Remote *BLA BLA*
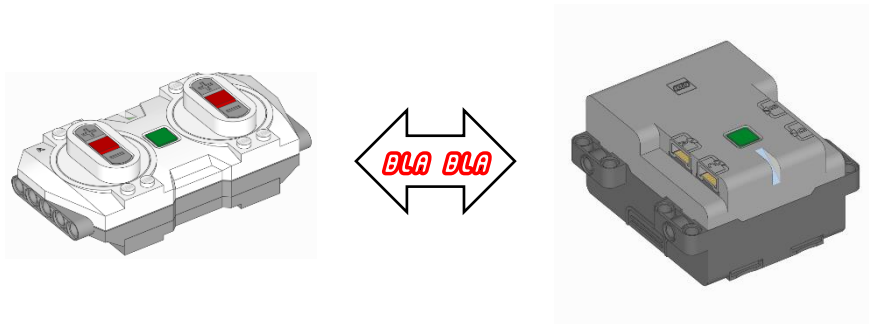
a configurable *LEGO* TechnicHub program

- no screens attached -

Version 0.98

by VascoLP

December 2021

Contents

For Remote Bla Bla version 0.98, December 2021.

1 Introduction

Remote Bla Bla is a Pybricks (https://pybricks.com) program for a LEGO PoweredUp TechnicHub and a LEGO PoweredUp Remote Control where you first define how each device answers to remote control button actions (config mode) and then you play with your MOC/Set using the defined configuration (play mode).

The configuration is saved so that you can turn off the hub, change batteries if needed, go back to your hub and everything is there. Just play. If the configuration is not what you want, you can go back to config mode and reconfigure the behavior.

Keep in mind that this is a computer with an input device of 7 buttons and an output device of just two LEDs. This is a Star Trek like interface, a real YDSWIG interface: *you don't see what you get*. However, once you learn it, you will notice that it is simple. No screens attached!

This is the first released version of Remote Bla Bla, so I am assuming it will need some improvements. Hence version 0.98.

1.1 Concepts

- BLA – Button LEGO Action (why not?). It corresponds to a set of buttons on the remote (typically a plus button and a minus button) and the action it does in some of the devices connected to the TechnicHub;
- BLA Mode: the type of interaction a BLA does with devices. For instance:
    - Simple Motor: Press plus button and motor spins clockwise. Release plus and motor stops. Press minus and motor spins counterclockwise.
    - Steering: press plus and motor spins clockwise until limit reached. Release plus and motor goes back to center position. Press minus and motor spins counterclockwise until limit reached.
- Config Mode: the mode used to configure how it should work
- Play mode: the mode used to play with your MOC/Set
- HOLD: In modes where the motor is stopped, a stepper for instance, when the motor is stopped in a given position, the motor keeps controlling axle position. If you try to move it, the motor will oppose to it. This means that you can build gearboxes, for instance, without a 90º multiple limiter… on the other hand, it means that it consumes energy even when stopped
- COAST: coast is the opposite of hold. When a motor is moved to a given position, it is left free in the destination position. This means that something external can set motor position in a wrong position. But it consumes less. And you might include position limiters in your build in such a way that there is no need for a hold stop

2 Installing

To install Remote Bla Bla you just need to follow the procedures described in http://pybricks.com and run the `RemoteBlaBla.py` file on your TechnicHub. `RemBlaBla.py` requires pybricks **beta** v3.1.0c1 on 2021-11-19. At the time of this

writing, there is a new release soon to be released, pybricks v3.1. Remote Bla Bla should also work with that release.

You can test Remote Bla Bla under the pybricks interface, but its true power happens when you include it in your TechnicHub firmware. By doing so, you will have a configurable standalone device which you can configure according to your needs.

Note: if you include Remote Bla Bla in your hub firmware, and turn off the hub completely (this is, no blinking lights) when you connect it back, you might need to click twice to start Remote Bla Bla. First click turns on pybricks, (blue blinking light), second click starts Remote Bla Bla (white blink light asking for remote).

