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**The Roboteq® Devices**

**API Documentation**

V1.1, July 5, 2017

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# Introduction

The Roboteq ® Devices API is a set of functions used to control motor controller behavior.

These API's come in form of static libraries that can be used on both Windows and Linux.

# Deliverables

## Windows

* **RoborunDevice.lib:** a static library contains the API's, which should be statically linked with your program.
* **RoboteqDevice.h:** contains the API's prototype.
* **ErrorCodes.h:** contains constants representing the error codes that can be returned by the API's.
* **Constants.h:** contains a set of constants representing the commands supported by the device.
* **sample.cpp:** a sample program representing how to use the API.

## Linux

* **RoborunDevice.o:** object file contains the API's, which should be compiled with your program.
* **RoboteqDevice.h:** contains the API's prototype.
* **ErrorCodes.h:** contains constants representing the error codes that can be returned by the API's.
* **Constants.h:** contains a set of constants representing the commands supported by the device.
* **sample.cpp:** a sample program representing how to use the API.

# How to use

The following is a sample to show how to use the API in a simple program:

|  |
| --- |
| #include <iostream>  #include <stdio.h>  #include <string.h>  #include "RoboteqDevice.h"  #include "ErrorCodes.h"  #include "Constants.h"  using namespace std;  int main(int argc, char \*argv[])  {  string response = "";  //Create an instance of RoboteqDevice.  RoboteqDevice device;  //Connect to the device, for windows use "\\\\.\\com1" for com1.  int status = device.Connect("/dev/ttyS0");  //Check to see if the connection succeeded.  if(status != RQ\_SUCCESS)  {  cout<<"Error connecting to device: "<<status<<"."<<endl;  return 1;  }  cout<<"- SetConfig(\_DINA, 1, 1)...";  if((status = device.SetConfig(\_DINA, 1, 1)) != RQ\_SUCCESS)  cout<<"failed --> "<<status<<endl;  else  cout<<"succeeded."<<endl;  //Wait 10 ms before sending another command to device  sleepms(10);  int result;  cout<<"- GetConfig(\_DINA, 1)...";  if((status = device.GetConfig(\_DINA, 1, result)) != RQ\_SUCCESS)  cout<<"failed --> "<<status<<endl;  else  cout<<"returned --> "<<result<<endl;  //Wait 10 ms before sending another command to device  sleepms(10);  cout<<"- GetValue(\_ANAIN, 1)...";  if((status = device.GetValue(\_ANAIN, 1, result)) != RQ\_SUCCESS)  cout<<"failed --> "<<status<<endl;  else  cout<<"returned --> "<<result<<endl;  //Wait 10 ms before sending another command to device  sleepms(10);  cout<<"- SetCommand(\_GO, 1, 1)...";  if((status = device.SetCommand(\_GO, 1, 1)) != RQ\_SUCCESS)  cout<<"failed --> "<<status<<endl;  else  cout<<"succeeded."<<endl;  device.Disconnect();  return 0;  } |

# API Documentation

## sleepms Function

Suspends the execution of the program until the timeout interval elapses.

**Syntax:**

|  |
| --- |
| void sleepms(int milliseconds) |

**Parameters:**

*milliseconds [in]*

The time interval for which execution is to be suspended, in milliseconds.

**Return Value:**

This function does not return a value.

**Remarks:**

Use this function to obtain pauses between two successive device requests.

**Examples:**

The following example shows how to use the sleepms function to obtain pauses. The example counts down for 10 seconds.

|  |
| --- |
| #include <iostream>  #include <stdio.h>  #include <string.h>  #include "RoboteqDevice.h"  using namespace std;  int main(int argc, char \*argv[])  {  for(int i = 0; i < 10; i++)  {  cout<<"Wait for: "<<10 - i<<" second(s)."<<endl;  sleepms(1000);  }  return 0;  } |

## RoboteqDevice:: Connect

Opens a connection to the device connected to a specified port.

**Syntax:**

|  |
| --- |
| int Connect(string port) |

**Parameters:**

*port [in]*

The port that device is attached to.

**Return Value:**

One of the following values determines the operation status:

|  |  |  |
| --- | --- | --- |
| Value | Constant | Description |
| 0 | RQ\_SUCCESS | The operation completed successfully. |
| 1 | RQ\_ERR\_OPEN\_PORT | Error occurred while trying to open the communication port. |
| 7 | RQ\_UNRECOGNIZED\_DEVICE | The device is not recognized. |
| 8 | RQ\_UNRECOGNIZED\_VERSION | Invalid device version. |

**Examples:**

The following example shows how to obtain a connection to Roboteq device.

|  |
| --- |
| #include <iostream>  #include <stdio.h>  #include <string.h>  #include "RoboteqDevice.h"  #include "ErrorCodes.h"  #include "Constants.h"  using namespace std;  int main(int argc, char \*argv[])  {  //Create an instance of RoboteqDevice.  RoboteqDevice device;  //Connect to the device, for windows use "\\\\.\\com1" for com1.  int status = device.Connect("/dev/ttyS0");  //Check to see if the connection succeeded.  if(status != RQ\_SUCCESS)  {  cout<<"Error connecting to device: "<<status<<"."<<endl;  return 1;  }  cout<<"Connection to device succeeded."<<endl;  device.Disconnect();  return 0;  } |

## RoboteqDevice:: Disconnect

Closes the connection to the device.

