CONVERGING SYSTEMS

Integration Note

Automation/Lighting Panel Manufacturer:	Bitwise/Leviton
Platforms:	**BCn Controllers**
Versions:	BitWise Controls Project Editor V. 1.9.89.0 or newer
Specific Profile/Driver Version:	-V1.0 BWC-SM 120/21/14 or later (consolidated version for IP and Serial control using Telnet Port 23).
Bitwise Dealer Store (option)	Converging Systems Lighting Module (extra fees from Bitwise Store apply)
Download location for Profile/Driver	Bitwise Controls dealer portal Note: current name is bw_driver_dNode
Document Revision Date:	March 23, 2015

OVERVIEW AND SUPPORTED FEATURES

The Bitwise Controls Project Editor and BC family of automation controllers support the Converging Systems' family of motor and LED lighting control products using either RS-232 serial connection (IBT-100) or Ethernet (e-Node).

Integration with Converging Systems' platforms is enabled from the range of Bitwise Controls wall pads, touchscreens and other user interfaces. Additionally, status available from a number of Converging Systems' controllers can trigger commands and other events within the above lighting /automation system. For example, a motor movement can trigger a lighting event. Or a lighting command issued can signal back to the touchscreen device as to its current setting (slider movement or level setting).

CURRENT DRIVER SUPPORT THE FOLLOWING FEATURES

The following commands are supported by the current driver for the various lighting and motor control devices (except those that are grayed out).

LED Lighting Commands

General CS-Bus Commands	Bitwise Naming Convention[1]	ILC-100	ILC-400	e-Node DMX
General LED Control Commands				
ON	Node_On	✓	✓	✓
OFF	Node_Off	✓	✓	✓
EFFECT,n (>1)	Execute_Effect	✓	✓	N/A
STORE,#	Store_Preset	✓	✓	✓
RECALL,#	Recall_Preset	✓	✓	✓
DISSOLVE.1=XX	Set_Dissolve_Rate	✓	✓	N/A
DISSOLVE.2=XX	Set_Dissolve_Rate	✓	✓	N/A
DISSOLVE.3=XX	Set_Dissolve_Rate	✓	✓	N/A
DISSOLVE.4=XX	Set_Dissolve_Rate	✓	✓	N/A
SEQRATE=XX	Set_Sequence_Rate	✓	✓	✓
SUN_UP	Sun_Up	✓	✓	✓
SUN_DOWN	Sun_Down	✓	✓	✓
SUN.S	Set_Circadian_Value	✓	✓	✓
HSB (HSL) Color Space Commands				
FADE_UP	Fade_Up	✓	✓	✓
FADE_DOWN	Fade_Down	✓	✓	✓
SET,L	Set_Brightness	✓	✓	✓
HUE_UP	Hue_Up	✓	✓	✓
HUE_DOWN	Hue_Down	✓	✓	✓
HUE,H	Set_Hue_Value	✓	✓	✓
SAT_UP	Sat_Up	✓	✓	✓
SAT_DOWN	Sat_Down	✓	✓	✓
SAT_S	Set_Saturation_Value	✓	✓	✓
STOP	STOP	✓	✓	✓
COLOR=H.S.L	Set_Preset_HLS Colorspace	✓	✓	N/A
PRESETH.X=XXX .XXX.XXX	Set LED Presets/HLS Color spacer for preset x	*	*	N/A
RGB Color Space Commands				
RED,R	Set_RED_Value	✓	✓	✓
GREEN,G	Set_GREEN_Value	✓	✓	✓
BLUE,B	Set_BLUE_Value	✓	✓	✓
VALUE=R.G.B				N/A
WHITE,W	Set_WHITE_Value	✓	✓	N/A
VALUE=R,G,B,W		*	*	N/A
PRESET.X=XXX.X XX.XXX (3-color)	Set LED Presets/RGB Color spacer for preset	*	*	*

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	x			
PRESET.X=XXX.XXX.XXX (4-color)		*	*	*
STOP	???	✓	✓	✓
Correlated Color Temperature (CCT) Commands				
CCT,XXXX	SET_Correlated_Color_Temp	✓	✓	✓
CCT_UP	Color_Temp_Up	✓	✓	✓
CCT_DOWN	Color_Temp_Down	✓	✓	✓
Bi-Directional Commands				
COLOR=?	Automatic polling within Driver	✓	✓	N/A
VALUE=?	Automatic polling within Driver	✓	✓	N/A
PRESETH.X=?		*	*	*
PRESET.X=?		*	*	*
Accessory Enode Command/Setup Parameters				
Verbose Mode				
UDP Port 4000/5000		✓	✓	✓
Telnet Login with Authentication (with e-Node		✓	✓	✓
Telnet Login without Authentication		✓	✓	✓

Notes:

***When needed, these can be implemented using dealer programmed serial strings user RAW CMD. See **Step 3g** for more information.

[1]See **Step 3d** below for information on how to see supported Bitwise Controls commands within the Library Browser.

Motor Commands (WIP currently)

General Commands	Bitwise Controls Naming Convention	IMC-100	BRIC ("Bric Mode")	
General Motor Control Commands				
UP		✓	✓	
DOWN		✓	✓	
STOP		✓	✓	
RETRACT		✓	✓	

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STORE,#		✓	✓	
RECALL,#		✓	✓	
PRESET.X=XX.XX				
Bi-Directional Commands				
STATUS=?				
POSITION=?				
Accessory Enode Command/Setup Parameters				
Verbose Mode				
UDP Port 4000/5000				
Telnet Login with Authentication (with e-Node		✓	✓	✓
Telnet Login without Authentication		✓	✓	✓

CURRENT PROFILES DO NOT SUPPORT THE FOLLOWING FEATURES

Other than any features that are grayed out below, any features specified below are currently unsupported.

Any feature not specifically notes as supported should be assumed to be unsupported

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WIRING DIAGRAM (for IP connection)

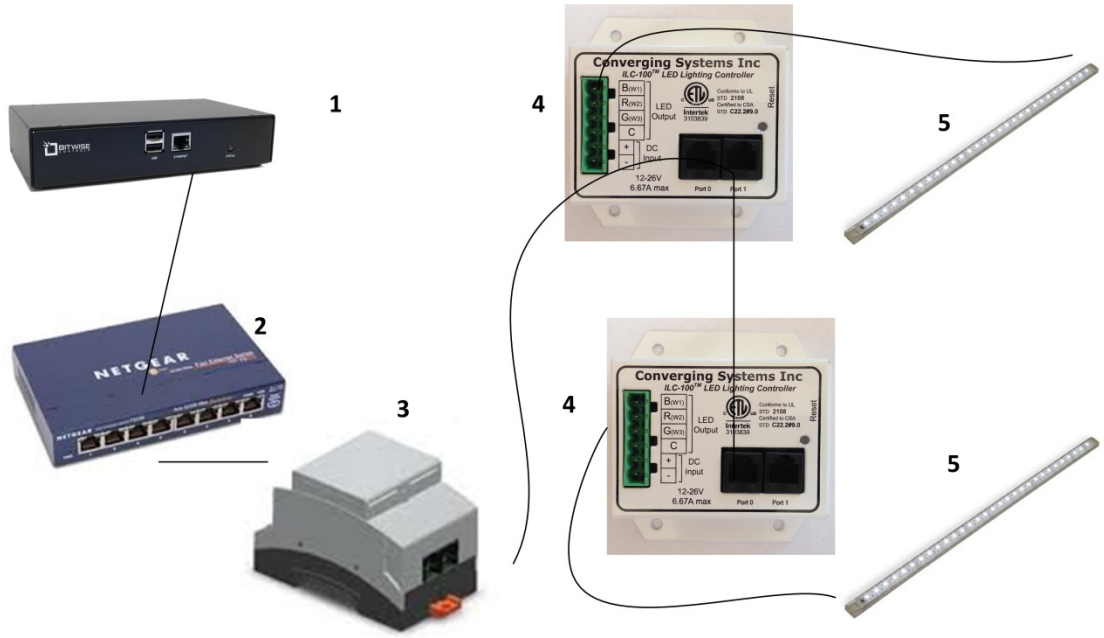

Figure 1

Wiring/Configuration Notes:

1. Maximum length of CS-Bus cabling from e-Node to the last ILC-100/ILC-400 using CAT5e or better cabling (and obeying the 1-1 pin-out requirements for the RJ-25-RJ25 cable) = 4000 feet
2. Maximum number of ILC-100/ILC-400 controllers and Converging Systems' keypads (if provided) that can exist on a single network connected to a single e-Node device = 254
3. Maximum number of e-Nodes that can exist on a Bitwise Controls system = 254

BILL OF MATERIALS (for IP control)

#	Device	Manufacturer	Part Number	Protocol	Connector Type	Notes
1	Bitwise BCn processor	Bitwise Controls	BC1, BC2,BC4	Ethernet	various	
2	Network Switch	Various	Various	Ethernet	RJ-45	
3	e-Node	Converging Systems	e-Node	Ethernet	RJ-45 (for Ethernet) RJ-25 for local bus	
4	Lighting Controller (or Motor Controller)	Converging Systems	ILC-100 or IMC-100 or (Stewart BRIC)	CS-Bus protocol	RJ-25 for CS-Bus communication	Must terminate beginning and end of bus with 120 ohm

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						resister on pins 3/4
5	Flexible Linear Lighting (FLLA) RGB or RGBW luminaries	Converging Systems	FLLA-RGB-xxx FLLA-RGBW-xxx		3-color 4 pin 4-color 5 pin 1-color 4 pin	

WIRING DIAGRAM (for RS-232 serial connection)[2]

