

# Logitech LCD SDK for Microsoft<sup>®</sup> Windows<sup>®</sup> (lglcd) V3.01

## Overview and Reference

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## What's new in Version 3.x?

Version 3.x denotes a major milestone in the development of the LCD SDK. This is the first release that supports an additional display type (QVGA color, as available on the Logitech G19 Keyboard). Also, the number of buttons available to the user on the device has been increased, and they have been arranged as directional buttons, plus an 'OK', 'Cancel' and 'Menu' are present. This arrangement will provide for a much richer experience in displaying content on the new display, as well as having the user interact in an intuitive way with the new content.

Also, the new features in the LCD Manager, which allow the user to choose which device individual applets are being displayed on, has guided the SDK in a new direction. In previous releases, the SDK put the burden on the applet to identify multiple devices in the system, gather information about the devices, and decide what to display for each individual device. Experience has shown that only a very small percentage of applet developers fully implement these features. For that reason, the V3.x SDK has simplified device access and streamlined CPU usage of applets through notifications.

### Open Device By Type

All the devices with a monochrome display (G15, Z-10, etc.) have been merged as one particular device: LGLCD\_DEVICE\_BW. There is also a new type of device with color support and directional buttons: LGLCD\_DEVICE\_QVGA. With just one call to [lgLcdOpenByType\(\)](#), an applet can open up any device that has either a BW or QVGA display. If there are multiple such devices attached to the system, LCD Manager will take care of duplicating display data to the various other devices.

### Notifications

New applets can now provide a combination of capabilities during the connection phase ([lgLcdConnectContextEx.dwAppletCapabilitiesSupported](#)), which will enable notification processing. The notifications will inform the applet when it is a good time to call the new [lgLcdOpenByType\(\)](#) function for a given display type. 'Good time' means that there is such a device attached and enabled on the system. Conversely, when a device removal notification is being received, the applet can safely stop trying to connect to a given display type, since the [lgLcdOpenByType\(\)](#) call will certainly fail.

LCD Manager also informs applets if the user has globally enabled/disabled the applet in LCD Manager. Such notifications can, for example, allow the applet to stop executing drawing functions and help cut down the CPU usage.

Make sure to check out the samples directory in the SDK for examples on how to use the new API and how to optimize your applet for speed and resource usage.

## Overview

### What can I do with this library?

The lgcd library allows applications to interact with an LCD found on a number of Logitech products, such as the G15 (B/W) or G19 (color) G-series keyboards and some Z-Series speakers. Using this library, applications can display images and text on the LCD. Some LCD devices also include, as part of their function, soft buttons that can be read by the lgcd library and return the status to an application. Since not all Logitech devices that have an LCD display also include soft buttons, support of soft buttons can be device specific. The documentation will point out these device specific requirements when they apply.

### What is included in this library?

The following files are included:

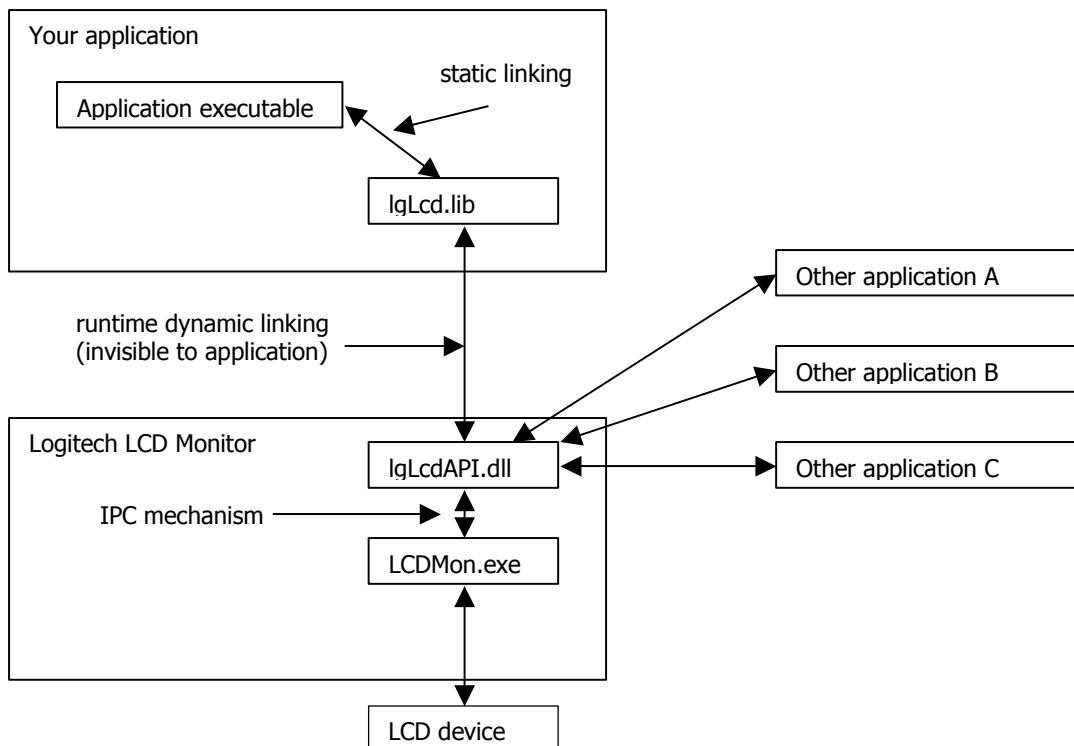
lgcd.h:

C/C++ header file containing all the structure definitions and function prototypes for use with the lgcd.lib library.

lgcd.lib:

Library to link to your executable.

The functionality contained in this library enables your application to connect to a Logitech software component called LCDMon that manages all attached LCDs and regulates access to these LCDs by multiple applications. LCDMon is provided with your product software and is installed when you setup your product.



## **What do I need to use this library?**

To use the library you need to have the following installed:

C/C++ development environment such as Microsoft® Visual Studio

## **How do I interface to this library?**

Include the header file into your project and link with the appropriate library (pick from 32-bit i386 or 64-bit x86-64). Call the functions as detailed in this document and handle errors as they happen. There are essentially two errors that will happen all the time: either the user doesn't have the LCD software installed (because they have a different keyboard without an LCD), or the software is installed but the keyboard is not present. Both cases are very common and need to be dealt with gracefully. Additionally, there is the possibility of users disconnecting and re-connecting their keyboards, which should be handled as gracefully as possible.

## **Versioning**

Versioning between the library and the LCD Manager Application is handled seamlessly by the LCD Manager and supporting library functions. More updated revisions of the monitor will support applications that have been linked with older libraries. Older revisions of the monitor will reject talking to newer libraries.

## **Synchronous vs. asynchronous operations**

The IgLcd library minimizes the time spent inside the library so making calls to the library will have minimal performance impact on your code. There is one function that can take place synchronously or asynchronously, [IgLcdUpdateBitmap\(\)](#). This function takes a long time to execute (in the range of 30 milliseconds) and may be used as a "pacemaker" in applications that solely use the LCD. For all other applications, it is more desirable to have a quick as possible update, which is the asynchronous version. Should the application deliver more screens than can be written to the LCD, some will be dropped.

## **Sharing with other clients**

Since the LCD is a shared resource, at any given time your application's bitmap may not be the one that is currently displayed. The user has the ability to switch among multiple clients writing to the LCD. None of the switching needs to be handled in your code. Your application gets its own "virtual LCD" and can continue to update screens and read soft buttons, completely unaware that it is not being displayed. Through a mechanism of priorities you can give a hint that your application has an "important" bitmap that might (depending on policy settings) allow your "important" bitmap to be displayed on the LCD.

# **General Features of Logitech LCD Products**

## **Display Properties**

Currently Logitech supports two display types: color and black & white.

Color displays are based on the QVGA standard (320 pixels horizontal, 240 pixels vertical) . The color depth for Logitech QVGA products can vary so you should consult your specific product specification for details on the features of your QVGA device.

