

COGNEX

Cognex Mobile Barcode SDK for iOS

Programmer's Guide

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Overview

The **Cognex Mobile Barcode SDK** (cmbSDK) is a simple, yet powerful tool for developing mobile barcode scanning applications. Based on Cognex's flagship DataMan technology and the Manatee Works Barcode Scanning SDK, the cmbSDK allows developers to create barcode scanning applications for the entire range of mobile scanning devices: from smartphones and tablets to the MX line of high-performance, industrial barcode scanners. By adhering to a few simple guidelines, developers can write applications that will work with any supported MX mobile terminal or smartphone with little or no conditional code. The SDK achieves this by abstracting the device through a "reader" connection layer: once the application establishes its connection with the desired reader, a single, unified API is used to configure and interface with the device.

The SDK provides two basic readers: an "MX reader" for barcode scanning with devices like the MX-1000 and MX-1502, and a "camera reader" for barcode scanning using the built-in camera of the mobile device.

Barcode Scanning with an MX Mobile Terminal

The SDK supports Cognex's line of MX mobile terminals, including the MX-1000 and MX-1502 devices. You can get a detailed description of these models at the official website of Cognex (<http://www.cognex.com>). Some of the relevant features of these devices regarding the cmbSDK usage are the following:

- **Hardware trigger:** MX mobile terminals include two built-in triggers for barcode scanning, and support an optional pistol grip with trigger.
- **Illumination and aiming:** MX mobile terminals have built-in illumination and aiming.
- **Stored configurations:** An MX mobile terminal can be preconfigured using Cognex's DataMan Setup Tool for Windows, the Quick Setup mobile application, or the SDK itself. The MX mobile terminal can save and restore multiple configuration sets.
- **High-capacity battery:** Each MX mobile terminal has an integrated battery that not only powers the MX scanning engine, but also provides power to the mobile device. The optional pistol grip includes a second battery that doubles the MX's power capacity.

The following features of the MX platform combine to make application development with them straightforward.

- **Ease of setup:** MX mobile terminals come preconfigured to provide an exceptional out-of-the-box experience. In many cases, it is not even necessary to change the defaults of the device. Also, since the MX mobile terminals have saved configurations that can be distributed to all your devices, setup is usually not necessary at the application level. Nevertheless, it is often desirable to put the device in a "known" state when the barcode scanning application starts, so the cmbSDK provides methods to restore the device defaults as well as to control individual settings.
- Having illumination and aimer, there is no need to have a live preview on the smartphone's screen like traditional, mobile barcode scanning applications often do. MX mobile terminals do not even support a "live-stream" decoding mode.

Barcode Scanning with a Smartphone

It is important to recognize that there are several fundamental differences in the capabilities of smartphones (and tablets) as barcode scanning devices. These differences result in a user experience different from purpose-built scanners, impacting the design of the mobile barcode scanning application.

These differences and the general impact they have on your application are the following:

- A smartphone does not have a dedicated hardware trigger. Without a hardware trigger, the application program itself is generally responsible for initiating the scanning process, which results in accessing the built-in camera, displaying a preview screen if required, and analyzing captured frames from the video stream for barcodes.
- A smartphone (unless otherwise configured) does not have an aimer. Generally, the application program provides a live-stream camera preview on the mobile device screen, thereby allowing the user to see what the camera sees and can then position the device over the barcode.
- Mobile device orientation may need to be considered. Most users hold and use a mobile device primarily in a portrait orientation and for barcode scanning. Having the camera in this orientation is generally sufficient. However, most mobile device cameras have a higher resolution along their landscape orientation. When scanning very long or dense barcodes, reorienting the device to landscape can be beneficial and even necessary to decode these barcodes.
- Image analysis and barcode decoding is performed in software on the mobile device which can be a CPU intensive task. For this reason (and others discussed later), it is highly recommended to only enable the symbologies and features of the SDK your application will need, not everything the cmbSDK is capable of.

The cmbSDK has been specifically engineered to make these differences as transparent as possible to the application developer and the user. By following a few simple guidelines, it is possible to develop applications that work and behave the same, whether using an MX-1000 mobile terminal, or just the built-in camera of the device.

Mobile Device Triggering

Without a hardware trigger, mobile devices must use alternative methods to initiate barcode scanning. There are three common paradigms used:

- **Application or workflow driven trigger:** In this paradigm, it is the application code itself, or the business logic/workflow of the application that starts the scanning process. In other words, the user of the application has reached a point where a barcode needs to be scanned, so the application invokes the scanning module. In simple programming terms, this is akin to calling a function like `"startScanner()"`.
- **Virtual trigger:** This is where the application program provides a button on the screen whereby the user can use to start/stop the scanning process. Depending on the application design, the user may be required to press and hold the virtual button to keep the scanner running. This method is similar to the workflow driven method as the button from the user interface is merely being used to invoke the scanning module.
- **Simulated trigger:** For this method, the volume buttons on the mobile device can be used to simulate a hardware trigger. When the user presses a volume button, the scanner starts/stops similarly to when a trigger is pulled on a purpose-built scanner.

Note: Unlike a purpose-built scanner's trigger that is normally pulled and held to start scanning, some mobile operating systems do not recognize if a button is being held. Thus, in this implementation, the user  merely presses a volume key to trigger scanning, and can press it a second time to stop scanning. This method of mobile device triggering is not commonly used as users find it non-intuitive and inconvenient to use the volume keys in this fashion.

