

# Icon Reference List

## Program Begin and End

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**Begin**

Beginning of program, required as the first command in every Inventor program.

**End**

End of program, required as the last command in every Inventor program.

**Stop A**

Stop Power to RCX Port A.

**Stop All Outputs**

Stop Power to RCX Ports A, B, C.

**Stop Outputs**

Stop Power to specified RCX Ports, default - Ports A, B, C.

## Specific Outputs

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**Motor A, Forward**

Turn RCX Port A on in forward direction at full power.

**Motor A, Reverse**

Turn RCX Port A on in reverse direction at full power.

**Lamp A**

Turn RCX Port A on full power.

**Play Sound #4**

Play a rising sweep on the RCX.

## General Outputs

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**Lamp**

Turn lamp on, default – all Ports, power level 5.

**Motor Forward**

Turn motor on, default – all Ports, power level 5.

**Motor Reverse**

Turn motor on in reverse direction, default – all Ports, power level 5.

**Flip Direction**

Flip direction of power to specified RCX Ports, default - all Ports.

**Play Sound**

Play a sound on the RCX. The sounds available are:  
1-Key Click                      4-Rising Sweep (default setting)  
2-BeepBeep                      5-Buzz  
3-Descending Sweep          6-Fast Rising Sweep

**Float Outputs**

Stops power to output Ports and allows devices to spin to a stop.



# Icon Reference List

## Wait For?

	<b>Wait For? Sub-menu</b>	Icons in this sub-menu specify when the command icons should stop executing.
	<b>Wait for 1 Second</b>	Wait 1 second before continuing.
	<b>Wait for Time</b>	Wait for specified amount of time, default - 1 second.
	<b>Wait Random Time</b>	Wait for a random amount of time, default - between 0 and 5 seconds.
	<b>Wait for Push</b>	Wait until touch sensor is pushed in, default - input Port 1.
	<b>Wait for Let Go</b>	Wait until touch sensor is released, default - input Port 1.
	<b>Wait for Light</b>	Wait until light sensor reads a value that is brighter than the number specified, default = 55, input Port 1.
	<b>Wait for Dark</b>	Wait until light sensor reads a value that is darker than the number specified, default = 55, input Port 1.
	<b>Wait for Brighter</b>	Wait for light sensor to read a value that is greater than current value. Default - input Port 1, light value increase of 5.
	<b>Wait for Darker</b>	Wait for light sensor to read a value that is less than current value. Default - input Port 1, light value decrease of 5.
	<b>Wait for Rotation Without Reset</b>	Wait until the Angle Sensor value is greater than the number of rotations specified (in 16ths of a rotation) in either direction. This program will not zero the sensor each time.
	<b>Wait for Increase in Camera Sensor</b>	Wait until the Camera Sensor reads a value that is greater than the number specified.
	<b>Wait for Decrease in Camera Sensor</b>	Wait until the Camera Sensor reads a value that is less than the number specified.
	<b>Wait for Increasing Temp (C)</b>	Wait until the temperature is greater than the number specified. Default - 30 Celsius on input Port 1.
	<b>RCX Wait for Rotation</b>	Wait until the angle sensor value is greater than the number of rotations specified. Default - 16 (one rotation) on input Port 1.
	<b>Wait for Angle</b>	Wait until the angle sensor value is greater than the angle specified (in either direction). Default - 180 degrees on input Motor 1.
	<b>Wait for Container</b>	Wait until the container is equal to the number specified. Default - red container equal to 1.
	<b>Wait for Timer</b>	Wait until the timer reaches a specified value. Default - red timer equal to 1 second. YOU MUST ZERO TIMER FIRST!
	<b>Wait for Mail</b>	Wait until mail received from another RCX is equal to the specified number. Default - any whole number.



# Icon Reference List

## Modifiers

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### Modifiers Sub-menu

Icons in this sub-menu specify port locations, power levels, and values used with the command icons.



### Input 1

Wire this modifier to a command to select input Port 1.



### Output A

Wire this modifier to a command to select output Port A.



### Power Level 4

Wire this modifier into a motor or lamp to set the power level to 4.



### Numeric Constant

Wire this modifier into a sensor or time to set a constant value.



### Value of Red Container

The value of red container.



### Red Container

Wire this to a container command to select red container.



### Random Number

A random number between 0 and 8.



### Value of Port 1

The value of Port 1.