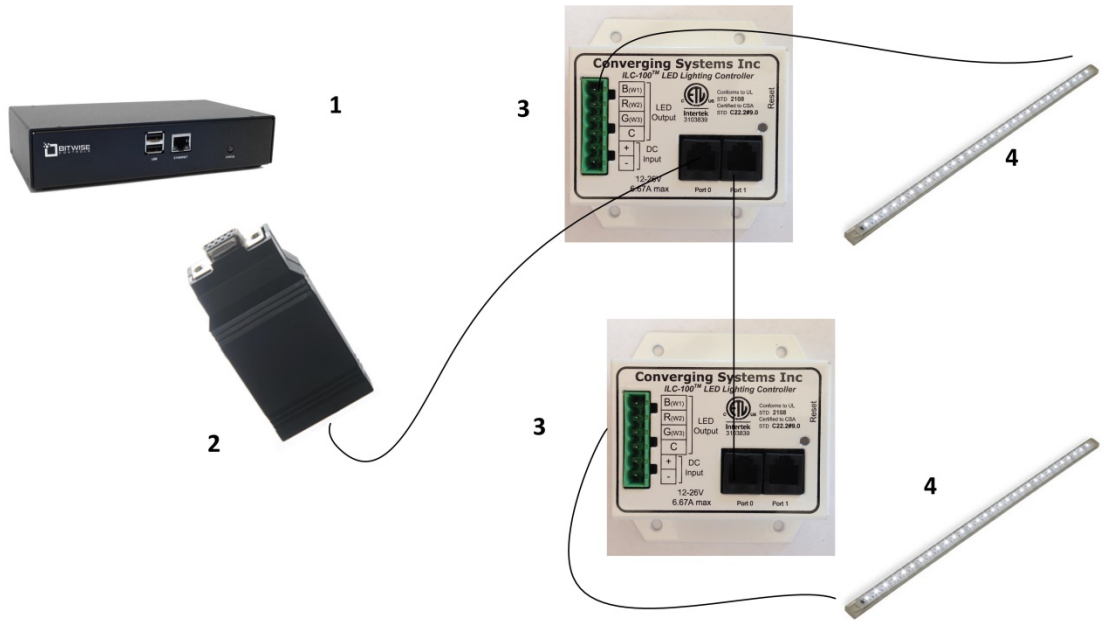

Figure 2

Wiring/Configuration Notes:

1. Maximum length of CS-Bus cabling from e-Node to the last ILC-100 using CAT5e or better cabling (and obeying the 1-1 pin-out requirements for the RJ-25-RJ25 cable) = 4000 feet
2. Maximum number of ILC-100/ILC-400 controllers and Converging Systems' keypads (if provided) that can exist on a single network connected to a single e-Node device = 254
3. Maximum number of e-Nodes that can exist on a Bitwise Controls system = 254

BILL OF MATERIALS (for RS-232c connection)

#	Device	Manufacturer	Part Number	Protocol	Connector Type	Notes
1	Bitwise BCn processor	Bitwise Controls	BC1, BC2,BC4	Ethernet	various	
2	IBT-100	Converging Systems	IBT-100	RS-232c	DB-9 (for Serial)	

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					RJ-25 for local bus	
3Bitwise Controls	Lighting Controller (or Motor Controller)	Converging Systems	ILC-100 or IMC-100 or (Stewart BRIC)	CS-Bus protocol	RJ-25 for CS-Bus communication	Must terminate beginning and end of bus with 120 ohm terminating resister on pins 3/4

System Configuration/Programming

Before proper operation between the Converging Systems' controllers and the Bitwise Controls' system can begin, it will be first necessary for most applications to configure the Converging Systems' products using the e-Node Pilot (PC-based) application (and the e-Node). In addition, communication parameters within the Bitwise Controls Integration Designer software are also required. Refer to the specified instructions below for the particular subsystem for more information.

Background

The Converging Systems e-Node is an Ethernet communication device which can be used to connect the Bitwise Controls Host to one or more Converging Systems motor and/or lighting controllers. Alternatively, the Converging Systems' IBT-100 serial interface device can be used alternatively to connect the same number of Converging Systems' controllers to a Bitwise Controls' processor in situations where Ethernet communication is not desired (but where bi-directional feedback is still required).

Regardless of which method (Ethernet or RS-232c) is desired to be used to communicate with Converging Systems' controllers, ***it is still suggested that initial set-up and commissioning of the controllers' addressing schemes and particular features are made using the e-Node Ethernet device and the e-Node Pilot application***. Settings that can be implemented using this setup are as follows:

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e-Node Programming/ Device Programming

Minimum requirements for this operation

- Computer running Windows XP or later OS, preferably with a wired Ethernet connection to a local router using CAT5 type cabling
- Converging Systems E-Node Ethernet adapter, connected using CAT5 cabling to the above router.
- Download of the latest version of e-Node Pilot application, unzipped and operating on your computer platform
- Powered up and connected ILC-x00 controller using straight thru (1-1) wiring using a 6-pin RJ-connector (Do not use EIA/TIA 568A or 568B wiring and simply chop of the browns because this does not preserve twisted pairs on pins 1 / 2, 3 /4 , and 5/ 6 which is required).

Recommended RJ-25 6P6C connections 6 wires		
e-Node Side	**ILC-x00 side**	**Color of wire**
Pin 1	**Pin 1**	**blue**
Pin 2	**Pin 2**	**Blue/white**
Pin 3	**Pin 3**	**Orange**
Pin 4	**Pin 4**	**Orange/white**
Pin 5	**Pin 5**	**Green**
Pin 6	**Pin 6**	**Green/white**

Suboptimal RJ-11 4P4C connection 4 wires		
e-Node Side	**ILC-x00 side**	**Color of wire**
Pin 1	**Pin 1**	**Orange**
Pin 2	**Pin 2**	**Blue**
Pin 3	**Pin 3**	**Blue/white**
Pin 4	**Pin 4**	**Orange/white**

Note: For the purposes of commissioning if *you do not have* 6P6C RJ-25 connectors, you can use standard 4-pin RJ11 connectors, but follow the wiring directions above preserving twisted pairs on Pin 2/3 and Pins 1 /4. **This cable will not work for keypad communication or IBT-100 communication**.

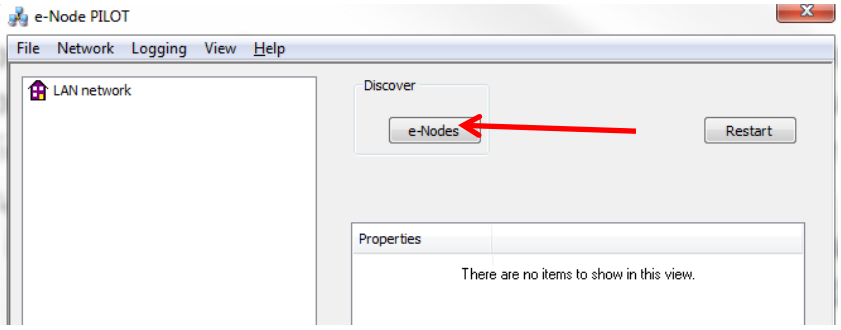
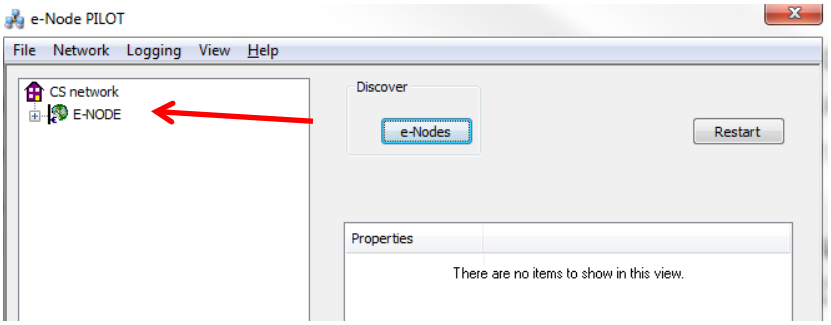
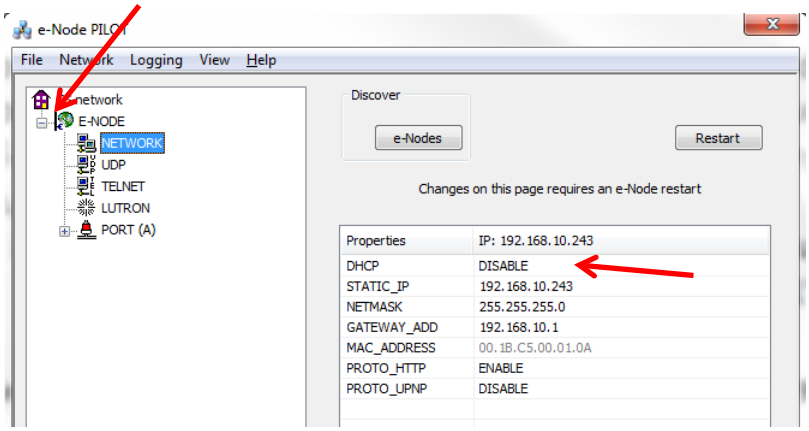
Please follow the below steps under "**e-Node Programming**" when using the e-Node for Ethernet communication

No special steps need to be followed to commission an IBT-100 for RS-232c communication.

