Large Hub

- Programmable Control Unit
- Intuitive Light Interface
- Intuitive Button Interface
- Autonomous or Stream
- 5x5 LED Display

- Six Input/Output Ports
- Six-Axis Gyro Sensor
- Three-button Navigation
- Speaker
- MicroPython
- Technic Compatible

- USB Compatible
- Bluetooth compatible
- 10-meter line of sight
- 4 Bluetooth Connections
- One touch On/Off Wireless

Color Sensor

- Detects color
- Detects reflectivity
- Detects ambient light
- Light output

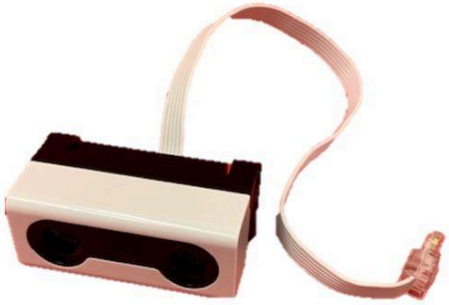
- Detects color
  - 16 mm optimal reading
  - White
  - Blue
  - Black
  - Green
  - Yellow
  - Red

- Detects reflectivity
  - 16 mm optimal
  - Non-reflective (0%)
  - Reflective (100%)

- Detects ambient light
  - Dark (0%)
  - Bright (100%)

- LED Output
  - White light
  - Controlled Individually
  - Increment power: 0% - 100%

Distance Sensor



Measures the distance to an object using ultrasonic technology.

Distance Sensor
- Range - 50 mm to 2000 mm
- Fast results 50 mm to 300 mm
- Entrance angle – 35°

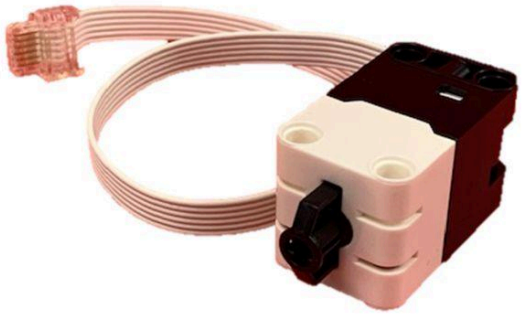
Technic design to allow combination with other models.

250 mm wire
for building models

LED Output
- Color – white
- Controlled individually
- Output Power: increments 0% - 100%

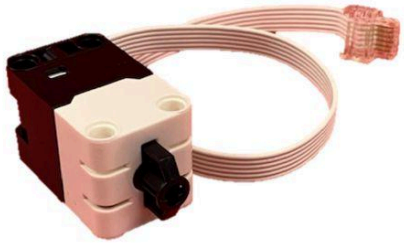
Force Sensor

- Touch Sensor
- Tap Sensor
- Force Sensor



Touch sensing:
- Activation zone: 0-2 mm
- Threshold point is defined in firmware 1 mm +/- 0.5 mm
- Activation force: 0.5-1.0 newton +/- 10%
- Sensor output is binary (1=activated or 0=not activated)

Tap sensing:
- Activation zone: 0-2 mm
- Threshold point is defined in firmware 1 mm +/- 0.5 mm
- Activation force: 0.5-1.0 newton +/- 10%
- Sensor data output: 0-3
- Applicable to the following:
  - Single tap
  - Quick tap
  - Press and hold



Force sensing:
- Activation zone: 2-8 mm
- Activation force: 2.5-10 newtons
- Sensor output resolution: 0.1 newton steps
- Sensor output is limited to a fixed max output value: 10 newtons
- Sensor output accuracy: +/- 0.65 newton

Force-filter sensing (high speed “peak” sensing): •
- Like the force sensing mode
- Internal sensor sample rate: 1kHz
- Keeps the maximum value until reset by the Hub firmware or powered down

Large Angular Motor

- Speed Sensor
- Relative Position
- Absolute Position

Rotation Sensor:

• Resolution: 360 counts per revolution

• Resolution is the number of counts the sensor makes for every full revolution (360 degrees) on the output axle

• Accuracy: ≤+/- 3 degrees

• Accuracy is defined as the tolerances in the sensor combined with the gearbox slack

• Update rate: 100 Hz

• Update rate is defined as the frequency at which a new sensor reading, position, and speed are available