### Red Timer

Wire this to a timer command to select red timer.



### Value of Red Timer

The value of red timer.



### Value of Mail

The value of the mail.



### Value of Firmware

The value is the firmware version number multiplied by 100.



### Value of Battery

The value is the battery voltage number multiplied by 1000.

## Music

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### Music Sub-menu

Icons in this sub-menu specify how musical notes should be played.



### Music Note C

Play musical note on the RCX. Default - quarter note in the standard scale.



### Rest

Insert a pause in the music.



### Musical Duration

Specify the length of time for a note to play.



### Up an Octave

Wire to a music command to raise the pitch by one octave or more octaves, if more than one is wired together.



# Icon Reference List



## Load Scroll from File

This routine will add the musical notes currently in a file into your inventor program.

### Structures – Jump and Land

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## Jumps Sub-menu

Icons in this sub-menu specify where the program will jump and land in the program.



## Jump

Make the program jump to a specific place in the string.



## Land

This command is where the program will jump to when you use red jump command.

### Structures – Loops

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## Loops Sub-menu

Icons in this sub-menu specify where the program loops will begin and end.



## Start of Loop

Start a loop structure. Default - loop twice.



## End of Loop

Jump back to start of loop a specified number of times.



## Touch Loop

Start a loop that repeats while the Touch Sensor is pushed.



## Loop While Camera Sensor is Greater Than

Starts a loop that repeats while the value of the camera sensor is greater than a specified number.



## Loop While Camera Sensor is Less Than

Starts a loop that repeats while the value of the camera sensor is less than a specified number.

### Structures – Forks and Tasks

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## Task Split

Start a new task with this command to run multiple tasks simultaneously.



## Forks Sub-menu

Icons in this sub-menu specify where the program will choose between two paths and where it will merge again.



## Touch Sensor Fork

Have the program choose between one of the two paths depending on the state of touch sensor. Default input Port 1.



## Fork Merge

Merge the two strings of a fork back together. It must be used with a fork.



## Camera Sensor Fork

Choose a path depending on whether the value of the Camera Sensor is greater-than or less-than a specified number. If the camera sensor is greater than the specified value, the program will follow the top string. If the camera sensor is less than the specified value, the program will follow the bottom string.



## Random Fork

Have the program choose between one of two paths randomly.



# Icon Reference List

## Structures - Subroutines

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### Create Subroutine

Create a new subroutine. The subroutine will not run at this point in the program. It will run when the program reaches the Run Subroutine icon.



### Run Subroutine

Specify where to run the subroutine in the program.



### Delete Subroutine

Delete the specified subroutines in the RCX. Default is to delete subroutine 0.

## Container

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### Container Sub-menu

Icons in this sub-menu manipulate containers (variables) and the values within them.



### Add to Container

Add a number to container. Default - add 1 to red container.



### Remove from Container

Subtract a number from container. Default - subtract 1 from red container.



### Fill Container

Set container to a certain value. Default - set red container to 1.



### Touch Container

Set container to the value of touch sensor.



### Timer Value Container

Set container to the value of the timer. Default - set red container to value of red timer.



### Formula Container

Set the container to a formula.



### Event State Container

Set the container to a certain event state. Tells whether the event is in the low, normal or high state depending on the set thresholds.



### Event Register Container

Set the container to a copy of the bit register of the successful event(s) for the current task.



### Camera Sensor Container

Set the container to a certain value.

## Reset

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### Reset Sub-menu

Icons in this sub-menu reset containers, timers, and sensors to zero.



### Empty Container

Reset container value to zero. Default - set red container to zero.



### Zero Timer

Reset the timer value to zero. Default - set red timer to zero.



### Zero Angle Sensor

Reset the angle sensor to zero. Default - input Port 1.

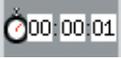
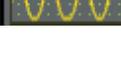


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	<b>Empty Mailbox</b>	Reset RCX mailbox value to zero. This empties the mailbox so the mail can be received from another RCX.
	<b>Zero Touch Sensor</b>	Reset the touch sensor.
	<b>Zero Light Sensor</b>	Reset the light sensor.
	<b>Zero Temperature Sensor (Celsius)</b>	Reset the temperature sensor to Celsius.
	<b>Zero Temperature Sensor (Fahrenheit)</b>	Reset the temperature sensor to Fahrenheit.