However, in all cases it recommended that you follow the steps under "**ILC-100/ILC-400 Programming**" regardless if you are using the **e-Node** for Ethernet communication or the **IBT-100** for serial communication.

e-Node Programming

Step	Setting	Choices
EN-1	**e-Node IP Address** setting	Static or Dynamic Addressing

	Set up the e-node with an appropriate Static or Dynamic IP address. Refer to the separate "e-Node Quick Start Guide" on how to make such settings.	-Launch the e-Node Pilot application.  -Select the **View e-Node** tab and select the Discover **e-Node** button**.** Any e-Node(s) connected on the same network will appear as shown.  -Select the **+** mark in front of the e-Node found to expand the menu.  -Review the **DHCP** entry, the factory default is ENABLE which means **DHCP** is activated. DISABLE for **DHCP** refers to static IP

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<table>
<tr><td></td><td></td><td>addressing. If you wish to set a STATIC IP address, enter the following variables in the order specified below:

<table>
<tr><td>STATIC_IP</td><td>xxx.xxx.xxx.xxx</td><td>Your new static IP address</td></tr>
<tr><td>GATEWAY_ADD</td><td>xxx.xxx.xxx.xxx</td><td>Typically the address of your network’s gateway</td></tr>
<tr><td>FINALLY and only after you have set the above variables, select DHCP</td><td>And Set to DISABLE</td><td>Now reboot the e-Node for this to take effect.</td></tr>
</table>

-Note: It is recommended that only STATIC addressing be used with the Bitwise processors.</td></tr>
<tr><td>EN-2</td><td>e-Node Telnet Server and Login setting</td><td>Follow these steps below to enable Telnet communication on the e-Node.

1) Select the View e-Node tab and select the Telnet tab. Set SERVER to ENABLE.

2) Login Settings.
a) If Telnet communication with Login <u>is desired</u>, set LOGIN to ENABLE and select the Restart button for the particular e-Node that you are utilizing to communicate with the Bitwise system.

b) If Telnet communication with Login is <u>not desired</u>, set LOGIN to DISABLE and select the Restart button for the particular e-Node that you are utilizing to communicate with the Bitwise system.</td></tr>
</table>

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		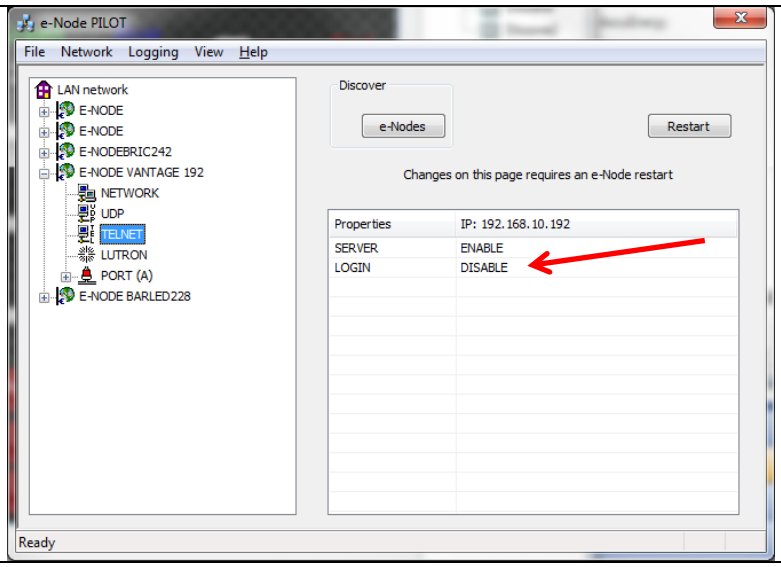

ILC-100/ILC-400 Programming

Step	Setting	Choices
DV-1	**ILC-x00 Discovery** and **Address Setup**	More thorough documentation of this step can be found in the *e-Node Commissioning Guide* referenced in Step EN-1 above. However for document completeness, an abridge version of this guide is summarized below. <u>Background</u>. From the factory the **ILC-x00** controllers do **not** have an assigned UID (unique ID) address. Units come equipped with a factory default address of **Zone**=2, **Group**=1, and **Node**=undefined or a 0. If you set up your Bitwise system to communicate with an ILC-x00 with an address of **2,1,0** the ILC-x00 will react but it will not provide feedback data which is required for automatic slider updates within the Bitwise systems. ***Therefore, it is advisable to set up a non-zero address for each ILC-x00 controller that is connected to either an IBT-100 or an e-Node.*** The directions below indicated how to perform this operation. (See Step 2b below for more information on Zone/Group/Node addressing.) <u>Process.</u> (1) Power on the e-Node and any connected ILC-x00

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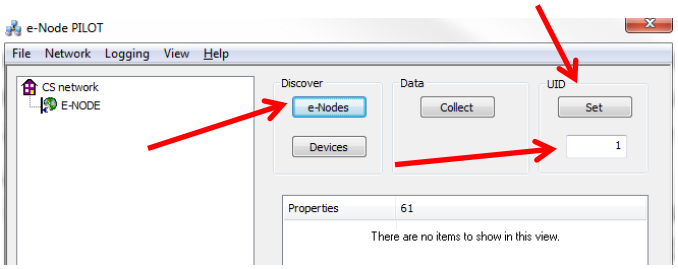
controllers.

(2) Launch the Pilot application and select the Discover **e-Node** within the **View Map** tab.

(3) Now, under the **UID** window, select and enter a unique UID number/address (good to start with 1 and work upwards but never use a duplicate number) and select **Set**.



.

4) You will now need to hit the discovery button on your respective controller. Now close down the pop-up menu.

5) Now you will need to depress for approximately ½ second the "Discovery/Reset" button on an ILC-x00 controller for the unit to become programmed with the selected UID address. See the appropriate section for your particular device.

- **ILC-100.** Take a larger type paper clip or similar device and gently insert it into the reset/discovery hole on the side of the chassis and press the momentary button that you will feel for ½ second and then release. The existence of the ILC-100 will appear under the e-Node entry within Pilot.
- **ILC-400**. Remove the white plastic protective shroud to the left of the dual RJ-25 connectors with your finger nail or a small flat-headed to expose a push button mounted to the PCB. Depress the pushbutton for ½ second and then release. The existence of the ILC-400 will appear under the e-Node entry within Pilot

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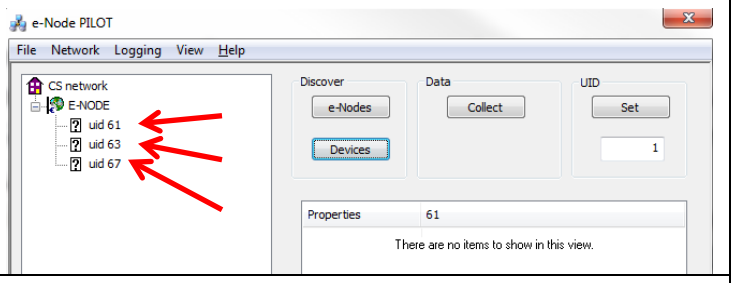
		-If you have more than one connected controller (ILC-100 or ILC-400) continue this process until you have **Discovered** all devices. In the example below, three ILC-100 devices have been Discovered or found. 
DV-2	Notify Mode	**Background.** The Converging Systems' lighting controller have a unique new feature called **NOTIFY**, which automatically transmits color state data back to the Bitwise controller ***only if*** there is a color state change (that is to say, only if the color has changed from its previous state). This feature dramatically reduces bus traffic for color space data is only transmitted onto the bus in those instances when there are color state changes. Three options exist within ILC-100 (fw 3.1 or higher) and all versions of the ILC-400 color controller. These include: **NOTIFY VALUE** (for RGB color space data), **NOTIFY COLOR** (for HSL color space data), and **NOTIFY BOTH** (for both RGB and HSL Color Data). It is recommended that one of these **NOTIFY** functions is utilized in any integration with Bitwise's products. After you make any change in this area, reboot by powering off and back on all ILC-x00 controllers reprogrammed. **Steps.** Within the e-Node Pilot application, select each controller (i.e. ILC Lighting Controller) that you wish to adjust from the **View Map** tab. Then open the **LED** tab. Find the **NOTIFY variable,** and set it to **VALUE (if you are using RGB sliders), COLOR (if you are using HSL sliders), or BOTH (if you are using both RGB and HSL sliders.** This will prevent the selected controller from broadcasting its status after every state change therefore reducing CS-Bus traffic.

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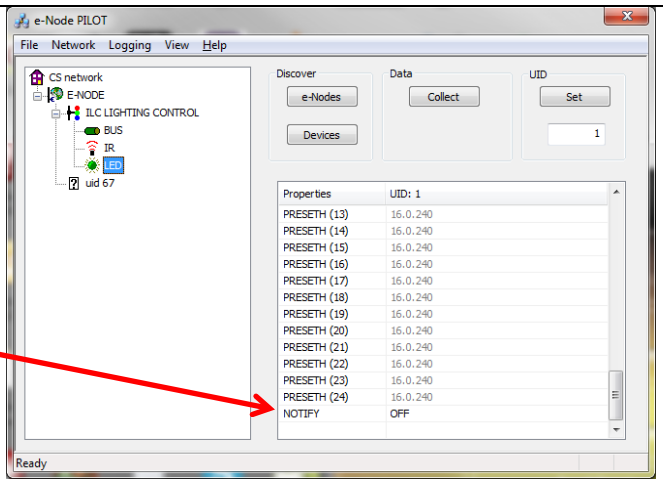
	Change this to the appropriate type of Notify	

Bitwise Controls Programming

Within this section are details on how to perform the various types of driver download and GUI screen development required in order to introduce a new device into the Bitwise architecture. Many of these steps can be eliminated or simplified by simply downloading a special BitWise Lighting Module which has been developed for Converging Systems' LED lighting products. See the special note in the below box on more detail on this exciting Module. However, depending upon whether you download the custom Bitwise Module from the Bitwise Store or you decide to try your hand a custom programming, the following section can be used as a general reference for both tacks.

