Crestron **e-Control® SDK for Adobe® Flash®** Software

Introduction and Tutorial

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This document was prepared and written by the Technical Documentation department at:

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Contents

Software: e-Control® SDK for Adobe® Flash®

Introduction

NOTE: This document assumes that the user has a proficient working knowledge of Flash and ActionScript 3 and is familiar with Crestron® Control Systems and their functions.

The Crestron e-Control® Software Development Kit (SDK) for Adobe® Flash® is designed to allow Flash developers to create Flash projects capable of bi-directional communication between Flash and Crestron 2-Series control systems.

This communication, employing Crestron's implementation of joins and signal types, allows for the creation of powerful dynamic interfaces that will run on any browser supporting Flash 9 and ActionScript 3.0.

Three basic data types can be sent and received: *digital*, *analog*, and *serial*. These data types may take a variety of forms corresponding to the various controls available in the SDK, but the control events sent to the control system would take some form of:

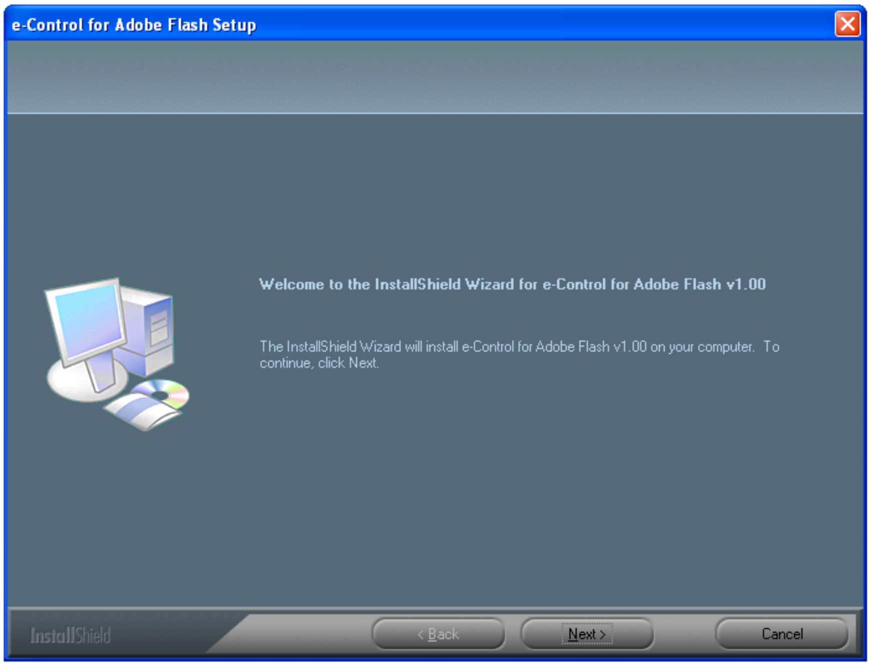
- onDigital
- onAnalog
- onSerial

Installing the e-Control SDK Component

Automatic Installation

Download the e-Control installer from the Crestron website (www.crestron.com) to your desktop. Double click the file to automatically install the e-Control SDK Component file. The Crestron e-Control for Adobe Flash "Setup Welcome" window will appear.

