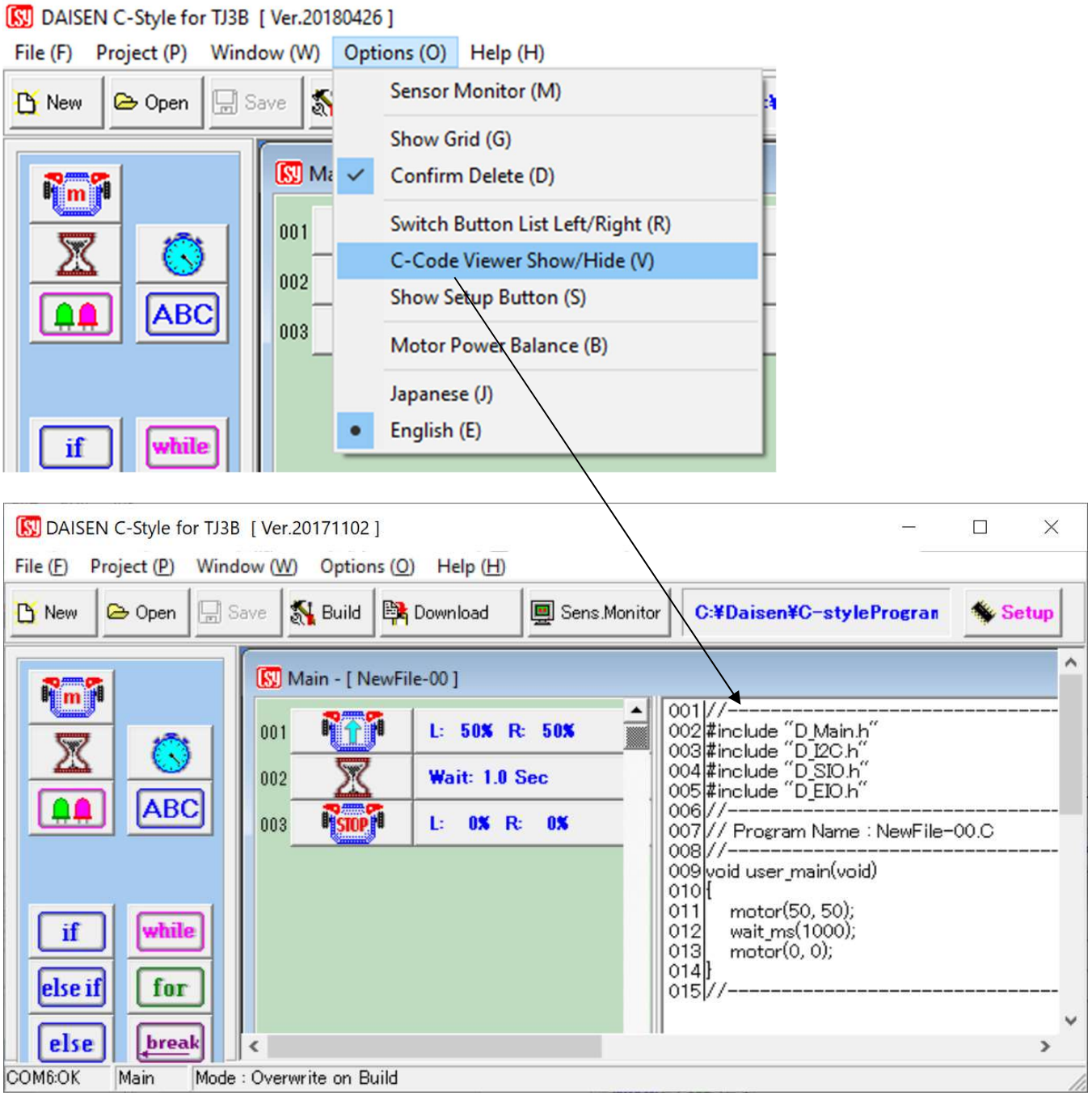
“Confirm delete” displays a warning message before a command button is deleted.