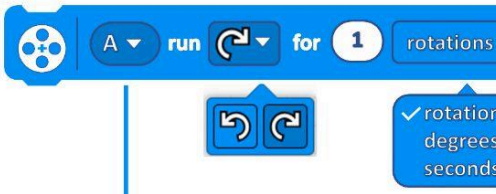
Medium Angular Motor

- Speed Sensor
- Relative Position
- Absolute Position

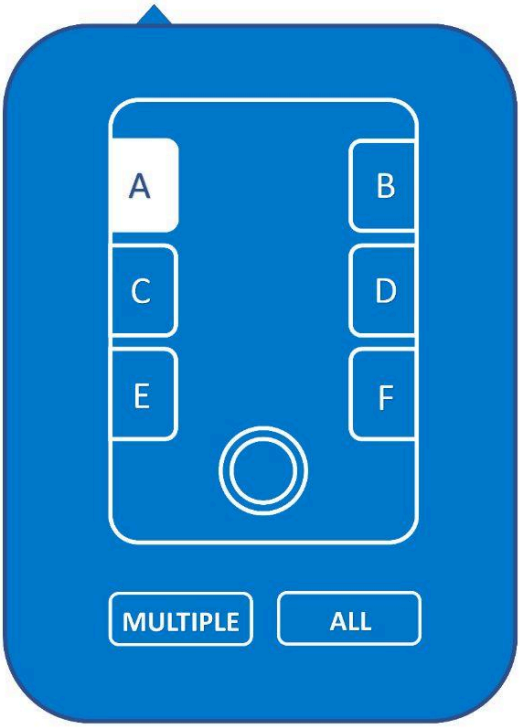
Rotation Sensor:

- Resolution: 360 counts per revolution
- Resolution is the number of counts the sensor makes for every full revolution (360 degrees) on the output axle
- Accuracy: ≤+/- 3 degrees
- Accuracy is defined as the tolerances in the sensor combined with the gearbox slack
- Update rate: 100 Hz
- Update rate is defined as the frequency at which a new sensor reading, position, and speed are available

Motors



Run Motor for Duration
This block will run or more motors clockwise or counterclockwise for a specified number of rotations, seconds, or degrees. The motor speed is set by the Speed Block. The default speed is 75%.



Motor Go To Position
This block sets one or more blocks to a certain position. The motor can be set to run clockwise, counterclockwise or to take the shortest path to the specified position. The position ranges from 0 to 359 degrees.

Set Motor Speed
This block sets the speed of one or more motors. The speed range is -100 to 100 with negative values being reverse direction. Default speed is 75%.

Start Motor
This block will run one or more motors clockwise or counterclockwise forever. The motor speed is set by the Set Speed Block.

Stop Motor
This block stops one or more motors from running. The motor will brake so that it quickly comes to a complete stop. The motor will not hold it's position once it stops.

Motor Position
Reports the current position of the motor.
0° – 359°

Motor Speed
Reports the actual current speed of the motor.
-100 to 100

Motors

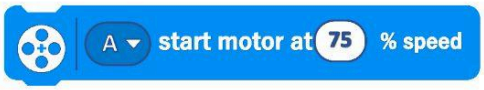
Adding Extensions
These blocks can be added to your programming platform by clicking on the "Add Extensions" button on the bottom left of your programming screen.

There are seven more sets of programming blocks that you can turn on in this screen.

All of the blocks here can be found in the "More Motor" extension.

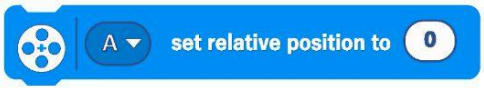
Run Motor for Duration at Speed
Runs motors clockwise or counterclockwise. Uses rotations, seconds or degrees.

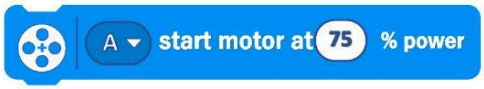
Start Motor at Speed
Runs motors clockwise or counterclockwise forever at the specified speed.



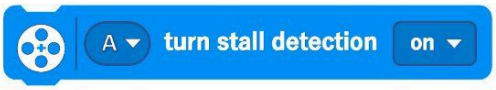
Go to Relative Position at Speed
Runs motors to a relative position at the specified speed.