The cmbSDK supports all three of these methods, any one of which (or multiple) can be used in an application.

Mobile Device Aiming

As previously discussed, unlike like purpose-built scanners, mobile devices do not have a built-in aimer. Barcode aiming is generally accomplished by providing a live-stream preview from the camera on the mobile device display: the user can then reposition the device until the barcode presents in the field of view and is decoded.

This task is greatly simplified with the cmbSDK as it provides a built-in preview control that can be displayed full-screen, partial screen, and in either portrait or landscape orientation.

The cmbSDK also supports "passive" aimers: devices that attach to the mobile device or mobile device case that use the LED flash of the device as a light source to project an aiming/targeting pattern. The advantage to these types of aimers is that an on-screen preview is no longer required (since the mobile device can now project an aimer pattern similar to a purpose-built scanner). One limitation of passive aimers, though, is that since the mobile device flash is being used for the aimer, using the LED flash for general scanning illumination is not available.

Mobile Device Orientation

Mobile devices support developing applications for either portrait orientation, landscape orientation, or auto-rotation between the two. The cmbSDK fully supports all three options for both the presentation of the barcode preview as well as the scan direction. As mentioned previously, most barcodes can be scanned by a mobile device regardless of the orientation of the application and/or mobile device.

In some circumstances, though, using landscape orientation may be advantageous or even necessary. Mobile cameras have a higher resolution along the "height" of the image in portrait mode. For example, a common resolution used is 1280x720. When scanning barcodes in portrait mode, this means that 720 pixels of data are available for barcode decoding along the horizontal axis. If scanning a particularly long or dense barcode (e.g. a large PDF417), using the landscape orientation provides 1280 pixels on the horizontal scan line. Orientation makes little to no difference when scanning "square" barcodes like QR, Data Matrix, and MaxiCode.

Mobile Device Performance

Today's smartphones and tablets have significant computing power. With multi-core CPUs and even dedicated image processors, they provide an ideal platform for cost-effective and efficient barcode decoding. As powerful as these devices are, developers are still advised to consider optimizing their barcode scanning applications. While the SDK has been optimized specifically for mobile environments, image analysis and barcode decoding is still a CPU intensive activity; and since these processes must share the mobile device CPU with the operating system, services, and other applications, developers should limit their applications to only using the features of the SDK that satisfy their needs.

Application optimizations include the following:

- Only enable decoding for the barcode types the application needs to scan. The cmbSDK supports the decoding of almost 40 different barcode types and subtypes, and while you can enable all of these, it can negatively impact performance as well as introduce unwanted side effects:
 - The more symbologies enabled, the slower the performance. This can lead to sluggish decoding and the degradation of the overall performance of the mobile device, leaving the user with an inaccurate impression of the SDK's capabilities.
 - False reads are possible. This is particularly possible when some of the weaker symbologies, like Code 25, are enabled without proper consideration and configuration of other, more advanced features like minimum code length and barcode location. These features help mitigate false reads with the weak symbologies, but at a cost of degraded performance (and again, are not intended to all be turned on and used at the same time).

- Using an optimal camera resolution. By default, the cmbSDK uses HD images (typically 1280x720) for barcode decoding. This resolution is sufficient for all but the very smallest or dense of barcodes. As the application developer, you can use a higher resolution (full HD), but keep in mind that these images are significantly larger, so they will require more time to analyze and decode.
- Using an appropriate decoder effort level. The SDK has a user-configurable effort-level that controls how aggressively the SDK performs image analysis. Like most other settings, the SDK uses a default value (level 2) that is sufficient for almost all barcodes. Using a higher level can result in better decoding of poorer quality barcodes, but at the price of slower performance.

For these reasons, when the cmbSDK is initialized for use with the built-in camera of the mobile device, no barcode symbologies are enabled by default: the application must explicitly enable the symbologies it needs. As most barcode scanning applications only truly need to scan a handful of symbologies, this behavior steers the developer to using the SDK in an efficient manner.

Enabling symbologies is a very simple process, which is explained later in this document.

cmbSDK for iOS

Getting Started

Perform the following steps to install the iOS cmbSDK:

1. Download the latest [XCode for iOS Development](#).
2. Download the Cognex Mobile Barcode SDK for iOS.

Using the SDK in XCode

Perform the following steps to set up your application to use the iOS cmbSDK:

1. Open XCode and start a new project.
2. Add the following lib and frameworks to your project:

```
* SystemConfiguration.framework
* AVFoundation.framework
* CoreGraphics.framework
* CoreMedia.framework
* CoreVideo.framework
* MediaPlayer.framework
* Security.framework
* AudioToolbox.framework
* libDataManSDK.a
```

3. Go to your project's **Info.plist** file and add the `Privacy - Camera Usage Description` or `NSCameraUsageDescription`. This is required by iOS and is used to display a message explaining the usage of the user's device camera by your application.

Licensing the SDK for Scanning with Smartphones/Tablets

If you plan to use the cmbSDK to do mobile [scanning with a smartphone or tablet](#) (with no MX mobile terminal), then the SDK requires the installation of a license key. Without a license key, the SDK will still operate, although scanned results will be obfuscated (the SDK will randomly replace characters in the scan result with an asterisk character).

Contact your Cognex Sales Representative for information on how to obtain a license key including trial licenses which can be used for 30 days to evaluate the SDK.