Crestron e-Control for Adobe Flash "Setup Welcome" Window



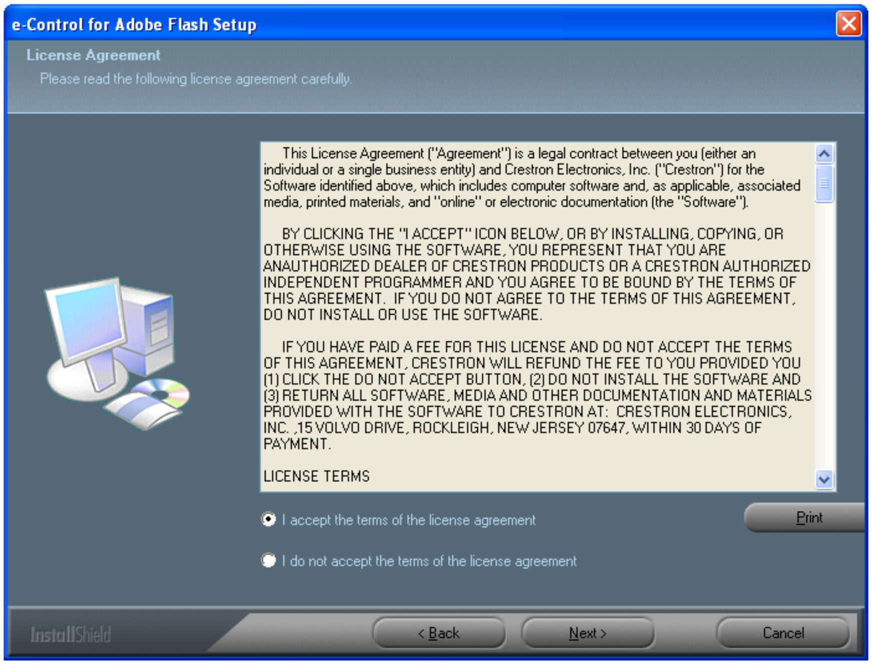
e-Control for Adobe Flash Setup

Welcome to the InstallShield Wizard for e-Control for Adobe Flash v1.00

The InstallShield Wizard will install e-Control for Adobe Flash v1.00 on your computer. To continue, click Next.

1. Click **Next** to display the "License Agreement" window where you will be prompted to accept (or not) the license agreement governing the Report Viewer application. Accept the agreement (if you want to continue) by clicking the appropriate radio button. You can also use the **Print** button to retain a copy for your records. Click **Next** to continue.

"License Agreement" Window



e-Control for Adobe Flash Setup

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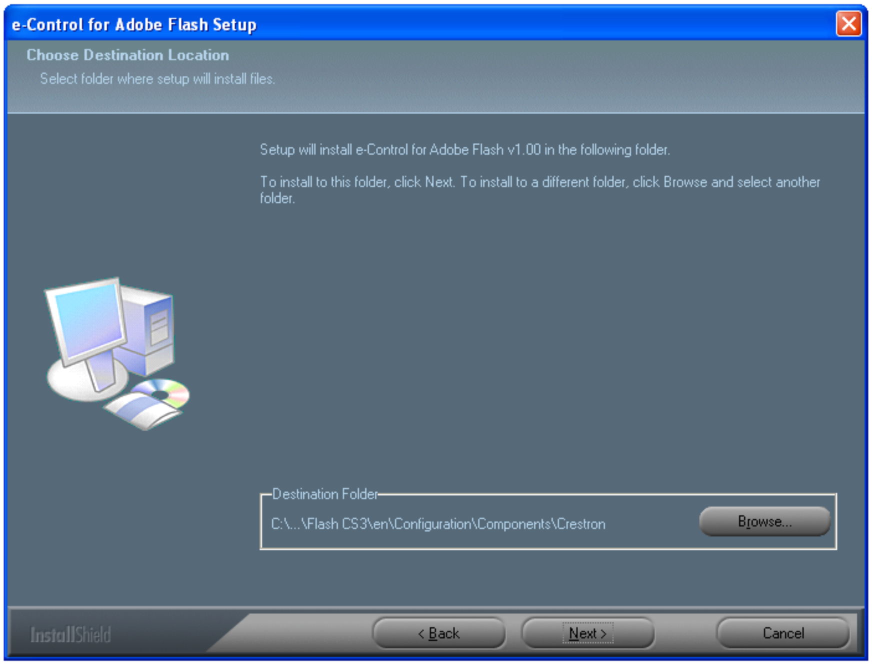
2. The "Choose Destination" window allows you to select the destination of the file; 'eControl.swc'. It is recommended that you accept the default unless your installation has other requirements.

"Choose Destination" Window



e-Control for Adobe Flash Setup

Choose Destination Location

Select folder where setup will install files.

Setup will install e-Control for Adobe Flash v1.00 in the following folder.

To install to this folder, click Next. To install to a different folder, click Browse and select another folder.