3 Quick Tour

3.1 Connecting

When you run Remote Bla Bla in your TechnicHub for the first time, the hub light starts to blink in white. This indicates that you should connect your remote control.

Note: When you turn on the hub, it goes to a steady blue light. This is Pybricks started but Remote Bla Bla not started yet.

After connecting the remote, the remote light will go to a steady white. That indicates that you are in config mode (notce

3.2 BLA Mode

The color and blink of hub´s light indicates in which BLA Mode the hub is in. There are 8 different colors in steady, slow blink, medium blink, and fast blink types. This means that Remote Bla Bla can have defined up to 32 different BLA Modes (although not all are defined).

You should have your hub light in a steady cyan, which is the simplest BLA Mode: press plus to activate the motor, press minus to activate it in the opposite direction.

Using the Red Buttons of the remote you can choose different BLA Modes. Try it.

3.3 Selecting a Mode

To select a mode, you have first to connect the device you want to control to the hub. Connect a motor, any motor, to a port, any port. Choose the steady cyan BLA Mode (BLASimpleMotor).

To choose the currently selected BLA Mode you will use one of the Plus and Minus keys of the remote. You then use the Plus and Minus keys on the remote, to define further characteristics of your BLA Mode. Press the Right Plus button on the remote. This means "rotate the motor clockwise in full power". When you press it, you get some green blinking on the hub light, and then, back to steady cyan. This means that your mode was successfully configured.

If you press again the Right Plus button, you will get some <mark>red</mark> blinking. This is because you haven't connected any other motor to the hub. The motor currently connected is assigned to the first BLA Mode you just defined, so cannot be reused.

If you want to configure another motor, go on, select steady <mark>magenta</mark>, using the red keys (BLAServo90_1_3), connect another motor (this time it must be one with position sensors) and choose it, by pressing Right Plus key. You are defining a Servo Motor.

3.4 Save configuration

To save your configuration, press the remote green button. This will save your current configuration and move to play mode. The remote and the hub lights will be <mark>green</mark>, showing that you are in play mode.

You can now move on to play mode directly. Or you can disconnect everything (press the button on the hub) and connect it again latter. After connecting the remote, you will be in play mode, as indicated by the green lights.

3.5 Play mode

If you followed the previous steps, you are in play mode. Press the Plus and Minus buttons of your remote and watch the motors running! The right buttons on the remote control the simple motor, the left buttons control the servo.

To go back to config mode, press the remote's green button for half a second[1]. You go back to config mode, but the saved configuration is still there. Configurations are saved only when you press successfully the remote's green button in config mode.

3.6 Doing more

We are now going to build a car with two drive motors, one steering control device and one gearbox control. Go back to config mode and disconnect all devices. Connect two motors to two ports, any ports. Notice that which ports you connect to is not important, you should connect to the ones that suit the most to your MOC/Set.

Choose BLASimpleMotor: if not already there, use the red buttons until you get a steady cyan. Select this BLA Mode by pressing Right Plus button.

Now pick one motor with sensors and connect it to another port. This will be the steering control device. The steering control will detect right and left limits of your steering, so you need to do something to have those limits. A simple setup like this is enough:

---
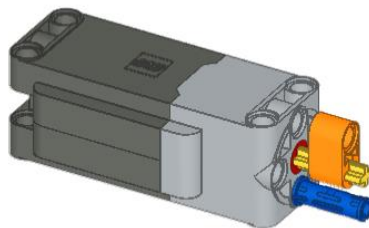
[1] Don´t press it too long, remote disconnects at 1.2s. Remote light will blink orange when you reach half a second, so you can release there.

Choose BlaSteering_1_3 BLA Mode (steady gray). Press the Right Plus to choose a simple steering. This will add the second BLA.

