



## Basics

As of ICD version 3.37 (and **PFx Brick** firmware versions 1.40+), the ability to execute complex actions and behaviours defined in script files was added. Script files are simple, human readable text files stored in the **PFx Brick** file system. These files conform to a simple script language syntax summarized in this cheatsheet.

- ▶ Scripts are ASCII text files stored in the **PFx Brick** file system.
- ▶ Scripts execute one at a time. Executing another script will terminate the current script and start the new one.
- ▶ Script execution is sequential line-by-line from the start of the file to the end. At the end, the script will either stop or repeat if a repeat command is the last line.

## Editing Scripts

Edit script files with the text editor of your choice (e.g. Notepad on Windows, TextEdit on macOS). PFX Language extensions with syntax highlighting for Visual Studio Code and Notepad++ can be found here:

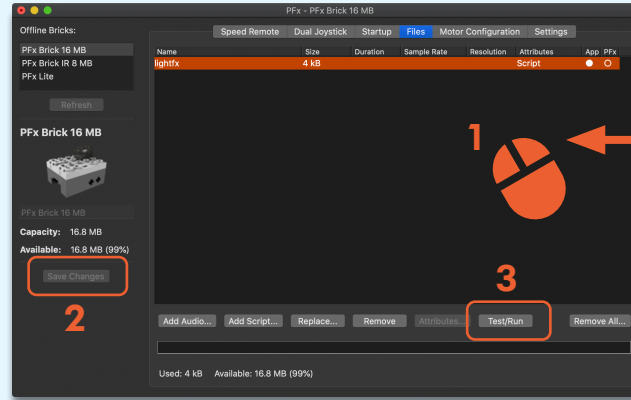
<https://github.com/fx-bricks/pfx-brick-vscode>

[https://github.com/Bricelectronic/pfxbrick\\_notepadplusplus](https://github.com/Bricelectronic/pfxbrick_notepadplusplus)

```

samples > traffic_light.pfx
1 # Traffic light sequence
2 #
3 # Ch 1: Red, Ch 2: Yellow, Ch 3: Green
4 # Ch 4: Don't Walk, Ch 5: Walk
5
6 # reset all light channels
7 light all off
8 # Red phase
9 light [1,4] on
10 light [2,3,5] off fade 0.2
11 wait 8.0
12 # Green phase
13 light [1,4] off fade 0.2
  
```

## Loading Scripts



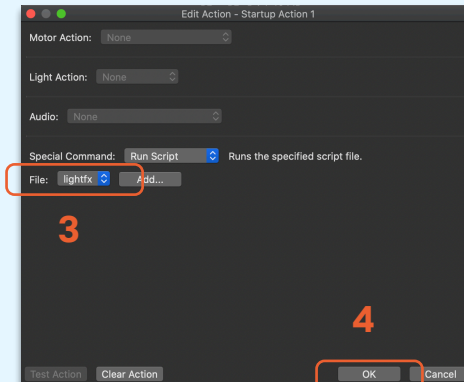
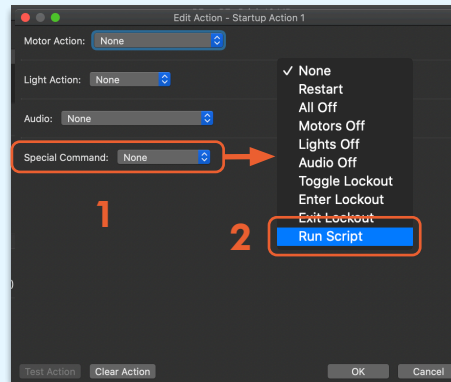
1. Drag and drop script file from computer to PFX App Files window



2. Click **Save Changes** to update **PFx Brick** with new script file

3. Select script file from file list and click **Test/Run** button to run script

## Configuring Scripts as Actions



1. Select any Remote or Startup action to edit and select **Special Command**
2. Select **Run Script** from the drop down list
3. Select a script file from **File** drop down list
4. Click **Ok** to confirm