Destination Folder

C:\...\Flash CS3\en\Configuration\Components\Crestron

3. Click **Next** to complete the installation.

Manual Installation

Normally, the installer provided by Crestron will set up the e-Control SDK, making it available as a component in Flash. However, there may be situations where a manual set up is necessary to install the component file so that it appears in the Components panel. To manually set up the e-Control SDK, proceed as follows:

NOTE: On a PC running Windows 2000, Windows XP, Vista or Windows 7, the component file, 'eControl.swc' must be installed in the following directories depending on the type of installation, as defined by the Adobe Flash documentation: Your directory structure may vary depending on your organization's needs.

Standalone Installation: C:\Program Files\Adobe\Adobe Flash CS3\en\Configuration\Components

User-Level Installation: C:\Documents and Settings*username*\Local Settings\Application Data\Adobe\Flash CS3*language*\Configuration

All-User-Level Installation: C:\Documents and Settings\All Users\Application Data\Adobe\Flash CS3*language*\Configuration

Adobe Flash CS4: When using Adobe Flash CS4, the component file, 'eControl.swc' must be manually copied to C:\Program Files\Adobe Flash CS4\Common\Configuration\Components in order to be listed in the Component Library.

NOTE: On a Macintosh running OS X, the component file, 'eControl.swc', must be installed in the following directories depending on the type of installation, as defined by the Adobe Flash documentation:

Standalone Installation: Macintosh HD:Applications:Adobe Flash CS3:Configuration:Components

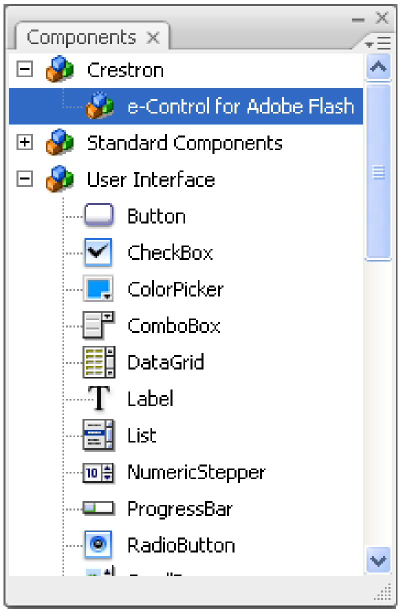
User-Level Installation: Macintosh HD/Users/*username*/Library/Application Support/Adobe/Flash CS3/*language*/Configuration/

All-User-Level Installation: Macintosh HD/Users/Shared/Application Support/Adobe/Flash CS3/*language*/Configuration/

Getting Started

1. Start Flash CS3. Select **Flash File (ActionScript 3.0)** in the "Create New" field on the splash screen or select **New** from the File menu and then **Flash File (ActionScript 3.0)** from the "New Document" dialog.

Components Panel

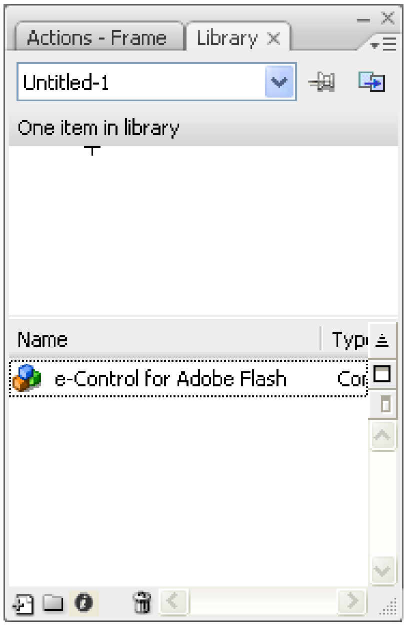


2. Open the Component panel by selecting **Components** from the Windows menu and locate the e-Control for Adobe Flash component under Crestron.

3. Open the Library panel by selecting **Library** from the Windows menu.

4. Drag the e-Control for Adobe Flash component into the Library panel.

Library Panel Showing e-Control for Adobe Flash



5. The e-Control for Adobe Flash component is now available for your project.

e-Control SDK Component Reference

NOTE: There may be additional parameters, events and return types for any given method. Refer to the Adobe Flash help file for more information.

