SYNTHIAM

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Control More Than One Robot

How to control more than one robot in a single EZ-Builder project. This tutorial uses Revolution robots that depend on the Auto Position control, but the similar approach can be used for any robot styles.

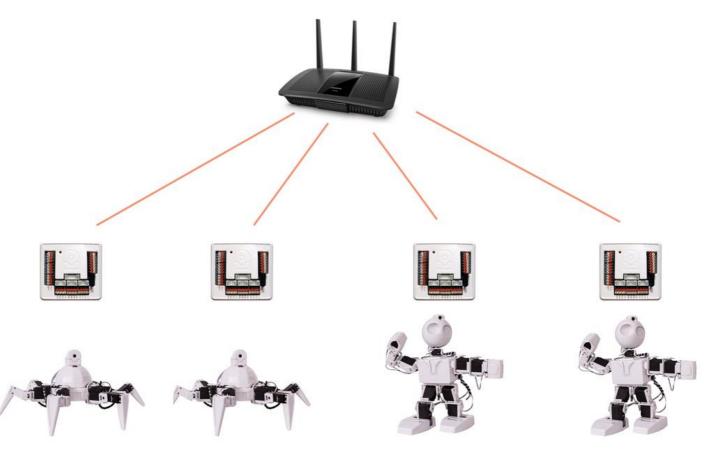
Last Updated: 9/4/2018

This tutorial will help you achieve something similar to how ez-robot created this video...

*Note: This tutorial uses the EZ-B v4.x/2 (Comm 2). Although the process can be achieved with the earlier Comm 1, there will be differences. It is recommended to upgrade to the <u>EZ-B v4/2 Comm</u> <u>Upgrade</u> or replace entirely with a <u>EZ-B v4/2 Wi-Fi Robot Controller</u> to utilize these advanced features.

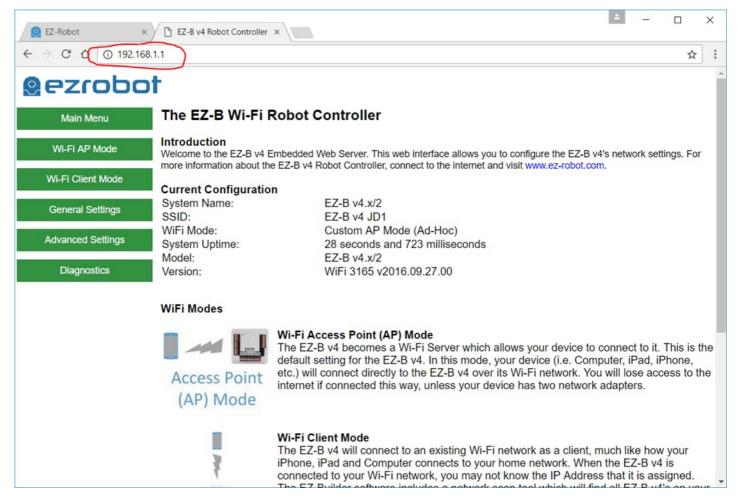
WiFi Mode The EZ-B of each robot is most likely in default AP mode. That means "Access Point", which you already have learned in the <u>EZ-B Tutorials</u> of the learn section. The AP mode limits the connection between PC and single EZ-B, only. In this step, each EZ-B will need to be configured to connect to a WiFi router in Client Mode.

In this example, we will use 2 Six's and 2 JD's...