Black and white displays are 160 pixels horizontal by 43 pixels vertical with a square pixel aspect ratio. They have a fully bitmapped display with 1 bit per pixel (monochrome). Due to the nature of the display (passive-matrix display), rapidly moved images leave a blurry and unreadable image. In particular, text should not scroll too quickly on a black and white display.

## **Buttons**

Some Logitech LCD products include integrated "soft buttons" that are located near the LCD display surface and provide some enhanced features. If your product includes soft buttons, you can use the SDK to read these buttons and take action when they are pressed. Soft button actions could toggle what is shown on the LCD display to provide different, or enhance views of your data, or provide menu functions for settings and user interactions. They could also be used as directional keys for games. Your product documentation should include an addendum that explains the soft buttons for your applet and have pointers on how to utilize them.

The SDK has interface functions that allow you to read device soft buttons. These functions will only return meaningful data if your device has soft buttons.

## Dos and Don'ts of lgLCD usage

These are a few guidelines that may help you implement better support in your application:

- Handle error conditions gracefully. There is a good chance that your application will not find a display, or not be able to connect to the LCD monitor at all. Not all of your customers will have a Logitech device that includes an LCD display.
- Considering that this display can be on a keyboard, handling unplug/replug scenarios might not seem as important. However, consider the case where such an auxiliary display is available stand-alone. Then, you should program your applet to properly handle the case where the device is removed and reconnected. It is recommended that you test this specific scenario during the development and testing of your applet.
- Think about what you want to present to the user and in which way. Especially for monochrome displays, the constraints of size and lack of color make it a challenge to design nice-looking and informative screens.
- Remember that for black and white displays, while the refresh rate can reach 30 frames per second, the slow response time of the pixels causes some blur and unreadable text. Anything that is crucial to read should be moved slowly if at all. For scrolling text, it is advisable to make it "jumpier", i.e., scroll it by larger distances but less often. Also, don't rely on getting a solid 30 fps as this is dependent on environment influences (CPU usage and other things).

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## Structures

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## IgLcdDeviceDesc

The **IgLcdDeviceDesc** structure describes the properties of an attached device. This information is returned through a call to [IgLcdEnumerate\(\)](#).

```
typedef struct
{
    DWORD Width;
    DWORD Height;
    DWORD Bpp;
    DWORD NumSoftButtons;
} IgLcdDeviceDesc;
```

### Members

#### Width

Specifies the width of the display in pixels.

#### Height

Specifies the height of the display in pixels.

#### Bpp

Specifies the depth of the bitmap in bits per pixel.

#### NumSoftButtons

Specifies the number of soft buttons that the device has.

### Remarks

The interface function will return a value of 32 Bpp color depth for color devices even if the physical hardware supports a lower color resolution (for example 16 Bpp). It is important for applet designers to be aware of this discrepancy and always consult your accompanied hardware documentation for information on the true color depth of your LCD display.

### See Also

[IgLcdEnumerate\(\)](#)

## IgLcdDeviceDescEx

The **IgLcdDeviceDescEx** structure describes the properties of an attached device. This information is returned through a call to [IgLCDEnumerateEx\(\)](#).

```
typedef struct
{
    DWORD deviceFamilyId;
    TCHAR deviceDisplayName[MAX_PATH];
    DWORD Width;
    DWORD Height;
    DWORD Bpp;
    DWORD NumSoftButtons;
    DWORD Reserved1;
    DWORD Reserved2;
} IgLcdDeviceDescEx;
```

### Members

#### **deviceFamilyId**

Specifies family Id of the device. Each device belongs to a family.

#### **deviceDisplayName**

Specifies the display name of the device. If this name is blank your device is emulated or "phantom". This is one way to tell a real device from an emulated device.

#### **Width**

Specifies the width of the display in pixels.

#### **Height**

Specifies the height of the display in pixels.

#### **Bpp**

Specifies the depth of the bitmap in bits per pixel.

#### **NumSoftButtons**

Specifies the number of soft buttons that the device has.

#### **Reserved1, Reserved2**

Not used.

### Remarks

This structure is used to return information about a device that is used by the LCD Manager. The interface function will return a value of 32 Bpp color depth for color

devices even if the physical hardware supports a lower color resolution (for example 16 Bpp). It is important for applet designers to be aware of this discrepancy and always consult your accompanied hardware documentation for information on the true color depth of your LCD display.

## **See Also**

[lgLcdEnumerateEx\(\)](#)

## **IgLcdBitmapHeader/IgLcdBitmap160x43x1/ IgLcdBitmapQVGAX32/IgLcdBitmap**

The **IgLcdBitmapHeader** exists at the beginning of any bitmap structure defined in IgLcd.h. Following the header is the actual bitmap as an array of bytes, as illustrated by **IgLcdBitmap160x43x1**. The generic IgLcdBitmap union provides a convenient way to handle both color and BW data using a single data member in your applet code.

```
typedef struct
{
    DWORD Format;
} IgLcdBitmapHeader;

typedef struct
{
    IgLcdBitmapHeader hdr; // Format = LGLCD_BMP_FORMAT_160x43x1
    BYTE pixels[LGLCD_BMP_WIDTH*LGLCD_BMP_HEIGHT];
} IgLcdBitmap160x43x1;

typedef struct
{
    IgLcdBitmapHeader hdr; // Format = LGLCD_BMP_FORMAT_QVGAX32
    BYTE pixels[LGLCD_QVGA_BMP_WIDTH *
                LGLCD_QVGA_BMP_HEIGHT *
                LGLCD_QVGA_BMP_BPP];
} IgLcdBitmapQVGAX32;

typedef union
{
    IgLcdBitmapHeader hdr; // provides easy access to the header
    IgLcdBitmap160x43x1 bmp_mono;
    IgLcdBitmapQVGAX32 bmp_qvga32;
} IgLcdBitmap;
```

### **Members**

#### **Format**

Specifies the format of the structure following the header. Currently, only LGLCD\_BMP\_FORMAT\_160x43x1 and LGLCD\_BMP\_FORMAT\_QVGAX32 are supported.

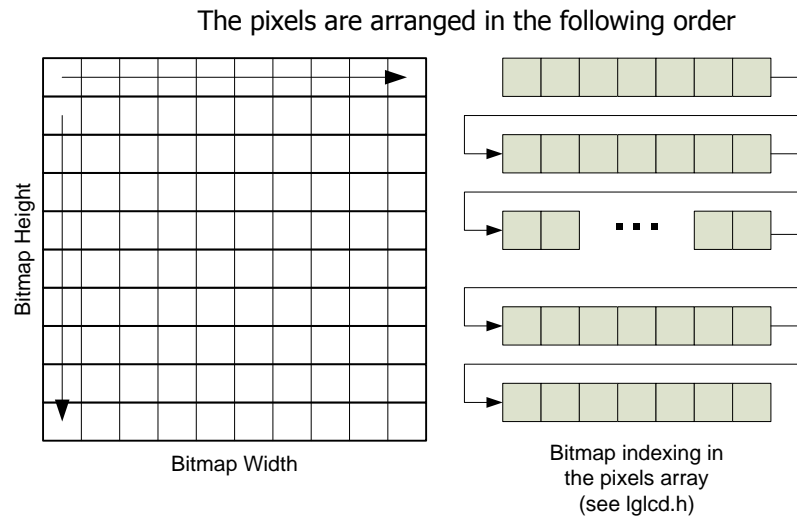
#### **pixels**

Contains the display bitmap. For the LGLCD\_BMP\_FORMAT\_160x43x1 type, every byte represents one pixel, with  $\geq 128$  being "on" and  $< 128$  being "off". For the LGLCD\_BMP\_FORMAT\_QVGAX32 type, each byte is part of an RGB Quad that represents the 32 bit color value.