Class CNXConnection

Package: Crestron
Class: CNXConnection
Inheritance: CNXConnection → Socket → Event Dispatcher → Object
Language: ActionScript 3.0
Player Version: Flash Player 9

The CNXConnection class handles the communication between Flash and a Crestron control system.

Constructor Detail

CNXConnection()

```
public function CNXConnection()
```

Language Version: ActionScript 3.0
Player Version: Flash Player 9

Method Detail

cnxConnect()

```
public function cnxConnect()
```

Language Version: ActionScript 3.0
Player Version: Flash Player 9

Begins the connection process.

Parameters

`host:String` — The name of the host to connect to expressed as a string. If no host is specified, the host contacted will be the host where the calling *.swf currently resides. If you do not specify a host, use an event listener to determine if the connection was successful.

`cid:String` — The Crestron Internet Protocol ID (CIPID). The default is 03.

`port:int` — The port number to connect to expressed in the form of an unsigned integer. The default is 41794 for the Crestron Control Port.

`heartbeat_interval:int` — Sets the time (in seconds) allowed to pass before a HeartbeatEvent is thrown. If the value is omitted or set to zero, the heartbeat will be disabled.

Return Type

`:Boolean` — Returns "true" if the connection process has begun.

Events

`CNXConnection.CONNECT:Event` — Dispatched when the connection to the control system is complete.

`ioError:IOErrorEvent` — Dispatched if a host is specified and an input/output error occurs that causes the connection to fail.

`SecurityError:SecurityErrorEvent` — Dispatched if a call to CNXConnection.CONNECT() attempts to connect to either a server outside the caller's security sandbox or to a port lower than 1024. Refer to the Flash help file for more information.

cnxDisconnect()

```
public function cnxDisconnect()
```

Language Version: ActionScript 3.0
Player Version: Flash Player 9

Begins the disconnect process.

Events

`CNXConnection.DISCONNECT:Event` — Dispatched when the control system is disconnected.

HasCnxConnection()

```
public function HasCnxConnection()
```

Language Version: ActionScript 3.0
Player Version: Flash Player 9

Returns the state of the connection to a control system as a Boolean.

Return Type

:Boolean—Returns "true" if connected, returns "false" if not.

SendDigital()

```
public function SendDigital()
```

Language Version: ActionScript 3.0
Player Version: Flash Player 9

Sends a digital to the control system.

Parameters

join:int—The join number to change.

value:Boolean—The new value for the join.

SendAnalog()

```
public function SendAnalog()
```

Language Version: ActionScript 3.0
Player Version: Flash Player 9

Sends an analog to the control system.

Parameters

join:int—The join number to change.

value:int—The new value for the join.

SendSerial()

```
public function SendSerial()
```

Language Version: ActionScript 3.0
Player Version: Flash Player 9

Sends a serial to the control system.

Parameters

join:int—The join number to change.

strValue:string—The new value for the join.

SendRepeatDigital()

```
public function SendRepeatDigital()
```

Language Version: ActionScript 3.0
Player Version: Flash Player 9

Sends a repeat digital to the control system. When a repeat digital is sent high it is continuously sent to the control system. If the control system does not receive a false within seven seconds of the last pulsed packet it will force the value to go low.

Parameters

join:int—The join number to change.

value:Boolean—The new value for the join.

Event Detail

AnalogEvent

Event Object Type: Crestron.AnalogEvent
Event type property = CNXConnection.ANALOG

Language Version: ActionScript 3.0
Player Version: Flash Player 9

Dispatched when an ANALOG is received from the control system.

PROPERTY	VALUE
Value	Integer—The new value for the join
Join	Integer—The join number to change

ClearAllEvent

Event Object Type: Crestron.ClearAllEvent
Event type property = CNXConnection.ALLCLEAR

Language Version: ActionScript 3.0
Player Version: Flash Player 9

The ALLCLEAR is used to zero all digital and analog joins and to empty all serials with a single message.

ConnectEvent

Event Object Type: Crestron.ConnectEvent
Event type property = CNXConnection.CONNECT

Language Version: ActionScript 3.0
Player Version: Flash Player 9

Dispatched after both handshake and ability query are complete.

