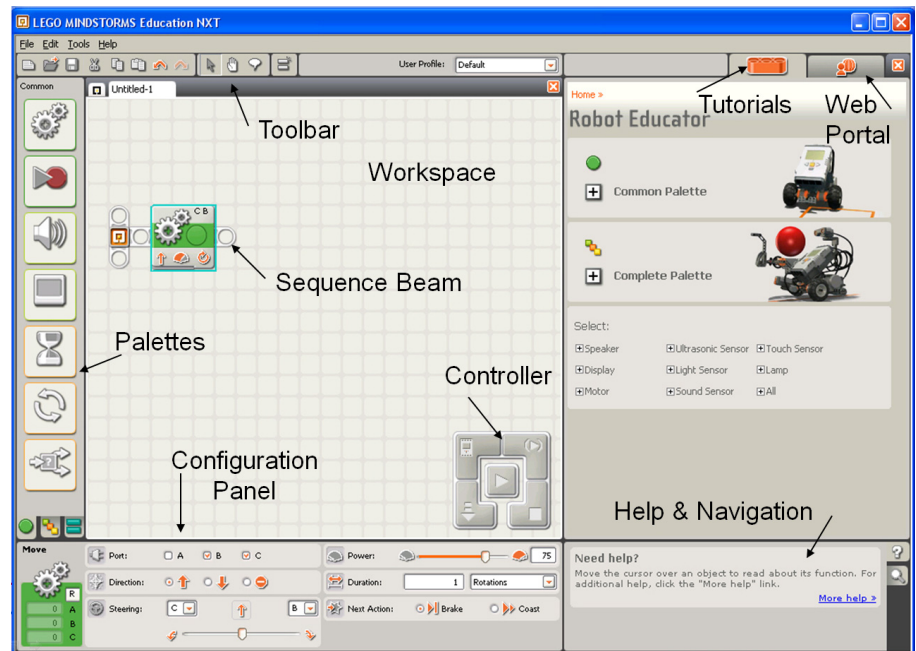


# Basic Building Blocks: NXT-G Programming



## Move Block

Use this block to set your robot to go forwards or backwards in a straight line or to turn by following a curve. Define how far your robot will go by using the Duration property.

### Block Variables

1. The letters at the top right corner of the block show which of your NXT's ports will be controlled.
2. The icon at the bottom left shows which direction your robot will go.
3. The icon at bottom center shows the power level. Your robot's speed may also be affected by other conditions, like the surface it is moving over or whether it is moving up or down a slope.
4. The icon at bottom right shows whether you have set the Duration property to unlimited, degrees, rotations, or seconds.



## Sound Block

You can use this block to play a sound file or a single tone. To compose a melody of tones, arrange several sound blocks in a row with each set to play different tones.

If you select "Wait for completion" in the configuration panel, the sound file or tone will finish playing before the program moves on to the next block. With this item unchecked, the sound file or tone will continue to play while the next block of your program proceeds.

Choosing "Repeat" will cause a sound file to play again and again.

### Block Variables

1. The icon at bottom left shows whether the block will play a sound file or a tone.
2. The icon at bottom center shows whether the block will start or stop playing a sound.
3. The icon at bottom right shows the block's volume. An icon with four orange bars is set to the loudest volume.
4. You can drag data wires from other blocks to this block's data hub that will affect the Lamp block's properties.



## Wait Block

This block lets your robot sense its environment for a certain condition before it continues. Use the slider or type in a value to set a trigger point so that the program continues when sensor values are below or above it.

1. The number or letter at the top right corner of the Wait block shows the port the block is monitoring. The configuration panel, which is described below, will let you change ports if necessary.
2. If you have chosen to wait for a light, sound, or ultrasonic sensor, this icon indicates at what level the trigger point is set; the more colored bars displayed, the higher the trigger point. If you have chosen to wait for a touch sensor, the icon will display the touch sensor condition (bumped, pressed, or released) that will trigger the block and allow the program to move on.