You can display the program buttons on the right:



4-2. Show/Hide C-Code

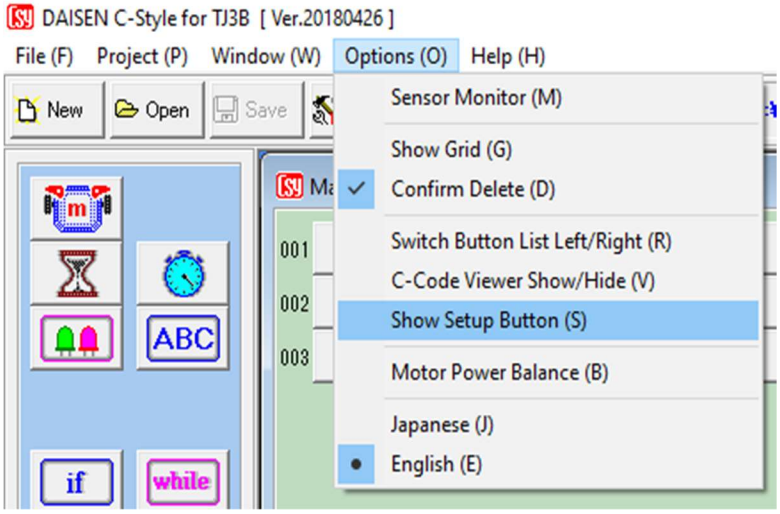
You can display C-Code on the right side while editing your C-Style program.



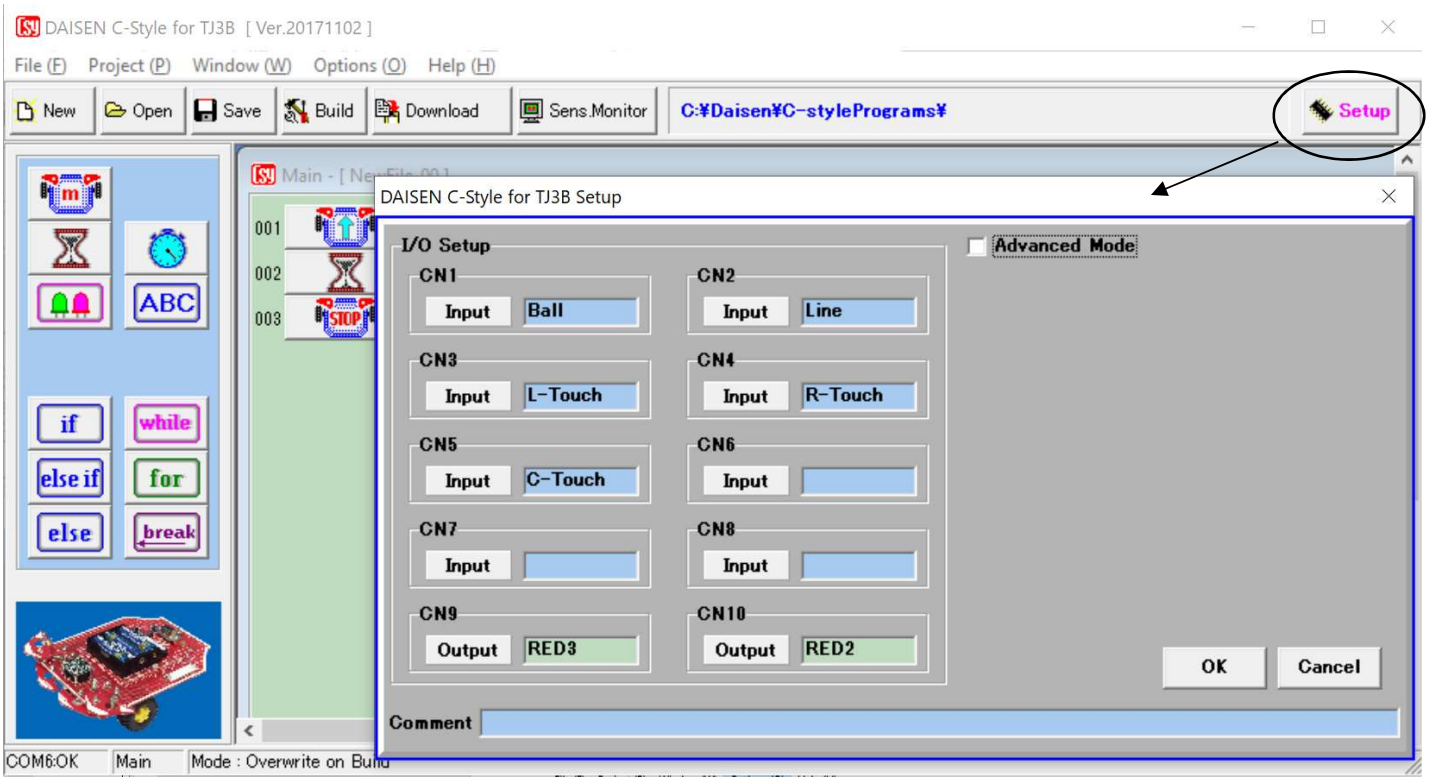
The C-Code on the right side in the C-Style screen cannot be edited. It shows the real-time transcription of the C-Style program you are editing. To edit C-Code directly, please refer to the booklet “C-Code Operation Guide”.