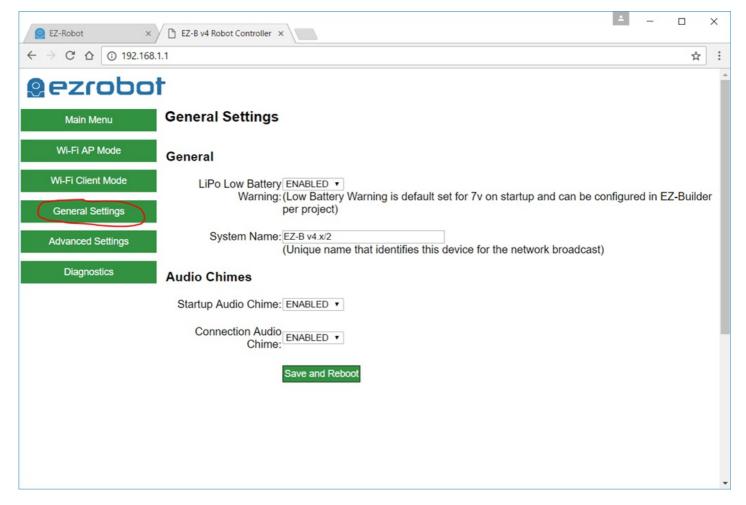


Web Config What you will need is a configured WiFi router. Keep note of the WiFi SSID Network name and the password. These two pieces of information will be entered into each EZ-B's web configuration tool.

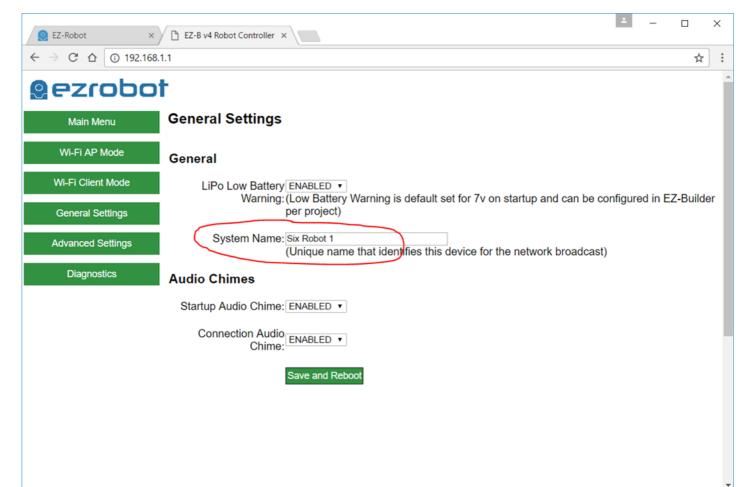
Step 1 Connect to the first robot's EZ-B WiFi network. Visit the default configuration in your web browser: <u>http://192.168.1.1</u>



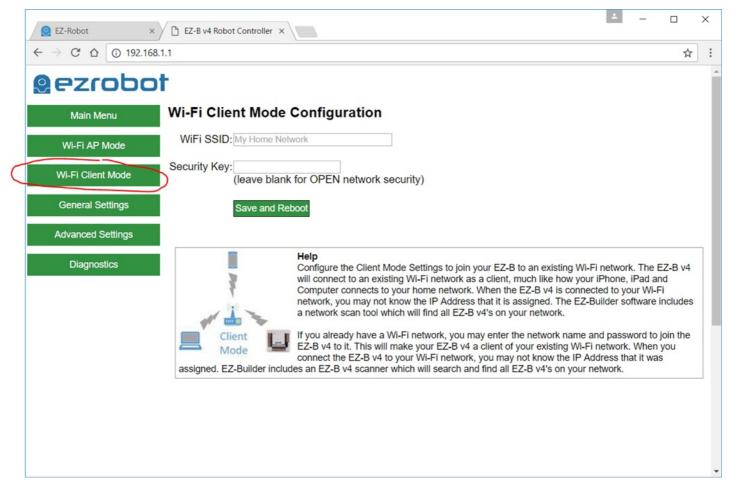
Step 2 We are going to give this EZ-B a specific System Name, which will be helpful to identify what robot it is during the Client Scan Mode later on in this tutorial. Press the General Settings menu option