DigitalEvent

Event Object Type: Crestron.DigitalEvent
Event type property = CNXConnection.DIGITAL

Language Version: ActionScript 3.0
Player Version: Flash Player 9

Dispatched when a DIGITAL is received from the control system.

PROPERTY	VALUE
Value	Integer—The new value for the join
Join	Integer—The join number to change

DisconnectEvent

Event Object Type: Crestron.DisconnectEvent
Event type property = CNXConnection.DISCONNECT

Language Version: ActionScript 3.0
Player Version: Flash Player 9

Dispatched when the connection to the control system is closed.

HeartbeatEvent

Event Object Type: Crestron.HeartbeatEvent
Event type property = CNXConnection.HEARTBEAT

Language Version: ActionScript 3.0
Player Version: Flash Player 9

Dispatched when a heartbeat from a control system is missed or after receiving a heartbeat following a miss.

PROPERTY	VALUE
Missed	true—Heartbeat missed indicating possible network issues. false—Indicates that the network connection has stabilized.

SerialEvent

Event Object Type: Crestron.SerialEvent
Event type property = CNXConnection.SERIAL

Language Version: ActionScript 3.0
Player Version: Flash Player 9

Dispatched when a SERIAL is received from the control system.

PROPERTY	VALUE
Value	Integer—The new value for the join
Join	Integer—The join number to change

How to Use Examples:

NOTE: Due to recent security changes in the Flash player, Crestron has developed a SIMPL Windows module called the Flash Policy Server that meets Adobe's new, stricter policy file requirements. To implement Crestron's Flash Policy Server, simply add it to your SIMPL Windows program before uploading to your control system.

The following examples show how the code can be used to initialize the CNXConnection, connect to a device, handle join events and show connection issues.

NOTE: Be sure to run a debugging session when you are finished with your code by selecting **Debug Movie** from the Debug menu, or by pressing **Ctrl**+**Shift**+**Enter**.

Initialization

1. Import the CNXConnection class and the other related classes from the Crestron package by using the import directive.

NOTE: It is only necessary to import the classes needed for your project.

```
import Crestron.CNXConnection;
import Crestron.AnalogEvent;
import Crestron.ClearAllEvent;
import Crestron.ConnectEvent;
import Crestron.DigitalEvent;
import Crestron.DisconnectEvent;
import Crestron.HeartbeatEvent;
import Crestron.SerialEvent;
```

2. Make cnx the global variable for the CNXConnection.

```
var cnx:CNXConnection = null;
```

3. Instantiate the connection.

```
cnx = new CNXConnection();
```

Connecting to a Device

In order to guarantee that the ConnectEvent is handled properly an event listener must be added and the IP address and IPID declared before a connection is attempted. Use the following procedure.

NOTE: Adding an event listener for a DisconnectEvent at the same time will notify the user when the control system disconnects.

1. Add the event listeners and declare the IP address and IPID.

```
cnx.addEventListener(CNXConnection.CONNECT,
onStateChange);

cnx.addEventListener(CNXConnection.DISCONNECT,
onStateChange);

var ourIpAddr:String = "192.168.1.10";

var ourIPID:String = "03";
```

2. Begin the connection process with the following statement:

```
cnx.cnxConnect(ourIpAddr, ourIPID);
```

3. Implement the CONNECT/DISCONNECT event listeners.

NOTE: Note that the base event class is used instead of the actual event class. This is necessary to handle both the CONNECT and DISCONNECT in the same function.

```
function onStateChange(e:Event)
{
  if (e.type == CNXConnection.CONNECT)
    trace("Hello device.");
  else
    trace("Disconnected.");
}
```

Handling Join Events

In the case of this example the program should respond to:

digital press 1 to raise analog 1
digital feedback 1 is digital press 1 high
digital press 2 to lower analog 1
digital feedback 2 is digital press 1 low
analog 1 is value ramped by digitals

NOTE: Two buttons and a slider must be drawn on the Flash stage for this example to work. The buttons must be called btnRaise and btnLower and the slider called sldrValue. The slider is to be read only.

NOTE: Be sure to import the required classes as described in “Initialization” on page 11.