4-2. Show the Setup Button

"Show Setup Button" gives advanced programmers access to the Setup screen for optional parts and in/output of the robot.



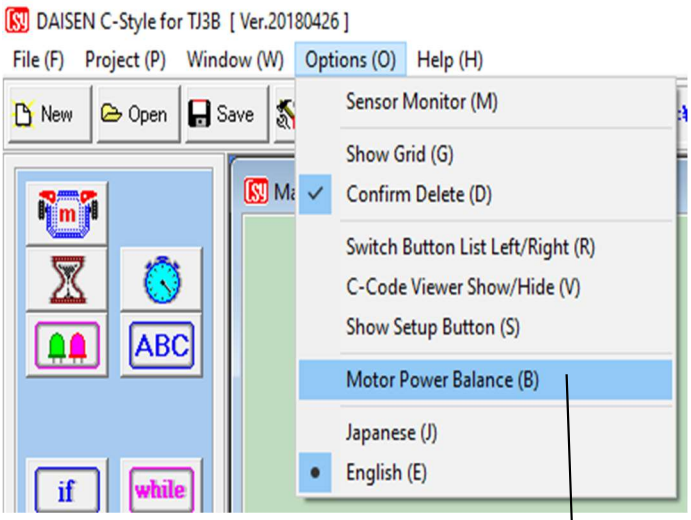
If the "Setup" button is not shown, select "Show Setup Button Setup (S)" under "Option (O)". The TJ3B Setup window will pop up, and can be accessed through the "Setup" button on the right side above on the screen.



Please refer to the booklet "C-Style Operation Guide" for how to operate "Setup". When you save your C-Style program, the "Setup" button show/hide setting is also saved.

4-4. Motor Power Balance

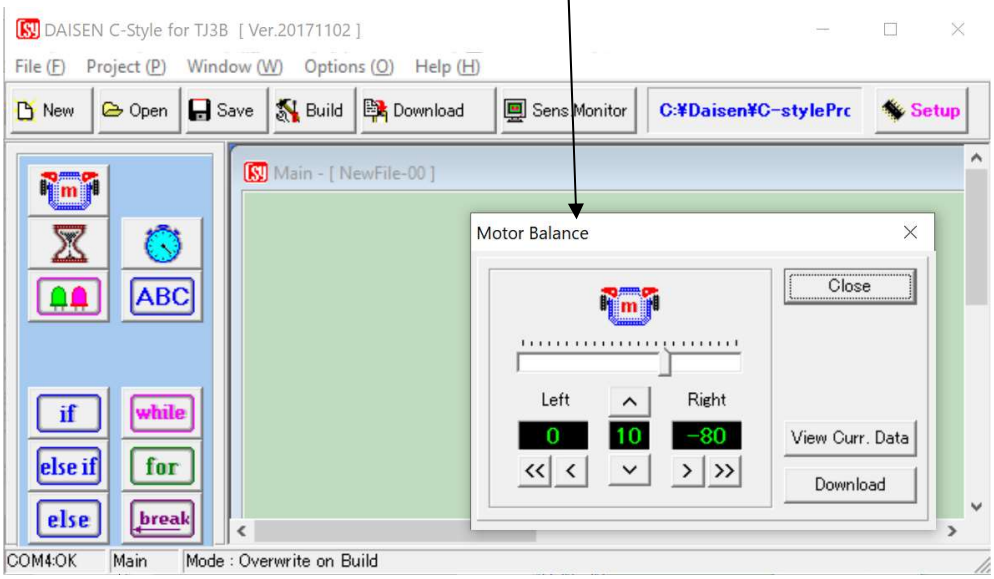
You can calibrate the output of motors (optional).
Motor power balance requires C-Style version V170511 or newer.



① Plug the USB to Serial Transfer Cable into the robot and turn it on.

② Select “Motor Power Balance” in “Options (O)”. The “Motor Balance” dialogue pops up.