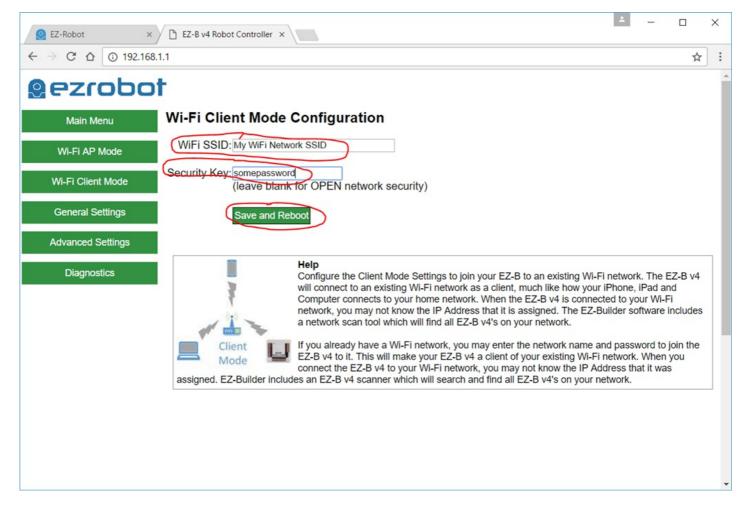
Step 3 Give this robot a specific System Name that defines what robot it is. In this case, I'm assigning this robot the System Name of Six Robot 1. This name will be broadcasted and used during the Client Scan Mode within EZ-Builder later in this tutorial. Press SAVE AND REBOOT



Step 4 The EZ-B will have rebooted. You may need to reconnect to the WiFi, although in most cases it happens so quickly that your PC will still maintain a connection. Either way, we wish to now visit the Wi-Fi Client Mode menu item.



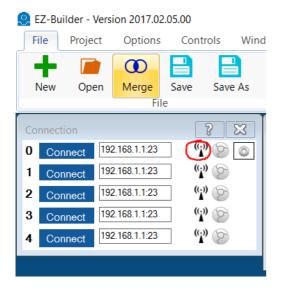
Step 5 Enter the name of your router's WiFi network SSID and its password. Save the settings. The EZ-B will reboot and connect to the WiFi router SSID with the credentials entered. The EZ-B will speak and verbally let you know if it was able to connect. If the EZ-B gives a verbal error message, then manually pressing the RESET button on the EZ-B will be necessary and repeating these steps, but entering the correct SSID and Password of your router next time.



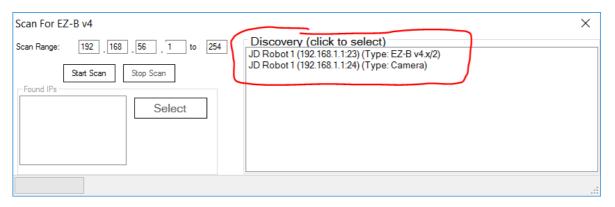
Almost There! Now that you have each robot connected to the WiFi network, you can move to the next step of this tutorial.

EZ-Builder will now need to know the IP Address of each EZ-B of the robots connected to the WiFi network. Ensure your laptop is connected to the WiFi network as well.

Step 1 Load EZ-Builder. Locate the Client Scan Tool icon in the Connection Control. Press the icon for the first EZ-B index.

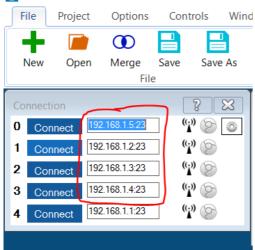


Step 2 Each EZ-B will be displayed as the broadcasts are received. The EZ-B's will broadcast their system name, which was entered for each robot in the previous step of this tutorial. This helps you identify all of the robots.



Repeat For Each Robot Repeat this process for each robot. We will add the SIX robots to index 0 and 1, and JD robots to index 2 and 3. When complete, each index of your connection control for 0, 1, 2 & 3 will have unique IP addresses.