## New in ICD v.3.38

- ▶ New **set** keyword to support the use of variables
- ▶ New **acc** keyword for motor acceleration
- ▶ **repeat** keyword supports encapsulated code (with {} braces) with nested repeat intervals
- ▶ Added **wait button** to allow scripts to pause until a button event occurs (requires touchLAB accessory)

ICD refers to the Interface Control Document; a document intended for the developer community to build software Apps compatible with the PFX Brick visit our GitHub repo here for more details: <https://github.com/fx-bricks/pfx-brick-dev>



## Syntax Basics

### Comments

start with # or //

```
# Valid comment
// Another valid comment
light 1 on # not a valid comment
```

⚠ cannot appear on a line with a command

### Numbers

#### Decimal values

0 127 -55 0.010 35.75 -90.5

#### Hexadecimal values

0x0 0xABCD 0x32

#### Lists

[0, 5, 8] enclose in [ ] comma “,” separated

### Strings

“This is a string” enclose in “ ” double quotes

## Keyword Commands

Keyword commands appear at the beginning of a line followed by other keywords and values depending on the command syntax.

<b>ir</b>	<b>repeat</b>	<b>sound</b>
<b>light</b>	<b>run</b>	<b>stop</b>
<b>motor</b>	<b>set</b>	<b>wait</b>

## Other Keywords

Other keywords are used in support of commands as qualifiers or arguments.

<b>acc</b>	<b>fade</b>	<b>play</b>
<b>all</b>	<b>flash</b>	<b>right</b>
<b>bass</b>	<b>fx</b>	<b>servo</b>
<b>beep</b>	<b>joy</b>	<b>speed</b>
<b>bright</b>	<b>left</b>	<b>treble</b>
<b>button</b>	<b>loop</b>	<b>up</b>
<b>ch</b>	<b>off</b>	<b>vol</b>
<b>down</b>	<b>on</b>	

⚠ all keywords must be separated by whitespace

## Run/Stop Commands

### execute another script

**run** *file* *file* : file ID number or string

```
run “traffic_light”
```

### stop execution

**stop**

## Wait Command

### wait for time delay

**wait** *time* *time* : 0.05 – 30000 sec

```
# wait for 3.5 seconds
wait 3.5
```

### wait for sound file playback end

**wait** **sound** *file* *file* : file ID number or string

```
# wait for sound file 2 to stop
wait sound 2
# wait for “Siren1.wav” to stop
wait sound “Siren1.wav”
```

### wait for IR event

**wait** **ir** *parameters*

*parameters* : any combination of:

**joy** : joystick remote  
**speed** : speed control remote  
**up, down, left, right, button** : remote actions  
**ch** *value* : IR channel (1, 2, 3, 4)

```
# wait for the joystick left control
# pushed up on any IR channel
wait ir joy left up
# wait for the left button on speed remote
# on IR channel 4
wait ir speed ch 4 left button
```

### wait for pushbutton event (from touchLAB)

**wait** **button**

```
# wait for button press
wait button
```

## Set Command

**set** *var* = *value*

There are 6x variable registers called:

**\$A, \$B, \$C, \$D, \$E, \$F** ⚠ must be uppercase

Both numeric and string values can be stored with the **set** command and can represent values in other commands

```
set $A = 50
motor a speed $A
```

```
set $A = 1.5
set $F = 0.1
light [1, 2] flash $A fade $F
set $B = “LongBeep.wav”
sound play $B
wait sound $B
```

## Repeat Command

### repeat current script from start

**repeat** restarts the script from the beginning

### repeat enclosed code block (with nesting)

**repeat** *count* { repeats a block of code  
; . . . *count* number of times  
} enclosed in braces { }

⚠ opening { must be on same line as **repeat**  
closing } must be on a line by itself

```
# repeat this code 5 times
repeat 5 {
  light 1 on
  wait 2.0
  light 1 off
  wait 10
}
```

```
# nested repeats
repeat 5 {
  light 1 fx 1
  repeat 3 {
    light 2 fx 1
    wait 2.0
  }
}
```