After obtaining your license key, add it as a String in your application's **Info.plist** file, under the key `MX_MOBILE_LICENSE`.

Key	Type	Value
▼ Information Property List	Dictionary	{17 items}
Localization native development region	String	en
Executable file	String	\$(EXECUTABLE_NAME)
Bundle identifier	String	\$(PRODUCT_BUNDLE_IDENTIFIER)
InfoDictionary version	String	6.0
Bundle name	String	\$(PRODUCT_NAME)
Bundle OS Type code	String	APPL
Bundle versions string, short	String	1.0
Bundle version	String	2
Application requires iPhone environment	Boolean	YES
MX_MOBILE_LICENSE	String	BIWrt2KS9sfHFfgdfg2317TL/mHhwe146+VweAVewqwe=
Privacy - Camera Usage Description	String	Camera Permission
Launch screen interface file base name	String	LaunchScreen
Main storyboard file base name	String	Main
▶ Required device capabilities	Array	{1 item}
▼ Supported external accessory protocols	Array	{2 items}
Item 0	String	com.cognex.dmcc
Item 1	String	com.demo.data
▶ Supported interface orientations	Array	{1 item}
▶ Supported interface orientations (iPad)	Array	{4 items}

Writing a Mobile Application

The cmbSDK has been designed to provide a high-level, abstract interface for supported scanning devices. This includes not only the MX series of mobile terminals, but also for applications that intend to use the mobile device camera as the imaging device. The intricacies of communicating with and managing these devices is encapsulated within the SDK itself, leaving the application to just connect to the device of choice, then using it.

The primary interface between your application and a supported barcode scanning device is the `CMBReaderDevice` class. This class represents the abstraction layer to the device itself, handling all communication as well as any necessary hardware management (e.g., for smartphone scanning).

Perform the following steps to use the cmbSDK:

1. Initialize a Reader Device for the type of device you want to use (MX reader or camera reader).
2. Connect the Reader Device.
3. Configure the reader (if necessary).
4. Start scanning.

Initialization, connection, and configuration generally need to be performed only once in your application, except for the following cases:

- An MX reader can become disconnected (e.g. times out, dead battery, etc.). A method has been provided to handle this case, and is discussed in a later section.
- Your application has been designed to allow the user to change devices. The cmbSDK is explicitly designed to support this: your application simply disconnects from the current device and establishes a new connection to a different device. The provided sample application has been written to explicitly demonstrate this capability.

Initializing a Reader Device

The cmbSDK provides two different reader class initializers: one for scanning using an MX mobile terminal (like the MX-1000 or MX-1502) and another for scanning using the built-in camera of the mobile device (iPhones, iPads, etc).

Using the MX Reader

Initializing the Reader Device for use with an MX mobile terminal like the MX-1000 or MX-1502 is easy: simply create the reader device using the MX device method (it requires no parameters), and set the appropriate delegate (normally self):

```
CMBReaderDevice *readerDevice = [CMBReaderDevice readerOfMXDevice];
[readerDevice setDelegate:self];
```

The availability of the MX mobile terminal can change when the device turns ON or OFF, or if the lightning cable gets connected or disconnected. You can handle those changes using the following *CMBReaderDeviceDelegate* method.

```
- (void)availabilityDidChangeOfReader:(CMBReaderDevice *)reader;
```

Using the Camera Reader

Barcode scanning with the built-in camera of the mobile device can be more complex than with an MX mobile terminal. The cmbSDK supports several configurations to provide the maximum flexibility. This includes support of optional, external aimers/illumination, as well as the ability to customize the appearance of the live-stream preview.

To scan barcodes using the built-in camera of the mobile device, initialize the CMBReaderDevice object using the *readerOfDeviceCameraWithCameraMode* static method. The camera reader has several options when initialized. The following parameters are required:

```
* CDMCameraMode
* CDMPreviewOption
* UIView
```

The *CameraMode* parameter is of the type *CDMCameraMode* (defined in **CDMDataManSystem.h**), and it accepts one of the following values:

- **kCDMCameraModeNoAimer**: This initializes the reader to use a live-stream preview (on the mobile device screen) so the user can position the barcode within the camera's field of view for detection and decoding. Use this mode when the mobile device does not have an aiming accessory.
- **kCDMCameraModePassiveAimer**: This initializes the reader to use a passive aimer, which is an accessory that is attached to the mobile device or mobile device case that uses the built-in LED flash of the mobile device as a light source for projecting an aiming pattern. In this mode, no live-stream preview is presented on the device screen, since an aiming pattern will be projected.
- **kCDMCameraModeFrontCamera**: This initializes the reader to use the front facing camera of the mobile device, if available (not all mobile devices have a front camera). This is an unusual, but possible configuration. Most front-facing cameras do not have auto focus and illumination, and provide significantly lower resolution images. This option should be used with care. In this mode, illumination is not available.

All of the above modes provide the following default settings for the reader:

- The rear camera is used.
- The zoom feature is available and a button to control it is visible on the live-stream preview (if displayed).
- The simulated hardware trigger is disabled.
- When *startScanning()* is called, the decoding process is started. (See [kCDMPreviewOptionPaused](#) below for more details.)

