



# CUE SDK

## Overview and Reference

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## Overview

The Corsair Utility Engine (CUE) SDK gives ability for third-party applications to control lightings on Corsair RGB devices. CUE SDK interacts with hardware through CUE so it should be running in order for SDK to work properly.

SDK features are supported in CUE version 1.10 or higher.

To use this SDK you should have basic knowledge in C and library linking.

### CUE SDK functional features:

- SDK provides ability to specify RGB color for every LED on keyboard, mouse and headset (ie. control lighting by key id).
- SDK provides information about connected hardware: models, physical and logical layouts.
- SDK provides information about HW geometry so that clients can show visual effects that depend on geometry like wave or ripple (ie. control lighting by key position).
- SDK provides helper functions to convert alphanumeric key names (like 'A', 'Q', 'Z') into identifiers for "tutorial" kind of clients that want to highlight exact keys taking into account logical layout (ie. control lighting by key name).
- SDK provides **exclusive** and **shared** access to SDK clients.
- User can forbid third-party applications to control lighting in CUE settings.

### Other SDK features:

- CUE works properly with multiple clients. SDK library itself is thread safe so that clients are able to use it from multiple threads within the same process.
- SDK is fail-safe. If CUE is not present, shuts down by the user or crashes this does not cause a client crashing or hanging.
- SDK handles handshake during client initialization to agree on protocol version that CUE implements, so that CUE can decide if it supports client protocol version and client can decide which of API functions it can call.

### SDK Package

The following folders are included:

- **include** contains C/C++ header files with function prototypes and enum declarations;
- **bin** contains both 32 and 64 bit .dll files;
- **lib** contains companion .lib files to access exported functions (32 and 64 bit);
- **examples** contains sample project that shows how to use SDK;
- **doc** contains SDK documentation (this document).

### Requirements

This SDK can be used on the same platforms that CUE does:

- **Windows 7** (32-bit and 64-bit);
- **Windows 8** (32-bit and 64-bit);
- **Windows 10** (32-bit and 64-bit).

## Supported devices

### Keyboards:

- CGK65 RGB
- K70 RGB
- K95 RGB
- STRAFE
- STRAFE RGB

### Mice:

- M65 RGB
- SABRE RGB Optical
- SABRE RGB Laser
- Scimitar

### Headsets:

- VOID USB
- VOID WIRELESS

## Multiple clients using the SDK at the same time

SDK provides **exclusive** and **shared** access to SDK clients.

- **Exclusive** access - lighting controlled only by client and not by CUE or other SDK clients. There can be only one **exclusive** client at a time. If there is already an active **exclusive** client A and a new client B requests **exclusive** access to the lighting then client B becomes **exclusive** client and client A loses **exclusive** control (ie "last win" strategy).
- **Shared** access - multiple clients may control lighting at the same time. There can be unlimited number of **shared** clients working simultaneously. If some client requests **exclusive** access then all other **shared** clients will not be able to override colors that were set by **exclusive** client. When **exclusive** client disconnects all **shared** clients can override colors again.
- CUE itself acts like a **shared** client, so if there is a client taking over **exclusive** control then CUE will not try to override colors.

The default access mode is **shared**.

## Other considerations

### Single-color devices

If a connected device only has LEDs of one color instead of all three (RGB) then when RGB color is set to such leds SDK chooses maximum of three (RGB) values and uses it as brightness for LED.

### On/off leds

If a connected device has some LEDs that support only on/off control then if supplied brightness value is  $\geq 128$  such LED will be switched on, otherwise it will be switched off.

### LEDs that are not controlled by SDK

Side LEDs on Corsair STRAFE keyboards can not be controlled by SDK. These LEDs remain controlled by CUE regardless of connected SDK clients.

### Memory management

SDK is responsible for freeing memory that was allocated by its functions. The memory is freed when SDK library is unloaded.