1. Add event listeners to handle join changes and button presses.

```
cnx.addEventListener(CNXConnection.DIGITAL,
onDigital);

cnx.addEventListener(CNXConnection.ANALOG, onAnalog);

btnRaise.addEventListener(MouseEvent.MOUSE_UP,
raiseAnalog);

btnRaise.addEventListener(MouseEvent.MOUSE_DOWN,
raiseAnalog);

btnLower.addEventListener(MouseEvent.MOUSE_UP,
lowerAnalog);

btnLower.addEventListener(MouseEvent.MOUSE_DOWN,
lowerAnalog);
```

2. Implement the digital listener. Digital join 1 feedback lets us know that the press of the raise button has been acknowledged by the control system.

NOTE: It is very important to decide what visual elements are controlled by the control system and change them on control system generated events only.

NOTE: “Emphasized” is used to show a button in a high state.

```
function onDigital(e:DigitalEvent)
{
  switch(e.Join)
  {
    case 1:
   {
     btnRaise.emphasized = e.Value;
     break;
   }
   case 2:
   {
     btnLower.emphasized = e.Value;
     break;
   }
  }
}
```

3. Implement the analog handler.

NOTE: This is also based on the changed join and its feedback controls the position of the slider.

```
function onAnalog(e:AnalogEvent)
{
  switch(e.Join)
  {
    case 1:
   {
      sldrValue.value = e.Value;
   }
  }
}
```

4. Implement the button presses for digital joins 1 and 2.

```
function raiseAnalog(e:Event)
{
  if (e.type == MouseEvent.MOUSE_DOWN)
   cnx.sendDigital(1, 1);
  else
    cnx.sendDigital(1, 0);
}

function lowerAnalog(e:Event)
{
  if (e.type == MouseEvent.MOUSE_DOWN)
   cnx.sendDigital(2, 1);
  else
    cnx.sendDigital(2, 0);
}
```

Showing Connection Problems

To enable the HeartbeatEvent, the cnxConnect function has to be called in a different manner.

NOTE: The SecurityErrorEvent and the IOErrorEvent can also be used to detect connection problems.

1. Replace the earlier cnxConnect call with the one that follows. The last parameter tells the connection to use the HeartbeatEvent.

```
cnx.cnxConnect(ourIpAddr, ourIPID, 41794, 1);
```

2. Add a listener.

```
cnx.addEventListener(CNXConnection.HEARTBEAT,
onHeartbeat);
```

3. Declare a global variable which will contain the number of heartbeats missed.

```
var iMissedHeartbeats:Number = 0;
```

4. Implement the handler. The missed property lets you know if this is a positive or negative message. If Missed = true then there is a possible connection problem. If Missed = false, then the connection problems have ceased. Re-enable the controls and reset the counter. In this example if five heartbeats are missed the controls will be disabled.

NOTE: It is recommended not to disconnect based on the heartbeat. If there are problems it is quicker to allow the socket to close itself than to force it to close. The intent of the heartbeat event is to offer early warnings that there may be a problem.

```
function onHeartBeat(e:HeartbeatEvent)
{
  if (e.Missed == true)
  {
    iMissedHeartbeats++;
    if (iMissedHeartbeats > 5)
    {
      btnRaise.enabled = false;
      btnLower.enabled = false;
      sldrValue.enabled = false;
    }
  }
  else
  {
   iMissedHeartbeats = 0;
   btnRaise.enabled = true;
   btnLower.enabled = true;
    sldrValue.enabled = true;
  }
}
```