Based on the selected mode, the following additional options and behaviors are set:

- **kCDMCameraModeNoAimer** (No Aimer)
 - The live-stream preview is displayed when the *startScanning()* method is called.
 - Illumination is available and a button to control it is visible on the live-stream preview.
 - If commands are sent to the reader for aimer control, they will be ignored.
- **kCDMCameraModePassiveAimer** (Passive Aimer)
 - The live-stream preview will not be displayed when the *startScanning()* method is called.
 - Illumination is not available and the live-stream preview will not have an illumination button.
 - If commands are sent to the reader for illumination control, they will be ignored, since it is assumed in this mode that the built-in LED of the mobile device is being used for the aimer.
- **kCDMCameraModeFrontCamera** (Front Camera)
 - The live-stream preview is displayed when the *startScanning()* method is called.
 - The front camera is used.
 - Illumination is not available, and the live-stream preview will not have an illumination button.
 - If commands are sent to the reader for aimer or illumination control, they will be ignored.

The *previewOptions* parameter (of type *CDMPreviewOption*, defined in **CDMDataManSystem.h**) is used to change the reader's default values or override defaults derived from the selected *CameraMode*. Multiple options can be specified by OR-ing them when passing the parameter. The available options are the following:

- **kCDMPreviewOptionDefaults**: Use this option to accept all defaults set by the *CameraMode*.
- **kCDMPreviewOptionNoZoomBtn**: This option hides the zoom button on the live-stream preview, preventing a user from adjusting the zoom of the mobile device camera.
- **kCDMPreviewOptionNoIllumBtn**: This hides the illumination button on the live-stream preview, preventing a user from toggling the illumination.
- **kCDMPreviewOptionHwTrigger**: This enables a simulated hardware trigger (either volume button) for starting and stopping scanning on the mobile device. When either volume button is pressed, scanning starts. The button cannot be held like a more traditional purpose-built scanner's trigger. Pressing the button a second time stops the scanning process.

 **Note:** It is the application owner's responsibility to conform to Apple's guideline as this option has impact on system volume handling/setting.

- **kCDMPreviewOptionPaused**: If using a live-stream preview, when this option is set, the preview will be displayed when the *startScanning()* method is called, but the reader will not start decoding (i.e. looking for barcodes) until the user presses the on-screen scanning button to actually start the scanning process.
- **kCDMPreviewOptionAlwaysShow**: This forces a live-stream preview to be displayed, even if an aiming mode has been selected (e.g. *CameraMode == kCDMCameraModePassiveAimer*)

The last parameter of type *UIView* is optional and is used as a container for the camera preview. If the parameter is left *nil*, a full screen preview will be used.

Examples

Create a reader with no aimer and a full screen live-stream preview:

```
CMBReaderDevice *readerDevice = [CMBReaderDevice
    readerOfDeviceCameraWithCameraMode:kCDMCameraModeNoAimer
    previewOptions:kCDMPreviewOptionDefaults
    previewView:nil];
readerDevice.delegate = self;
```

Create a reader with no aimer, no zoom button, and using a simulated trigger:

```
CMBReaderDevice *readerDevice = [CMBReaderDevice
    readerOfDeviceCameraWithCameraMode:kCDMCameraModeNoAimer
    previewOptions:(kCDMPreviewOptionNoZoomBtn | kCDMPreviewOptionHwTrigger)
    previewView:nil];

readerDevice.delegate = self;
```

Connecting to the Device

After initializing the Reader Device and setting a delegate to handle responses from the reader, you are ready to connect using `connectWithCompletion:`

```
// Make sure the device is turned ON and ready
if (readerDevice.availability == CMBReaderAvailabilityAvailable) {
    // create the connection between the readerDevice object and device
    [readerDevice connectWithCompletion:^(NSError *error) {
        if (readerDevice.connectionState == CMBConnectionStateConnected) {
            // Connected successfully
        } else {
            if (error) {
                // handle connection error
            }
        }
    }];
}
```

If everything was done correctly, `connectionStateDidChangeOfReader` in the delegate will be called, where you can check the connection status in your Reader Device's `connectionState` parameter. It should be `CMBConnectionStateConnected`, which means that you have successfully made the connection to the Reader Device, and can begin using the Cognex Mobile Barcode SDK.

Configuring the Reader Device

After connecting to the scanning device, you may want (or need) to change some of its settings. The cmbSDK provides a set of high-level, device independent APIs for setting and retrieving the current configuration of the device.

Like in the case of initializing the Reader Device, there are some differences between using an MX reader and the camera reader for scanning. These differences are detailed in the following sections.

MX Mobile Terminals

The MX family of mobile terminals provides sophisticated device configuration and management, including saved configurations on the device itself. In general, these devices come from Cognex preconfigured for an exceptional out-of-the-box experience with most symbologies and features ready to use.

When custom reconfiguration is desired, this is typically done using either the DataMan Setup Tool, or the DataMan Quick Setup as these tools can be used to distribute saved configurations easily to multiple devices, thereby greatly simplifying configuration management.

However, it is still possible (and sometimes desirable) for the mobile application itself to configure the MX device:

- You can have multiple scanning applications, each of which requires a different set of device settings.
- You may simply want to guarantee that the certain options are in a “known” state and not rely on the fact that the device has been preconfigured correctly.

Built-in Camera

Much like an MX mobile terminal, the cmbSDK employs a default set of options for barcode reading with the built-in camera of the mobile device, providing a good out-of-box experience. However, there are two important differences to keep in mind:

- The cmbSDK does not implement saved configurations for the camera reader. This means that every time an application that uses the camera reader starts, it starts with its defaults.
- The cmbSDK does not enable *any* symbologies by default: you as the application programmer *must* enable all barcode symbologies your application needs to scan. By requiring the application program to explicitly enable only the symbologies it needs, the most optimal scanning performance can be achieved. This concept was more thoroughly discussed in the [Overview](#) section.