### **Remarks**

All display data is sent from the LCD Manager to the device as bitmap data where each bit in bitmap vector represents a color for that bit. Although your bitmap image is logically a WIDTH x

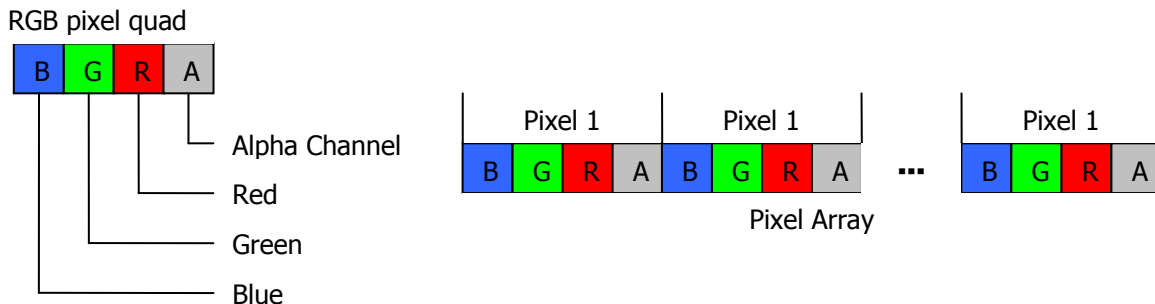
HEIGHT matrix, the LCD Manager will provide bitmap data in a one dimensional character array of equivalent size. The bitmap data simply stored from the upper left corner of the bitmap to the lower right corner from left to right, top to bottom. The illustration below shows the logical transformation of the data.



#### Storage of bitmap data in the pixels array

The LCD Manager presently only supports black and white (1 bit) and 32 bit color bitmaps. For black and white bitmaps, although they could be expressed in a single bit, the data is stored in a byte with a value of  $\geq 128$  as ON and a value  $< 128$  as OFF.

32 bit values are stored in 4 consecutive bytes that represent the RGB color values for that pixel. These values use the same top left to bottom right raster style transform to the flat character array with the exception that each pixel value is specified using 4 consecutive bytes. The illustration below shows the data arrangement for these RGB quads.



#### Pixel storage for 32 bit devices

Each of the bytes in the RGB quad specify the intensity of the given color. The value ranges from 0 (the darkest color value) to 255 (brightest color value)

### See Also

[lgLcdUpdateBitmap\(\)](#)

## IgLcdConfigureContext/IgLcdOnConfigureCB

The **IgLcdConfigureContext** is part of the [IgLcdConnectContext](#) and is used to give the library enough information to allow the user to configure your application. The registered callback is called when the user clicks the "Configure..." button or the "Configure" context menu item in the LCDMon list of applications.

```
// Callback used to allow client to pop up a "configuration panel"
typedef DWORD (WINAPI *IgLcdOnConfigureCB) (IN int connection,
                                           IN const PVOID pContext);

typedef struct
{
    // Set to NULL if not configurable
    IgLcdOnConfigureCB configCallback;
    PVOID configContext;
} IgLcdConfigureContext;
```

### Members

#### **configCallback**

Specifies a pointer to a function that should be called when the user wants to configure your application. If no configuration panel is provided or needed, leave this parameter NULL.

#### **configContext**

Specifies an arbitrary context value of the application that is passed back to the client in the event that the registered configCallback function is invoked.

### Remarks

For applications which don't have a stand-alone UI, such as a simple little utility that requires the LCD to be present, you can use the configuration callback mechanism to allow the user to access your UI through the common LCDMon front end. In LCDMon's list of applications, there is a button labeled "Configure..." which, when pressed, invokes the registered configuration callback. This saves you from having to implement any other UI (tray icon or regular window) if all the UI your application does is LCD related.

Note that this callback is executed in the context of a thread within the library. Therefore, take the necessary precautions for thread safety should the callback code share resources with other threads in your application.

### See Also

[IgLcdConnectContext](#), [IgLcdConnect\(\)](#), [IgLcdConnectEx\(\)](#)

## IgLcdNotificationContext/IgLcdOnNotificationCB

The **IgLcdNotificationContext** is part of the [IgLCDConnectContextEx](#) and is used to give the library enough information to allow the user to have notifications from the LCD Manager. The registered callback is called when there are any notifications for the application. Among notifications are arrivals and removals of new devices.

```
// Callback used to notify client of events from the LCD Manager

typedef DWORD (WINAPI *IgLCDOnNotificationCB)(IN int connection,
                                             IN const PVOID pContext,
                                             IN DWORD notificationCode,
                                             IN DWORD notifyParm1,
                                             IN DWORD notifyParm2,
                                             IN DWORD notifyParm3,
                                             IN DWORD notifyParm4);

typedef struct
{
    // Set to NULL if not configurable
    IgLCDOnNotificationCB notificationCallback;
    PVOID notificationContext;
} IgLCDNotificationContext;
```

### Members

#### notificationCallback

Specifies a pointer to a function that should be called when LCD Manager has notifications for the application. If the application is not interested in receiving notifications, then it should set this parameter to NULL.

#### notificationContext

Specifies an arbitrary context value of the application that is passed back to the client in the event that the registered notificationCallback function is invoked.

### Remarks

In order for notifications to work properly, your applet must provide its capabilities using the *dwAppletCapabilitiesSupported* field in the connect context structure. See [IgLCDConnectContextEx](#) for details on setting this field.

Currently the IgLCD API provides support for the following notifications:

Value	Meaning
LGLCD_NOTIFICATION_DEVICE_ARRIVAL	At least one device of the type given in notifyParm1 has been attached to the system or enabled by the user.
LGLCD_NOTIFICATION_DEVICE_REMOVAL	All devices of the type given in notifyParm1 have been removed from the system or disabled by the user.
LGLCD_NOTIFICATION_APPLET_ENABLED	The user has enabled the applet



	globally.
LGLCD_NOTIFICATION_APPLET_DISABLED	The user has disabled the applet globally.
LGLCD_NOTIFICATION_CLOSE_CONNECTION	LCD Manager has requested the applet to close the connection.

### Device Arrival

This notification is sent when at least one device that the applet supports (as indicated by the field *dwAppletCapabilitiesSupported* in the [IgLCDConnectContextEx](#) structure) arrives in the system. A device arrival can also be triggered when the user enables a device that was previously disabled. The notification parameters will be as follows.

Field	Value
notificationCode	LGLCD_NOTIFICATION_DEVICE_ARRIVAL
notifyParam1	One of the following two values: LGLCD_DEVICE_BW or LGLCD_DEVICE_QVGA.

### Device Removal

This notification is sent when the user disables all devices of a given type, or when the all physical devices of a given type have been unplugged. The notification parameters will be as follows.

Field	Value
notificationCode	LGLCD_NOTIFICATION_DEVICE_REMOVAL
notifyParam1	One of the following two values: LGLCD_DEVICE_BW or LGLCD_DEVICE_QVGA.

### Applet Enable and Disable

Applets are enabled and disabled using the Programs configuration panel on the LCD Manager (LCDMon) application program. The global enable and disable functions are initiated by the user on this configuration screen. Applet enabled and disabled are flagged by the following notification codes:

Field	Value
notificationCode	LGLCD_NOTIFICATION_APPLET_ENABLED or LGLCD_NOTIFICATION_APPLET_DISABLED

### Connection Closure

If the applet's connection to the LCD Manager application is disrupted for any reason, the applet will receive a connection closure notification. This notification is indicated using the following notification code:

Field	Value
notificationCode	LGLCD_NOTIFICATION_CLOSE_CONNECTION

When this notification is received, the applet must assume all communication with the LCD Manager has been lost and all open devices are no longer valid. All further attempts at communication with the LCD Manager using the API library will result in a returned failure code. As a recovery strategy, the applet designer can decide to attempt to open a new connection with the LCD Manager, simply continue operation of the applet without further communication with the LCD Manager or terminate the applet completely.

## **See Also**

[lgLcdConnectContextEx](#), [lgLcdConnectEx\(\)](#), [lgLcdOpen\(\)](#), [lgLcdOpenByType\(\)](#)

## IgLcdConnectContext

The **IgLcdConnectContext** contains all the information that is needed to connect your application to LCDMon through [IgLcdConnect\(\)](#). Upon successful connection, it also contains the connection handle that has to be used in subsequent calls to [IgLcdEnumerate\(\)](#), [IgLcdOpen\(\)](#) and [IgLcdOpenByType\(\)](#).

```
typedef struct
{
    // "Friendly name" display in the listing
    LPCTSTR appFriendlyName;
    // isPersistent determines whether this connection
    // persists in the list
    BOOL isPersistent;
    // isAutostartable determines whether the client can be started by
    // LCDMon
    BOOL isAutostartable;
    IgLcdConfigureContext onConfigure;
    // --> Connection handle
    int connection;
} IgLcdConnectContext;
```

### Members

#### appFriendlyName

Specifies a string that contains the “friendly name” of your application. This name is presented to the user whenever a list of applications is shown.