Set Relative Motor Position to "#"
Set motor to relative position at specified value. "0" resets relative position.





Start Motor with Power
Runs motor at specified power level forever.

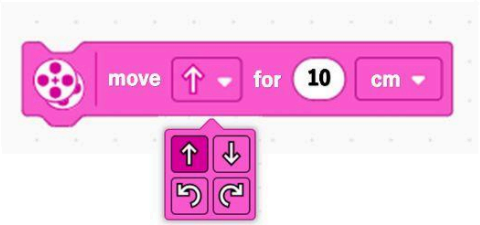


Turn Stall Detection On/Off
Use to disable the stall detection on motor and movement blocks. If stall detection is off, the motor will try to complete blocks even when prevented. If detection is on, the code will move on to the next block.

Stop and Coast Motors
Defines how the motor will stop.

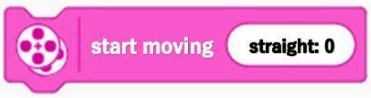
Was movement Interrupted?
If a motor block with a specified duration did not complete, it was interrupted.

Movement

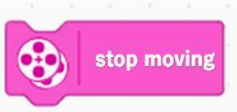


Move for Duration
Move forward, backwards, left or right based On your type of measurement. This block provides a "tank-type movement" for your robot.

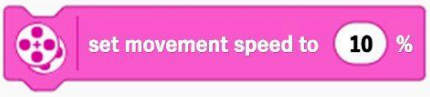
Move with Steering for Duration
Move forward, backwards, left or right based On your type of measurement. This block provides a "arc-type turn" for your robot, like how a car turns.



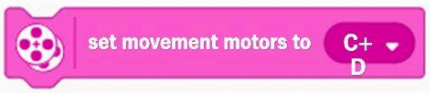
Start Moving with Steering
Starts the motors moving with an option to add steering. Turn Left (¯1 - ¯100), Turn Right (1 - 100), Move Straight (0)



Stop Moving
Stops the motor(s) moving.



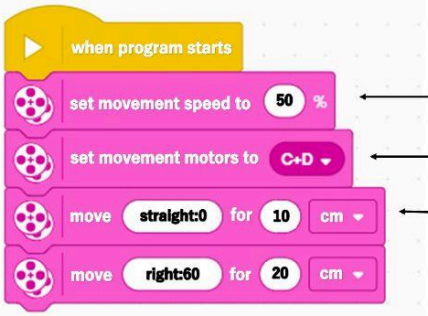
Set Movement Speed
Sets the motors to move at a percentage of their maximum speed. Positive numbers (1 to 100) move your motor in a forward direction. Negative numbers (-1 to -100) move your motor in a reverse direction.
NOTE: *"%" represents a percentage of the battery level. Keep battery charged.*



Set Movement Motors
Defines which motors are used for movement in your program.

Set 1 Rotation to Distance Moved
Defines how many cm or inches one motor rotation equals.

Sample Program



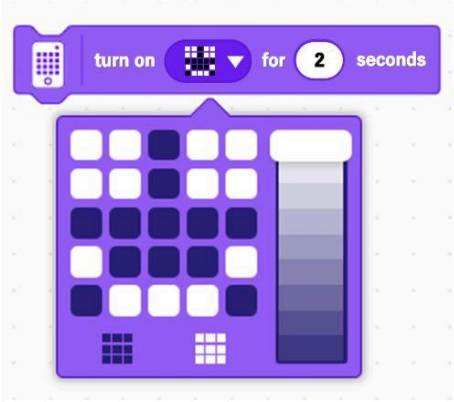
First, set your speed.

Then, identify your motors.

Now, program your movement(s).

Light

Turn on 5x5 Light Matrix for Seconds



This block lets you create a pattern out of the 5x5 light matrix for a specified amount of time.
You click on the squares to turn them on/off (black/white). You can also use the slide scale to adjust the brightness of each light.

Turn on 5x5 Light Matrix

This block creates a pattern out of the 5x5 light matrix. The pattern will stay lit until the program tells it to do something else or the program is stopped.

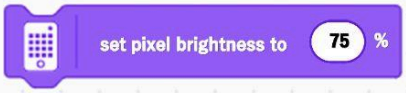
Write on 5x5 Matrix

This block displays a text string across the 5x5 light matrix by displaying one letter at a time.