Enabling Symbologies

Individual symbologies can be enabled using the following method of the Reader Device object:

```
- (void) setSymbology:(CMBSymbology) symbology
    enabled:(bool) enabled
    completion:(void (^)(NSError *error)) completionBlock;
```

All symbologies used for the *symbology* parameter in this method can be found in **CMBReaderDevice.h**.

You can query the enabled state of a given symbology by calling the `isSymbologyEnabled` asynchronous method:

```
[self.readerDevice isSymbologyEnabled:CMBSymbologyQR completion:^(BOOL enabled, NSError
*error){
    if (!error){
        // use enabled parameter
    }
    else {
        //handle error
    }
}]];
```

The first parameter is the symbology you want to query, the second is a completion block that takes two arguments: the enabled state Boolean value and an error object.

Examples

```
/* Enable QR scanning */
[readerDevice setSymbology:CMBSymbologyQR
    enabled:YES completion:^(NSError *error) {
    if (!error) {
        // Success
    }else{
        /* Unsuccessful
        probably the symbology is unsupported by
        the current device, or there is a problem with
        the connection between
        the readerDevice and MX device
        */
    }
}]];
```

The same method can also be used to turn symbologies off:

```

/* Disable Code 25 scanning */
[readerDevice setSymbology:CMBSymbologyC25
  enabled:NO completion:^(NSError *error) {
    if (!error) {
        // Success
    }else{
        // Unsuccessful
    }
  }
];

```

Illumination Control

If your reader device is equipped with illumination lights (e.g. LEDs), you can control whether they are ON or OFF when scanning starts using the following method of your Reader Device object:

```

- (void) setLightsON:(bool)on
  completion:(void (^)(NSError *error))completionBlock;

```

Keep in mind that not all devices and device modes supported by the cmbSDK allow for illumination control. For example, if using the built-in camera in passive aimer mode, illumination is not available since the LED is being used for aiming.

Resetting the Configuration

The cmbSDK includes a method for resetting the device to its default settings. In the case of an MX mobile terminal, this is the configuration saved by default (not the factory defaults), while in the case of the built-in camera, these are the defaults identified in [Appendix B](#), where no symbologies will be enabled. This method is the following:

```

- (void) resetConfigWithCompletion:(void (^)(NSError *error))completionBlock;

```

Advanced Configuration

Every Cognex scanning device implements DataMan Control Commands (DMCC), a method for configuring and controlling the device. Virtually every feature of the device can be controlled using this text based language. The API provides a method for sending DMCC commands to the device. Commands exist both for setting and querying configuration properties.

[Appendix A](#) includes the complete DMCC reference for use with the camera reader. DMCC commands for other supported devices (e.g. the MX-1000) are included with the documentation of that particular device.

[Appendix B](#) provides the default values for the camera reader's configuration settings as related to the corresponding DMCC setting.

The following examples show different DMCC commands being sent to the device for more advanced configuration.

Change the scan direction to omnidirectional:

```

[self.dataManSystem sendCommand:@"DECODER.1DSYMBOLORIENTATION 0"
  withCallback:^(CDMResponse *response) {

    if (response.status == DMCC_STATUS_NO_ERROR)
    { ... }
    else
    { ... }
  }
];

```

Change the scanning timeout of the live-stream preview to 10 seconds:

```
[self.dataManSystem sendCommand:@"DECODER.MAX-SCAN-TIMEOUT 10"
withCallback:^(CDMResponse *response) {

    if (response.status == DMCC_STATUS_NO_ERROR)
    { ... }
    else
    { ... }
}];
```

Get the type of the connected device:

```
[self.dataManSystem sendCommand:@"GET_DEVICE.TYPE"
withCallback:^(CDMResponse *response) {

    if (response.status == DMCC_STATUS_NO_ERROR)
    {NSString *deviceType = response.payload; }
    else
    { ... }
}];
```

Scanning Barcodes

With a properly configured reader, you are now ready to scan barcodes. This is simply accomplished by calling the *startScanning()* method from your Reader Device object. What happens next is based on the type of Reader Device and how it has been configured, but in general:

- If using an MX reader, the user can now press a trigger button on the device to turn the scanner on and read a barcode.
- If using the camera reader, the cmbSDK starts the camera, displays the configured live-stream preview, and begins analyzing the frames from the video stream, looking for a configured barcode symbology.

Scanning stops under one of the following conditions:

- The reader found and decoded a barcode.
- The user released the trigger or pressed the stop button on the live-stream preview screen.
- The camera reader timed out without finding a barcode.
- The application program itself calls the *stopScanning()* method.

When a barcode is decoded successfully (the first case), you will receive a *CMBReadResults* array in your Reader Device's delegate using the following *CMBReaderDeviceDelegate* method:

```
- (void)didReceiveReadResultFromReader:(CMBReaderDevice *)reader results:(CMBReadResults *)readResults;
```

The following is an example to simply display a *ReadResult* after scanning a barcode:

```

- (void)didReceiveReadResultFromReader:(CMBReaderDevice *)reader
  results:(CMBReadResults *)readResults
{
    for (CMBReadResult *readResult in readResults.readResults)
    {
        if (readResult.image)
        {
            _ivPreview.image = readResult.image;
        }

        if (readResult.readString)
        {
            _lblCode.text = readResult.readString;
        }
    }
}

```

In the example above, `_ivPreview` is an `UIImageView` used to display an image of the barcode that was scanned, and `_lblCode` is a `UILabel` used to show the result from the barcode. You can also use the `BOOL` from `readResult.goodRead` to check whether the scan was successful or not.