#### isPersistent

The function of this parameter has been deprecated in Version 3.00 and is provided for legacy support. The LCDMon application will ignore and not honor this value.

#### isAutostartable

Specifies whether or not your application can be started by LCDMon.

#### onConfigure

Specifies context that is necessary to call back for configuration of your application. See [IgLcdConfigureContext](#) for more details.

#### connection

Upon successful connection, this member holds the “connection handle” which is used in subsequent calls to [IgLcdEnumerate\(\)](#), [IgLcdOpen\(\)](#) and [IgLcdOpenByType\(\)](#). A value of LGLCD\_INVALID\_CONNECTION denotes an invalid connection.

### Remarks

Typically, an application is either LCD-enabled (as one of the many features, such as for example a game) or an LCD-specific application (such as, for example, a clock that shows on the LCD only). For an LCD-enabled type of application, it is common to have `.isAutostartable` set to `FALSE` and a configuration callback of `NULL`. For an LCD-specific application, `.isAutostartable` is usually `TRUE` and there can be a good reason for implementing the configuration callback (say, to switch between 12 and 24 hour format). It's up to the configuration callback to implement whatever UI is needed for that particular application.

Connections are kept open until [lgLcdDisconnect\(\)](#) is called, or until the library is de-initialized with [lgLcdDeInit\(\)](#).

The connection handle that is returned is used with [lgLcdEnumerate\(\)](#), [lgLcdOpen\(\)](#) and [lgLcdOpenByType\(\)](#). To distinguish between valid and invalid connection handles, use the constant `LGLCD_INVALID_CONNECTION`.

A single application can open multiple connections to LCDMon. This can be useful if the client wants to appear with multiple separate entries in LCDMon's application list. For example, if your application hosts both a stock ticker display, as well as an e-mail polling application. In that case, your application would call [lgLcdConnect\(\)](#) once with a friendly name of "Stock Ticker", and a second time with "E-mail poller". The two LCD clients, while sharing the same housing, are for all purposes separate (including separate configuration screens), and therefore require a separate connection. Additionally, opening multiple connections allows the user to direct each connection to a specific device of her choice by enabling/disabling the applet on particular devices.

## See Also

[lgLcdConnect\(\)](#), [lgLcdDisconnect\(\)](#), [lgLcdEnumerate\(\)](#), [lgLcdOpen\(\)](#), [lgLcdOpenByType\(\)](#)

## IgLcdConnectContextEx

The **IgLcdConnectContextEx** contains all the information that is needed to connect your application to LCDMon through [IgLcdConnectEx\(\)](#). Upon successful connection, it also contains the connection handle that has to be used in subsequent calls to [IgLcdEnumerate\(\)](#), [IgLcdEnumerateEx\(\)](#), [IgLcdOpen\(\)](#) and [IgLcdOpenByType\(\)](#).

```
typedef struct
{
    // "Friendly name" display in the listing
    LPCTSTR appFriendlyName;
    // isPersistent determines whether this connection
    // persists in the list
    BOOL isPersistent;
    // isAutostartable determines whether the client can be started by
    // LCDMon
    BOOL isAutostartable;
    IgLcdConfigureContext onConfigure;
    // --> Connection handle
    int connection;
    DWORD dwAppletCapabilitiesSupported;
    DWORD dwReserved1;
    IgLcdNotificationContext onNotify;
} IgLcdConnectContextEx;
```

### Members

#### appFriendlyName

Specifies a string that contains the "friendly name" of your application. This name is presented to the user whenever a list of applications is shown.

#### isPersistent

The function of this parameter has been deprecated in Version 3.00 and is provided for legacy support. The LCDMon application will ignore and not honor this value.

#### isAutostartable

Specifies whether your application can be started by LCDMon or not.

#### onConfigure

Specifies context that is necessary to call back for configuration of your application. See [IgLcdConfigureContext](#) for more details.

#### connection

Upon successful connection, this member holds the "connection handle" which is used in subsequent calls to [IgLcdEnumerate\(\)](#), [IgLcdEnumerateEx\(\)](#) and [IgLcdOpen\(\)](#). A value of LGLCD\_INVALID\_CONNECTION denotes an invalid connection.

## dwAppletCapabilitiesSupported

This field contains an Or'd combination of the capabilities supported by the applet. The Applet capabilities will be one of the following values.

Value	Meaning
LGLCD_APPLET_CAP_BASIC	Legacy support for B/W applets only. No device arrival/removal notifications, limited enumeration support.
LGLCD_APPLET_CAP_BW	B/W applet only. No enumeration support, device arrival/removal notifications for B/W devices only.
LGLCD_APPLET_CAP_QVGA	QVGA applet only. No enumeration support, device arrival/removal notifications for QVGA devices only.

Legacy applets (before Version 3.x) will use the basic capability in conjunction with [lgLcdEnumerate\(\)](#)/[lgLcdEnumerateEx\(\)](#) and [lgLcdOpen\(\)](#). Newer applets may use BW and QVGA caps to inform the LCD Manager what display format they are capable of sending. If an applet can send both color and B/W data they can logically OR the appropriate flags to express this capability.

Device arrival/removal notifications will only be sent if an applet sets at least one of the flags LGLCD\_APPLET\_CAP\_BW and/or LGLCD\_APPLET\_CAP\_QVGA. In this case, the applet must use the [lgLcdOpenByType\(\)](#) function to obtain the device handle for a given type of device.

## onNotify

Specifies context that is necessary to call back for notification to your application. See [lgLcdNotificationContext](#) for more details

## Remarks

Typically, an application is either LCD-enabled (as one of the many features, such as for example a game) or an LCD-specific application (such as, for example, a clock that shows on the LCD only). For an LCD-enabled type of application, it is common to have `.isAutostartable` set to FALSE and a configuration callback of NULL. For an LCD-specific application, `.isAutostartable` is usually TRUE and there can be a good reason for implementing the configuration callback (say, to switch between 12 and 24 hour format). It's up to the configuration callback to implement whatever UI is needed for that particular application.

Connections are kept open until [lgLcdDisconnect\(\)](#) is called, or until the library is de-initialized with [lgLcdDeInit\(\)](#).

The connection handle that is returned is used with [lgLcdEnumerate\(\)](#), [lgLcdEnumerateEx\(\)](#), [lgLcdOpen\(\)](#) and [lgLcdOpenByType\(\)](#). To distinguish between valid and invalid connection handles, use the constant LGLCD\_INVALID\_CONNECTION.

A single application can open multiple connections to LCDMon. This can be useful if the client wants to appear with multiple separate entries in LCDMon's application list. For example, if your application hosts both a stock ticker display, as well as an e-mail polling application. In that case, your application would call [lgLcdConnectEx\(\)](#) once with a

friendly name of "Stock Ticker", and a second time with "E-mail poller". The two LCD clients, while sharing the same housing, are for all purposes separate (including separate configuration screens), and therefore require a separate connection.

## **See Also**

[lgLcdConnectEx\(\)](#), [lgLcdDisconnect\(\)](#),[lgLcdEnumerate\(\)](#),[lgLcdEnumerateEx\(\)](#),  
[lgLcdOpen\(\)](#), [lgLcdOpenByType\(\)](#)

## IgLcdSoftbuttonsChangedContext/IgLcdOnSoftButtonsCB

The **IgLcdSoftbuttonsChangedContext** is part of the [IgLCDOpenContext](#) and is used to give the library enough information to allow changes in the state of the soft buttons to be signaled into the calling application through a callback.

```
// Callback used to notify client of soft button change
typedef DWORD (WINAPI *IgLCDOnSoftButtonsCB) (IN int device,
                                              IN DWORD dwButtons,
                                              IN const PVOID pContext);

typedef struct
{
    // Set to NULL if no softbutton notifications are needed
    IgLCDOnSoftButtonsCB softbuttonsChangedCallback;
    PVOID softbuttonsChangedContext;
} IgLCDSoftbuttonsChangedContext;
```

### Members

#### softButtonsChangedCallback

Specifies a pointer to a function that should be called when the state of the soft buttons changes. If no notification is needed, leave this parameter NULL.