EZ-Builder - Version 2017.02.05.00

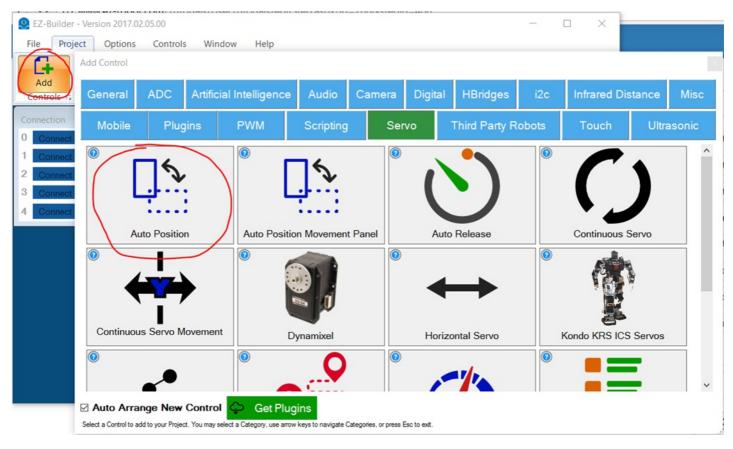


The E-Builder project should be empty, except for the connection control, which has IP addresses entered for each robot.

EZ-Builder - Version 2017.02.0	05.00 Controls Window	Help		- 0	×
New Merge Open Save File	Save As Exit Open	Save Browse Online EZ-Cloud AppStore	RoboScratch (F8) 1 (F10) Blockly (F9) 2 (F11) Workspaces	3 (F12)	
Connection 192.168.1.5.23 1 Connect 192.168.1.2.23 2 Connect 192.168.1.3.23 3 Connect 192.168.1.4.23 4 Connect 192.168.1.1.23					

We will now add an auto position for each robot. Remember, we connected... EZ-B Index 0 -> Six EZ-B Index 1 -> Six EZ-B Index 2 -> JD EZ-B Index 3 -> JD

Step 1 Add an Auto Position for the first SIX robot. Press Add Control->Servos->Auto Position



Step 2 Press the Config button on the Auto Position.

Actions	Frames	Stop	Settings	Panic 🚳
	STAND	otop	ootango	
	Jump To			
	Speed: 🄱	5		
	Steps: 🄱	2		
Execute	Transition To			

Step 3 Select the IMPORT/EXPORT tab

Frames	Actions	Settings	Import/Export Utilities	$\sum_{i=1}^{n}$
Export to File	±	Generate Servo Source	e Code	
Import from File	±	Generate SDK Source	e Code	
Save Change Image				

Step 4 Select IMPORT FROM FILE button

Frames	Actions Settings Import/Export Utilities	×
Export to File	Generate Servo Source Code	
Import from File	Generate SDK Source Code	
Save Change Image		

Step 5 Navigate to the appropriate project and select it. If using the public Six and JD projects, they will be located in C:\Users\Public\Documents\EZ-Builder\Examples. Again, remember that in this example we are adding SIX for EZ-B index 0 & 1. JD is for EZ-B index 2 & 3. So this first time we will be loading a SIX project.

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🖈 Quick access	^	Name	Date modified	Туре	Size
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L Deckton	~				
File	e name:	Six.EZB		EZ-Builder File	es (*.AutoPosition;

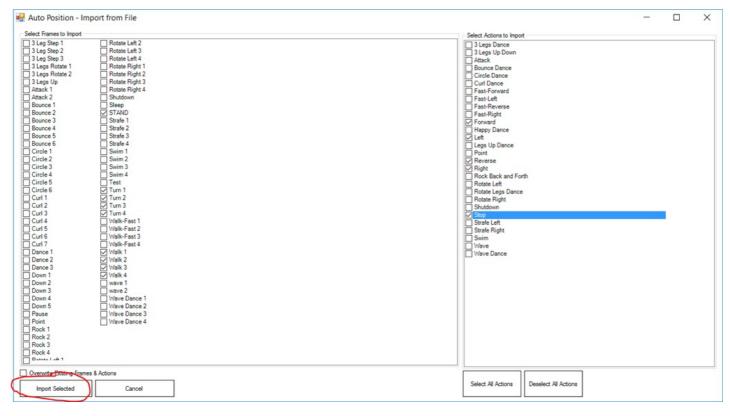
Step 6 A dialog will display prompting which Auto Position control to import the settings from. There will be only one control in the default SIX and JD projects, so simply press SELECT.