Working with Results

When a barcode is successfully read, a `CMBReadResult` object is created and returned by the `didReceiveReadResultFromReader:results:` method. In case of having multiple barcodes successfully read on a single image/frame, multiple `CMBReadResult` objects are returned. This is why the `CMBReadResults` class has an array of `CMBReadResult` objects containing all results.

The `CMBReadResult` class has properties describing the result of a barcode read:

- **goodRead** (`BOOL`): tells whether the read was successful or not
- **readString** (`NSString`): the decoded barcode as a string
- **image** (`UIImage`): the image/frame that the decoder has processed
- **imageGraphics** (`NSData`): the boundary path of the barcode as SVG data
- **XML** (`NSData`): the raw XML that the decoder returned
- **symbology** (`CMBSymbology`): the symbology type of the barcode. This enum is defined in `CMBReaderDevice.h`.

When a scanning ends with no successful read, a `CMBReadResult` is returned with the `goodRead` property set to false. This usually happens when scanning is canceled or timed out.

To enable the `image` and `imageGraphics` properties being filled in the `CMBReadResult` object, you have to set the corresponding `imageResultEnabled` and/or `SVGResultEnabled` properties of the `CMBReaderDevice` object.

To see an example on how the image and SVG graphics (Image Graphics) are used and displayed in parallel, refer to the sample applications provided in the SDK package.

Image Results

By default, the image and SVG results are disabled, which means that when scanning, the `CMBReadResults` will not contain any data in the corresponding properties.

To enable image results, set the `imageResultEnabled` property from the `CMBReaderDevice` class by using the following method:

```
[readerDevice setImageResultEnabled:YES];
```

To enable SVG results, set the `imageResultEnabled` property from the `CMBReaderDevice` class by using the following method:

```
[readerDevice setSVGResultEnabled:YES];
```

SVG result type means standard SVG formatted data about the read code. SVG data consists of a bounding rectangle graphics around the code and other information in textual form.

To generate an image from the received SVG data, you have to use a 3rd party library. Having an image representation of the SVG data, you can add it as an overlay to the received image result.

You can enable receiving SVG data by setting the `SVGResultEnabled` property to `true`.

Note: Currently, the Phone Camera mode does not support sending SVG data.

Handling Disconnects

There may be cases when a device disconnects due to low battery condition or manual cable disconnection. These cases can be detected by the `connectionStateDidChangeOfReader` callback of the `CMBReaderDeviceDelegate`.

Note: The `availabilityDidChangeOfReader` method is also called when the device becomes physically unavailable. It means that the (re)connection is not possible. Always check the `availability` property of the `CMBReaderDevice` object before trying to call the `connectWithCompletion` method.

Appendix A - DMCC for the Camera Reader

The following table lists the various DMCC commands supported by the cmbSDK when using the built-in camera for barcode scanning.

Note: Many of these commands are also supported by the MX mobile terminals. Commands that are unique to the camera reader are indicated as such with an X in the last column.

GET/SET	Command	Parameter(s)	Description	
GET/SET	BATTERY.CHARGE		Returns the current battery level of the device as a percentage.	
	BEEP		Plays the audible beep (tone).	
GET/SET	BEEP.GOOD	[0-3] [0-2]	Sets the number of beeps (0-3) and the beep tone/pitch (0-2, for low, medium, high). For the built-in camera, only a single beep with no pitch control is supported. Thus, 0 1 turns the beep off, 1 1 turns the beep on.	
GET/SET	CODABAR.CODESIZE	ON min max OFF min max	Accepts any length Codabar. Sets min/max length of accepted Codabar.	X X
GET/SET	C11.CHKCHAR	ON OFF	Turns Code 11 check digit on/off.	X
GET/SET	C11.CHKCHAR-OPTION	1 2	Requires single checksum. Requires double checksum.	X X
GET/SET	C11.CODESIZE	ON min max OFF min max	Accepts any length Code 11. Sets min/max length of accepted Code 11.	X X
GET/SET	C25.CODESIZE	ON min max OFF min max	Accepts any length Code 25. Sets min/max length of accepted Code 25.	X X
GET/SET	C39.ASCII	ON OFF	Turns Code 39 extended ASCII on/off.	
GET/SET	C39.CODESIZE	ON min max OFF min max	Accepts any length Code 39. Sets min/max length of accepted Code 39.	
GET/SET	C39.CHKCHAR	ON OFF	Turns Code 39 check digit on/off	
GET/SET	C93.ASCII	ON OFF	Turns Code 93 extended ASCII on/off	X
GET/SET	C93.CODESIZE	ON min max OFF min max	Accepts any length Code 93. Sets min/max length of accepted Code 93.	
	CONFIG.DEFAULT		Resets most of the camera API settings to default, except those noted as not resetting (see Appendix B). To reset all settings, use DEVICE.DEFAULT.	
GET/SET	DATA.RESULT-TYPE	0 1 2 4 8	Specifies results to be returned (sum of multiple values): None Text string result (default) XML results XML stats Scan image (see IMAGE.* commands)	
GET/SET	DATABAR.EXPANDED	ON OFF	Turns the DataBar Expanded symbology on/off.	
GET/SET	DATABAR.LIMITED	ON OFF	Turns the DataBar Limited symbology on/off.	
GET/SET	DATABAR.RSS14	ON OFF	Turns the DataBar RSS14 symbology on/off.	X
GET/SET	DATABAR.RSS14STACK	ON OFF	Turns the DataBar RSS14 Stacked symbology on/off.	X
GET/SET	DECODER.1D-SYMBOLORIENTATION	0 1 2 3	Use omnidirectional scan orientation. Use horizontal and vertical scan orientation. Use vertical scan orientation. Use horizontal scan orientation.	