Now a gearbox control. Suppose it is a 90⁰ steps controlled gearbox. Connect another motor with sensors to the remaining port. Choose BLAStepperZero90_4_5 (slow blink cyan). Select it by pressing Right Plus button.

Now you have a remotely controlled 3 thingy. Before moving to play mode, notice that the steering mode needs some calibration: it needs to find its limits. This happens when you select play mode. Do select play mode!

Now you have:

- Right Plus and Minus control the two drive motors
- Left Plus and Minus control the steering
- Right and Left buttons control the gearbox

4 One Remote, Four Devices

The LEGO powered up remote is best designed to control two devices. The TechnicHub has four devices. So, you have these options:

- One BLA Mode (controlling 1 up two 4 motors):
    - o Right Plus and Right Minus buttons control devices power
    - o Right Red button set power to zero

- Two BLA Modes:
    - o Right Plus and Right Minus buttons control first BLA devices power
    - o Right Red button set power to zero on first BLA
    - o Left Plus and Left Minus buttons control second BLA devices power
    - o Left Red button set power to zero on second BLA

- Three BLA Modes:
    - o Right Plus and Right Minus buttons control first BLA devices power
    - o Left Plus and Left Minus buttons control second BLA devices power
    - o Right Red (acts as plus) and Left Red (acts as minus) buttons control third BLA devices power

- Four BLA Modes (Red buttons acting as Shift key):
    - o Right Plus and Right Minus buttons control first BLA device power
    - o Left Plus and Left Minus buttons control second BLA device power
    - o Shift Right Plus and Shift Right Minus buttons control third BLA device power
    - o Shift Left Plus and Shift Left Minus buttons control fourth BLA device power

5 Config Mode

Config mode is used to associate BLA Modes to devices. The sequence is:

1) Choose the current BLA Mode using Red buttons on the remote control.

2) Connect the device(s) you want to be controlled by current BLA mode to the Hub.
3) After connecting the device(s), select current BLA Mode appropriate detail configuration by pressing one of the 8 available options (use Red buttons to shift):
   1. Right Plus
   2. Left Plus
   3. Shift Right Plus
   4. Shift Left Plus
   5. Right Minus
   6. Left Minus
   7. Shift Right Minus
   8. Shift Left Minus

   As a rule (not always though…):

   o Plus buttons choose clockwise rotation of the motors
   o Minus buttons choose counterclockwise rotation of motors
   o On steady BLA modes (servo, stepper, steering) without Shift you have HOLD modes and with Shift you have COAST modes

   If current BLA Mode does not support one of the devices, you will get a red blink on the hub light. If everything is ok, you will get some green blinks on hub light.

4) To choose another BLA Mode, go back to step 1.
5) Last defined BLA Mode can be deleted from configuration by pressing Shift Green button on command. Successful delete will result in green blinks in hub light. If there is nothing to delete, you will get some red blinks. You can keep on pressing Shift Green until everything is deleted.
6) To save everything, press green button on remote. This is the only time when a configuration is saved. If there is nothing to save, you will get some red blinks on the hub light. If saving is ok, you will get some green blinks on hub light and move to Play Mode.

6 Play Mode

In play mode, remote buttons will control devices as described in chapter 4 - One Remote, Four Devices. To go back to config mode, press the remote's green button for half a second[2].

When you enter Play Mode, BLA Mode needed device initializations will happen. For instance, in a steering mode the limits of the steering will be found. Notice that if there are no limits in an initialization that needs limits, device initialization might run forever.

---

[2] Don´t press it too long, remote disconnects at 1.2s. Remote light will blink orange when you reach half a second, so you can release there.

7 Saved configuration

Technic Hub does not have the ability to save any data. So, configuration is saved in the Remote name property, in and encoded way. This means that you can "move" one saved configuration from one hub to another by using the same remote.