## Data Logging – Investigator Levels 1-3

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	<b>Light Sensor</b>	Collect light sensor data.
	<b>Touch Sensor</b>	Collect a count of touch sensor presses.
	<b>Temperature Sensor</b>	Collect temperature sensor data.
	<b>Rotation Sensor</b>	Collect angle sensor data.
	<b>Sensor Adapter</b>	Collect adapter sensor data.
	<b>1 sec</b>	Set the sampling rate to 1 second between each data point.
	<b>Data Logging Interval</b>	Set the sampling rate to the user-specified time interval between each data point.
	<b>Touch sensor-based interval</b>	Collect data every time the touch sensor is released.
	<b>10 Points</b>	Collect 10 data points.
	<b>Set Points</b>	Collect as many data points as specified.
	<b>Data Logging On</b>	Collect data during the step.
	<b>Data Logging Off</b>	Do not collect data during the step.



# Icon Reference List

## Data Logging – Investigator Level 4

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### Investigator Sub-menu

Icons in this sub-menu control the operation of the data logging functions of the RCX.



### Initialize Light Sensor Logging

Initialize light sensor to take data and configures data logging settings. Default settings: sensor on input Port 1, data set to the red set.



### Initialize Touch Sensor Logging

Initialize touch sensor to take data and configures data logging settings. Default settings: sensor on input Port 1, data set to the red set.



### Initialize Temperature Sensor Logging

Initialize temperature sensor to take data and configures data logging settings. Default settings: sensor on input Port 1, data set to the red set.



### Initialize Rotation Sensor Logging

Initialize rotation sensor to take data and configures data logging settings. Default settings: sensor on input Port 1, data set to the red set.



### Initialize Clicks Sensor Logging

Initialize touch sensor to take number of clicks as data and configures data logging settings. Default settings: sensor on input Port 1, data set to the red set.



### Initialize Container Logging

Initialize a Container to take data and configures data logging settings.



### Initialize Timer Logging

Initialize a Timer to take data and configures data logging settings.



### Start Data Logging

Start capturing or logging data.



### Stop Logging

Stop capturing or logging data.



### Resume Logging

Resume capturing or logging data.



### Start Data Logging With Clicks

Start capturing or logging data and clicks each time a data point is taken.

## Data Logging Modifiers

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### Sample One Tenth Sec

Capture data every one tenth of a second.



### Sample One Minute

Capture data every minute.



### Sample One Hour

Capture data every hour.



### Touch Sampling

Capture data every time the touch sensor is pressed.



### Red Data Set

Identify the location where data is stored.



### Free Sample With Time Stamp

Capture data every time you write on the data set and mark the data with the time.



# Icon Reference List

## Compute Tools 1

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**Add**

Add two values.



**Subtract**

Subtract one value from another.



**Multiply**

Multiply two values together.



**Divide**

Divide one value by another.

## Compute Tools 3

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**Maxima**

Plot the maximum value of each data set in the selected bin.



**Minima**

Plot the minimum value of each data set in the selected bin.



**Mean**

Plot the mean value of each data set in the selected bin.



**Standard Deviation**

Plot the standard deviation of each data set in the selected bin.



**No Change**

Plot all the data sets in the selected bin.



**Slope**

Plot the value of the slope for each data set in the selected bin.



**Integrate**

Plot a line that is the integral for each set of data in the selected bin.



**Differentiate**

Plot a line that is the derivative for each data set in the selected bin.



**Average Line**

Plot one line that is the average of all data sets in the selected bin.



**Fit Line**

Plot a linear best fit curve for each data set in the selected bin.  
The linear equations are also shown.



# Icon Reference List

## Compute Tools 4

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### View All

Show the data set in any bin. Default: red bin.



### Extract

Separate the X and Y coordinates of a data set in two arrays.



### Combine

Combine the X and Y values into a plot.



### Combine Bins

Combines two plots together.



### XY Plot

Add the data set defined by the X and Y numbers to an existing bin.



### Bin Plots

Put the contents of a plot into a bin.



### Well Time

Find the time the measured value in a data set is below a given threshold.



### Peak Time

Find the time the measured value in a data set exceeds a given threshold.



### Threshold

Extract the measured values in a data set when they are between two thresholds.



### Fit Curve

Fit a curve to the specified data set.



### Fit Exponential

Fit an exponential to the specified data set.



### Histogram

Give a histogram for each data set.



### Bin Modifiers

Select the bin for the data set.