Select Auto Position Cont	_		×
Select Auto Position Co	ntrol to	import	from
Auto Position (AutoPosition	ו)	•	
Select	ancel		

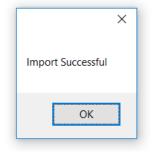
Step 7 A window will be displayed with all ACTIONS and FRAMES of the auto position control. Select the FORWARD, LEFT, RIGHT, REVERSE, and STOP actions. Ensure the PAUSE is UNCHECKED in the FRAMES list. This is because PAUSE is a default frame and cannot be imported.

🛃 Auto Position - Import from File		-	×
Select Frames to Import	Select Actions to Import		
Select Frames to Import 3 Leg Step 1 3 Leg Step 2 Rotate Left 2 3 Leg Step 3 Rotate Left 4 3 Leg Step 1 Rotate Left 4 3 Leg Step 1 Rotate Right 1 3 Leg Step 1 Rotate Right 2 Rotate Right 3 Attack 1 Rotate Right 4 Attack 2 Shuddown Bounce 1 Seep Bounce 2 Strafe 1 Bounce 5 Strafe 1 Bounce 5 Strafe 3 Bounce 5 Strafe 4 Circle 1 Swim 3 Circle 3 Swim 4 Circle 5 Circle 6 Turn 1 Curl 2 Curl 3 Curl 4 Walk-Fast 1 Curl 5 Walk-Fast 2 Curl 6 Curl 7 Walk-Fast 3 Dunce 1 <t< td=""><td>Select Actions to Import 3 Legs Dance 3 Legs Up Down Attack Bounce Dance Circle Dance Curl Dance Fast-Reverse Fast-Reverse Fast-Reverse Variation Right Rock Back and Forth Rotate Legs Dance Rotate Legs Dance Rotate Legs Dance Studiown Strafe Left Strafe Left Strafe Left Strafe Left Strafe Left Wave Dance</td><td>-</td><td>×</td></t<>	Select Actions to Import 3 Legs Dance 3 Legs Up Down Attack Bounce Dance Circle Dance Curl Dance Fast-Reverse Fast-Reverse Fast-Reverse Variation Right Rock Back and Forth Rotate Legs Dance Rotate Legs Dance Rotate Legs Dance Studiown Strafe Left Strafe Left Strafe Left Strafe Left Strafe Left Wave Dance	-	×
Deven 5 Wave Dance 2 Pause Wave Dance 3 Point Wave Dance 4 Rock 1 Wave Dance 4 Rock 2 Rock 4 Potes 1 = 6 1			
Overvrite Existing Frames & Actions Import Selected Cancel	Select All Actions Deselect All Actions		