8 Goodies

8.1 Reverse direction

When you connect more than one device to the same BLA Mode, both devices will rotate in the same clockwise our counterclockwise direction. However, many modes have a reverse direction option. This means that the second device will run in the opposite direction of the first device. If there is a third device, it will run in the same direction of the first device. If there is a fourth device, it will run in the opposite direction of the first device. Devices order is defined by ports order: A, B, C, D.

8.2 Autorepeat

In play mode, when it makes sense, keeping a remote button pressed will do autorepeat and increase/decrease the corresponding action. When limits are reached, the remote light blinks to red. When zero position is crossed, the remote light blinks to magenta.

8.3 City Hub Support

City Hub has much less memory than Technic Hub, so it can't run Remote Bla Bla. However, there is a small footprint `RemoteCityBla.py` program that runs in the City Hub, but it runs only Play Mode. To configure a City Hub, you use a Technic Hub to execute the configuration step, using only ports A and B. Since configuration is saved in the Remote, you just need to turn on the City Hub, connect to the remote and play.

8.4 Saving and sharing configurations

Remote Bla Bla is saved as a readable string in the remote name. So, after building your configuration, you can get it and share with someone else.

To do it, you can use pybricks code interface and run the following simple program. You should use the same pybricks version as the one recommended for Remote Bla Bla.

```
1 from pybricks.pupdevices import Remote
2 print('Connect remote')
3 rem = Remote()
4 print('Remote current name=',rem.name())
5
6 # To set remote name uncomment following line
7 # rem.name('rby1g.........')
8 print('Remote new name=',rem.name())
```

Lines 1 to 3 ask for you to connect the remote. Line 4 prints remote current name. If it is a Remote Bla Bla configuration string it looks like rb*1222333444* where numbers

correspond to the configuration of each BLA mode. When a BLA mode is not used, you will get dots (…).

Line 7 of this script is used to save a configuration on the remote. Notice that here the line is commented.

You can write anything you want… Remote Bla Bla will only work with a proper configuration string. In this example, the configuration is for one BLA mode, the other possible modes are marked unused with the dots.

You can even use a Hub with Remote Bla Bla on its firmware to run this program. When you turn completely off a hub (no blinking light) and then you click to turn on, you get a blue light. At that moment if you click again you go to Remote Bla Bla mode. But if you don't click, you can connect to pybricks code interface.

8.5 Turn off

To tur off the hub press the hub button for one second.

8.6 Auto turnoff

If you do not touch any button for 5 minutes, the hub auto shuts down. Even if some motor is running (maybe arguable in GBC scenario…).

9 BLA Modes

The next table describes all existing BLA Modes. The configuration is chosen by selecting the buttons in the remote:

1. RP y– Right Plus
2. LP – Left Plus
3. RM – Right Minus
4. LM – Left Minus
5. SRP – Shift Right Plus
6. SLP – Shift Left Plus
7. SRM – Shift Right Minus
8. SLM – Shift Left Minus
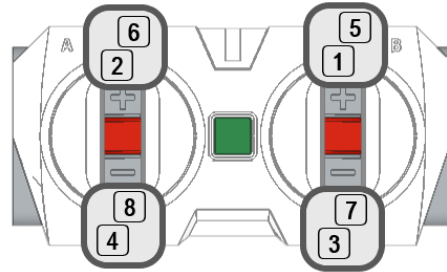
In the table, each BLA Mode is also numbered. This way, you can specify a BLA Mode in a simple way. For instance, BLA Mode 5.4 is BLAStepperLimits90_180, counterclockwise, coast stop, 90º stepper.