## Events

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### Event Sub-menu

Icons in this sub-menu allow you to set up programming based on events. More information is available at <http://www.LEGO.com/education/mindstorms>.



### Start Monitoring for an Event

Start monitoring for the corresponding event(s).



### Stop Event Monitoring

Stop all event monitoring.



### Event Landing

This command is where the program will jump to when any event is triggered.



# Icon Reference List



## Set Up Pressed Event

Set up an event to occur when the touch sensor is pressed.



## Set Up Enter High Event

Set up an event to be triggered when the value of the event source goes above the upper threshold.



## Define Event

Define the settings for Enter (low, normal, and high) events.



## Reset Event

Reset monitoring for an event.



## Force an Event

Force the firmware to behave as if the events, whose bits are set in the calculated 16 bit value, had actually happened.



## Clear All Events

Clear all 16 events.

### Events Modifiers

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## Event Modifiers Sub-menu

Icons in this sub-menu allow you to modify the Event based program icons. More information is available at <http://www.LEGO.com/education/mindstorms>.



## Red Event

Wire this to an Event Definition or Monitor command to select the Red Event.



## Value of Red Event

Wire this to an Event Definition or Monitor to select the Red Timer.



## Value of Red Upper Threshold

The value of the upper threshold for the red event.



## Value of Red Lower Threshold

The value of the lower threshold for the red event.



## Value of Red Hysteresis

The value of the hysteresis for the red event.



## Value of Red Duration

The value of the duration for the red event.

### Task Priority

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## Task Priority Sub-menu

Monitors access control – if any task of higher priority wants control of the outputs, jump to the red access landing.



## Task Priority

Icons in this sub-menu allow you to set priorities of different tasks in your program.



## Start Monitoring for Output Access Control

This sets the priority of any task. **Note:** 0 is the highest priority.



# Icon Reference List



## Start Monitoring for Sound Access Control

Monitor access control of sound – if any task of higher priority wants control of the sound, jump to the red access landing.



## Access Control Landing

This command is where the program will jump to when another task of higher priority wants control of the outputs.



## Stop Access Control Monitoring

Stop access control monitoring.

## RCX Communication

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## RCX Communication Sub-menu

Icons in this sub-menu specify commands used in RCX communication.



## Send Mail

Send mail to another RCX. Default - send the number 1.



## Snap Image

This will tell Vision Control to snap an image and save it in the Image Folder. (This will only work with Vision Control open.)



## Set Display

Set the RCX LCD display to show a certain value.



## Fill Mailbox

Reset the RCX mailbox to a value.



## Fill Remote Container

Set the container to a certain value on a remote RCX.



## Start Direct RCX Communication

Start Direct Commands sent to other RCXs.



## End Direct RCX Communication

End direct communication sequence with remote RCX(s).



## Start Remote Program

Start remote programming to other RCXs.



**Download Remote Program** Download a sequence of commands as a program to remote RCX(s).



## Clear Sound Buffer

This command immediately empties the sound buffer in the RCX from any and all queued tones or system sounds.



## Mute Sound

This command empties the sound buffer and ignores future sounds.



## Unmute Sound

This command restarts the sound buffer to play sounds.



# Icon Reference List

## Direct Functions

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**Direct Functions Sub-menu** Icons in this sub-menu specify direct functions that return information to the computer.



**Memory Map** This command gives back the memory allotment within the RCX.



**Read Run Status** Read the Run Status of the RCX.



**Read Tower Power** Read the transmitter power on the RCX.



**RCX Tower Power** Set the transmitter power of the RCX.



**RCX Battery Power** Check the battery level of the RCX. Outputs a value between 0 and 9.

## Advanced

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**Advanced Sub-menu** Icons in this sub-menu allow you to program specific types of coding. More information is available at <http://www.LEGO.com/education/mindstorms>.



**Begin RCX** Begins an Inventor program for the RCX.



**Begin LASM** Begins an Inventor program and shows the LASM interface.



**Begin Direct Mode** String a command in after this one to run the following commands immediately in direct mode (no download).



**Generate LASM cmd** This powerful icon allows you to enter LASM text directly. Simply wire in the line(s) of text into LASM Cmd and have the begin and end wire on either side.



**Set Modifier Value** Set any writeable source and value.

## Control Lab

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**Control Lab Interface Sub-menu** Icons in this sub-menu allow you to write programs for the LEGO Interface B.