GET/SET	Command	Parameter(s)	Description	
GET/SET	DECODER.EFFORT	1-5	Sets the effort level for image analysis/decoding. The default is 2. Do not use 4-5 for online scanning.	X
GET/SET	DECODER.MAX-SCAN-TIMEOUT	1-120	Sets the timeout for the live-stream preview. When the timeout is reached, decoding is paused; the live-stream preview will remain on-screen.	X
	DEVICE.DEFAULT		Resets the camera API settings to default (see Appendix B).	
GET	DEVICE.FIRMWARE-VER		Gets the device firmware version.	
GET	DEVICE.ID		Returns device ID assigned by Cognex to the scanning device. For a built-in camera, the SDK returns 53.	
GET/SET	DEVICE.NAME		Returns the name assigned to the device. By default, this is "MX-" plus the last 6 digits of DEVICE.SERIAL-NUMBER.	
GET	DEVICE.SERIAL-NUMBER		Returns the serial number of the device. For a built-in camera, the SDK assigns a pseudo-random number.	
GET	DEVICE.TYPE		Returns the device name assigned by Cognex to the scanning device. For a built-in camera, the SDK returns "MX-Mobile".	
GET/SET	FOCUS.FOCUSTIME	0-10	Sets the camera's auto-focus period (how often the camera should attempt to refocus). The default is 3.	
GET/SET	I205.CHKCHAR	ON OFF	Turns Interleaved 2 of 5 check digit on/off.	
GET/SET	I205.CODESIZE	ON min max OFF min max	Accepts any length Interleaved 2 of 5. Sets min/max length of accepted Interleaved 2 of 5.	X X
GET/SET	IMAGE.FORMAT	0 1 2	Scanner returns image result in bitmap format. Scanner returns image result in JPEG format. Scanner returns image result in PNG format.	
GET/SET	IMAGE.QUALITY	10, 15, 20, ...90	Specifies JPEG image quality.	
GET/SET	IMAGE.SIZE	0 1 2 3	Scanner returns full size image. Scanner returns ¼ size image. Scanner returns 1/16 size image. Scanner returns 1/62 size image.	
GET/SET	LIGHT.AIMER	0-1	Disables/enables the aimer (when the scanner starts).	
GET/SET	LIGHT.AIMER-TIMEOUT	0-600	Timeout in seconds for an aimer. <i>This value is always overridden by DECODER.MAX-SCAN-TIMEOUT.</i>	
GET/SET	LIGHT.INTERNAL-ENABLE	ON OFF	Enables/disables illumination (when the scanner starts).	
GET/SET	MSI.CHKCHAR	ON OFF	Turns MSI Plessey check digit on/off.	
GET/SET	MSI.CHKCHAR-OPTION	0 1 2 3 4 5	Use mod 10 checksum Use mod 10 mod 10 checksum Use mod 11 checksum (IBM algorithm) Use mod 11 mod 10 checksum (IBM algorithm) Use mod 11 checksum (NCR algorithm) Use mod 11 mod 10 checksum (NCR algorithm)	X X
GET/SET	MSI.CODESIZE	ON min max OFF min max	Accepts any length MSI Plessey. Sets min/max length of accepted MSI Plessey.	X X
GET/SET	SYMBOL.AZTECCODE	ON OFF	Turns the Aztec Code symbology on/off.	
GET/SET	SYMBOL.CODABAR	ON OFF	Turns the Codabar symbology on/off.	
GET/SET	SYMBOL.C11	ON OFF	Turns the Code 11 symbology on/off.	X
GET/SET	SYMBOL.C128	ON OFF	Turns the Code 128 symbology on/off.	