Remote 🅱🅻🅰 🅱🅻🅰 Modes										
			1 RP	**2 LP**	**3 RM**	**4 LM**	**5 SRP**	**6 SLP**	**7 SRM**	**8 SLM**
BLASimpleMotor Steady cyan	1	Simple motor. Button pressed rotates, button released stops. Can choose motor power and direction, and relative directions when more than one device. Allows sensor less motors.								
One device	Power		100%	80%	100%	80%	60%	40%	60%	40%
	Direction		↻	↻	↺	↺	↻	↻	↺	↺
Multiple devices	Power		100%	100%	100%	100%	70%	70%	70%	70%
	Direction		↻	↻/↺	↺	↺/↻	↻	↻/↺	↺	↺/↻
BLAStepsMotor Steady yellow	2	Steps motor. Pressing button will rise power until maximum number of steps is reached. Allows sensor less motors.								
One device	Steps		7	5	7	5	3	9	3	9
	Direction		↻	↻	↺	↺	↻	↻	↺	↺
Multiple devices	Steps		7	7	7	7	5	5	5	5
	Direction		↻	↻/↺	↺	↺/↻	↻	↻/↺	↺	↺/↻
BlaSteering_1_3 Steady gray	3	Steering motor. Finds steering limits by stalling, and centers. If one step, pressing buttons steers, releasing buttons returns to center. If more than one step, each button moves forward/backward one step.								
	Steps		1	1	1	1	3	3	3	3
	Direction		↻	↻	↺	↺	↻	↻	↺	↺
	Stop		Hold	Coast	Hold	Coast	Hold	Coast	Hold	Coast
BlaSteering_5_7 Steady orange	4	Like BlaSteering_1_3 but 5 or 7 steps.								
BLAStepperLimits90_180 Steady blue	5	Adjustable gearbox stepper. Finds lower limit by stalling, finds upper limit by stalling, adjusts limits to step size multiple (90º or 180º) and finds number of speeds in gearbox. Plus button increases speed, minus button decreases speed. Works with one device only.								
	Direction		↻	↻	↺	↺	↻	↻	↺	↺
	Stop		Hold	Coast	Hold	Coast	Hold	Coast	Hold	Coast
	Step		90º	90º	90º	90º	180º	180º	180º	180º
BlaServo90_1_3 Steady magenta	6	Servo motor 90º. 0º is on device absolute zero angle. If one step, pressing buttons rotates 90º, releasing buttons returns to center. If more than one step, each button moves forward/backward one step, until maximum of 90º.								
	Steps		1	1	1	1	3	3	3	3
	Direction		↻	↻	↺	↺	↻	↻	↺	↺
	Stop		Hold	Coast	Hold	Coast	Hold	Coast	Hold	Coast
BlaServo90_5_7 Steady green	7	Like BlaServo90_1_3 but 5 or 7 steps.								
BLAStepperZero90_2_3 Steady white	8	Gearbox 90º stepper with 2 or 3 speeds, starting in device's absolute 0 angle. Plus button increases gearbox selector position, minus button decreases gearbox select position.								
	Steps		1	1	1	1	2	2	2	2
	Direction		↻	↻	↺	↺	↻	↻	↺	↺
	Stop		Hold	Coast	Hold	Coast	Hold	Coast	Hold	Coast