## Reference

```
bool CorsairSetLedsColors(int size, CorsairLedColor* ledsColors)
```

**Description:** set specified leds to some colors. The color is retained until changed by successive calls. This function does not take logical layout into account. This function executes synchronously, if you are concerned about delays consider using ***CorsairSetLedsColorsAsync***

### Input arguments:

- ***int size*** - number of leds in ***ledsColors*** array;
- ***CorsairLedColor\* ledsColors*** - array containing colors for each LED.

**Returns:** boolean value. True if successful. Use ***CorsairGetLastError()*** to check the reason of failure. If there is no such ledId present in currently connected hardware (missing key in physical keyboard layout, or trying to control mouse while it's disconnected) then function completes successfully and returns true.

### Possible errors:

- ***CE\_ServerNotFound, CE\_NoControl, CE\_ProtocolHandshakeMissing***
- ***CE\_InvalidArguments*** - if some of r, g, b values are beyond [0..255] interval or array contains duplicates of some led ids.



```
bool CorsairSetLedsColorsAsync(int size, CorsairLedColor* ledsColors,  
void(*CallbackType)(void*, bool, CorsairError), void *context)
```

**Description:** same as *CorsairSetLedsColors* but returns control to the caller immediately.

#### Input arguments:

- **int size** - number of leds in *ledsColors* array;
- **CorsairLedColor\* ledsColors** - array containing colors for each LED;
- **void (\*CallbackType)(void\* context, bool result, CorsairError error)** - callback that is called by SDK when colors are set. Can be **NULL** if client is not interested in result:
  - context contains value that was supplied by user in *CorsairSetLedsColorsAsync* call;
  - result is true if call was successful, otherwise false;
  - error contains error code if call was not successful (**result==false**);

**Possible errors:** *CE\_ServerNotFound, CE\_NoControl*

- **void\* context** - arbitrary context that will be returned in callback call. Can be **NULL**.

**Returns:** boolean value. True if successful. Use *CorsairGetLastError()* to check the reason of failure.

#### Possible errors:

- *CE\_ProtocolHandshakeMissing*
- *CE\_InvalidArguments* - if some of r, g, b values are beyond [0..255] interval or array contains duplicates of some led ids.

***int CorsairGetDeviceCount()***

**Description:** returns number of connected Corsair devices. Returns not more than one device of each type (keyboard, mouse, headset) in case if there are multiple devices of the same type connected to the system. Use ***CorsairGetDeviceInfo()*** to get information about a certain device.

**Input arguments:** no.

**Returns:** integer value. -1 in case of error. [0..3] are possible values.

**Possible errors:**

- ***CE\_ServerNotFound, CE\_ProtocolHandshakeMissing***

```
CorsairDeviceInfo *CorsairGetDeviceInfo(int deviceIndex)
```

**Description:** returns information about a device based on provided index.

**Input arguments:**

- ***int deviceIndex*** - zero-based index of device. Should be strictly less than a value returned by ***CorsairGetDeviceInfo()***

**Returns:** pointer to ***CorsairDeviceInfo*** structure that contains information about device or ***NULL*** pointer if error has occurred.

**Possible errors:**

- ***CE\_ServerNotFound, CE\_ProtocolHandshakeMissing***
- ***CE\_InvalidArguments*** - if ***deviceIndex*** is invalid.

***CorsairLedPositions \*CorsairGetLedPositions()***

**Description:** provides list of keyboard LEDs with their physical positions.

**Input arguments:** no.

**Returns:** returns pointer to ***CorsairLedPositions*** struct or ***NULL*** if error has occurred.

**Possible errors:**

- ***CE\_ServerNotFound, CE\_ProtocolHandshakeMissing***

***CorsairLedId CorsairGetLedIdForKeyName(char keyName)***

**Description:** retrieves led id for key name taking logical layout into account. So on AZERTY keyboards if user calls ***CorsairGetLedIdForKeyName('A')*** he gets ***CLK\_Q***. This id can be used in ***CorsairSetLedsColors*** function.