## Sound Command

**sound** *command*

### Commands

#### simple playback

**play** *file*

```
sound play 3
sound play "Siren1.wav"
```

#### continuously repeated playback

**play** *file* **repeat**

```
sound play 3 repeat
sound play "Siren1.wav" repeat
```

#### playback a number of times

**play** *file* **loop** *value* *value* : 1 – 255

```
sound play 3 loop 5
sound play "Siren1.wav" loop 5
```

#### stop playback

**stop** *file* *file* : file ID number, string, or all

```
sound stop 3
sound stop "Siren1.wav"
sound stop all
```

#### set volume

**vol** *value* *value* : 0 – 255

```
sound vol 0
sound vol 0xF0
```

#### set bass / treble

**bass** *value* *value* : -20 – +20

**treble** *value*

```
sound bass 3
sound treble -10
```

#### short beep sound

**beep**

```
sound beep
```

## Light Command

**light** *channels* *commands*

### Channels

**light** 1 single channel  
**light** [2, 4, 5] multiple channels  
**light** all all channels

### Commands

#### simple on/off

**on** **off**

```
light 1 on
light [1, 2, 4] off
light all off
```

#### flashing light

**flash** *ontime* *offtime*

*ontime*, *offtime* : 0.05 – 60 seconds  
*offtime* is optional; if omitted *ontime*=*offtime*

```
# on for 0.5 sec, off for 0.5 sec
light 1 flash 0.5
# on for 0.1 sec, off for 0.4 sec
light [1, 2, 4] flash 0.1 0.4
```

#### optional fade

**fade** *time* *time* : 0 – 10 seconds

combine with **on**, **off**, & **flash** commands

```
# fade channel 1 on
light 1 on fade 0.5
# fade channels 3, 5 off
light [3, 5] off fade 1.0
# 1.5 sec flash with 0.2 sec fade
light 8 flash 1.5 fade 0.2
```

#### set brightness

**bright** *value* *value* : 0 – 255

```
# channel brightness 10
light 1 bright 10
# channels 1,2,4 brightness 255
light [1, 2, 4] bright 255
```

## Motor Command

**motor** *channels* *commands*

### Channels

**motor** a single channel  
**motor** [a, b] multiple channels  
**motor** all all channels

### Commands

#### set speed

**speed** *value* *value* : -255 – +255

```
motor a speed -50
motor all speed 100
```

#### stop

**stop**

```
motor b stop
motor all stop
```

#### servo angle

**servo** *value* *value* : -90 – +90

```
motor a servo -90
```

#### optional acceleration/deceleration momentum

**acc** *rate* *rate* : 0 – 15

combine with **speed** & **stop** commands

```
# accelerate motor b to half speed gradually
motor b speed 128 acc 12
# stop motor a with gentle slow down
motor a stop acc 8
```

## IR Command

**ir on** activate IR sensor

**ir off** disables IR sensor

# Fx Commands

Commands using the **fx** keyword are used for activating the advanced builtin effects

```
light channels fx id parameters
light all fx id parameters
motor channels fx id parameters
sound channels fx id parameters
```

An effect is specified by a numeric *id* value. Zero or more *parameters* are appended to the command if required. Parameter values follow immediately separated by spaces or in a list.

```
# Equally valid syntaxes for fx parameters
# Parameters after
light all fx 2 4 3 0 1
# Parameters in a list
light all fx 2 [4, 3, 0, 1]
```

Each Fx type has its own number of parameters. The number of parameters and their respective definitions are shown in the diagrams over the next few pages.