**Syntax:**

|  |
| --- |
| void Disconnect() |

**Parameters:**

This function does not need any parameters.

**Return Value:**

This function does not return a value.

**Examples:**

See **RoboteqDevice:: Connect** example.

## RoboteqDevice:: IsConnected

Checks whether connection to device is opened.

**Syntax:**

|  |
| --- |
| bool IsConnected() |

**Parameters:**

This function does not need any parameters.

**Return Value:**

Returns true if the device connection is open, false otherwise.

## RoboteqDevice:: SetConfig

Changes one of the controller's configuration parameters. The changes are made in the controller's RAM and take effect immediately. Configuration changes are not stored in EEPROM.

**Syntax:**

|  |
| --- |
| int SetConfig(int configItem, int index, int value)  int SetConfig(int configItem, int value) |

**Parameters:**

*configItem [in]*

The configuration item needs to be changed. See ***Table 1 below*** for constants that can be used with this function.

*index [in]*

Used to select one of the configuration item in multi-channel configurations. When accessing a configuration parameter that is not part of an array, the index value 1 must be used. Details on the various configurations items, their effects and acceptable values can be found in the Controller's User Manual.

If the index is omitted, it is supposed to be 0.

*value [in]*

The new parameter configuration value.

Table 1 Configuration Items Constants

| *Config Item* | *Description* |  | *Config Item* | *Description* |
| --- | --- | --- | --- | --- |
| \_ACS | Enable Ana Center Safety |  | **\_EMOD** | Encoder Operating Mode |
| \_ACTR | Analog Center |  | **\_EPPR** | Encoder PPR |
| \_ADB | Analog Deadband |  | **\_ICAP** | Motor(s) Int Cap |
| \_AINA | Analog Input Actions |  | **\_KD** | Set PID Differential Gain |
| \_ALIM | Motor Amps Limit |  | **\_KDC1** | KD Curve Points for Motor1 |
| \_ALIN | Analog Linearity |  | **\_KDC2** | KD Curve Points for Motor2 |
| \_AMAX | Analog Max |  | **\_KI** | Set PID Integral Gain |
| \_AMAXA | Action on Analog Input Max |  | **\_KIC1** | KI Curve Points for Motor1 |
| \_AMIN | Analog Min |  | **\_KIC2** | KI Curve Points for Motor2 |
| \_AMINA | Action on Analog Input Min |  | **\_KP** | Set PID Proportional Gain |
| \_AMOD | Analog Input Mode |  | **\_KPC1** | KP Curve Points for Motor1 |
| \_AMS | Enable Ana Min/Max Safety |  | **\_KPC2** | KP Curve Points for Motor2 |
| \_APOL | Analog Input Polarity |  | **\_MAC** | Motor(s) Desired Acceleration |
| \_ATGA | Amps Trigger Action |  | **\_MDEC** | Motor(s) Desired Deceleration |
| \_ATGD | Amps Trigger Delay |  | **\_MMOD** | Motor Operating Mode |
| \_ATRIG | Amps Trigger Value |  | **\_MVEL** | Motor(s) Default Position Velocity |
| \_BHL | Encoder High Limit |  | **\_MXPF** | Motor Max Power |
| \_BHLA | Encoder High Limit Action |  | **\_MXPR** | Motor Max Power |
| \_BHOME | Brushless Counter Load at Home Position |  | **\_MXRPM** | Motor RPM at 100% |
| \_BLFB | Speed and Position sensor feedback |  | **\_MXTRN** | Number of Motor Turns between Limits |
| \_BLL | Encoder Low Limit |  | **\_PCTR** | Pulse Center |
| \_BLLA | Encoder Low Limit Action |  | **\_PDB** | Pulse Deadband |
| \_BLSTD | BL Stall Detection |  | **\_PIDM** | Set PID Options |
| \_BPOL | Number of Poles of BL Motor |  | **\_PINA** | Pulse Input Actions |
| \_CLERD | Close Loop Error Detection |  | **\_PLIN** | Pulse Linearity |
| \_CLIN | Command Linearity |  | **\_PMAX** | Pulse Max |
| \_DFC | Default Command value |  | **\_PMAXA** | Action on Pulse Input Max |
| \_DINA | Digital Input Action |  | **\_PMIN** | Pulse Min |
| \_DINL | Read Digital Inputs |  | **\_PMINA** | Action on Pulse Input Min |
| \_DOA | Digital Output Action |  | **\_PMOD** | Pulse Input Mode |
| \_DOL | Digital Output Action |  | **\_PMS** | Enable Pulse Min/Max safety |
| \_ECHOF | Disable/Enabe RS232 & USB Echo |  | **\_PPOL** | Pulse Input Polarity |
| \_EHL | Encoder High Limit |  | **\_RWD** | RS232 Watchdog (0 to disable) |
| \_EHLA | Encoder High Limit Action |  | **\_SXC** | Sepex Curve Points |
| \_EHOME | Encoder Counter Load at Home Position |  | **\_SXM** | Minimum Field Current |
| \_ELL | Encoder Low Limit |  |  |  |
| \_ELLA | Encoder Low Limit Action |  |  |  |