Turn off Pixels

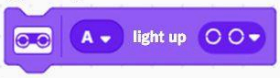
This block turns off all lights on the 5x5 light matrix.

Set Pixel Brightness



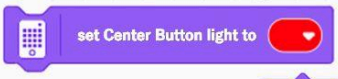
This block sets the brightness on the matrix for the next block. If a value is not specified, then the default brightness is 100%.

Light Up Distance Sensor



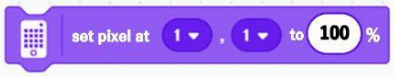
This block turns the Distance Sensor lights on and off.

Set Center Button Light



This block sets the color of the Center Button light.

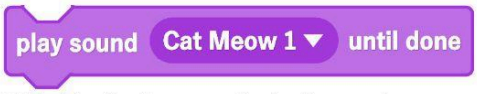
Set Pixel



This block sets the brightness of individual pixels on the 5x5 matrix. Conly the specified pixel is updated. The of the matrix remains unchanged.

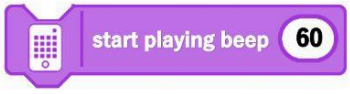
Sound

Play Sound Until Done



This block plays a selected sound on your device and pauses the program until the sound is completed. There are over 150 sounds within the program, plus you can record your own sounds or edit existing sounds.

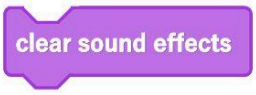
Start Playing Beep



This block plays a beep tone on your device until the program stops it.

Basic Sound Blocks

These blocks initiate basic sound commands on your device.

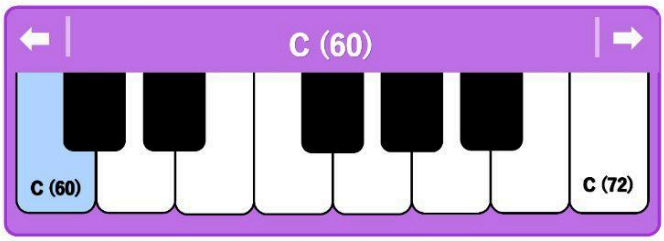


Reports the current volume.

Start Sound

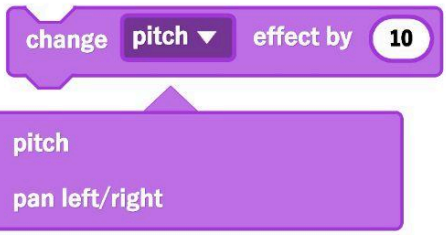
This block starts playing sound on your device and immediately plays the next block.

Play Beep for Seconds



This block plays a beep tone on your device for a specified number of seconds. There is keyboard here that allows to pull several different tones.

Change Pitch Effect By



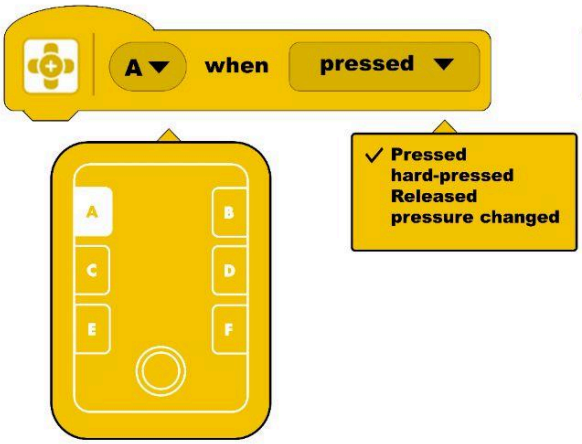
This block changes the pitch effect played on the device. Pan left/right determines which channel your sound emits from.

EVENTS

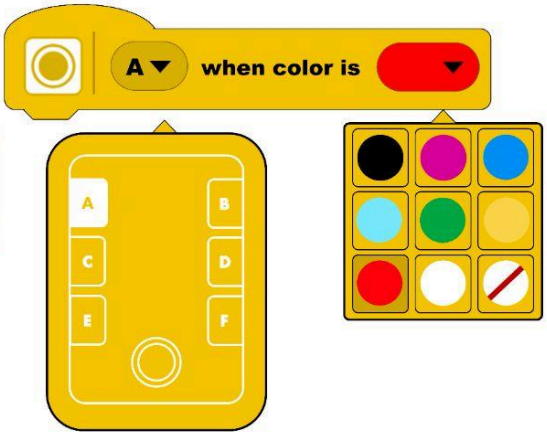
Event Blocks are always the first block in a programming stack and other blocks can only attached beneath them. They are sometimes called “Hat Blocks.” Event Blocks offer various options and are required to start a programming stack .