This example shows a light Fx command and its corresponding details for each parameter

```
# Bargraph Sweep
# Right to Left
# 1 sec period, 10% fade, 8 lights
light all fx 2 4 3 0 1
```

id	Effect Name	Param 1	Param 2	Param 3	Param 4	Param 5
2	Bargraph Sweep	PERIOD	FADE_FACTOR	SIZE	SWEEP_STYLE	

PERIOD				FADE_FACTOR				SIZE			SWEEP_STYLE	
0	0.1 sec	8	2.0 sec	0	No Fade	8	40%	0	8 lights		0	Left to Right
1	0.25 sec	9	2.5 sec	1	1%	9	50%	1	7 lights		1	Right to Left
2	0.5 sec	10	3.0 sec	2	5%	10	75%	2	6 lights			
3	0.75 sec	11	4.0 sec	3	10%	11	90%	3	5 lights			
4	1.0 sec	12	5.0 sec	4	15%	12	100%	3	4 lights			
5	1.25 sec	13	8.0 sec	5	20%	13	150%					
6	1.5 sec	14	10.0 sec	6	25%	14	200%					
7	1.75 sec	15	20.0 sec	7	30%	15	400%					

# Light Fx Command

Light channels fx id parameters (up to 5 parameters)

id	Effect Name	Param 1	Param 2	Param 3
1	On/Off with options	DIR_OPTION	FADE_TIME	FLICKER_ON
2	Increase Brightness			
3	Decrease Brightness			
4	Set Brightness	BRIGHTNESS		
5	50% Flasher (positive)	PERIOD	FADE_FACTOR	
6	50% Flasher (negative)	PERIOD	FADE_FACTOR	
7	Strobe Flasher (positive)	PERIOD	DUTY_CYCLE	BURST_COUNT
8	Strobe Flasher (negative)	PERIOD	DUTY_CYCLE	BURST_COUNT
9	Gyalite Flasher (positive)	PERIOD	FADE_FACTOR	
10	Gyalite Flasher (negative)	PERIOD	FADE_FACTOR	
11	Flicker	PERIOD2	FADE_FACTOR	
12	Random Blinker	PERIOD2	FADE_FACTOR	
13	Photon Torpedo	PERIOD2		
14	Laser Pulse	PERIOD2		
15	Engine Glow	PERIOD		
16	Lighthouse	PERIOD		
17	Broken Light	FAULT_RATE	FADE_TIME	FAULT_INTENSITY
18	Status Indicator	SOURCE1	SOURCE2	INVERT
19	Sound Modulated	FADE_TIME		INVERT
20	Motor Speed Modulated	FADE_TIME	SOURCE2	INVERT

XX	All Effects	Param 4	Param 5
			RGB

7 6 5 4 3 2 1 0  
X X

## DURATION

0	0.5 sec	8	15 sec
1	1.0 sec	9	20 sec
2	1.5 sec	10	30 sec
3	2.0 sec	11	45 sec
4	3.0 sec	12	60 sec
5	4.0 sec	13	90 sec
6	5.0 sec	14	2 min
7	10 sec	15	5 min

## TRANSITION

0	Toggle
1	On
2	Off
3	On for DURATION

## RGB

0	White
1	Red
2	Green
3	Blue
4	Cyan
5	Magenta
6	Yellow
7	Orange
8	Turquoise
9	Violet

## DIR\_OPTION

0	None	9	Odd if A ▲ Even if A ▼
1	On if A ▲	10	Odd if B ▲ Even if B ▼
2	On if A ▼	11	Odd if C ▲ Even if C ▼
3	On if B ▲	12	Odd if D ▲ Even if D ▼
4	On if B ▼	13	Odd if A ▼ Even if A ▲
5	On if C ▲	14	Odd if B ▼ Even if B ▲
6	On if C ▼	15	Odd if C ▼ Even if C ▲
7	On if D ▲	16	Odd if D ▼ Even if D ▲
8	On if D ▼		