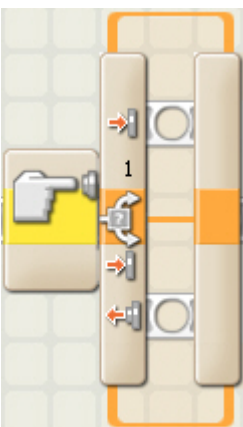


## Loop Block

Use this block to repeat sequences of code. Set the condition that will end the loop: elapsed time, the number of repetitions, a logic signal or a sensor. You can also set a loop to go on forever.

### Block Variables

1. When a Loop block's action property is set to "Forever," an infinity symbol ( $\infty$ ) is displayed at the bottom of the trailing portion of the block.
2. If the "Show Counter" checkbox is selected in the configuration panel, a plug will appear that will allow you to use the number of completed loops as an input elsewhere in your program (if you connect a data wire from the plug to another block's data hub). You can also use current count to control the loop itself. (See the Count setting in the Configuring the Loop Block section below).
3. If you choose for a sensor to control the loop, the trailing portion of the Loop block will expand in size revealing an icon for the chosen sensor. For example, if you choose a Light Sensor to control the loop, a Light Sensor icon will be displayed in the expanded portion of the block. Also, any relevant information about the chosen control property will be displayed at the bottom of the block.



## Switch Block

Use this block to choose between two sequences of code. For example, when configured with a touch sensor, the switch block might run one series of blocks when the sensor is pressed and another when the touch sensor is not.

### Block Variables

1. The icon at the beginning of the switch block indicates the sensor or other condition that will cause the block to choose between the two rows of programming blocks. In this case the current status of a touch sensor will cause the program to switch.
  - The upper blocks will run if the touch sensor is pressed.
  - The lower block will run if the touch sensor is not being pressed.

# Sensor Blocks



## Touch Sensor Block

This block checks a touch sensor's condition at a specific point in the program. It sends out its finding as a logic signal (true or false) through a data wire. If the sensor has been triggered, the block will send out a "true" signal; if it has not been triggered, the block will send a "false" signal.

You must drag an output data wire from this block's data hub to another block for any information to be sent.

### Block Variables

Use the radio buttons to decide which action will produce the "true" signal.

1. The number shows which of your NXT's ports are connected to the touch sensor. You can change this number in the configuration panel if you need to.
2. This icon will show which action will send a "true" signal (Bumped, Pressed, or Released).
3. The block's data hub will open automatically when the block is placed in the work area. A data wire must be dragged from the block's output plug to another block's data hub.



## Sound Sensor Block

This block is a sound detector. Using data wires, it can send out the current sound value and a logic signal (true/false) based on whether the current sound value falls above or below a trigger point.

Specify the trigger point by using the slider or by typing a value into the input box. To specify the range (above or below the trigger point) that will generate the "true" signal, use the radio buttons or the pull-down menu. The "true" portion of the range will be in color; the "false" portion will be gray.

The default setting for the sound sensor block is for sound levels above 50% to generate a "true" signal. The radio button to the right of the range is selected and the slider is set at 50. To switch the "true" portions of the range (setting values below 50% as "true"), you would select the left radio button.

The feedback box in the configuration panel shows the current sound value. (To receive feedback, make sure that the sensor is connected to the chosen port and that communication has been established with the NXT.)

You must drag at least one output data wire from this block's data hub to another block for any information to be sent.

### Block Variables

1. The number shows which of your NXT's ports is connected to the sound sensor. You can change this number in the configuration panel if you need to.
2. The icon at bottom right indicates at what level the trigger point is set. The more colored bars displayed, the higher the trigger point.
3. The block's data hub will open automatically when the block is attached to a sequence beam. At least one data wire must be dragged from the block's output plug to another block's data hub.



## Light Sensor Block

This sensor detects ambient (surrounding) light. Using data wires, it can send out the current light value and a logic signal (true/false) based on whether the current light value falls above or below a trigger point.

Specify the trigger point by using the slider or by typing a number into the input box. To specify the range (above or below the trigger point) that will generate the “true” signal, use the radio buttons or the pull-down menu. The “true” portion of the range will be in color; the “false” portion will be gray.