Availability of a Special Bitwise Converging Systems Lighting Module (Bitwise Store)

Bitwise also has developed a special optional Converging Systems Lighting Module for use with Converging Systems lighting controllers. This BitWise Store Module contains a significant amount of custom engineering designed to make the dealer installation process quite seamless. Advanced feedback and even a real-time color on-screen proofing widget are available to enable to you see the color that you have picked! Converging System's recommends that dealers download this Module to reduce their programming time for a professional user interface.

This module is available from the Bitwise Store for authorized Bitwise dealers. The dealer store can be found at http://store.bitwisecontrols.com/

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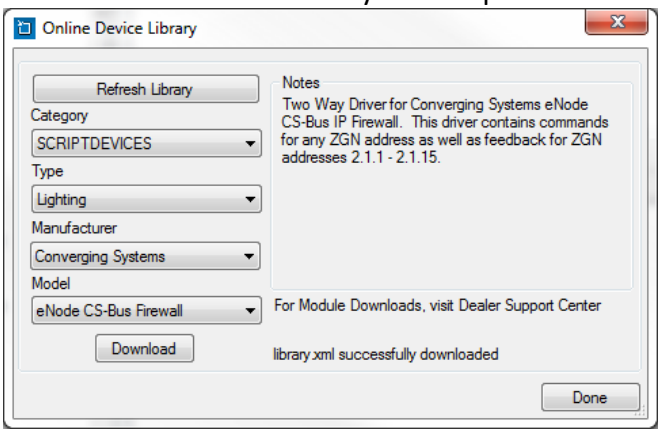
Below is a summary of those steps required to import the Converging Systems' e-Node Ethernet adapter/firewall and one or more loads (motors or lighting). Screen shots are provided for additional information. Typically, the following features are set-up within the Bitwise Controls' commissioning software (Project Editor).

1. Import Converging Systems Intelligent Lighting Controller into your project.

Step	Step	Detail
1a	You will need to decide if you want to (i) download the **SCRIPTDEVICE** driver for the Converging Systems' **eNode** into your BitWise Controls Project Editor/Device library, or (ii) download the BitWise Module from the BitWise Store **Note**: Make sure you download latest version from whatever source you have chosen.	-If you desire to download the **SCRIPTDEVICE** using the Online Device library, proceed to **Step 1a1** below. -If you would prefer to download the BitWise pre-engineered Module form the Bitwise Store, proceed to **Step 1a2** below.
1a1	Online Device Library Option (for download).	-Select **Tools/Online Device Library, hit the Refresh Library** and load the eNode CS-Bus Firewall. If it is not already downloaded, select **Download** which downloads this driver onto your computer. 
1a2	BitWise Store Option (for download).	-Login the BitWise store at http://store.bitwisecontrols.com/ and download the Converging Systems Lighting Module. Once you have found a module and want to purchase it, you will

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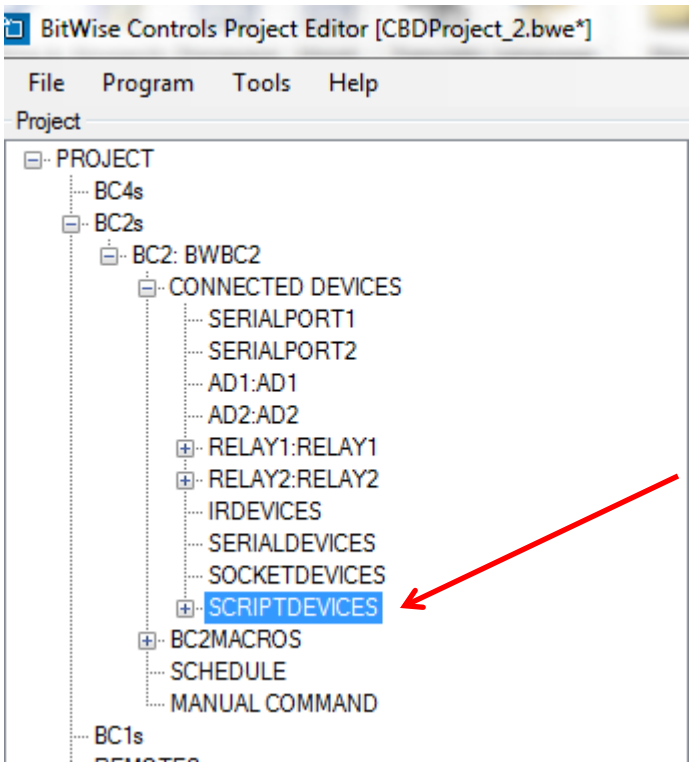
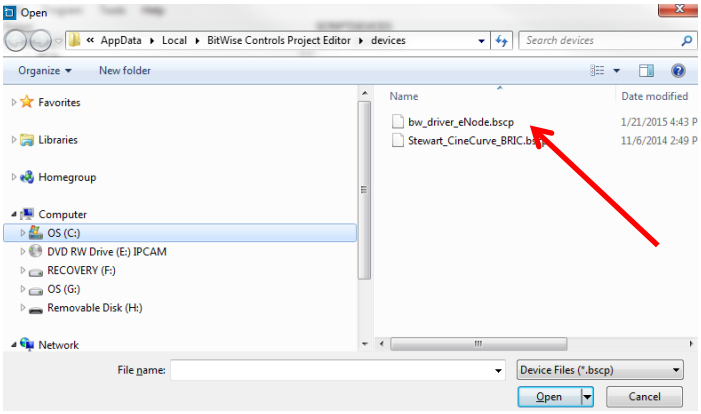
		need to provide the MAC address for a controller that will be present on the network where the module will be installed. The module does not need to be placed on this same controller in the project but it does need to be present on the network for authentication. Modules are sold on a per project basis.
1b	Import this **SCRIPTDEVICE driver into your Project under SCRIPTDEVICES** (i.e. BC2 in this case).	-After you have downloaded either the Online Driver or the BitWise Module, you must now import this **SCRIPTDEVICE** into you project. -See the specific directions below under your download type for more information ***<u>Online Device Library</u>*** -Within your project, expand your processor and find the entry for the **SCRIPTDEVICES**  -Right click on the **SCRIPTDEVICES** entry and select

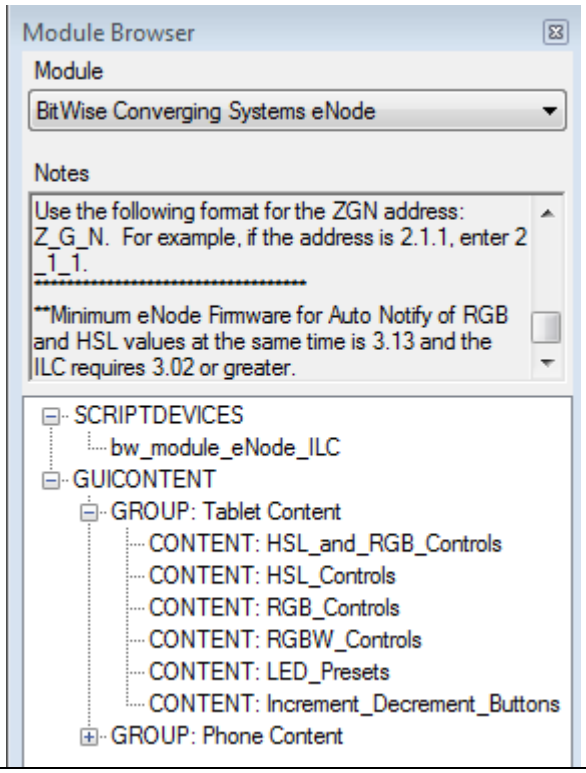
Import Script Device and browse within you BitWise Controls Project Editor/Device library to find the targeted BW driver for the eNode.

-Highlight file name and select **Open**.



Bitwise Store Download

-Open your download with the Module Browser



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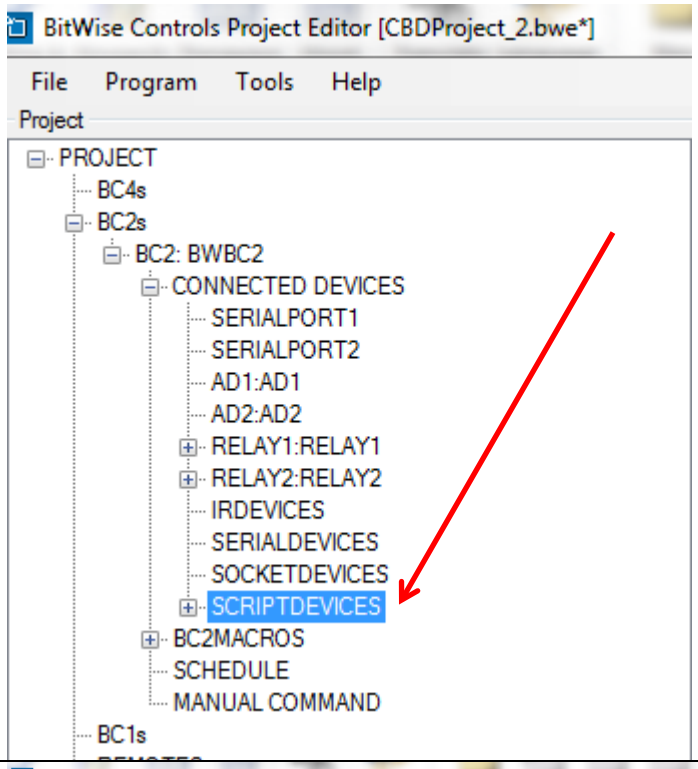
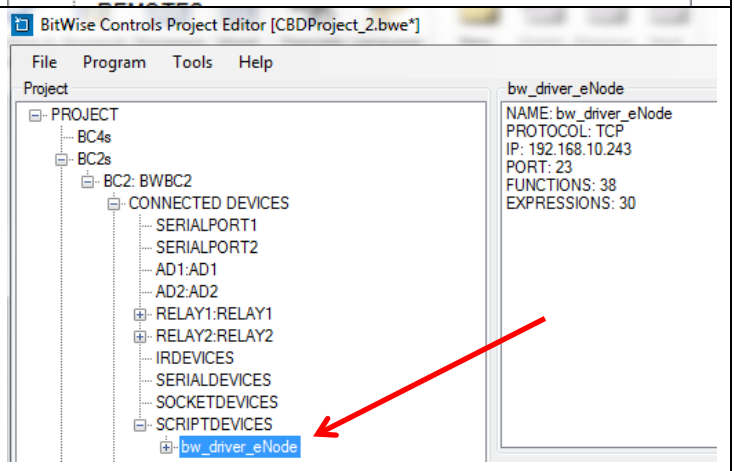
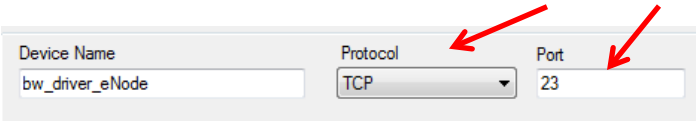
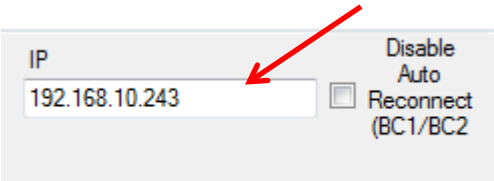
		-Drag the **bw_module_eNode_ILC** from its location within the Module Browser under the **SCRIPTDEVICES** entry to a location below your project's processor (BC2 in this case). 
1c	After you have added the **Converging Systems Intelligent Lighting Controller** to your Bitwise Controls processor's **SCRIPTDEVICES** library**,** you will see the following entry. **Note**: depending upon the type of download, your file's name may vary from this example.	