## SOURCE1

0x01	USB Connected
0x02	USB Activity
0x04	IR Activity
0x08	IR Lockout active
0x10	Audio active
0x20	BLE Connected
0x40	BLE Activity
0x80	File system active

logic OR combo

## SOURCE2

0x01	Motor A ▲
0x02	Motor A ▼
0x04	Motor B ▲
0x08	Motor B ▼
0x10	-
0x20	-
0x40	Button
0x80	-

logic OR combo

## PERIOD

0	0.1 sec	8	2.0 sec
1	0.25 sec	9	2.5 sec
2	0.5 sec	10	3.0 sec
3	0.75 sec	11	4.0 sec
4	1.0 sec	12	5.0 sec
5	1.25 sec	13	8.0 sec
6	1.5 sec	14	10.0 sec
7	1.75 sec	15	20.0 sec

## PERIOD2

0	0.05 sec	8	0.8 sec
1	0.1 sec	9	0.9 sec
2	0.2 sec	10	1.0 sec
3	0.3 sec	11	1.25 sec
4	0.4 sec	12	1.5 sec
5	0.5 sec	13	1.75 sec
6	0.6 sec	14	2.0 sec
7	0.7 sec	15	3.0 sec

## FLICKER\_ON

0	No
1	Yes

## BURST\_COUNT

0	1 pulse
1	2 pulses
2	3 pulses
3	4 pulses

## FADE\_TIME

0	No Fade	8	1.0 sec
1	50 ms	9	1.5 sec
2	0.1 sec	10	2.0 sec
3	0.2 sec	11	2.5 sec
4	0.4 sec	12	3.0 sec
5	0.5 sec	13	4.0 sec
6	0.6 sec	14	5.0 sec
7	0.8 sec	15	10.0 sec

## FADE\_FACTOR

0	No Fade	8	40%
1	1%	9	50%
2	5%	10	75%
3	10%	11	90%
4	15%	12	100%
5	20%	13	150%
6	25%	14	200%
7	30%	15	400%

## INVERT

0	No
1	Yes

## FAULT\_RATE

0	Rare
1	Occasionally
2	Often
3	Very Often

## DUTY\_CYCLE

0	1%	5	20%	10	60%	15	90%
1	2%	6	25%	11	70%	16	95%
2	5%	7	30%	12	75%	17	98%
3	10%	8	40%	13	80%	18	99%
4	15%	9	50%	14	85%		

## FAULT\_INTENSITY

0	Subtle
1	Moderate
2	Severe
3	Maximum

# Light Combo Fx Command

Light all fx id parameters (up to 5 parameters)

id	Effect Name	Param 1	Param 2	Param 3	Param 4	Param 5
1	Linear Sweep	PERIOD	FADE_FACTOR	SIZE	SWEEP_STYLE	
2	Bargraph Sweep	PERIOD	FADE_FACTOR	SIZE	SWEEP_STYLE	
3	Knight Rider	PERIOD	FADE_FACTOR			
4	Emergency Flasher (Twinsonic)	TWIN_STYLE	SEQ	FLASH_RATE		
5	Emergency Flasher (Whelen)	WHELEN_STYLE	SEQ	FLASH_RATE		
6	Times Square	PERIOD2	FADE_FACTOR			
7	Noise	PERIOD2	FADE_FACTOR			
8	Twinkling Stars	PERIOD	DUTY_CYCLE			
9	Traffic Lights	TRAFFIC_STYLE	FADE_FACTOR	SEQ_TIME		
10	Sound Bar	BAR_STYLE	FADE_FACTOR	SIZE		
11	Alternating Flashers	PERIOD	FADE_FACTOR	DUTY_CYCLE	OUT_MASK	TRANSITION
12	Lava Lamp	PERIOD	SIZE			
13	Laser Cannon	FLASH_RATE	FADE_FACTOR	SIZE	SWEEP_STYLE	
14	Dragster Starter	DRAGSTER_STYLE	FADE_FACTOR			
15	Airport Runway	RUNWAY_RATE	FADE_FACTOR	RUNWAY_BRIGHT		
16	Formula 1 Indicators	F1_STYLE	FADE_FACTOR	FLASH_RATE		