#### softbuttonsChangedContext

Specifies an arbitrary context value of the application that is passed back to the client in the event that soft buttons are being pressed or released. The new value of the soft buttons is reported in the dwButtons parameter of the callback function.

### Remarks

There are two methods of getting soft button states. One of them is using the polling method through [IgLCDReadSoftButtons\(\)](#), the second is by using this notification callback that alerts the application of any changes as they take place.

Note that this callback is executed in the context of a thread within the library. Therefore, take the necessary precautions for thread safety should the callback code share resources with other threads in your application.

### See Also

[IgLCDOpenContext](#), [IgLCDOpenByTypeContext](#), [IgLCDOpen\(\)](#), [IgLCDOpenByType\(\)](#), [IgLCDReadSoftButtons\(\)](#)



## IgLcdOpenContext

The **IgLcdOpenContext** contains all the information that is needed to open a specified LCD display through [lgLcdOpen\(\)](#). Upon successful completion of the open it contains the device handle that has to be used in subsequent calls to [lgLcdReadSoftButtons\(\)](#), [lgLcdUpdateBitmap\(\)](#) and [lgLcdClose\(\)](#).

```
typedef struct
{
    int connection;
    // Device index to open
    int index;
    lgLcdSoftbuttonsChangedContext onSoftbuttonsChanged;
    // --> Device handle
    int device;
} IgLcdOpenContext;
```

### Members

#### connection

Specifies the connection (previously opened through [lgLcdConnect\(\)](#)) which this [lgLcdOpen\(\)](#) call is for.

#### index

Specifies the index of the device to open (see [lgLcdEnumerate\(\)](#) or [lgLcdEnumerateEx\(\)](#) for details).

#### onSoftbuttonsChanged

Specifies the details for the callback function that should be invoked when this device has changes in its soft button status, i.e. the user has pressed or released a soft button. For details, see [lgLcdSoftbuttonsChangedContext](#).

#### device

Upon successful opening, this member holds the device handle which is used in subsequent calls to [lgLcdReadSoftButtons\(\)](#), [lgLcdUpdateBitmap\(\)](#) and [lgLcdClose\(\)](#). A value of LGLCD\_INVALID\_DEVICE denotes an invalid device.

### Remarks

Use this structure to open a device and retrieve its handle. The handle stays valid until the device is unplugged or [lgLcdClose\(\)](#) is called. To distinguish between valid and invalid connection handles, use the constant LGLCD\_INVALID\_DEVICE.

For a given connection, multiple devices can be opened. While this might not make much sense for a keyboard (who will have two of those connected to the same system), it does provide the flexibility for having multiple standalone displays connected.

### See Also

[IgLcdConnect\(\)](#), [IgLcdEnumerate\(\)](#),[IgLcdConnectEx\(\)](#), [IgLcdEnumerateEx\(\)](#), [IgLcdOpen\(\)](#)

## IgLcdOpenByTypeContext

The **IgLcdOpenByTypeContext** contains all the information that is needed to open LCD display of a given type through [lgLcdOpenByType\(\)](#). Upon successful completion of the open it contains the device handle that has to be used in subsequent calls to [lgLcdReadSoftButtons\(\)](#), [lgLcdUpdateBitmap\(\)](#) and [lgLcdClose\(\)](#).

```
typedef struct
{
    int connection;
    // Device index to open
    int deviceType;
    lgLcdSoftbuttonsChangedContext onSoftbuttonsChanged;
    // --> Device handle
    int device;
} IgLcdOpenByTypeContext;
```

### Members

#### connection

Specifies the connection (previously opened through [lgLcdConnect\(\)](#)) which this [lgLcdOpenByType\(\)](#) call is for.

#### deviceType

Specifies the display type to open. Must be one of the following two values:

Value	Meaning
LGLCD_DEVICE_BW	Open up any device capable of displaying 160 by 43 monochrome display data.
LGLCD_DEVICE_QVGA	Open up any device capable of displaying 320 by 240 color display data.

#### onSoftbuttonsChanged

Specifies the details for the callback function that should be invoked when this device has changes in its soft button status, i.e. the user has pressed or released a soft button. For details, see [lgLcdSoftbuttonsChangedContext](#).

#### device

Upon successful opening, this member holds the device handle which is used in subsequent calls to [lgLcdReadSoftButtons\(\)](#), [lgLcdUpdateBitmap\(\)](#) and [lgLcdClose\(\)](#). A value of LGLCD\_INVALID\_DEVICE denotes an invalid device.

### Remarks

Use this structure to open a device and retrieve its handle. The handle stays valid until the device is unplugged or [lgLcdClose\(\)](#) is called. To distinguish between valid and invalid connection handles, use the constant LGLCD\_INVALID\_DEVICE.

### See Also

[lgLcdConnect\(\)](#), [lgLcdConnectEx\(\)](#), [lgLcdOpenByType\(\)](#)

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## IgLcdInit

The **IgLcdInit()** function initializes the Logitech LCD library. You must call this function prior to any other function of the library.

```
DWORD WINAPI IgLcdInit(void);
```

### Parameters

None

### Return Values

If the function succeeds, the return value is ERROR\_SUCCESS.

If the function fails, the return value can be one of the following:

Value	Meaning
RPC_S_SERVER_UNAVAILABLE	The Logitech LCD subsystem is not available (this is the case for systems that don't have the software installed)
ERROR_OLD_WIN_VERSION	Attempted to initialize for Windows 9x. The library only works on Windows 2000 and above.
ERROR_NO_SYSTEM_RESOURCES	Not enough system resources.
ERROR_ALREADY_INITIALIZED	<a href="#">IgLcdInit()</a> has been called before.

### Remarks

No other function in the library can be called before [IgLcdInit\(\)](#) is executed. For result codes RPC\_S\_SERVER\_UNAVAILABLE, ERROR\_OLD\_WIN\_VERSION, and ERROR\_NO\_SYSTEM\_RESOURCES, the calling application can safely assume that the machine it is running on is not set up to do LCD output and therefore disable its LCD-related functionality.

### See Also

[IgLcdDeInit\(\)](#)

## IgLcdDeInit

Use **IgLcdDeInit()** after you are done using the library in order to release all resources that were allocated during [IgLCDInit\(\)](#).

```
DWORD WINAPI IgLcdDeInit(void);
```

### Parameters

None.

### Return Values

This function always returns `ERROR_SUCCESS`.

### Remarks

All resources that were allocated during use of the library will be released when this function is called. After this function has been called, no further calls to the library are permitted with the exception of [IgLCDInit\(\)](#).

### See Also

[IgLCDInit\(\)](#)

## IgLcdConnect

Use **IgLcdConnect()** to establish a connection to the LCD monitor process. This connection is required for any other function to find, open and communicate with LCDs.

```
DWORD WINAPI IgLcdConnect (IN OUT lgLcdConnectContext *ctx);
```

### Parameters

**ctx**

Pointer to a structure which holds all the relevant information about the connection which you wish to establish. Upon calling, all fields except the "connection" member need to be filled in; on return from the function, the "connection" member will be set. See [lgLcdConnectContext](#) for details.

### Return Values

If the function succeeds, the return value is ERROR\_SUCCESS.

If the function fails, the return value can be one of the following:

Value	Meaning
ERROR_SERVICE_NOT_ACTIVE	<a href="#">lgLcdInit()</a> has not been called yet.
ERROR_INVALID_PARAMETER	Either ctx or ctx->appFriendlyName are NULL.
ERROR_FILE_NOT_FOUND	LCDMon is not running on the system.
ERROR_ALREADY_EXISTS	The same client is already connected.
RPC_X_WRONG_PIPE_VERSION	LCDMon does not understand the protocol.
Xxx	Other (system) error with appropriate error code.