2. Set-up communication parameters for the Converging Systems Intelligent Lighting Controller

Step	Step	Detail
2a	Set-up communication parameters for the Converging Systems interface (**e-Node IP device** or **IBT-100 serial device**) that will be used with one or more Intelligent Lighting Controller within **Connection Settings tab**	-Determine what will be the communication linkage that you will use to connect to the Converging Systems' device. Refer to the appropriate section below depending upon your choice. ***IP Communication (Telnet)***: - Right click on the **SCRIPTDEVICES** driver for Converging Systems and select the **Properties** Tab. Here at the top of the displayed window will be the parameter for this communication device. The default should be **Protocol** -TCP and **Port**-23. If these values are not displayed by default, enter them.  -To the right you will see the **IP** Setting window. Enter here the IP address for your eNode.  - While still in the Properties screen, select the **User Settings Tab**, and enter within the quote marks (" ") the **User Name** and **Password** for your targeted e-Node. The default **User Name** and **Password** are already entered by default. You only need to change them if you have updated your e-Node with a new **User Name** or **Password** through e-Node Pilot software. -When finished entering these parameters, select **OK** to close this window.

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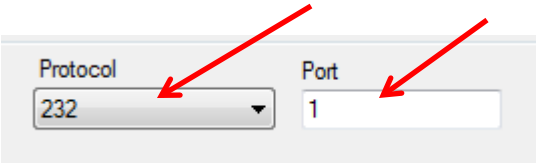
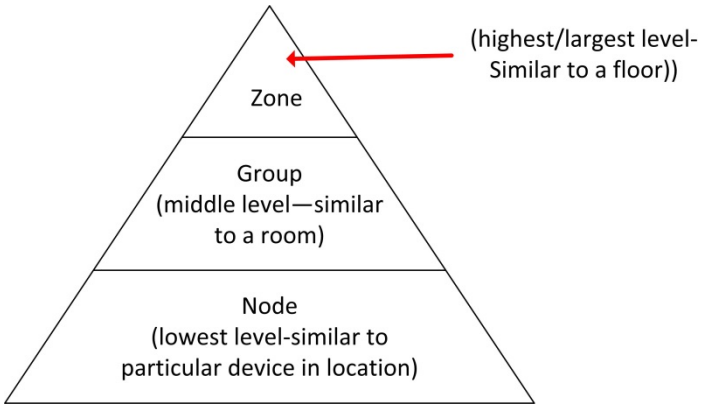
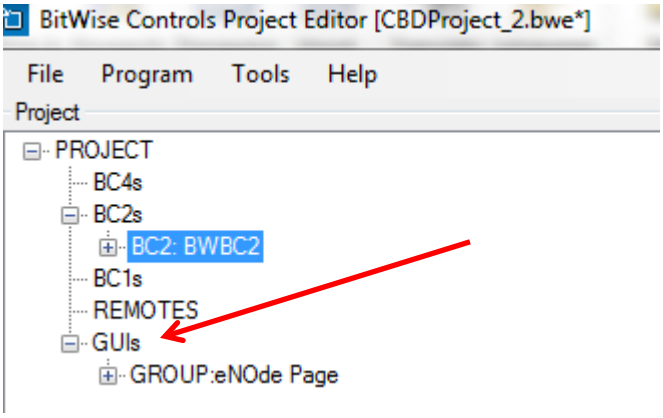
		Serial Communication: -Right click on the **SCRIPTDEVICES** driver for Converging Systems and select the **Properties** Tab. Here at the top of the displayed window will be the parameter for this communication device. For RS-232 communication, it will be necessary to change the **Protocol** setting to "232" and the **Port** to whatever is your relevant serial port for your Bitwise Controls processor. The default should be Protocol-TCP and Port-23. If these values are not displayed by default, enter them.  -When finished entering these parameters, select **OK** to close this window. **Note**: ***you will find much valuable information within Bitwise's Driver Notes. In most cases, these driver notes will be all that you will need to complete your project. However, in the interest of completeness the rest of this manual should be reviewed.***
2b	Understand the addressing scheme that you wish to implement for the connection of specific loads that you want to connect to your particular communication device (eNode or IBT-100).	This information is only relevant for when you start adding buttons and sliders within the GUI section of your BitWise Controls' project. All Converging Systems' devices (loads) that are connected to a communication device (eNode or IBT-100) will be addressed using a unique Zone/Group/Node addressing scheme (Z/G/N). Those addresses are referred to within Project Editor as **ZGN_Addresses.** **YOU MUST HAVE PRE-ASSIGNED ZGN ADDRESSES TO ALL LOADS BEFORE PROCEEDING. See the Converging Systems' documentation on the eNode Pilot application for more information here.** At this point it would be useful to write down a "map" of all interconnected loads and their re-assigned **ZGN Addresses**. From the factory, all lighting devices have a default address of **Zone**-=2,

		Group=1, **Node**=0 or undefined or wildcard. Once a device is programmed using the e-node Pilot application to a non-zero value, then **AND ONLY THEN** can those devices can be queried for color state data which is quite useful in auto-updating sliders and numerical readouts. **Background on ZGN Addresses**: The largest group is referred to as the **Zone**, which might be associated with a floor of a building. The next smaller group is referred to as the **Group**, which might be associated with a room on that floor of a building. Finally, the smallest entity is referred to as the Node, or the particular unit in that Room or Group, and within that Floor of Zone.  Please note-- no two controllers should be assigned the same Z.G.N. address. **Range of ZGN Addresses**: Enter a number between 1 and 254 for Zone numbers, Group numbers, and Node numbers. **Example**: If you have a device with a Z.G.N. address of 2.1.1. , then the Bitwise Controls system can poll that device to determine its current lighting status. If you choose to enter a wildcard address of a 2.1.**0**. (that is a broadcast to all units with Z.G.N. addresses between 2.1.1. and 2.1.254.), only the unique color settings available from the device with an address of 2.1.1. or the first Z.G.N. unit in the series will be queried.

3. Now, add Tasks or Macro to a specific button push or action.

Step	Step	Detail
3a	You can create a user interface (UI) for your system that is suited to your customer's requirements. This **Integration Note** will not focus on the creation of unique pages or the updating of template pages download as part of Bitwise Module. **Note**: The Bitwise Module accompanying GUI screens will save the installer much time in creating a world-class bi-directional lighting interface.	As an example, a simple set up buttons have been added to blank page to demonstrate some functionality of the Converging Systems' LED Lighting Control system. We will quickly demonstrate how these buttons and their underlying programming are created. 
3b	First create a new GUI Group and a single GUI Page underneath that Group.	-Under the **Project** window, right click **on GUIs** and select **Add GUI Group,**  -Next,right clock on your new **GUI Group** and select