**Input arguments:**

- ***char keyName*** - key name. ['A'..'Z'] (26 values) are valid values.

**Returns:** proper ***CorsairLedId*** or ***CorserLed\_Invalid*** if error occurred.

**Possible errors:**

- ***CE\_ServerNotFound, CE\_ProtocolHandshakeMissing***
- ***CE\_InvalidArguments*** - if ***keyName*** is invalid.

```
bool CorsairRequestControl(CorsairAccessMode accessMode)
```

**Description:** requests control using specified access mode. By default client has shared control over lighting so there is no need to call ***CorsairRequestControl()*** unless a client requires exclusive control.

**Input arguments:**

- ***CorsairAccessMode accessMode - requestedAccessMode***

**Returns:** boolean value. Returns true if SDK received requested control or false otherwise.

**Possible errors:**

- ***CE\_ProtocolHandshakeMissing, CE\_ServerNotFound***
- ***CE\_InvalidArguments*** - if provided ***accessMode*** is not supported by this version of SDK.

### *CorsairProtocolDetails CorsairPerformProtocolHandshake()*

**Description:** checks file and protocol version of CUE to understand which of SDK functions can be used with this version of CUE.

**Input arguments:** no.

**Returns:** *CorsairProtocolDetails* struct.

**Possible errors:**

- *CE\_ServerNotFound*

### ***CorsairError CorsairGetLastError()***

**Description:** returns last error that occurred in this thread while using any of Corsair\* functions.

**Input arguments:** no.

**Returns:** *CorsairError* value.

**Possible errors:** no.



***enum CorsairLedId***

**Description:** contains shared list of all leds on all devices (kb, mouse, hs) and all models/physical layouts.

**Item samples:**

- *CLK\_F1, CLK\_Esc, CLK\_Q, CLK\_1, CLK\_UpArrow, CLK\_G1, ...* - for keyboard leds;
- *CLM\_1, CLM\_2, ..., CLM\_4* - for mouse leds;
- *CLH\_LeftLogo, CLH\_RightLogo* - for headset leds;
- *CLI\_Invalid* - dummy value.

### *enum CorsairDeviceType*

**Description:** contains list of available device types.

**Items:**

- ***CDT\_Keyboard*** - for keyboards;
- ***CDT\_Mouse*** - for mice;
- ***CDT\_Headset*** - for headsets.

***enum CorsairPhysicalLayout***

**Description:** contains list of available physical layouts for keyboards.

**Items:**

- ***CPL\_US, CPL\_UK, CPL\_JP, CPL\_KR, CPL\_BR*** - valid values for keyboard;
- ***CPL\_Zones1, CPL\_Zones2, CPL\_Zones3, CPL\_Zones4*** - valid values for mouse, number represents configurable mouse LEDs;
- ***CPL\_Invalid*** - dummy value.

***enum CorsairLogicalLayout***

**Description:** contains list of available logical layouts for keyboards.

**Items:**

- *CLL\_US\_Int, CLL\_NA, CLL\_EU, CLL\_UK, CLL\_BE, CLL\_BR, CLL\_CH, CLL\_CN, CLL\_DE, CLL\_ES, CLL\_FR, CLL\_IT, CLL\_ND, CLL\_RU4, CLL\_JP, CLL\_KR, CLL\_TW, CLL\_MEX* - valid values;
- *CLL\_Invalid* - dummy value.

### *enum CorsairDeviceCaps*

**Description:** contains list of device capabilities. First version of SDK only supports lighting, but future versions may also support other capabilities.

#### **Items:**

- ***CDC\_None == 0*** - for devices that do not support any SDK functions;
- ***CDC\_Lighting == 1*** - for devices that has controlled lighting.