### Remarks

A connection needs to be established for an application to start using LCD devices. [lgLcdConnect\(\)](#) attempts to establish that connection. If the LCD Monitor process is not running (either because it has not been started or not installed (the user is using a different keyboard)), the connection attempt will not succeed. In that case, your application should consider running without any LCD support.

Since a string is part of the connection context, this function exists in an ANSI and a UNICODE version. The header file picks the appropriate version depending on whether the symbol UNICODE is present or not.

### See Also

[lgLcdDisconnect\(\)](#), [lgLcdEnumerate\(\)](#), [lgLcdOpen\(\)](#)



## IgLcdConnectEx

Use **IgLcdConnectEx()** to establish a connection to the LCD monitor process. This connection is required for any other function to find, open and communicate with LCDs.

```
DWORD WINAPI IgLcdConnectEx(IN OUT IgLcdConnectContextEx *ctx);
```

### Parameters

**ctx**

Pointer to a structure which holds all the relevant information about the connection which you wish to establish. Upon calling, all fields except the "connection" member need to be filled in; on return from the function, the "connection" member will be set. See [IgLcdConnectContext](#) for details.

### Return Values

If the function succeeds, the return value is ERROR\_SUCCESS.

If the function fails, the return value can be one of the following:

Value	Meaning
ERROR_SERVICE_NOT_ACTIVE	<a href="#">IgLcdInit()</a> has not been called yet.
ERROR_INVALID_PARAMETER	Either ctx or ctx->appFriendlyName are NULL.
ERROR_FILE_NOT_FOUND	LCDMon is not running on the system.
ERROR_ALREADY_EXISTS	The same client is already connected.
RPC_X_WRONG_PIPE_VERSION	LCDMon does not understand the protocol.
Xxx	Other (system) error with appropriate error code.

### Remarks

A connection needs to be established for an application to start using LCD devices. [IgLcdConnect\(\)](#) attempts to establish that connection. If the LCD Monitor process is not running (either because it has not been started or not installed (the user is using a different keyboard)), the connection attempt will not succeed. In that case, your application should consider running without any LCD support.

Since a string is part of the connection context, this function exists in an ANSI and a UNICODE version. The header file picks the appropriate version depending on whether the symbol UNICODE is present or not.

### See Also

[IgLcdDisconnect\(\)](#), [IgLcdEnumerate\(\)](#), [IgLcdEnumerateEx\(\)](#), [IgLcdOpen\(\)](#)

## IgLcdDisconnect

Use **IgLcdDisconnect()** to close an existing connection to the LCD monitor process.

```
DWORD WINAPI IgLcdDisconnect(int connection);
```

### Parameters

#### connection

Specifies the connection handle that was returned from a previous successful call to [IgLcdConnect\(\)](#) or [IgLcdConnectEx\(\)](#).

### Return Values

If the function succeeds, the return value is ERROR\_SUCCESS.

If the function fails, the return value can be one of the following:

Value	Meaning
ERROR_SERVICE_NOT_ACTIVE	<a href="#">IgLcdInit()</a> has not been called yet.
ERROR_INVALID_PARAMETER	Specified connection handle does not exist.
Xxx	Other (system) error with appropriate error code.

### Remarks

Closing a connection invalidates all devices that have been opened using that connection. These invalid handles, if used after closing the connection, will cause errors to be returned by calls to [IgLcdUpdateBitmap\(\)](#), [IgLcdReadSoftButtons\(\)](#), and [IgLcdClose\(\)](#).

Additionally, if a callback for configuration had been registered in the call to [IgLcdConnect\(\)](#), the callback will no longer be valid and no further calls to it will be made.

### See Also

[IgLcdConnect\(\)](#), [IgLcdConnectEx\(\)](#)

## IgLcdSetDeviceFamiliesToUse

This function has been deprecated in V3.x and later.

The **IgLcdSetDeviceFamiliesToUse()** function is used to inform the LCDManager of what device types (families are types) the applet is interested in using. After this call, all subsequent calls to [IgLcdEnumerate\(\)](#) or [IgLcdEnumerateEx\(\)](#) will only return devices that are in the families requested.

```
DWORD WINAPI IgLcdSetDeviceFamiliesToUse(IN int connection,  
                                         IN DWORD dwDeviceFamiliesSupported,  
                                         IN DWORD dwReserved1);
```

### Parameters

#### connection

Specifies the connection that this command refers to.

#### dwDeviceFamiliesSupported

An or'ed list of device families the applet is interested in. Refer to lgld.h for a complete listing of all supported device families..

#### dwReserved1

Must be set to 0.

### Return Values

If the function succeeds, the return value is ERROR\_SUCCESS.

If the function fails, the return value can be one of the following:

Value	Meaning
ERROR_SERVICE_NOT_ACTIVE	<a href="#">IgLcdInit()</a> has not been called yet.
ERROR_INVALID_PARAMETER	The dwDeviceFamiliesSupported is not valid.
Xxx	Other (system) error with appropriate error code.

### Remarks

The connection parameter is returned by a call to [IgLcdConnect\(\)](#) or [IgLcdConnectEx\(\)](#).

Use this function prior to any enumeration of devices. This gives the applet the ability to only use devices that it is interested in and knows how to communicate with.

### See Also

[IgLcdConnect\(\)](#), [IgLcdConnectEx\(\)](#), [IgLcdConnectContext](#), [IgLcdDeviceDesc](#), [IgLcdDeviceDescEx\(\)](#), [IgLcdOpen\(\)](#), [IgLcdClose\(\)](#)

## IgLcdEnumerate

This function has been deprecated in V3.x and later.

The **IgLcdEnumerate()** function is used to retrieve information about all the currently attached and supported Logitech LCD devices.

```
DWORD WINAPI IgLcdEnumerate(IN int connection, IN int index,  
                             OUT lgLcdDeviceDesc *description);
```

### Parameters

#### connection

Specifies the connection that this enumeration refers to.

#### index

Specifies which device information is requested. See Remarks.

#### description

Points to an [lgLcdDeviceDesc](#) structure which will be filled with information about the device.

### Return Values

If the function succeeds, the return value is ERROR\_SUCCESS.

If the function fails, the return value can be one of the following:

Value	Meaning
ERROR_SERVICE_NOT_ACTIVE	<a href="#">lgLcdInit()</a> has not been called yet.
ERROR_NO_MORE_ITEMS	There are no more devices to be enumerated. If this error is returned on the first call, then there are no devices attached.
ERROR_INVALID_PARAMETER	The description pointer is NULL.
Xxx	Other (system) error with appropriate error code.

### Remarks

The connection parameter is returned by a call to [lgLcdConnect\(\)](#) or [lgLcdConnectEx\(\)](#).

To enumerate the attached devices, you should call [lgLcdEnumerate\(\)](#) and pass in 0 as *index* parameter. On subsequent calls, increase the *index* parameter by 1 until the function returns ERROR\_NO\_MORE\_ITEMS or you have enumerated a device that you wish to open.

Once you have identified a device, you will use the index value of the device in the call to [lgLcdOpen\(\)](#) to identify it to the LCD Manager.

If an applet has announced the capability to send either color or B/W data or both using the *dwAppletCapabilitiesSupported* field of the [lgLcdConnectContextEx](#) structure when

the applet connects to the LCD Manager, enumeration will not any devices. Such an applet **must** use [lgLcdOpenByType\(\)](#) to open devices of a given type.

## See Also

[lgLcdConnect\(\)](#), [lgLcdConnectEx\(\)](#), [lgLcdConnectContext](#), [lgLcdDeviceDesc](#), [lgLcdOpen\(\)](#),  
[lgLcdOpenByType\(\)](#), [lgLcdClose\(\)](#)

## IgLcdEnumerateEx

This function has been deprecated in V3.x and later.