PERIOD			
0	0.1 sec	8	2.0 sec
1	0.25 sec	9	2.5 sec
2	0.5 sec	10	3.0 sec
3	0.75 sec	11	4.0 sec
4	1.0 sec	12	5.0 sec
5	1.25 sec	13	8.0 sec
6	1.5 sec	14	10.0 sec
7	1.75 sec	15	20.0 sec

SWEEP_STYLE	
0	Left to Right
1	Right to Left

FLASH_RATE	
0	Slow (60 fpm)
1	Med (90 fpm)
2	Fast (120 fpm)
3	V. Fast (150 fpm)

PERIOD2			
0	0.05 sec	8	0.8 sec
1	0.1 sec	9	0.9 sec
2	0.2 sec	10	1.0 sec
3	0.3 sec	11	1.25 sec
4	0.4 sec	12	1.5 sec
5	0.5 sec	13	1.75 sec
6	0.6 sec	14	2.0 sec
7	0.7 sec	15	3.0 sec

SIZE	
0	8 lights
1	7 lights
2	6 lights
3	5 lights
3	4 lights

SEQ	
0	Solid
1	Left/Right
1	In/Out

FADE_FACTOR			
0	No Fade	8	40%
1	1%	9	50%
2	5%	10	75%
3	10%	11	90%
4	15%	12	100%
5	20%	13	150%
6	25%	14	200%
7	30%	15	400%

SEQ_TIME	
0	Slow (60 sec)
1	Med (45 sec)
2	Fast (30 sec)
3	Very Fast (20 sec)

TWINSONIC_STYLE	
0	Single
1	Dual
2	Aero
3	Combo

DUTY_CYCLE			
0	1%	10	60%
1	2%	11	70%
2	5%	12	75%
3	10%	13	80%
4	15%	14	85%
5	20%	15	90%
6	25%	16	95%
7	30%	17	98%
8	40%	18	99%
9	50%		

BAR_STYLE	
0	Left to Right
1	Right to Left
2	In to Out
3	Out to In

TRAFFIC_STYLE	
0	Standard
1	Standard with flashing green
2	European
3	Flash red (NS), flash yellow (EW)
4	Standard w/ped crossing
5	European w/ped crossing
6	Flash red (EW), flash yellow (NS)
7	International
8	International w/ped crossing
9	International 2
10	International 2 w/ped crossing

WHELEN_STYLE	
0	Signal Alert
1	Signal Alert Steady
2	Comet Flash
3	Action Flash 50
4	Action Flash 150
5	Modu Flash
6	Single Flash
7	Double Flash
8	Triple Flash
9	Warning
10	Random

DRAGSTER_STYLE	
0	Standard countdown to green
1	Pro countdown (0.5 sec)
2	Pro countdown (0.4 sec)

F1_STYLE	
0	Race start countdown
1	Training countdown
2	Race break/caution
3	Training start
4	Training break
5	Training end

RUNWAY_RATE	
0	Steady (no flashing)
1	Slow
2	Med
3	Fast

RUNWAY_BRIGHT	
0	Maximum
1	Med
2	Low
3	Minimum

OUT_MASK <small>logic OR combo</small>			
0x01	Ch 1	0x10	Ch 5
0x02	Ch 2	0x20	Ch 6
0x04	Ch 3	0x40	Ch 7
0x08	Ch 4	0x80	Ch 8