## Scout

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**Scout Commands Sub-menu** Icons in this sub-menu allow you to write programs for the LEGO Scout.



# Icon Reference List

## Multimedia

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### Multimedia Sub-menu

Icons in this sub-menu allow you do additional programming with video or sound. More information is available at [www.LEGO.com/education/mindstorms](http://www.LEGO.com/education/mindstorms).



### Init Small Image

This VI initializes the camera at its small setting (160x120).



### Init Internet Image

This VI initializes the camera at Internet Setting (320x240).



### Close Camera

This VI closes the camera.



### Grab RGB

This VI grabs a single image from an initialized camera. The color of the image is specified by Image Type.



### Convert to Picture

This VI converts an image to a LabVIEW™ picture.



### Convert to Array

This VI converts an image into a 2-dimensional array of rows and columns (e.g., 320 columns and 240 rows).



### Get Pixel Value

This VI gets the value of the pixel located at the specified position and returns its value (either as an 8-bit number or an RGB cluster).



### Advanced Video Sub-menu

The icons in this sub-menu allow you to do very advanced video processing.



### Init Mic

This initializes the microphone.



### Grab Sound

This VI collects one second of sound data.



### Play Sound

This VI plays sound data.



### Close Mic

This VI closes the microphone.



### Save Sound

This VI saves sound data to a .wav file.



### Frequency Analysis

This VI does a Fourier Transform on the one second of sound grabbed.



# Icon Reference List

## Media Window

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**Music  
Piano Player**

Opens the Piano Player Window.



**Play Current Song**

Plays the selected song on the computer.



**Single Play**

Plays the selected song one time.



**Continuous Play**

Plays the selected song in a continuous loop.



**Camera Setup**

Opens the Camera Setup window.



**Camera Pause**

Freezes image in Camera window. Selecting Camera Pause again starts continual image updates.



**Save Image**

Opens a save file window that allows you to name and save the current image in the Camera window to a file.



# Icon Reference List

## Piano Player

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**Delete Note**

Deletes the selected note.



**Record**

Toggles whether or not the notes being played are kept on the scroll.



**Play Current Song**

Plays the current song through the computer.



**Select Computer**

Selects the computer as the device which plays the notes.



**Select RCX**

Selects the RCX as the device which plays the notes.



**Tempo**

Controls the tempo at which the song is played. This is displayed in beats/min.

## Note Articulation

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**Staccato**

Play note for 50% of the specified duration.



**Normal**

Play note for 80% of the specified duration.



**Slurred**

Play note for 100% of the specified duration.

## Investigator Template Icons

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**Line points graph**

Plots data points with a line for each data set.



**Line graph**

Plots each data set as a line.



**Points graph**

Plots the points of each data set.



**Bar graph**

Plots each data set as a bar graph.



**Numeric Table**

Lists the numeric values of each data set.



# Icon Reference List

## Investigator Graph Tools



The Graph Tools allow you to change the way your plot looks on the screen without changing the data itself. The data sets will automatically plot with all points visible. The Graph Tools only need to be used if you want to change the scale of your axes, zoom in or out on the graph, or manipulate cursors to determine the value of specific points in the data set.



### Autoscale X Data

Set the scale of the x-axis of the graph to match the range of the data set.



### Autoscale Y Data

Set the scale of the y-axis of the graph to match the range of the data set.



### Lock Autoscaling

Turns on or off the x or y autoscale feature. Right is autoscaling on. Left is autoscaling off.



### Format and Precision Control

Allows you to set the format (linear or logarithmic scales) and the decimal place precision of the x and y scales.



### Standard Operate Mode

Graph Tools open in the standard operate mode.



### Zoom Button

Opens a window with multiple options for zooming in or out on the graph.



### Pan Button

Allows you to "grab" the plot and move it within the graph area.



### Enlarge Button

Opens a screen-sized graph window with two cursors. Clicking and dragging the cursors over points from the data set shows the actual values. It also lets you identify which lines go with each data set.

## Vision Center



### Select Camera

Selects which camera to use.



### Define Sensor

Defines a sensor for the camera to use.



### Save Picture

Saves the current image to a bitmap file.



### Connection Speed

Toggles between No Connection with the RCX, Slow Connection, and Fast Connection.



### Plane

Selects which color plane to view the image in. Selecting a container will allow you to view the manipulated image for that sensor.