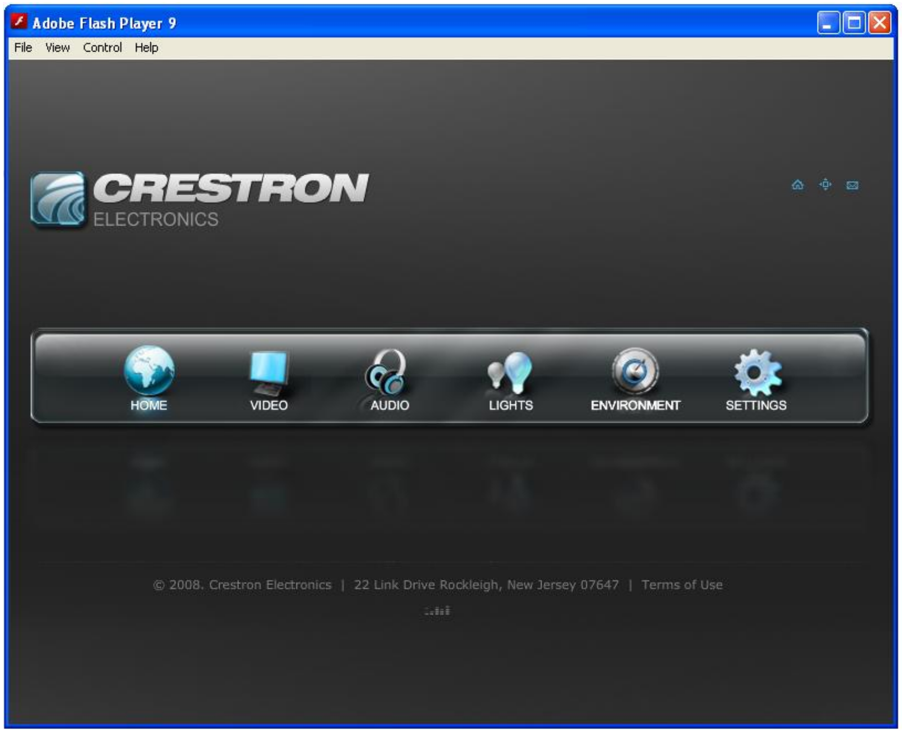
The Example Program

The e-Control for Adobe Flash Example Program is available from the Crestron website and shows one possible way to use the Flash SDK as well as a methodology for things like naming multiple instances of the same object, importing classes and declaring variables and functions, etc.

Opening the example program’s individual files (i.e., files whose names end in .fla) in Adobe Flash CS3 Professional will provide you with insight regarding the creation and implementation of a Flash project suitable for your needs.

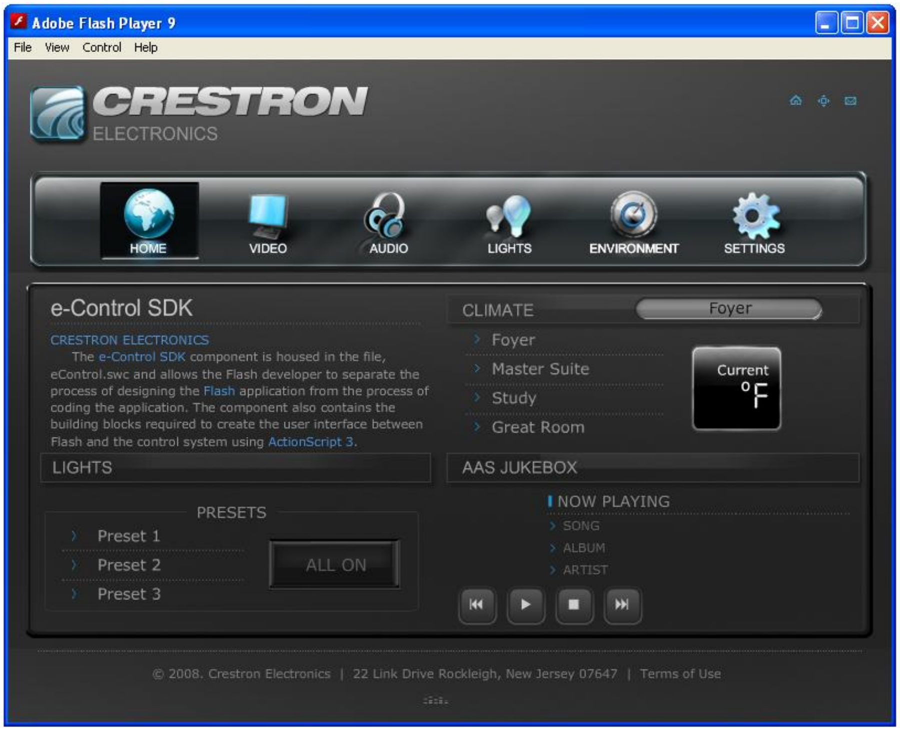
- To open the example program, double click on the file named: **Home.swf**. This will open the Flash 9 player. Select **Play** from the **Control** menu or press **Ctrl** and **Enter** at the same time. The demo program shown below will open.