GET/SET	Command	Parameter(s)	Description	
GET/SET	SYMBOL.C25	ON OFF	Turns the Code 25 symbology on/off (standard).	
GET/SET	SYMBOL.C39	ON OFF	Turns the Code 39 symbology on/off.	
GET/SET	SYMBOL.C93	ON OFF	Turns the Code 93 symbology on/off.	
GET/SET	SYMBOL.COOP	ON OFF	Turns the COOP symbology (Code 25 variant) on/off.	X
GET/SET	SYMBOL.DATAMATRIX	ON OFF	Turns the Data Matrix symbology on/off.	
GET/SET	SYMBOL.DATABAR	ON OFF	Turns the DataBar Expanded and Limited symbologies on/off.	
GET/SET	SYMBOL.DOTCODE	ON OFF	Turns the DotCode symbology on/off.	
GET/SET	SYMBOL.IATA	ON OFF	Turns the IATA symbology (Code 25 variant) on/off.	X
GET/SET	SYMBOL.INVERTED	ON OFF	Turns the Inverted symbology (Code 25 variant) on/off.	X
GET/SET	SYMBOL.ITF14	ON OFF	Turns the ITF-14 symbology (Code 25 variant) on/off.	X
GET/SET	SYMBOL.UPC-EAN	ON OFF	Turns the UPC-A, UPC-E, EAN-8, and EAN-13 symbologies on/off.	
GET/SET	SYMBOL.MATRIX	ON OFF	Turns the Matrix symbology (Code 25 variant) on/off.	X
GET/SET	SYMBOL.MAXICODE	ON OFF	Turns the MaxiCode symbology on/off.	X
GET/SET	SYMBOL.MSI	ON OFF	Turns the MSI Plessey symbology on/off.	
GET/SET	SYMBOL.PDF417	ON OFF	Turns the PDF417 symbology on/off.	
GET/SET	SYMBOL.PLANET	ON OFF	Turns the PLANET symbology on/off.	
GET/SET	SYMBOL.POSTNET	ON OFF	Turns the POSTNET symbology on/off.	
GET/SET	SYMBOL.4STATE-IMB	ON OFF	Turns the Intelligent Mail Barcode symbology on/off.	
GET/SET	SYMBOL.4STATE-RMC	ON OFF	Turns the Royal Mail Code symbology on/off.	
GET/SET	SYMBOL.QR	ON OFF	Turns the QR and MicroQR symbologies on/off.	
GET/SET	TRIGGER.TYPE	0 1 2 3 4 5	Not supported Not supported Manual (default) Not supported Not supported Continuous	
GET/SET	UPC-EAN.EAN13	ON OFF	Turns the EAN-13 symbology on/off.	X
GET/SET	UPC-EAN.EAN8	ON OFF	Turns the EAN-8 symbology on/off.	X
GET/SET	UPC-EAN.UPC-A	ON OFF	Turns the UPC-A symbology on/off.	X
GET/SET	UPC-EAN.UPC-E	ON OFF	Turns the UPC-E symbology on/off.	X
GET/SET	UPC-EAN.UPCE1	ON OFF	Turns the UPC-E1 symbology on/off.	
GET/SET	UPCEAN.SUPPLEMENT	0 1-4	Turns off UPC supplemental codes. Turns on UPC supplemental codes.	

Appendix B - Camera Reader Defaults

The following table lists the defaults the SDK uses on startup for the camera reader.

Note: At the low-level, the cmbSDK supported devices can perform two types of configuration resets: a device reset and a config reset. A device reset restores all configuration properties to their saved defaults, while a config reset restores mostly the scanning settings, leaving communication settings alone. In the table below, those items that are only reset by a device reset are indicated.

Note: The Reader Device method *resetConfig()* performs a config reset. To perform a device reset, the DMCC command DEVICE.RESET would need to be issued.

Setting	Default Value	Device Reset Only?
BEEP.GOOD	1 1 (Turn beep on)	
C11.CHKCHAR	OFF	
C11.CHKCHAR-OPTION	1	
C39.ASCII	OFF	
C39.CHKCHAR	OFF	
C93.ASCII	OFF	
COM.DMCC-HEADER	1 (Include Result ID)	Y
COM.DMCC-RESPONSE	0 (Extended)	Y
DATA.RESULT-TYPE	1	Y
DECODER.1D-SYMBOLORIENTATION	1	
DECODER.EFFORT	2	
DECODER.MAX-SCAN-TIMEOUT	60	
DEVICE.NAME	"MX-" + the last six digits of DEVICE.SERIAL-NUMBER	
Symbologies (SYMBOL.*)	OFF (all symbologies are disabled)	
Symbology sub-types (groups): DATABAR.EXPANDED DATABAR.LIMITED DATABAR.RSS14 DATABAR.RSS14STACK UPC-EAN.EAN13 UPC-EAN.EAN8 UPC-EAN.UPC-A UPC-EAN.UPC-E UPCEAN.UPCE1	ON OFF OFF OFF ON ON ON ON ON OFF	
FOCUS.FOCUSTIME	3	
I2O5.CHKCHAR	OFF	
IMAGE.FORMAT	1 (JPEG)	
IMAGE.QUALITY	50	
IMAGE.SIZE	1 (1/4 size)	
LIGHT.AIMER	Default based on cameraMode: 0: NoAimer and FrontCamera 1: PassiveAimer and ActiveAimer	Y
LIGHT.AIMER-TIMEOUT	60	
LIGHT.INTERNAL-ENABLE	OFF	

Setting	Default Value	Device Reset Only?
Minimum/maximum code lengths	ON 4 40	
MSI.CHKCHAR	OFF	
MSI.CHKCHAR-OPTION	0	
TRIGGER.TYPE	2 (Manual)	
UPC-EAN.SUPPLEMENT	0	

Precautions

Observe these precautions when installing the Cognex product, to reduce the risk of injury or equipment damage:

- To reduce the risk of damage or malfunction due to over-voltage, line noise, electrostatic discharge (ESD), power surges, or other irregularities in the power supply, route all cables and wires away from high-voltage power sources.
- Changes or modifications not expressly approved by the party responsible for regulatory compliance could void the user's authority to operate the equipment.
- Cable shielding can be degraded or cables can be damaged or wear out more quickly if a service loop or bend radius is tighter than 10X the cable diameter. The bend radius must begin at least six inches from the connector.
- This device should be used in accordance with the instructions in this manual.
- All specifications are for reference purpose only and may be changed without notice.