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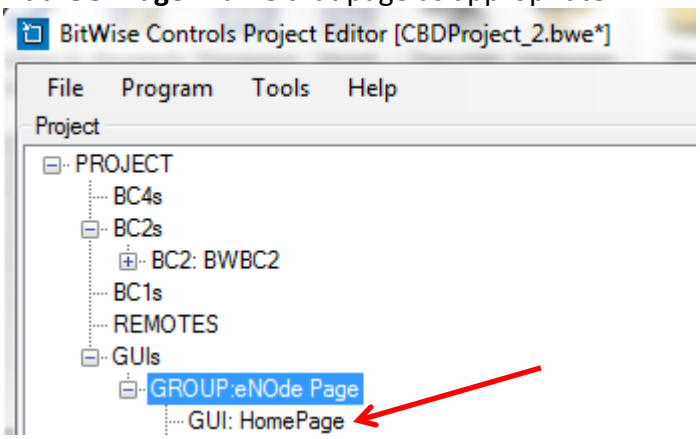
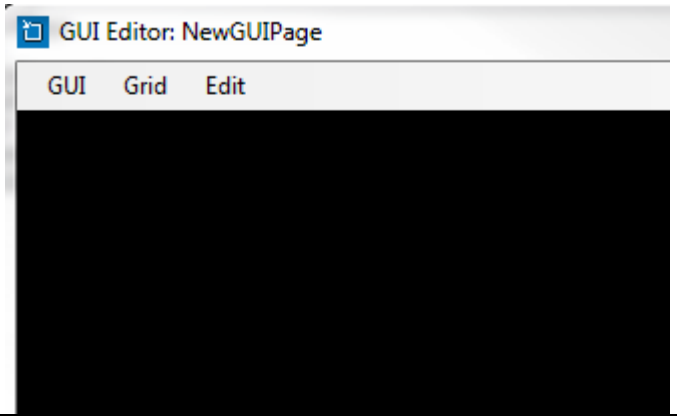
		Add GUI Page. Name that page as appropriate.  -Now we have a blank page to which we can start adding buttons and sliders 
3c	If you have downloaded a Bitwise **Module**, you can quickly set up device control from a set of pre-programmed GUI pages. To load these GUI pages follow these directions, otherwise proceed to **Step 3d**	The GUI content available as part of the Bitwise Module includes two different groups, Tablet and Phone. Within the **Module Browser**, expand the group that best fits your target page to reveal the **GUI Content**. Content can be added to pages while they are still closed, however, it's typically best to open the GUI page before adding content to see how it will fit on your page. Open the GUI page, then drag the desired GUI Content to the page. After the GUI data has been transferred you will be prompted for the Zone_Group_Node address for the device that the button or slider will be controlling. Enter this data in the format Z_G_N in the provided field.

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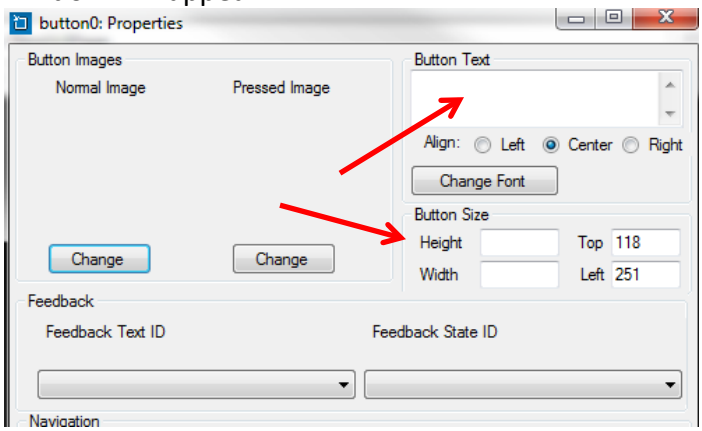
3d	Next, let us create a few buttons (or additional buttons) and a slider (or an additional slider) to start controlling your Converging Systems' LEDS. **Note**: If you are working from a BitWise Module, you may simply decide to copy and paste rather than creating new buttons as described in the text on the right for simplicity.	-Right click anywhere on the black screen, and select **Add/New** Button. The new button properties window will appear.  -Let's enter button image data, button text data and adjust the button size as appropriate before making our new masterpiece of a button operational. -First enter the image data for the button. There are two images for a button, one is the **Normal Image** and the other is **Pressed Image**. Select the Change button and navigate to the **Project Editor/Sample** directory to select a default button. -Next add appropriate button text for your button -Populate any other fields above the Feedback section and then proceed to the next section. **Note**: Those commands listed under **LED Control** are those which have been pre-programmed within the Bitwise Controls Driver. If one or more commands that you wish to support are not currently within the Bitwise Controls Driver, you may add those within Step 3i below.
3e	Now let us make our button do something on a Button Press (if they have not already been programmed to function	Here is the bottom portion of the Button Properties windows.

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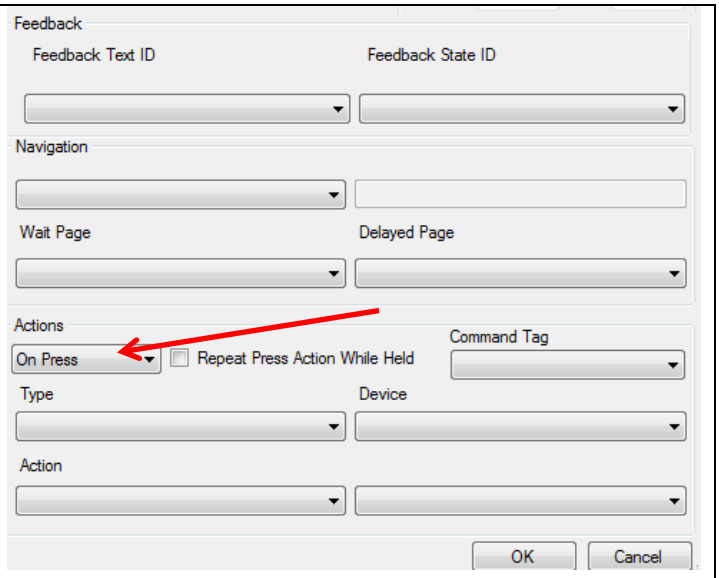
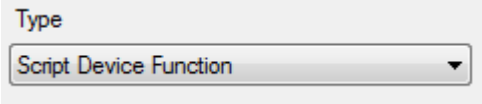
already as is the case with BitWise Modules).

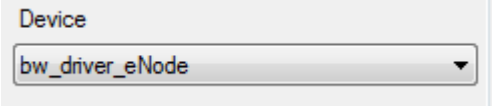


Let us first program the operation of the button **On Press**.

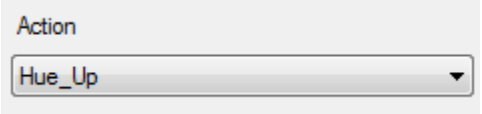
-First elect the **Type** bar and expand its menu choices. Select our **Script Device Function**.

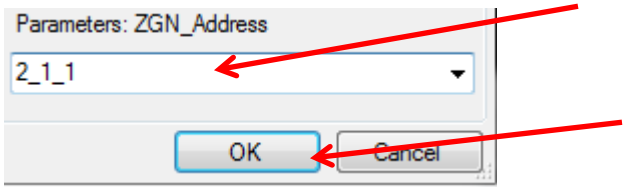
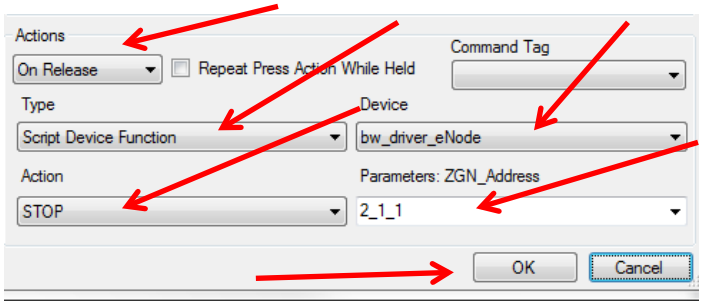
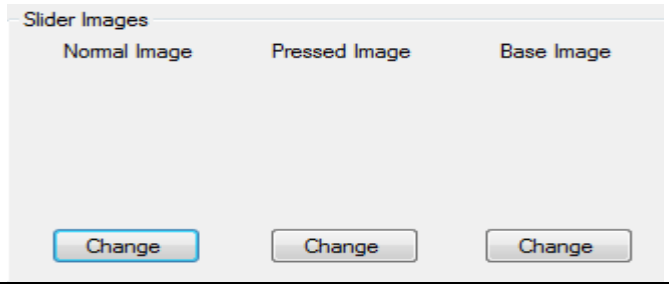


-Next select the **Device** Bar, and expand its menu choices. Select **bw_driver_Node**.



-Now, select the **Action** bar, and expand its menu choices to find the supported Converging Systems' device command for the desired operation for a button push. In this simple example, pick **Hue_Up, to initiate a color change operation for LEDs.**



		-Finally, and most importantly, you must input important Parameters in the bottom right box in order to direct the just programmed command to reach the proper ILC-100/ILC-400 load. In this example, enter the requested Parameter of ZGN_Address in the format of Z_G_N.  -Now to program any different action upon a **Button Release** proceed to the next step. Otherwise, if you do not want to program a separate Button Release step, select OK and proceed to **Step 3g** below.
3f	Next let us make our button do something on a Button Release (if they have not already been programmed to function already as is the case with BitWise Modules).	-Finally, to complete the programming for this button, select under Actions, **On Release. Now, repeat the steps above for Type/Device/Action to complete the programming**  -Select OK and proceed to the next step.
3g	The next level of sophistication is to create a slider. Sliders are very useful to adjust color (hue) as well as brightness and saturation (amount of color or white in a particular hue). Let us create a **Brightness** slider. After having created that Brightness slider, we can copy and paste to make a similar Hue and	-Right click anywhere on the black screen, and select **Add/New Slider**. The new button properties window will appear. 