Remote *BLA BLA* Modes									
		1 RP	**2 LP**	**3 RM**	**4 LM**	**5 SRP**	**6 SLP**	**7 SRM**	**8 SLM**
BLAStepperZero90_4_5 Slow blink cyan	9	Like BLAStepperZero90_2_3 but 4 or 5 speeds (3 or 4 steps).							
BLAStepperZero90_6_7 Slow blink yellow	10	Like BLAStepperZero90_2_3 but 6 or 7 speeds (5 or 6 steps).							
BLAStepperZero90_8_9 Slow blink gray	11	Like BLAStepperZero90_2_3 but 8 or 9 speeds (7 or 8 steps).							
BLAStepperInit90_2_3 Slow blink orange	12	Gearbox 90º stepper with 2 or 3 speeds. Finds lower limit by stalling, adjusts limits 90º multiple starting. Plus button increases gearbox selector position, minus button decreases gearbox select position.							
		Step	1	1	1	1	2	2	2	2
		Direction	↻	↻	↺	↺	↻	↻	↺	↺
		Stop	Hold	Coast	Hold	Coast	Hold	Coast	Hold	Coast
BLAStepperInit90_4_5 Slow blink blue	13	Like BLAStepperInit90_2_3 but 4 or 5 speeds (3 or 4 steps).							
BLAStepperInit90_6_7 Slow blink magenta	14	Like BLAStepperInit90_2_3 but 6 or 7 speeds (5 or 6 steps).							
BLAStepperInit90_8_9 Slow blink green	15	Like BLAStepperInit90_2_3 but 8 or 9 speeds (7 or 8 steps).							
BlaSteeringRev_1_3 Slow blink white	16	Like BlaSteering_1_3 but when multiple devices, first rotates in one direction, second rotates in opposite direction.							
BlaSteeringRev_5_7 Medium blink cyan	17	Like BlaSteeringRev_1_3 but 5 or 7 steps.							
BlaServoRev90_1_3 Medium blink yellow	18	Like BlaServo_1_3 but when multiple devices, first rotates in one direction, second rotates in opposite direction.							
BlaServoRev90_5_7 Medium blink gray	19	Like BlaServoRev90_1_3 but 5 or 7 steps.							
BLAStepperZero90Rev_2_3 Medium blink orange	20	Like BLAStepperZero90_2_3 but when multiple devices, first rotates in one direction, second rotates in opposite direction.							
BLAStepperZero90Rev_4_5 Medium blink blue	21	Like BLAStepperZero90Rev_2_3 but 4 or 5 speeds (3 or 4 steps).							
BLAStepperZero90Rev_6_7 Medium blink magenta	22	Like BLAStepperZero90Rev_2_3 but 6 or 7 speeds (5 or 6 steps).							
BLAStepperZero90Rev_8_9 Medium blink green	23	Like BLAStepperZero90Rev_2_3 but 8 or 9 speeds (7 or 8 steps).							
BLAStepperInit90Rev_2_3 Medium blink white	24	Like BLAStepperInit90_2_3 but when multiple devices, first rotates in one direction, second rotates in opposite direction.							
BLAStepperInit90Rev_4_5 Fast blink cyan	25	Like BLAStepperInit90Rev_2_3 but 4 or 5 speeds (3 or 4 steps).							
BLAStepperInit90Rev_6_7 Fast blink yellow	26	Like BLAStepperInit90Rev_2_3 but 6 or 7 speeds (5 or 6 steps).							
BLAStepperInit90Rev_8_9 Fast blink gray	27	Like BLAStepperInit90Rev_2_3 but 8 or 9 speeds (7 or 8 steps).							
BLAStepperInit60_5_6 Fast blink orange	28	Like Gearbox BLAStepperInit90_2_3 but with a 60º step and 5 or 6 speeds (4 or 5 steps).							

10 Issues

10.1 Tested devices

Remote Bla Bla has only been tested with:

- WeDo 2.0 Medium Motor
- Technic L Motor
- Technic XL Motor
- Technic Large Angular Motor

These are the only ones I have. There also is no special support for Powered Up lights because I don´t have any… but it should be easy to add some support to it with BLASimpleMotor… maybe it already works?

10.2 Connecting WeDo Medium Motor

When in config mode, devices are detected. Usually, with sensor motors there are no problems. However, for some reason, the sensor less WeDo Medium Motor sometimes hangs, especially if hub batteries are weak. Device de taction is always done with the hub light in red. So, if your hub gets stuck with a red light it might be due to this. Try to do your configuration with fresh batteries.

10.3 Clockwise and Conterclockwise

Every BLA mode has a clockwise and a counterclockwise configuration. These results in the existence of many BLA Modes. This is arguable since remote buttons can rotate. But I think I prefer this way.

10.4 Hold vs Coast

The ability to define things stop modes in hold and coast also contributes to the existence of many BLA Modes. One could argue that coast is not really needed…