The default setting for the light sensor block is for light levels above 50% to generate a “true” signal. The radio button to the right of the range is selected and the slider is set at 50. To switch the “true” portions of the range (setting values below 50% as “true”), you would select the left radio button.

The feedback box in the configuration panel shows the current light value. (To receive feedback, make sure that the light sensor is connected to the chosen port and that communication has been established with the NXT.)

You must drag at least one output data wire from this block’s data hub to another block for any information to be sent.

### Block Variables

1. The number shows which of your NXT’s ports are connected to the light sensor. You can change this number in the configuration panel if you need to.
2. This icon indicates at what level the trigger point is set. The more colored bars displayed, the higher the trigger point.
3. This icon is displayed if “Generated Light” is turned on.
4. The block’s data hub will open automatically when the block is placed in the work area. At least one data wire must be dragged from the block’s output plug to another block’s data hub.



## Ultrasonic Sensor Block

This block can detect objects at a maximum range of about 250 cm (or 100 inches). Using data wires, it can send out the current ultrasonic reading and a logic signal (true/false) based on whether the current ultrasonic reading falls above or below a trigger point.

Specify the trigger point by using the slider or by typing a value into the input box. To specify the portion of the ultrasonic sensor’s range (above or below the trigger point) that will generate the “true” signal, use the radio buttons or the pull-down menu. The “true” portion of the range will be in color; the “false” portion will be gray.

The default setting for the ultrasonic sensor block is for objects detected at less than 50 cm to generate a “true” signal. The radio button to the left of the range is selected and the slider is set at 50. To switch the “true” portion of the range (setting readings at more than 50 cm as “true”), you would select the right radio button.

The feedback box in the configuration panel shows the current ultrasonic reading. (To receive feedback, make sure that the sensor is connected to the chosen port and that communication has been established with the NXT.)

You must drag at least one output data wire from this block's data hub to another block for any information to be sent.

### Block Variables

1. The number at top right shows which of your NXT's ports are connected to the ultrasonic sensor. You can change this number in the configuration panel if you need to.
2. The icon at bottom right shows whether the ultrasonic sensor is set to detect objects nearby or farther away. The more colored bars, the farther away the detection.
3. The block's data hub will open automatically when the block is placed in the work area. At least one data wire must be dragged from the block's output plug to another block's data hub. The trigger point can be set dynamically by connecting an input data wire.



### NXT Buttons Block

This block outputs a "true" signal through a data wire when one of the NXT buttons is activated. You will have to select the button and the action that will send the "true" signal.

### Block Variables

1. The icon at the bottom of the block indicates which NXT button has been selected.
2. The block's data hub will automatically open when the block is placed on the sequence beam. You will need to drag a data wire from the NXT Buttons block to another block that can accept a logic (true/false) signal.



### Rotation Sensor Block

This block counts the number of degrees (one full rotation is 360 degrees) or full rotations that your motor turns. Through data wires, this block can send out the current number of degrees or rotations, and a logic signal (true/false) based on whether the number of degrees or rotations falls above or below a trigger point.

Specify the trigger point by typing a number into the input box. To specify the range (above or below the trigger point) that will generate the "true" signal, use the pull-down menu to choose greater than or less than [the trigger point].

The default setting for the Rotation Sensor block is for degrees more than 180 to generate a "true" signal.

The feedback box will count how many degrees or rotations your motors turn. As a default, the box is set to display degrees. With the Duration property set to Rotation, the current count will be displayed in full rotations. Press the reset button to return it to zero. (To receive feedback, make sure that the motor is connected to the chosen port and that communication has been established with the NXT.)

### Block Variables

1. The letter at top right shows which port the Rotation Sensor block will be monitoring. You can change to another port in the configuration panel if you need to.
2. The icon at bottom right will show whether the block is counting the number of rotations (the solid circular arrow) or degrees (the dashed circular arrow).
3. # The block's data hub will open automatically allowing you to drag out a logic (true/false) data wire or a number (#) data wire that will transmit the Rotation Sensor's current count.