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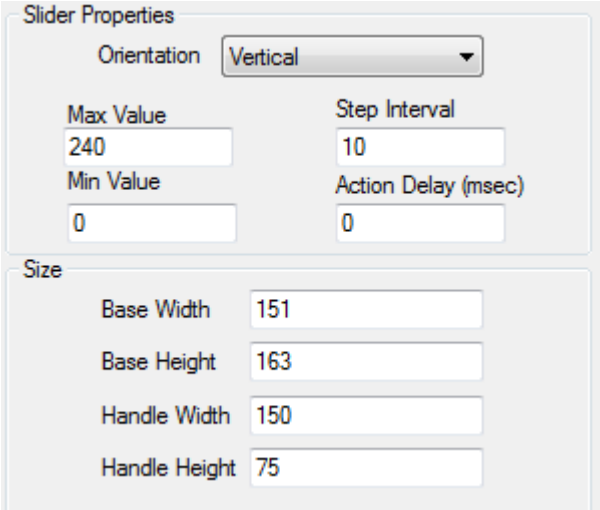
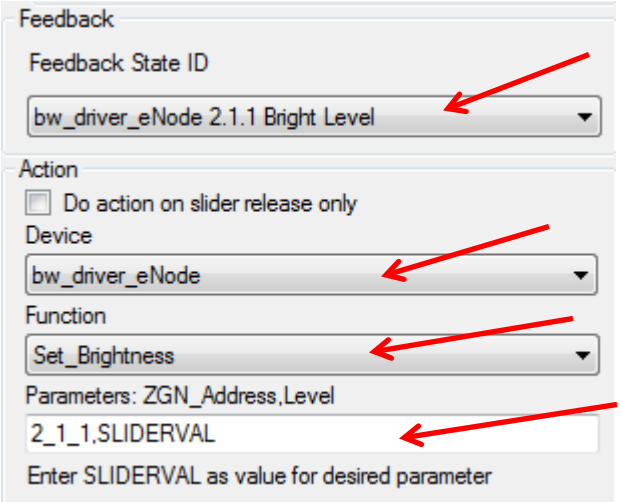
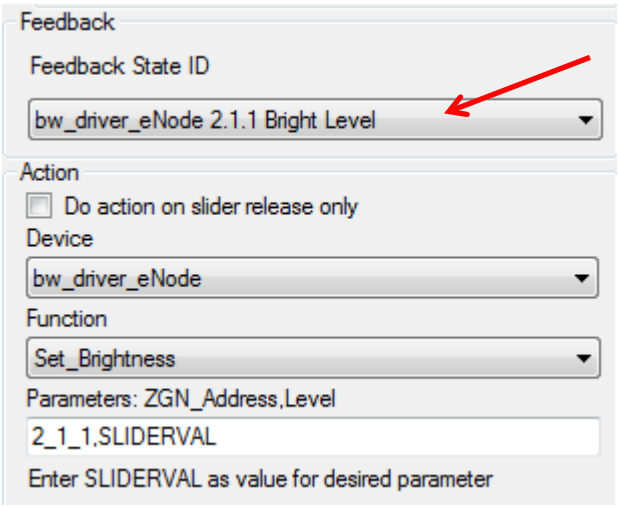
	Saturation slider. **Note**: If you are working from a BitWise **Module**, you may simply decide to copy and paste rather than creating new sliders as described in the text to the right for simplicity.	Again, as with the button creation process in **step 3d**, select an appropriate image for the **Normal Image**, the **Pressed Image** and the **Base Image**. -Next, customize your sliders as appropriate within the Slider Properties section.  -Finally, we will make the Slider operational and interactive. Proceed to the next step.
3h	We are now ready to make a **BRIGTHNESS** slider control an LED operation. **Note**: If you are working from a BitWise Module, this Slider already exists.	-Proceed to the Feedback section of the above **Slider Properties Window**.  -First let us connect this slider to a particular **Device**.

		Under **Device** select the **bw_driver_eNode**. -Select the **Function** that you wish it to control. In this case, it is **Set_Brightness** command. (Please see the beginning of the document for all supported commands. **Note**: If Converging Systems releases new firmware with new commands, you can either program that command yourself within the driver or consult with Bitwise Controls for more information. -Enter the requested Parameters. Hints are provided below the Parameter window for entering this information. -Finally, we are going to update this **Properties** window to enable the slider to actually respond to color state changes. This is particularly useful if you want to see on touch screen, or other feedback device the actual color that is selected and its color state. Proceed to the next step for more information.
3i	This step enables a slider to be interactive in nature an actually move without operator intervention when there is a color state change. **Note**: If you are working from a BitWise Module, this function has already been implemented for RGB color space, RGBW color space and HSL color space.	-Still within the **Feedback** section of the above **Slider Properties Window**, locate the **Feedback State ID** window. It is here that received back from the Converging Systems' controllers can be trapped and utilized to update the interactive sliders. 

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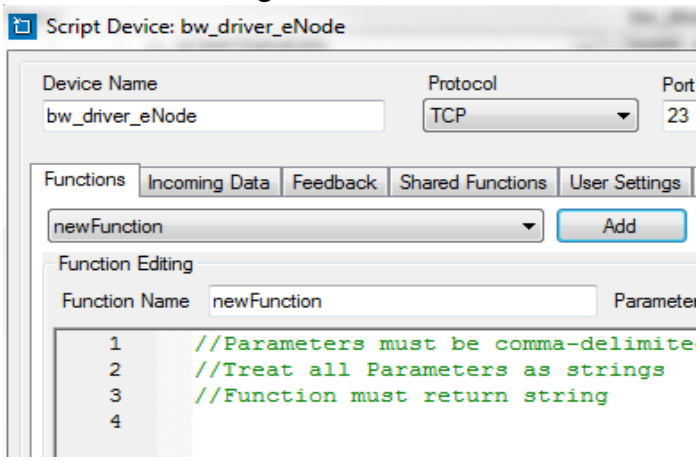
		-Since in this example, we are interested in having this slider respond to **Brightness** levels, select from the Feedback choices the Z.G.N Bright level for your particular controller load. In this case, the **Z.G.N**_Address is 2.1.1 so the command is as shown. Follow the hint provided below the input window for the necessary parameter to enter to populate variable data. (i.e. **SLIDERVAL** in this case).
3j	Continue this process until you have all your buttons and sliders programmed. Should you encounter a specific Converging Systems' command that is not supported by the Bitwise Controls Driver, download our *Third Party CS-Bus Device Driver Toolkit-Programmer's Guide* and program those commands directly using the **bw_driver_eNode/ Properties** window within Project Editor. **Note**: This toolkit can be downloaded from http://convergingsystems.com/inres_programmingdesignkit.htm	Under **SCRIPTDEVICES**, seelct the **bw_driver_eNode** and perform a right click to expose the **Properties** windows. Under the **Functions** tab, you can add a new command using the Add function.  Then enter your new command within programming block. When finished hit **OK**.

4. Upload System file (*.bwe) or Generate HTML file and Test

4a	Upload System file (*.bwe) to Touch Device.	-Make sure you are connected to your Bitwise Controls processor and upload your System file. Right click on the top level **Group Page** within your project and select **Upload Group to BitWise Touch App…** -Test your **GUI** by selecting buttons on your Touch device.
4b	Alternatively, you can auto-generate an HTML file from any GUI page and test sequences directly from the	Right click on a specific GUI page to be tested and select **Generate GUI Page as HTML**. Launch the file and test the operation of you GUI.

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	HTML page	**Note**: Obviously, you need to have your BitWise processor on-line for this testing.

Bitwise Controls Programming-User Interfaces

The individual installer typically designs the User Interface (UI) for the particular needs of the end-user. Converging Systems may add from time-to-time new UIs with advanced functionality. Sample UI screens are pictured below.

LED CONTROL ENVIRONMENTS

The following illustrations provide some sample UI for LED control interfaces. Those available as part of the BitWise Module are marked accordingly.

Figure 3 Standard UI

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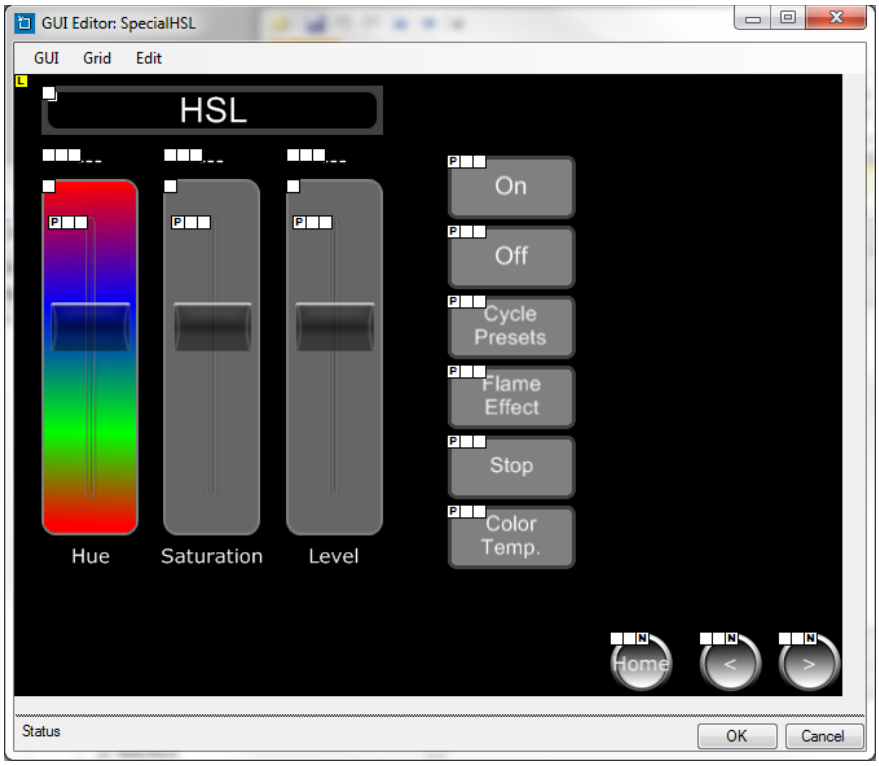