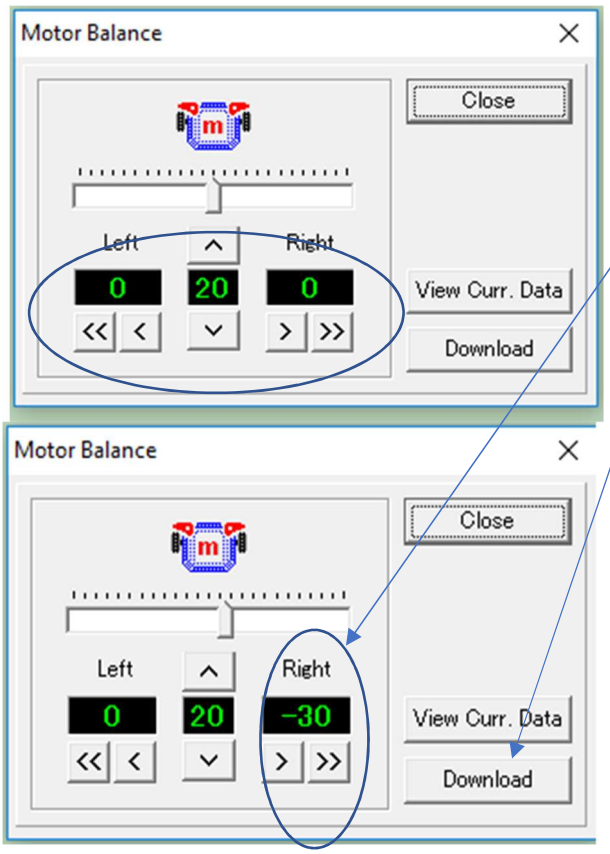
③ If the robot communicates correctly with C-Style through the cable, the robot’s setting will be displayed in green.
The robot now automatically runs a program for motor power balance adjustment.



④ Unplug the cable, but do not turn off the robot.

If the robot is turned off, the program for Motor Power Balance terminates and the program downloaded previously is run.

Push the robot’s red Start button.
The program for motor power balance runs as follows;
Forward with 50% power for 2 seconds → **Forward with 100% power** for 1 second → **Stop** for 0.5 seconds → **Backwards with 50% power** for 2 seconds → **Backwards with 100% power** for 1 second → **Stop**.



⑤ First, focus on how the robot drives forward with 50% motor power.
The initial settings are Left: 0, Right: 0, Center: 20.

⑥ When the robot turns left, reduce the right motor by clicking “>” or “>>”, as the right motor power is too fast.

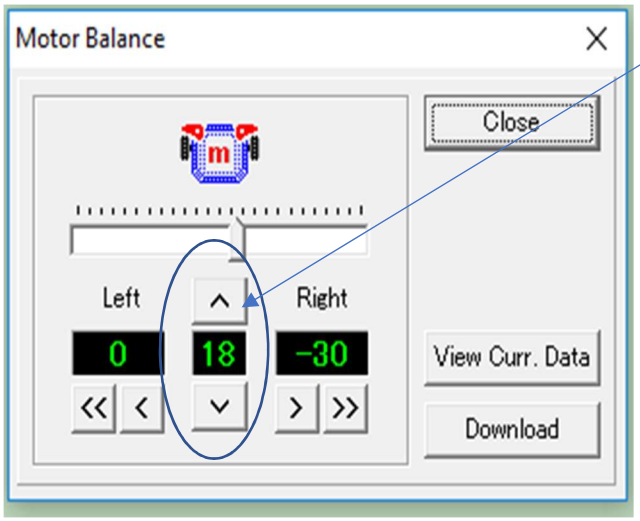
⑦ Click “Download to transfer and save the numbers to the robot.

⑧ Unplug the USB to Serial Cable and check whether the motor power balance has improved, by running the robot.

⑨ If not improved, plug in the USB to Serial cable again, and click “View Curr, Data”.

If the numbers you set previously are shown, the communication with the robot has successfully resumed. Therefore, go back to the step ⑤.

■Next, balance how the robot runs forward with 100% motor power, using the center indicator.



⑩ As each motor varies, you have to play around with the numbers. In case the robot turns either left or right with 100% power forward, adjust the center number box.

⑪ Click “Download” and run the robot several times.

Do not change numbers under Left and Right when adjusting the center number.

The number range of the balance on the left and right side is 0 – 240.
The number range of center balance is 1-20.
Terminate the program for Motor Balance by turning off the robot. When you turn the robot back on, it will go back the user program you previously downloaded.

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