The **IgLcdEnumerateEx()** function is used to retrieve information about all the currently attached and supported Logitech LCD devices.

```
DWORD WINAPI IgLcdEnumerateEx(IN int connection, IN int index,  
                                OUT lgLcdDeviceDescEx *description);
```

### Parameters

#### connection

Specifies the connection that this enumeration refers to.

#### index

Specifies which device information is requested. See Remarks.

#### description

Points to an [lgLcdDeviceDescEx](#) structure which will be filled with information about the device.

### Return Values

If the function succeeds, the return value is ERROR\_SUCCESS.

If the function fails, the return value can be one of the following:

Value	Meaning
ERROR_SERVICE_NOT_ACTIVE	<a href="#">lgLcdInit()</a> has not been called yet.
ERROR_NO_MORE_ITEMS	There are no more devices to be enumerated. If this error is returned on the first call, then there are no devices attached.
ERROR_INVALID_PARAMETER	The description pointer is NULL.
Xxx	Other (system) error with appropriate error code.

### Remarks

The connection parameter is returned by a call to [lgLcdConnect\(\)](#) or [lgLcdConnectEx\(\)](#).

To enumerate the attached devices, you should call [lgLcdEnumerateEx\(\)](#) and pass in 0 as *index* parameter. On subsequent calls, increase the *index* parameter by 1 until the function returns ERROR\_NO\_MORE\_ITEMS or you have enumerated a device that you wish to open.

Once you have identified a device, you will use the index value of the device in the call to [lgLcdOpen\(\)](#) to identify it to the LCD Manager.

If an applet has announced the capability to send either color or B/W data or both using the *dwAppletCapabilitiesSupported* field of the [lgLcdConnectContextEx](#) structure when

the applet connects to the LCD Manager, enumeration will not any devices. Such an applet **must** use [lgLcdOpenByType\(\)](#) to open devices of a given type.

## See Also

[lgLcdConnect\(\)](#), [lgLcdConnectEx\(\)](#), [lgLcdConnectContext](#), [lgLcdDeviceDesc](#), [lgLcdOpen\(\)](#),  
[lgLcdOpenByType\(\)](#), [lgLcdClose\(\)](#)

## IgLcdOpen

This function has been deprecated in V3.x and later.

The **IgLcdOpen()** function starts the communication with an attached device. You have to call this function before retrieving button information or updating LCD bitmaps.

```
DWORD WINAPI IgLcdOpen(IN OUT lgLcdOpenContext *ctx);
```

### Parameters

**ctx**

Specifies a pointer to a structure with all the information that is needed to open the device. See [lgLcdOpenContext](#) for details. Before calling [IgLcdOpen\(\)](#), all fields must be set, except the "device" member. Upon successful return, the "device" member contains the device handle that can be used in subsequent calls to [lgLcdUpdateBitmap\(\)](#), [lgLcdReadSoftButtons\(\)](#), and [lgLcdClose\(\)](#).

### Return Values

If the function succeeds, the return value is ERROR\_SUCCESS.

If the function fails, the return value can be one of the following:

Value	Meaning
ERROR_SERVICE_NOT_ACTIVE	<a href="#">lgLcdInit()</a> has not been called yet.
ERROR_INVALID_PARAMETER	Either ctx is NULL, or ctx->connection is not valid, or ctx->index does not hold a valid device.
ERROR_ALREADY_EXISTS	The specified device has already been opened in the given connection.
Xxx	Other (system) error with appropriate error code.

### Remarks

The open context structure expects a valid device index. You can find a device index using the [lgLcdEnumerate\(\)](#) functions above. Once a device is opened, it (and all associated emulated devices) will be removed from the enumeration pool. This is to prevent applets from attempting to open the same device more than once.

It is possible to open multiple devices using the same connection. To achieve this, you would create an additional open context, enumerate for the desired device, and open a new data handle to the device based on the enumerated index.

A handle retrieved through this function stays valid until either of the following conditions occurs:

- The device has been unplugged. Any operation with the given handle will result in an error code of ERROR\_DEVICE\_NOT\_CONNECTED.
- The handle has been closed using [lgLcdClose\(\)](#).



Part of the opening context is a callback that can be pointed to a function that is to be called when soft button changes take place on the LCD. This callback is issued when the LCD's soft buttons change while your application owns the LCD space. See the definition of [lgLcdOpenContext](#) and [lgLcdSoftbuttonsChangedContext](#) for details.

## See Also

[lgLcdOpenContext](#), [lgLcdClose\(\)](#), [lgLcdEnumerate\(\)](#), [lgLcdEnumerateEx\(\)](#),  
[lgLcdUpdateBitmap\(\)](#), [lgLcdReadSoftButtons\(\)](#)

## IgLcdOpenByType

The **IgLcdOpenByType()** function starts the communication with an attached device. You have to call this function before retrieving button information or updating LCD bitmaps. This is the open function to use in V3.x and later.

```
DWORD WINAPI IgLcdOpenByType (IN OUT lgLcdOpenByTypeContext *ctx);
```

### Parameters

**ctx**

Specifies a pointer to a structure with all the information that is needed to open the device. See [lgLcdOpenByTypeContext](#) for details. Before calling [lgLcdOpenByType\(\)](#), all fields must be set, except the "device" member. Upon successful return, the "device" member contains the device handle that can be used in subsequent calls to [lgLcdUpdateBitmap\(\)](#), [lgLcdReadSoftButtons\(\)](#), and [lgLcdClose\(\)](#).

### Return Values

If the function succeeds, the return value is ERROR\_SUCCESS.

If the function fails, the return value can be one of the following:

Value	Meaning
ERROR_SERVICE_NOT_ACTIVE	<a href="#">lgLcdInit()</a> has not been called yet.
ERROR_INVALID_PARAMETER	Either ctx is NULL, or ctx->connection is not valid, or ctx->deviceType does not hold a valid device type.
ERROR_ALREADY_EXISTS	The specified device has already been opened in the given connection.
Xxx	Other (system) error with appropriate error code.

### Remarks

The open context structure expects a valid device type in the field *deviceType*. The function will open a device of the requested type if it is currently attached to the system and the applet has been enabled to run on it.

A handle retrieved through this function stays valid until either of the following conditions occurs:

- The device has been unplugged. Any operation with the given handle will result in an error code of ERROR\_DEVICE\_NOT\_CONNECTED. Note that in this case, it is advisable to try again to open a device of the same type, since there might be multiple devices of a given type attached to the system.
- The handle has been closed using [lgLcdClose\(\)](#).

Part of the opening context is a callback that can be pointed to a function that is to be called when soft button changes take place on the LCD. This callback is issued when the

LCD's soft buttons change while your application owns the LCD space. See the definition of [lgLcdOpenByTypeContext](#) and [lgLcdSoftbuttonsChangedContext](#) for details.

## **See Also**

[lgLcdOpenContext](#), [lgLcdClose\(\)](#), [lgLcdUpdateBitmap\(\)](#), [lgLcdReadSoftButtons\(\)](#)

## IgLcdClose

The **IgLcdClose()** function stops the communication with the previously opened device.

```
DWORD WINAPI IgLcdClose(IN int device);
```

### Parameters

#### device

Specifies the device handle retrieved in the [IgLcdOpenContext](#) by a previous call to [IgLcdOpen\(\)](#) or in the [IgLcdOpenByTypeContext](#) by a previous call to [IgLcdOpenByType\(\)](#).

### Return Values

If the function succeeds, the return value is ERROR\_SUCCESS.

If the function fails, the return value can be one of the following:

Value	Meaning
ERROR_SERVICE_NOT_ACTIVE	<a href="#">IgLcdInit()</a> has not been called yet.
ERROR_INVALID_PARAMETER	The specified device handle is invalid.
Xxx	Other (system) error with appropriate error code.

### Remarks

After calling [IgLcdClose\(\)](#), the soft button callback specified in the call to [IgLcdOpen\(\)](#)/[IgLcdOpenByType\(\)](#) will not be called anymore.

### See Also

[IgLcdOpen\(\)](#), [IgLcdOpenByType\(\)](#)

## IgLcdReadSoftButtons

The **IgLcdReadSoftButtons()** function reads the current state of the soft buttons for the specified device.

```
DWORD WINAPI IgLcdReadSoftButtons(IN int device, OUT DWORD *buttons);
```

### Parameters

#### device

Specifies the device handle for which to read the soft button state.