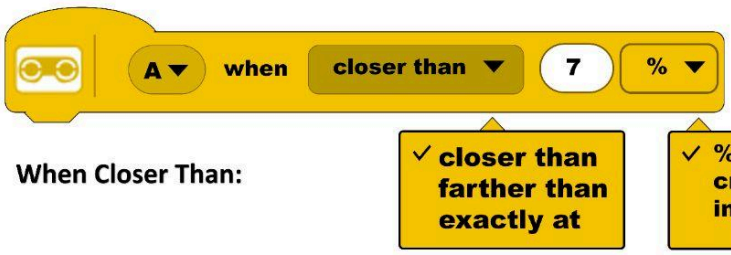
When Program Starts
Runs all blocks attached to it, from top to bottom, when the program starts. You can begin this sequence by using he Download and Run button , or by selecting the program on the EV3 Brick.

When Pressure Is
This cap plays all blocks that are attached to it when the Force Sensor is pressed, hard-pressed, released, or when a change in pressure is detected.



When Color Is
This cap plays all blocks that are attached to it when the chosen color is detected by the Color Sensor.



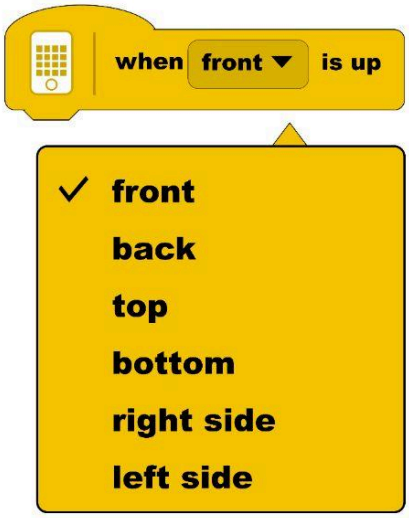


When Closer Than:

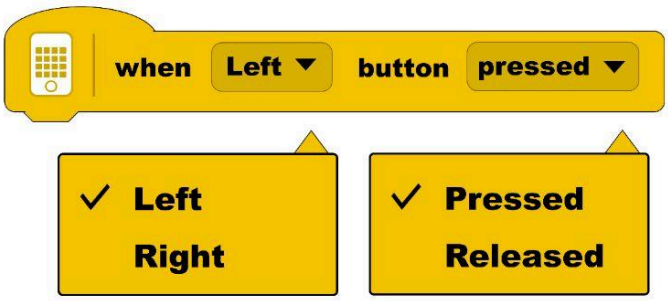
Plays all the blocks attached to the stack when the Distance Sensor detects that n object is closer than the specified distance.

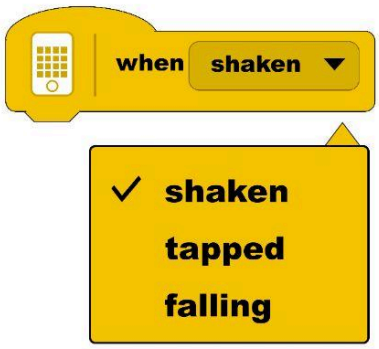
EVENTS

When Hub Orientation is Up
Plays all the blocks attached to the stack when the Hub is oriented to the specified direction.



When Hub Button is Pressed
This cap plays all blocks that are attached to it when the right or left buttons are pressed or released.





When Hub Shaken
This cap plays all blocks that are attached to it when the hub is shaken, tapped or falling.

When I receive Message:
Plays all the blocks attached to the stack when a specific message is received. You must have a Broadcast block somewhere else in the active program.

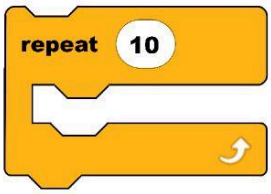
Broadcast Message:
Broadcasts a specific message as selected. When this message is sent, all Hat blocks for that message will play.