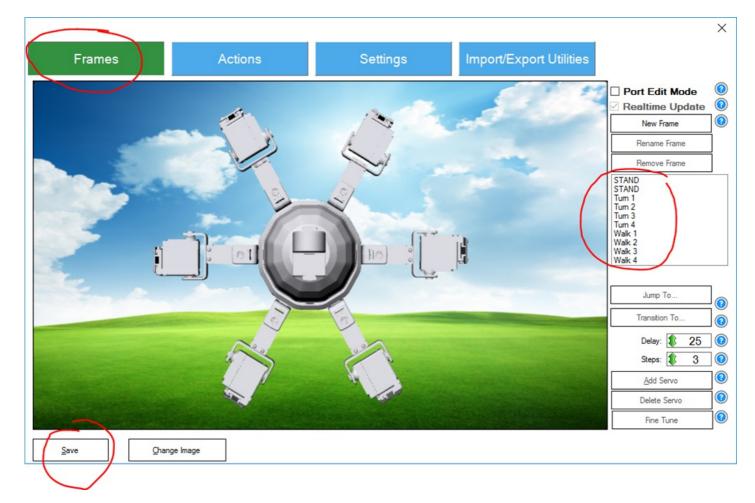
Step 8 Press IMPORT SELECTED



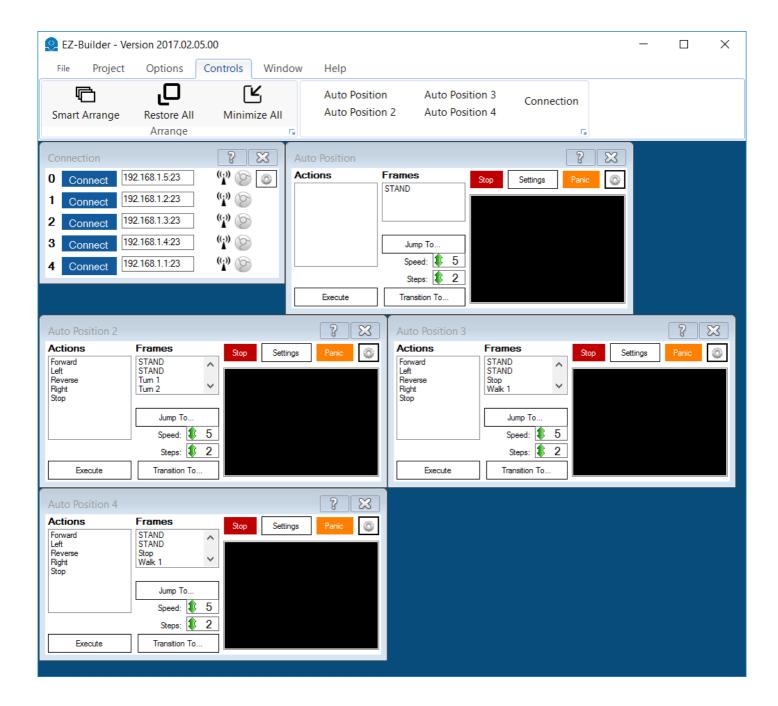
Step 9 Import should now be successful



Step 10 You may now press FRAMES tab to view that all frames have been loaded. And press SAVE to save this configuration.



REPEAT Repeat these steps for each robot, remembering that Index 0 & 1 is SIX, and index 2 & 3 is JD. When complete, your project should look like...



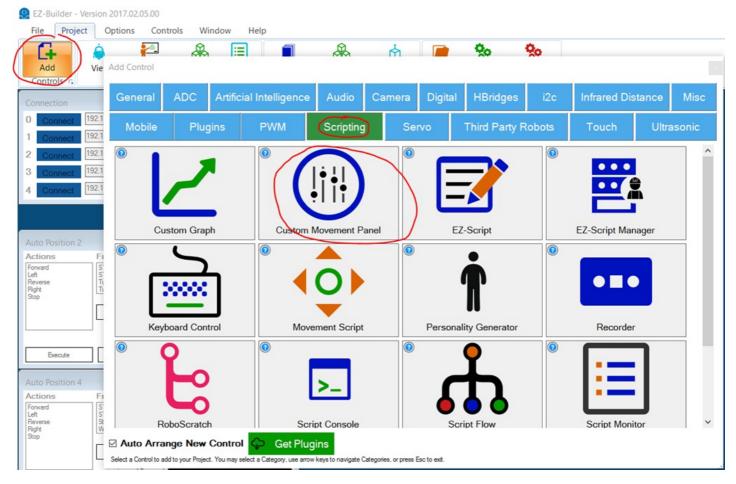
We're now going to add a movement panel which will control all of the robots at the same time. The movement panel that we will use is a Custom Movement Panel, which allows custom ez-script to be added. Each Auto Position will be instructed to execute movement actions using the ControlCommand().

*For more information about ControlCommand(), view this tutorial here: <u>http://www.ez-robot.com/Tutorials/Lesson/78?courseId=6</u>

*For more information about Movement Panels, view this tutorial here: <u>http://www.ez-robot.com/Tutorials/Lesson/77?courseId=6</u>

Actually, you really should have already read the Activity Guide here: <u>http://www.ez-robot.com/Tutorials/Course/6</u>

Step 1 Add Control->Scripting->Custom Movement Panel



Step 2 We will now press configure on the movement panel. The window that opens is the configuration, which allows you to edit code that will be executed for each movement direction.