For full list of constants, please refer to your controller’s reference manual.



**Return Value:**

One of the following values determines the operation status:

|  |  |  |
| --- | --- | --- |
| Value | Constant | Description |
| 0 | RQ\_SUCCESS | The operation completed successfully. |
| 2 | RQ\_ERR\_NOT\_CONNECTED | The device not connected, you should call the Connect function and insure that the device connection succeeded. |
| 3 | RQ\_ERR\_TRANSMIT\_FAILED | Error occurred while transmitting data to device. |
| 4 | RQ\_ERR\_SERIAL\_IO | Error occurred to serial communication. |
| 5 | RQ\_ERR\_SERIAL\_RECEIVE | Error occurred while transmitting data from device. |
| 6 | RQ\_INVALID\_RESPONSE | Invalid response to the issued command. |
| 9 | RQ\_INVALID\_CONFIG\_ITEM | Invalid configuration item, it should be in the range [0, 255]. |
| 12 | RQ\_INDEX\_OUT\_RANGE | The item index is out of range. |
| 13 | RQ\_SET\_CONFIG\_FAILED | Failed to set device configuration. |

**Examples:**

See ***sample.cpp***.

## RoboteqDevice:: GetConfig

Reads one of the controller's configuration parameters.

**Syntax:**

|  |
| --- |
| int GetConfig(int configItem, int index, int &result)  int GetConfig(int configItem, int &result) |

**Parameters:**

*configItem [in]*

The configuration item needs to be read. See ***Table 1 above*** for constants that can be used with this function.

*index [in]*

Used to select one of the configuration item in multi-channel configurations. When accessing a configuration parameter that is not part of an array, the index value 1 must be used. Details on the various configurations items, their effects and acceptable values can be found in the Controller's User Manual.

If the index is omitted, it is supposed to be 0.

*result [out]*

Contains the configuration item value in case of function success.

**Return Value:**

One of the following values determines the operation status:

|  |  |  |
| --- | --- | --- |
| Value | Constant | Description |
| 0 | RQ\_SUCCESS | The operation completed successfully. |
| 2 | RQ\_ERR\_NOT\_CONNECTED | The device not connected, you should call the Connect function and insure that the device connection succeeded. |
| 3 | RQ\_ERR\_TRANSMIT\_FAILED | Error occurred while transmitting data to device. |
| 4 | RQ\_ERR\_SERIAL\_IO | Error occurred to serial communication. |
| 5 | RQ\_ERR\_SERIAL\_RECEIVE | Error occurred while transmitting data from device. |
| 6 | RQ\_INVALID\_RESPONSE | Invalid response to the issued command. |
| 9 | RQ\_INVALID\_CONFIG\_ITEM | Invalid configuration item, it should be in the range [0, 255]. |
| 12 | RQ\_INDEX\_OUT\_RANGE | The item index is out of range. |
| 14 | RQ\_GET\_CONFIG\_FAILED | Failed to get device configuration. |

**Examples:**

See ***sample.cpp***.

## RoboteqDevice:: SetCommand

This function is used to send operating commands to the controller at runtime. The function requires a Command Item, and a Value as parameters. The Command Item can be any one from the table below. Details on the various commands, their effects and acceptable ranges can be found in the Controller's User Manual.

**Syntax:**

|  |
| --- |
| int SetCommand(int commandItem, int index, int value)  int SetCommand(int commandItem, int value) |

**Parameters:**

*commandItem [in]*

The command item needs to be set. See ***Table 2 below*** for constants that can be used with this function.

*index [in]*

Used to select one of the command channel in multi-channel commands. Details on the various commands, their effects and acceptable ranges can be found in the Controller's User Manual.

If the index is omitted, it is supposed to be 0.

*value [in]*

The new command value.