Crestron e-Control for Adobe Flash Demo Program



- When you move your cursor over the buttons, you will notice that they move in a fairly complex manner. This is because each button itself is a small Flash movie that has been called into the time line of the larger example program.
- Clicking one of the buttons (in this case, **HOME**) causes the main button bar to move up out of the way while another page (in this case, Page 1, file name **page1.swf**) is loaded into the player. As with the buttons, Page 1 is a separate Flash movie called into the demo program.

Crestron e-Control for Adobe Flash Demo Program Page 1



e-Control SDK

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The e-Control SDK component is housed in the file, eControl.swc and allows the Flash developer to separate the process of designing the Flash application from the process of coding the application. The component also contains the building blocks required to create the user interface between Flash and the control system using ActionScript 3.

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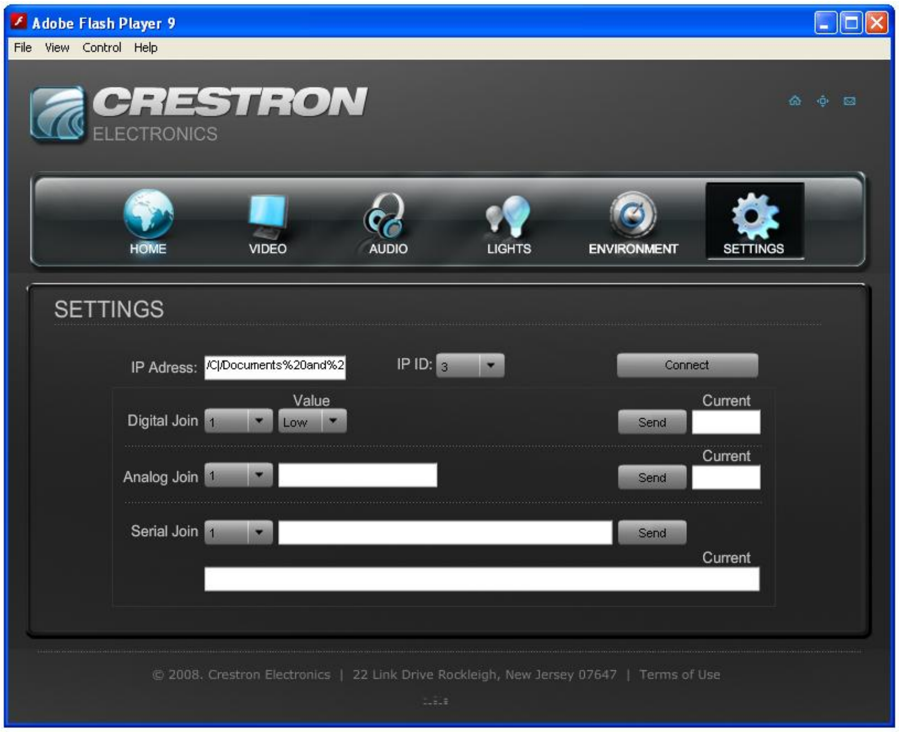
- Clicking on any of the other buttons will call their associated pages into the space now occupied by Page 1. In this way, the Flash project can control associated functions through an attached 2-Series control system.
- Clicking on the **SETTINGS** button opens the SETTINGS page (**page6.swf**), which governs connectivity issues between the Flash project and the attached 2-Series control system.

Crestron e-Control for Adobe Flash Demo Program Settings Page



SETTINGS

IP Adress: /C|/Documents%20and%2 IP ID: 3

Digital Join 1 Value Low Current

Analog Join 1 Current

Serial Join 1 Current

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- Creating a page similar to the SETTINGS page could be important to your Flash project as it allows communication and control parameters to be edited. Open the file called **page6.swf** in Flash CS3 for ideas on how to implement something like this in your project.

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