Curron	n Movement 💡	
	Movement Script Co	fig X
Click Fo	Stop Command: [Forward Command: [Right Command: [Script Help Port Summary Image: Second state
	Reverse Command:	Image: Constraint of the second se
	Speed Changed:	Sleep (milliseconds)
		Save Cancel Cancel • Pauses for specified milliseconds • Example sleeps for 1 second: Sleep(1000)
		 SleepRandom (lowMilliSec, highMilliSec) Pauses for a random millisecond delay between the 2 provided values Example: SleepRandom(1000, 5000)
		 Servo (servoPort, position) Move servo to the specified position Servo position is between 1 and 180 Example: Servo(D14, 25)
		SetServoMin (cervoPort_position) Y

Step 3 Let's start by demonstrating how to add STOP commands for each Auto Position. Press the EDIT button on the STOP command.

Movement Script Co	nfig X
Stop Command:	Script Help Port Summary
Forward Command:	
Right Command:	Find Next Print Page Setup Save -
Reverse Command:	
Left Command:	EZ-Script Functions
Speed Changed:	Sleep (milliseconds) Save Cancel Save Cancel Sleep (milliseconds) • Pauses for specified milliseconds • Example sleeps for 1 second: Sleep(1000)
	SleepRandom (lowMilliSec, highMilliSec) Pauses for a random millisecond delay between the 2 provided values Example: SleepRandom(1000, 5000)
	 Servo (servoPort, position) Move servo to the specified position Servo position is between 1 and 180 Example: Servo(D14, 25)
	SetServoMin (servoDort_position)

Step 4 Depending on what your default editor is configured, either BLOCKLY or EZ-SCRIPT editor will be displayed. Press the EZ-SCRIPT tab, because we will be editing ez-script for this example.

Event EZ-Scrip	Editor										×
Blockly EZ-Scr	ipt										
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1			^			Find Next	Print	Page Setup	Save -	+	
				EZ-S	cript Fu	Inctions					^
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Run (Alt-R)				PWM		ort, speed)	Width M	odulation)	to the desi	red duty	, v
Save	Cancel										

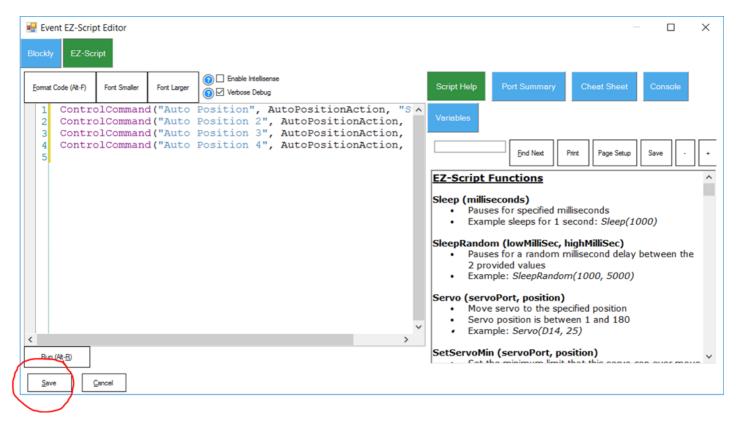
Step 5 Right-click in the editor window and locate the first Auto Position, and select the STOP option.