### *enum CorsairAccessMode*

**Description:** contains list of available SDK access modes.

**Items:**

- *CAM\_ExclusiveLightingControl*

***enum CorsairError***

**Description:** contains shared list of all errors that could happen during calling of Corsair\* functions.

**Items:**

- ***CE\_Success*** - If previously called function was completed successfully;
- ***CE\_ServerNotFound*** - if CUE is not running or was shut down or third-party control is disabled in CUE settings (runtime error);
- ***CE\_NoControl*** - if some other client has or took over exclusive control (runtime error);
- ***CE\_ProtocolHandshakeMissing*** - if developer did not perform protocol handshake (developer error);
- ***CE\_IncompatibleProtocol*** - if developer is calling the function that is not supported by the server (either protocol has been broken by server or client or the function is new and server is too old. Check ***CorsairProtocolDetails*** for details), (developer error);
- ***CE\_InvalidArguments*** - if developer supplied invalid arguments to the function (for specifics look at function descriptions), (developer error).

***struct CorsairLedColor***

**Description:** contains information about led and its color.

**Fields:**

- ***CorsairLedId ledId*** - identifier of LED to set;
- ***int r*** - red brightness [0..255];
- ***int g*** - green brightness [0..255];
- ***int b*** - blue brightness [0..255].



***struct CorsairDeviceInfo***

**Description:** contains information about device.

**Fields:**

- ***CorsairDeviceType type*** - enum describing device type;
- ***const char \*model*** - null-terminated device model (like "K95RGB");
- ***CorsairPhysicalLayout physicalLayout*** - enum describing physical layout of the keyboard or mouse. If device is neither keyboard nor mouse then value is ***CPL\_Invalid***
- ***CorsairLogicalLayout logicalLayout*** - enum describing logical layout of the keyboard as set in CUE settings. If device is not keyboard then value is ***CLL\_Invalid***
- ***int capsMask*** - mask that describes device capabilities, formed as logical "or" of ***CorsairDeviceCaps*** enum values.

***struct CorsairLedPositions***

**Description:** contains number of leds and array with their positions.

**Fields:**

- ***int numberOfLeds*** - integer value. Number of elements in the following array;
- ***CorsairLedPosition\** *pLedPosition*** - array of led positions.

***struct CorsairLedPosition***

**Description:** contains led id and position of led rectangle. Most of the keys are rectangular. In case if key is not rectangular (like Enter in ISO/UK layout) it returns the smallest rectangle that fully contains the key.

**Fields:**

- ***CorsairLedId ledId*** - identifier of led;
- ***double top, double left, double height, double width*** - values in mm.

***struct CorsairProtocolDetails***

**Description:** contains information about SDK and CUE versions.

**Fields:**

- ***const char \*sdkVersion*** - null-terminated string containing version of SDK (like "1.0.0.1"). Always contains valid value even if there was no CUE found;
- ***const char \*serverVersion*** - null-terminated string containing version of CUE (like "1.0.0.1") or ***NULL*** if CUE was not found;
- ***int sdkProtocolVersion*** - integer number that specifies version of protocol that is implemented by current SDK. Numbering starts from 1. Always contains valid value even if there was no CUE found;
- ***int serverProtocolVersion*** - integer number that specifies version of protocol that is implemented by CUE. Numbering starts from 1. If CUE was not found then this value will be 0;
- ***bool breakingChanges*** - boolean value that specifies if there were breaking changes between version of protocol implemented by server and client.

## Examples of how to use SDK

There are three usage **examples** in examples folder:

- **color\_pulse** plays pulse effect on all available LEDs on connected devices using *CorsairGetDeviceCount*, *CorsairGetDeviceInfo*, *CorsairGetLedPositions*, *CorsairSetLedsColorsAsync* functions;
- **progress** shows how to implement basic progress bar with all keyboard LEDs using *CorsairGetLedPositions*, *CorsairSetLedsColors* functions;
- **test\_highlight** gets word from user input and one by one highlights keys that correspond to every char of that word. This example describes sample usage of *CorsairRequestControl*, *CorsairGetLedIdForKeyName*, *CorsairSetLedsColors* functions.

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