#### buttons

Specifies a pointer to a DWORD that receives the state of the soft buttons at the time of the call. See comments for details.

### Return Values

If the function succeeds, the return value is ERROR\_SUCCESS.

If the function fails, the return value can be one of the following:

Value	Meaning
ERROR_SERVICE_NOT_ACTIVE	<a href="#">IgLcdInit()</a> has not been called yet.
ERROR_INVALID_PARAMETER	The specified device handle or the result pointer is invalid.
ERROR_DEVICE_NOT_CONNECTED	The specified device has been disconnected.
Xxx	Other (system) error with appropriate error code.

### Remarks

The resulting DWORD contains the current state of the soft buttons, 1 bit per button. You can use the mask definitions provided in `Iglcd.h` for both current and legacy devices to determine which button has been pressed. Refer to the "Soft-Buttons available through the SDK" in the `Iglcd.h` header file for the details on button masks.

Value	Meaning
ERROR_SERVICE_NOT_ACTIVE	<a href="#">IgLcdInit()</a> has not been called yet.

If your application is not being currently displayed, you will receive a resulting "buttons" DWORD of 0, even if some soft buttons are being pressed. This is in order to avoid users inadvertently interacting with an application that does not presently show on the display.

### See Also

[IgLcdOpen\(\)](#)

## IgLcdUpdateBitmap

The **IgLcdUpdateBitmap()** function updates the bitmap of the device.

```
DWORD WINAPI IgLcdUpdateBitmap(IN int device,  
                                IN const lgLcdBitmapHeader *bitmap,  
                                IN DWORD priority);
```

### Parameters

#### device

Specifies the device handle for which to update the display.

#### bitmap

Specifies a pointer to a bitmap header structure. See comments for details.

#### priority

Specifies a priority hint for this screen update, as well as whether the update should take place synchronously or asynchronously. See comments for details.

The following priorities are defined:

Value	Meaning
LGLCD_PRIORITY_IDLE_NO_SHOW	Lowest priority, disable displaying. Use this priority when you don't have anything to show.
LGLCD_PRIORITY_BACKGROUND	Priority used for low priority items.
LGLCD_PRIORITY_NORMAL	Normal priority, to be used by most applications most of the time.
LGLCD_PRIORITY_ALERT	Highest priority. To be used only for critical screens, such as "your CPU temperature is too high"

In addition, there are three macros that can be used to indicate whether the screen should be updated synchronously (`LGLCD_SYNC_UPDATE()`) or asynchronously (`LGLCD_ASYNC_UPDATE()`). When using synchronous update the LCD library can notify the calling application of whether the bitmap was displayed or not on the LCD, using the macro (`LGLCD_SYNC_COMPLETE_WITHIN_FRAME()`). Use these macros to indicate the behavior of the library.

### Return Values

If the function succeeds, the return value is `ERROR_SUCCESS`.

If the function fails, the return value can be one of the following:

Value	Meaning
<code>ERROR_SERVICE_NOT_ACTIVE</code>	<a href="#">lgLcdInit()</a> has not been called yet.
<code>ERROR_INVALID_PARAMETER</code>	The specified device handle, the bitmap header

	pointer or the type of bitmap is invalid.
ERROR_DEVICE_NOT_CONNECTED	The specified device has been disconnected.
ERROR_ACCESS_DENIED	Synchronous operation was not displayed on the LCD within the frame interval (30 ms). This error code is only returned when the priority field of the <code>IgLCDUpdateBitmap</code> uses the macro <code>LGLCD_SYNC_COMPLETE_WITHIN_FRAME()</code> .
Xxx	Other (system) error with appropriate error code.

## Remarks

The bitmap header parameter should point to an actual bitmap. The current revision of the library defines a structure called [IgLCDBitmap160x43x1](#) or `IgLcdBitmapQVGa32` depending on your device type which holds as a first member a bitmap header. You would typically instantiate one of these structures, set the `hdr.Format` to `LGLCD_BMP_FORMAT_160x43x1` or `LGLCD_BMP_FORMAT_QVGa32`, then fill in the bitmap to be displayed in the `pixels[]` member. Finally, you call [IgLCDUpdateBitmap\(... &yourBitmap.hdr ...\)](#) to issue the bitmap update. Future versions of the SDK could have additional bitmap types declared, but all of them will have the same header at the beginning.

At any given time there may be multiple applications attempting to display a bitmap on the LCD. The priority parameter is a hint for LCDMon's display scheduling algorithm. In a scenario where there is contention for screen display time, LCDMon needs to determine which application's bitmap to display. In order to aid this scheduling, it can (but depending on user settings might not) take into account the hints that an application gives through the priority parameter. It is highly advisable that your application gives the appropriate priority for any given screen update to improve the user experience. A well-behaved LCD-enabled application should not use high priorities except for alerts.

The difference between asynchronous and synchronous updates is as follows: an asynchronous update will place the bitmap to be displayed into LCDMon and return immediately, before the bitmap is actually sent out to the device. For synchronous updates, the call to [IgLCDUpdateBitmap\(\)](#) will only return after the bitmap has been sent out to the device, which takes 30 milliseconds or more. In case the application currently does not show on the LCD because another application is displayed, the synchronous update returns after a time that is similar to an update when the application is visible. If the macro `LGLCD_SYNC_COMPLETE_WITHIN_FRAME()` is used, an error is returned to the calling application when this condition arises.

The benefit of using the synchronous update is that your application will run "locked" with the LCD updates. It will be suspended for the entire duration of writing to the screen, and only get to run when the display is ready to accept a new screen. A "mini-game" on the LCD would profit from this behavior in order to get the highest possible frame rates while minimizing CPU usage.

The asynchronous updates are beneficial to applications that don't care about the exact sequence and timing of screen updates and have many other things to do. They just deposit a bitmap to be sent to the device every once in a while and don't worry about it actually going out and being in sync with this event.

## See Also

[lgLcdOpen\(\)](#), [lgLcdOpenByType\(\)](#), [lgLcdBitmapHeader](#), [lgLcdBitmap160x43x1](#)



## IgLcdSetAsLCDForegroundApp

The **IgLcdSetAsLCDForegroundApp()** allows an application to become the one shown on the LCD and prevents the LCD library from switching to other applications, when the **foregroundYesNoFlag** parameter is set to **LGLCD\_LCD\_FOREGROUND\_APP\_YES**. When the calling application calls this function with **foregroundYesNoFlag** parameter set to **LGLCD\_LCD\_FOREGROUND\_APP\_NO**, the LCD library resumes its switching algorithm that the user had chosen.

```
DWORD WINAPI IgLcdSetAsLCDForegroundApp(IN int device,  
                                         IN int foregroundYesNoFlag);
```

### Parameters

#### device

Specifies the device handle for which the command is intended for.

#### foregroundYesNoFlag

Specifies whether the calling application is interested in becoming the front most application shown on the LCD or it is trying to remove itself from being the front most. See comments for details.

The following foregroundYesNoFlag values are defined:

Value	Meaning
LGLCD_LCD_FOREGROUND_APP_NO	Calling application does not want to be the only application shown on the LCD.
LGLCD_LCD_FOREGROUND_APP_YES	Calling application wants to be the only application shown on the LCD.

### Return Values

If the function succeeds, the return value is **ERROR\_SUCCESS**.

If the function fails, the return value can be one of the following:

Value	Meaning
<b>ERROR_LOCK_FAILED</b>	The operation could not be completed.
Xxx	Other (system) error with appropriate error code.

### Remarks

An application, such as a game, that wants to be shown on the LCD and does not want to be swapped out by other applications can use this call to become the front most application shown on the LCD. The LCD library will not swap out the application, except for other applications that call this function at a later date. The front most application's bitmaps supplied using the [IgLCDUpdateBitmap\(\)](#) call will all be displayed on the LCD.

### See Also

[lgLcdUpdateBitmap\(\)](#)

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