TRANSITION	
0	Toggle
1	to On
2	to Off



# Motor Fx Command

**motor** channels **fx id** parameters (up to 2 parameters)

id	Effect Name	Param 1	Param 2
0	Emergency Stop		
1	Stop		
2	Increase Speed	MOTOR_STEP	
3	Decrease Speed	MOTOR_STEP	
4	Increase Speed (Bidirectional)	MOTOR_STEP	
5	Decrease Speed (Bidirectional)	MOTOR_STEP	
6	Change Direction		
7	Set Speed	MOTOR_SPEED	
8	Set Speed (Timed duration)	MOTOR_SPEED	DURATION
9	Oscillate	MOTOR_SPEED	MOTOR_PERIOD
10	Oscillate Bidirectional	MOTOR_SPEED	MOTOR_PERIOD
11	Oscillate Bidirectional with Wait	MOTOR_SPEED	MOTOR_PERIOD
12	Random	MOTOR_SPEED	MOTOR_PERIOD
13	Random Bidirectional	MOTOR_SPEED	MOTOR_PERIOD
14	Sound Modulated	MOTOR_SPEED	
15	Set Servo	MOTOR_POS	

## MOTOR\_STEP

- 0 ±1 step (high res)
- 1 1% (100 steps)
- 2 2% (50 steps)
- 3 3% (33 steps)
- 4 5% (20 steps)
- 5 6% (16 steps)
- 6 10% (10 steps)
- 7 20% (5 steps)
- 8 25% (4 steps)
- 9 33% (3 steps)
- 10 LEGO compatible 7 steps
- 11 15 deg (servo increment)

## MOTOR\_PERIOD

- | id | Duration | id | Duration |
|----|----------|----|----------|
| 0  | 0.25 sec | 8  | 3.0 sec  |
| 1  | 0.5 sec  | 9  | 4.0 sec  |
| 2  | 0.75 sec | 10 | 5.0 sec  |
| 3  | 1.0 sec  | 11 | 10 sec   |
| 4  | 1.25 sec | 12 | 15 sec   |
| 5  | 1.5 sec  | 13 | 20 sec   |
| 6  | 2.0 sec  | 14 | 30 sec   |
| 7  | 2.5 sec  | 15 | 60 sec   |

## MOTOR\_POS

- | id | Angle   | id | Angle  |
|----|---------|----|--------|
| 0  | -90 deg | 7  | 15 deg |
| 1  | -75 deg | 8  | 30 deg |
| 2  | -60 deg | 9  | 45 deg |
| 3  | -45 deg | 10 | 60 deg |
| 4  | -30 deg | 11 | 75 deg |
| 5  | -15 deg | 12 | 90 deg |
| 6  | 0 deg   |    |        |

## DURATION

- | id | Duration | id | Duration | id | Duration |
|----|----------|----|----------|----|----------|
| 0  | 0.5 sec  | 4  | 3.0 sec  | 8  | 15 sec   |
| 1  | 1.0 sec  | 5  | 4.0 sec  | 9  | 20 sec   |
| 2  | 1.5 sec  | 6  | 5.0 sec  | 10 | 30 sec   |
| 3  | 2.0 sec  | 7  | 10 sec   | 11 | 45 sec   |
|    |          |    |          | 12 | 60 sec   |
|    |          |    |          | 13 | 90 sec   |
|    |          |    |          | 14 | 2 min    |
|    |          |    |          | 15 | 5 min    |

## MOTOR\_SPEED

Low Resolution 8 Speed Step Range

- | id | Speed  | id | Speed  |
|----|--|----|--|
| 0  | stopped  | 8  | stopped  |
| 1  | 10%  | 9  | 10%  |
| 2  | 25%  | 10 | 25%  |
| 3  | 33%<br>% of maximum<br>speed in the<br>forward direction | 11 | 33%<br>% of maximum<br>speed in the<br>reverse direction |
| 4  | 50%  | 12 | 50%  |
| 5  | 67%  | 13 | 67%  |
| 6  | 75%  | 14 | 75%  |
| 7  | 100%   | 15 | 100%   |

High Resolution 64 Speed Step Range

- | id  | Speed                | id  | Speed                |
|-----|----------------------|-----|----------------------|
| 128 | stopped              | 192 | stopped              |
| 129 | 1                    | 193 | 1                    |
| 130 | 2                    | 194 | 2                    |
| ⋮   | Forward<br>Direction | ⋮   | Reverse<br>Direction |
| 190 | 62                   | 254 | 62                   |
| 191 | 63                   | 255 | 63                   |