Table 2 Command Items Constants

| *Command Item* | *Description* |
| --- | --- |
| ACCEL | Set Acceleration |
| \_DECEL | Set Deceleration |
| \_DOUT | Set all Digital Out bits |
| \_DRES | Reset Individual Digital Out bits |
| \_DSET | Set Individual Digital Out bits |
| \_ESTOP | Emergency Shutdown |
| \_GO | Set Motor1 Command |
| \_HOME | Load Home counter |

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**Return Value:**

One of the following values determines the operation status:

|  |  |  |
| --- | --- | --- |
| Value | Constant | Description |
| 0 | RQ\_SUCCESS | The operation completed successfully. |
| 2 | RQ\_ERR\_NOT\_CONNECTED | The device not connected, you should call the Connect function and insure that the device connection succeeded. |
| 3 | RQ\_ERR\_TRANSMIT\_FAILED | Error occurred while transmitting data to device. |
| 4 | RQ\_ERR\_SERIAL\_IO | Error occurred to serial communication. |
| 5 | RQ\_ERR\_SERIAL\_RECEIVE | Error occurred while transmitting data from device. |
| 6 | RQ\_INVALID\_RESPONSE | Invalid response to the issued command. |
| 11 | RQ\_INVALID\_COMMAND\_ITEM | Invalid command item, it should be in the range [0, 255]. |
| 12 | RQ\_INDEX\_OUT\_RANGE | The item index is out of range. |
| 16 | RQ\_SET\_COMMAND\_FAILED | Failed to set device command. |

**Examples:**

See ***sample.cpp***.

## RoboteqDevice:: GetValue

Reads one of the controller's operating parameters.

**Syntax:**

|  |
| --- |
| int GetValue(int operatingItem, int index, int &result)  int GetValue(int operatingItem, int &result) |

**Parameters:**

*operatingItem [in]*

The operating item needs to be read. See ***Table 3 below*** for constants that can be used with this function.

*index [in]*

Used to select one of the operating item in multi-channel configurations. When accessing operating parameter that is not part of an array, the index value 1 must be used. Details on the various operating items, can be found in the Controller's User Manual.

If the index is omitted, it is supposed to be 0.

*result [out]*

Contains the operating item value in case of function success.

Table 3 Operating Items Constants

| *Config Item* | *Description* |  | *Config Item* | *Description* |
| --- | --- | --- | --- | --- |
| \_ABCNTR | Absolute Encoder Count |  | **\_FLTFLAG** | Fault Flags |
| \_ABSPEED | Encoder Motor Speed in RPM |  | **\_LOCKED** | Lock status |
| \_ANAIN | Analog Inputs |  | **\_LPERR** | Closed Loop Error |
| \_BATAMPS | Battery Amps |  | **\_MOTAMPS** | Motor Amps |
| \_BLCNTR | Absolute Brushless Counter |  | **\_MOTCMD** | Actual Motor Command |
| \_BLRCNTR | Brushless Count Relative |  | **\_MOTPWR** | Applied Power Level |
| \_BLRSPEED | BL Motor Speed as 1/1000 of Max |  | **\_PLSIN** | Pulse Inputs |
| \_BLSPEED | BL Motor Speed in RPM |  | **\_RELCNTR** | Encoder Count Relative |
| \_CMDANA | Internal Analog Command |  | **\_RELSPEED** | Encoder Motor Speed as 1/1000 of Max |
| \_CMDPLS | Internal Pulse Command |  | **\_STFLAG** | Status Flags |
| \_CMDSER | Internal Serial Command |  | **\_TEMP** | Case & Internal Temperatures |
| \_DIGIN | All Digital Inputs |  | **\_TIME** | Time |
| \_DIGOUT | Current Digital Outputs |  | **\_VAR** | User Variable |
| \_DIN | Individual Digital Inputs |  | **\_VOLTS** | Internal Voltages |
| \_FEEDBK | Feedback |  |  |  |

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**Return Value:**

One of the following values determines the operation status:

|  |  |  |
| --- | --- | --- |
| Value | Constant | Description |
| 0 | RQ\_SUCCESS | The operation completed successfully. |
| 2 | RQ\_ERR\_NOT\_CONNECTED | The device not connected, you should call the Connect function and insure that the device connection succeeded. |
| 3 | RQ\_ERR\_TRANSMIT\_FAILED | Error occurred while transmitting data to device. |
| 4 | RQ\_ERR\_SERIAL\_IO | Error occurred to serial communication. |
| 5 | RQ\_ERR\_SERIAL\_RECEIVE | Error occurred while transmitting data from device. |
| 6 | RQ\_INVALID\_RESPONSE | Invalid response to the issued command. |
| 10 | RQ\_INVALID\_OPER\_ITEM | Invalid operating item, it should be in the range [0, 255]. |
| 12 | RQ\_INDEX\_OUT\_RANGE | The item index is out of range. |
| 15 | RQ\_GET\_VALUE\_FAILED | Failed to get operating item value. |

**Examples:**

See ***sample.cpp***.