Broadcast Message and Wait:
Similar to the block above except that it will wait until all programming stacks attached to the message are played before it moves on to the next block.

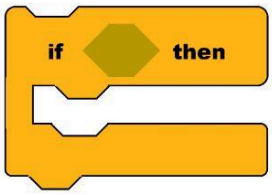
CONTROLS

Control Blocks are the blocks that can modify the linear flow of block execution, such as “wait for” commands, loops or conditions.

Wait for Seconds
Pauses the programming stack for the specified number of seconds. The wait time can also be a decimal number.

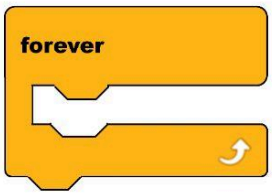


Repeat Loop
Repeats the blocks held inside it for the specified number of times before allowing the programming stack to continue.

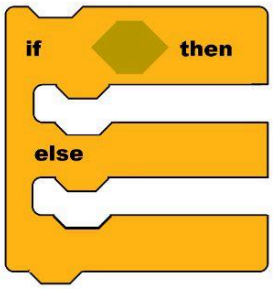


If Then
Runs all of the blocks held inside if its Boolean condition is true, and then continues the programming stack.

Wait Until
Pauses the programming stack until the Boolean condition is true.

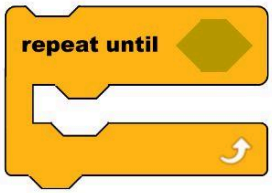


Forever Loop
Repeats the blocks held inside it forever. The only way to stop the loop is to click the Stop Button, use the Stop Block inside of the loop, or use the Stop Other Stacks Block outside the loop.

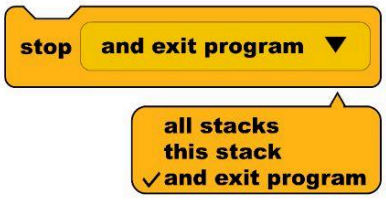


If Then Else
Runs all of the blocks held inside top if its Boolean condition is true, or the blocks held inside of the bottom if its Boolean condition is false. Then continues the programming blocks.

Stop Other Stacks
Stops all other programming stacks that are currently running.



Repeat Until Loop
Repeats all of the blocks held inside it until its Boolean condition is “true,” then the programming stack continues.

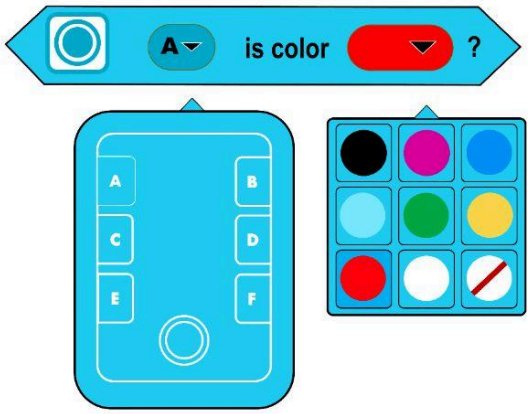


Stop
Stops all running programming stacks, its own programming stack, or stops and exits the program.

SENSORS

Sensor Blocks receive information from the sensors attached to your Brick. Sensor blocks are offered in various formats:

Color Sensor



Is Color?

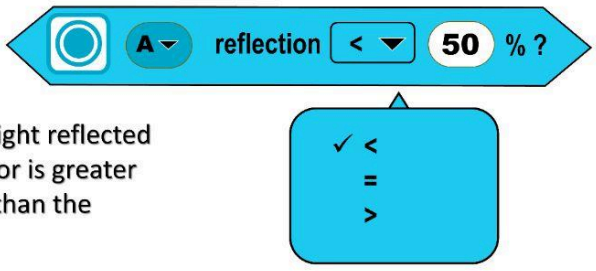
Returns "True" if the color sensor detects the specified color.
Returns "False" if the color sensor does not detect the specified color.
The program blocks following this Boolean condition can only proceed if the return is "True."

Color

Returns the Color Sensor's detected color as a number code. Possible values are:

0 = Black	1 = Violet	3 = Blue	4 = Light Blue
5 = Green	7 = Yellow	9 = Red	10 = White
-1 = No Color			

Is Reflected Light?