## MOTOR\_PERIOD

bit position 7 6 5 4 3 2 1 0

### OFF TIME

- | id | Duration | id | Duration |
|----|----------|----|----------|
| 0  | 0.25 sec | 8  | 3.0 sec  |
| 1  | 0.5 sec  | 9  | 4.0 sec  |
| 2  | 0.75 sec | 10 | 5.0 sec  |
| 3  | 1.0 sec  | 11 | 10 sec   |
| 4  | 1.25 sec | 12 | 15 sec   |
| 5  | 1.5 sec  | 13 | 20 sec   |
| 6  | 2.0 sec  | 14 | 30 sec   |
| 7  | 2.5 sec  | 15 | 60 sec   |

### ON TIME

- | id | Duration | id | Duration |
|----|----------|----|----------|
| 0  | 0.25 sec | 8  | 3.0 sec  |
| 1  | 0.5 sec  | 9  | 4.0 sec  |
| 2  | 0.75 sec | 10 | 5.0 sec  |
| 3  | 1.0 sec  | 11 | 10 sec   |
| 4  | 1.25 sec | 12 | 15 sec   |
| 5  | 1.5 sec  | 13 | 20 sec   |
| 6  | 2.0 sec  | 14 | 30 sec   |
| 7  | 2.5 sec  | 15 | 60 sec   |



# Sound Fx Command

sound channels fx id parameters (up to 2 parameters)

id	Effect Name	Param 1	Param 2
1	Increase Volume		VOLUME
2	Decrease Volume		VOLUME
3	Set Volume		VOLUME
4	Play Once	RETRIGGER	RELVOLUME
5	Play Continuous		RELVOLUME
6	Play N Times	REPEAT_COUNT	RELVOLUME
7	Play for Duration	DURATION	RELVOLUME
8	Play Motor Pitch Modulated	MOTOR_OUTPUT	GAIN
9	Play Gated Motor Modulated	MOTOR_OUTPUT	GAIN
10	Play Amplitude Motor Modulated	MOTOR_OUTPUT	GAIN
11	Stop		
12	Play Indexed by Motor Speed	MOTOR_OUTPUT	IDX_OPTIONS
13	Random Playback	PROBABILITY	

## VOLUME

0 ~ 255 Volume range

## REPEAT\_COUNT

1 ~ 100 Playback times

## RETRIGGER

0 No, toggle playback

1 Yes, restart playback

## REL\_VOLUME

0 0 dB 8 -8 dB

1 1 dB 9 -7 dB

2 +2 dB 10 -6 dB

3 +3 dB 11 -5 dB

4 +4 dB 12 -4 dB

5 +5 dB 13 -3 dB

6 +6 dB 14 -2 dB

7 +7 dB 15 -1 dB

## DURATION

0 0.5 sec 8 15 sec

1 1.0 sec 9 20 sec

2 1.5 sec 10 30 sec

3 2.0 sec 11 45 sec

4 3.0 sec 12 60 sec

5 4.0 sec 13 90 sec

6 5.0 sec 14 2 min

7 10 sec 15 5 min

## MOTOR\_OUTPUT

0 A Target Speed 4 A Current Speed

1 B Target Speed 5 B Current Speed

2 C Target Speed 6 C Current Speed

3 D Target Speed 7 D Current Speed

## PROBABILITY

0 Rare

1 Occasionally

2 Often

3 Very Often

## GAIN

-100 ~ 1000 Gain range

## IDX\_OPTIONS

bit position 7 6 5 4 3 2 1 0

### STARTUP\_OVERRIDE

0 No

1 Yes

### PLAY\_STARTUP/SHUTDOWN

0 No

1 Yes

### VOL\_MODULATION

0 None

1 Min

2 Med

3 Max