Event EZ-Scrip	ot Editor			ENTRO I SETTINGS LE PARTS LEUX LE CONTRA DE CO
Blockly EZ-Sc	Font Smaller	Font Larger		ble Intellisense Script Help Port Summary
1	Copy Cut Paste	1		EZ-Script Functions
	Auto F Auto F	Position 2 Position 2 Position 3 Position 4 Position	 - - - -	ControlCommand("Auto Position", AutoPositionAction, "Forward") ControlCommand("Auto Position", AutoPositionAction, "Left") ControlCommand("Auto Position", AutoPositionAction, "Reverse") ControlCommand("Auto Position", AutoPositionAction, "Right") ControlCommand("Auto Position", AutoPositionAction, "Stop") p(
	Custo	m Movem	ent	Servo (servoPort, position)

Step 6 Now repeat the same process for each of the Auto Position Controls, so your code will look like this...

```
1 ControlCommand("Auto Position", AutoPositionAction, "Stop")
2 ControlCommand("Auto Position 2", AutoPositionAction, "Stop")
3 ControlCommand("Auto Position 3", AutoPositionAction, "Stop")
4 ControlCommand("Auto Position 4", AutoPositionAction, "Stop")
5
```

Step 7 Save the script



REPEAT You guessed right, this process must be repeated for each movement (forward, left, right, reverse, stop).

Each robot may require a servo profile to fine tune the servo resting position. The process of creating a servo profile for multiple EZ-B's at the same time can be achieved by using the "Advanced Servo Profile" editor.

Because only one 3D Robot design can be stored in a project, the Advanced Servo Profile editor does not display the graphical representation of the robots. This means you will need to know what servo ID (i.e. D0, D2, D8, etc.) maps to each joint for adjustment.

To access the Advanced Servo Profile editor, press the button from the top ribbon menu of EZ-Builder.

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Add	View	Instructions	Design	Details	Library	Bit Builder	3D Scan	Load	Configure	Advanced
Controls 🗔		My EZ-Ro	bot	5		EZ-Bits	5		Servo Profile	e r

The Advanced Servo Profile editor contains a tab for each EZ-B and each servo port. See the image below...

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Port: D21	Postion:	; 90 Off	e: 0	Port: D22	Position:	\$ 90 Offset: 0 · ·	Pot: D23	Position:	\$ 90	Offset: 0	· •		Left Upper Leg Servo: D12
Port: NA	Position:	90 Offs	et: 0 🔸 🔸	Port: V0	Position:	\$ 90 Offset: 0 · •	Port: V1	Position:	\$ 90	Offset: 0	•]	Right Foot Ankle: D18 Right Foot Knee: D17
Port: V2	Postion:	90 Off	et: 0	Port: V3	Position:	\$ 90 Offset: 0 -	Port: V4	Position:	\$ 90	Offset: 0		1	Right Forearm Servo: D8
Port: V5	Poston:	: 90 Off	e: 0 · · ·	Port: V6	Position:	\$ 90 Offset: 0	Pot: V7	Position:	\$ 90	Offset: 0		í	Right Gripper Servo: D9
										[1	Right Upper Arm : 07
Port: V8	Postion:	90 Off	e: 0 [• [•	Port: V9	Position:	\$ 90 Offset: 0 · •	Pot: V10	Position:	\$ 90	Offset: 0	•		Right Upper Leg Servo: D16
Port: V11	Postion:	90 Off	et: 0 +	Port: V12	Position:	\$ 90 Offset: 0 · ·	Port: V13	Position:	\$ 90	Offset: 0	•		
Port: V14	Postion:	90 Offs	et: 0 🕞 🔸	Port: V15	Position:	\$ 90 Offset: 0 -	Port: V16	Position:	\$ 90	Offset: 0	•]	
Port: V17	Postion:	1 90 Off	et: 0	Port: V18	Position:	\$ 90 Offset: 0 - •	Port: V19	Position:	\$ 90	Offset: 0		1	
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Hey, you're done. All you have to do is press CONNECT on each EZ-B index of the Connection Control. Use the Custom Movement Panel and the robots will all respond to the commands.

Со	Connection ? 🔀								
0	Connect	192.168.1.5:23	(p) 📀 💿						
1	Connect	192.168.1.2:23	(*)						
2	Connect	192.168.1.3:23	(;;)						
3	Connect	192.168.1.4:23	(;)						
4	Connect	192.168.1.1:23	(;))						

If you want an example of this project, here it is: <u>MultiRobotExample.EZB</u>