Returns "True" if the light reflected back to the color sensor is greater than, equal to or less than the specified percentage.

Reflected Light

Reports the values of the reflected light back to the Color Sensor.

SENSORS

Sensor Blocks receive information from the sensors attached to your Brick. Sensor blocks are offered in various formats:

Touch Sensor

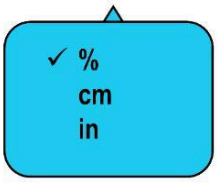
Is Pressed?
Returns "true" when the Touch Sensor is pressed (>0 newton), hard pressed (>5 newton), or released (= 0 newton)

Pressure
Reports the current pressure being applied to the Touch Sensor in newtons (2-10 newtons) or as a percentage.

Distance Sensor

Is Distance?

Returns "true" when the Distance Sensor detects something closer than, exactly or greater than a specified distance.



Distance

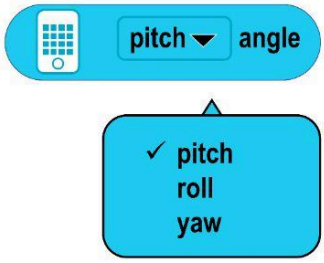
Reports the current distance the Distance Sensor is detecting in cm, in or percentages.

SENSORS

Sensor Blocks receive information from the sensors attached to your Brick. Sensor blocks are offered in various formats:

The Hub

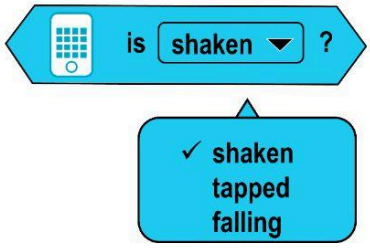
Is Hub orientation?
Reports "True" when the Hub is placed in the specified orientation.



Hub Pitch Roll Yaw
This block reports the Hub's pitch, roll or yaw. These terms are commonly used to describe an airplane's movement.

- Pitch refers to the airplane's nose going up or down.
- Roll refers to the airplane's wings going up or down.
- Yaw refers to the direction of the airplane compared to the ground.

Set Hub Yaw Angel to 0
This block sets the yaw angle of the Hub to "0." BY default, the yaw angle will be "0" in the direction of the Hub when the program starts.



Is Shaking?
This block returns "true" when the Hub's Force Sensor is either:

- Shaken
- Tapped
- Falling

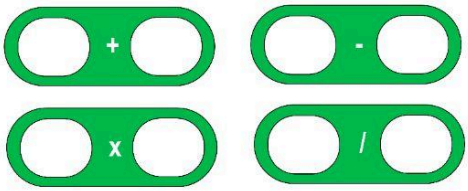
Timer
Reports the time in seconds since the program started.

Reset Timer
Resets the timer to "0 seconds."

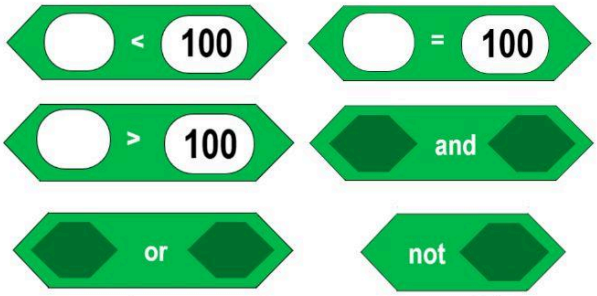
OPERATORS

Operator blocks perform all the mathematical operations that can be done using numerical values.

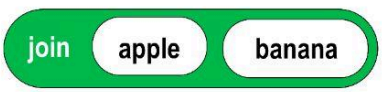
Pick Random Picks a random number within a specified range, including both endpoints.



Basic Math Operations Works the operation of the block and returns the result..



Boolean Operators Returns true if the Boolean value is True.



Join Strings Joins two values together and returns the result. For example, "good" and "bye" were input into the block, it would return "goodbye."

Length of String Returns the number of characters contained in a given string.

Math Functions Performs the specified function on a given number and reports the result.

Mod Returns the remainder of the division when the first value is divided by the second. For example, when "15" is the first input and "4" is the second input, the block will report "3" because 15 divided by 4 gives a remainder of 3.

Round Following standard rules of rounding, this block rounds a given number to the nearest integer.