Figure 4 BitWise Module GUI

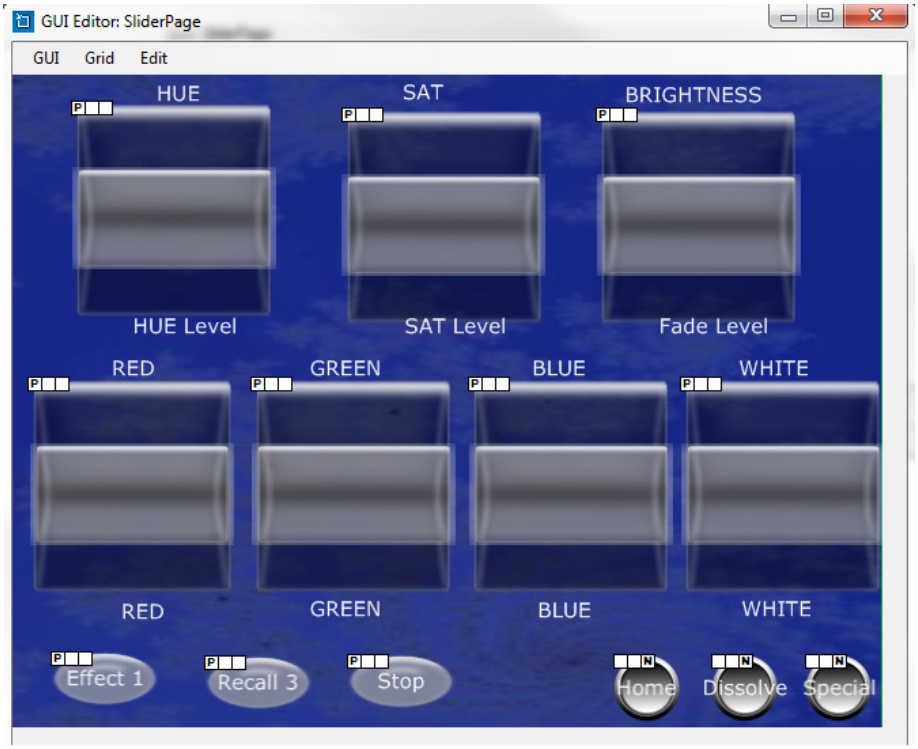

Figure 5 Standard Sliders (very very basic)

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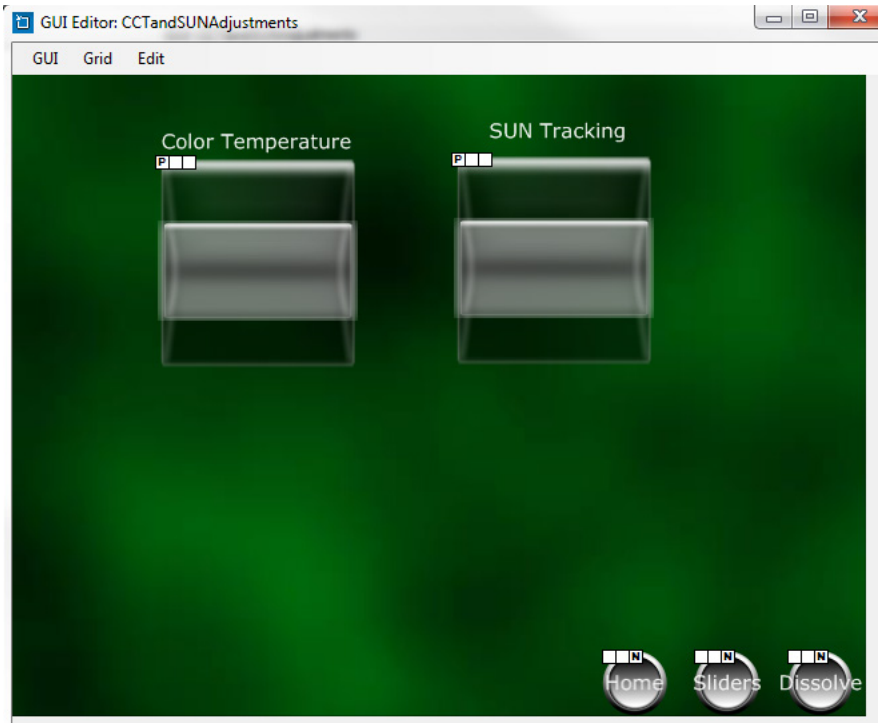

Figure 6 Standard Sliders

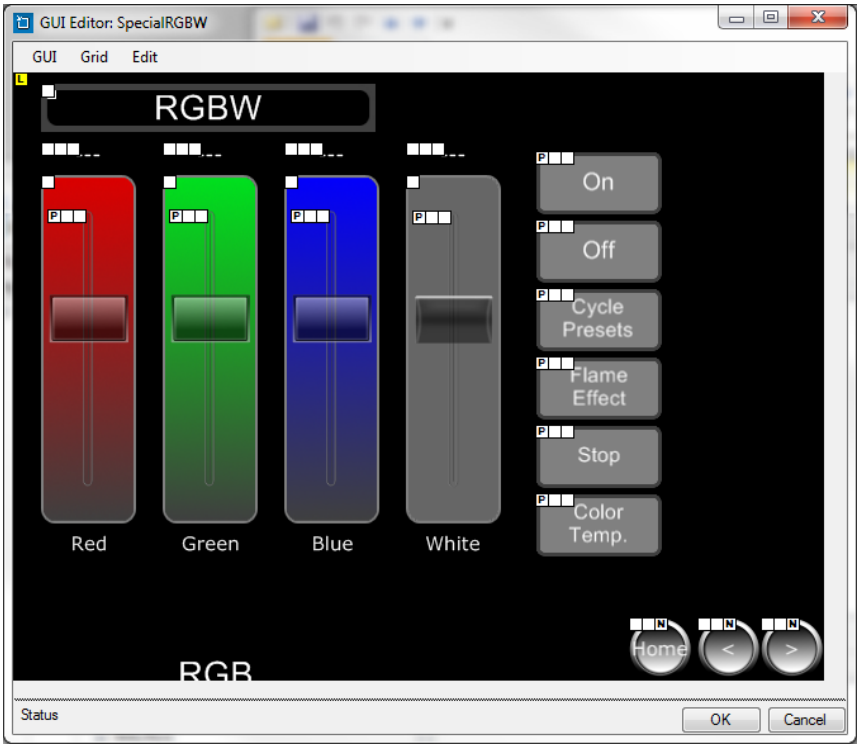

Figure 7 BitWise Module GUI

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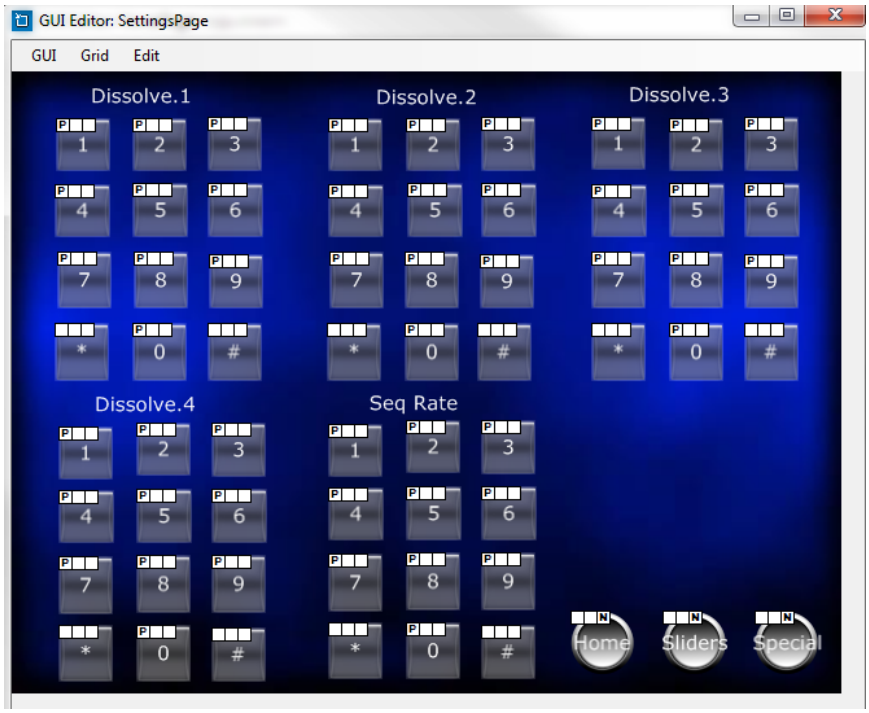

Figure 8

Figure 9 Standard GUI

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Appendix 1

Common Mistakes

1. Forgetting to set the addresses for controllers (motor or lighting) from within Project Editor.

2. (FUTURE). Forgetting to make sure that the alias name for the e-Node is E-NODE and the password for e-NODE is ADMIN. These are set within the Bitwise Controls driver. If you want to change those alias names and passwords for the e-NODE make sure you change them within the Bitwise Controls Project Editor.

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APPENDIX 2

(reserved)

Appendix 3

ADVANCED Bitwise Controls PROGRAMMING

Note on Color Space. Converging Systems recommends that only the HSB (Hue, Saturation and Brightness color space is used for it is infinitely more accurately and user friendly to control color. Although **Figure 4** below shows both HSB and RGB on the same UI, this is probably more confusing for the typical user than the simple subset of HSB (hue, saturation, brightness) controls**. Since there is no concept of dimming within the RGB color space, having RGB sliders only frustrates the user who may just want to dim an existing colored output. However, if the User is intent on having RGB sliders, we would recommend leaving the Brightness slider to get accurate dimming.**

Figure 10

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Appendix 4

(reserved)

Appendix 5

DMX Options

Note on DMX Lighting Devices. There are many third-party lighting devices available in the marketplace that support the DMX512 lighting standard ("standard for digital communication). DMX devices were originally utilized for theatrical interior and architectural lighting application only, but recently their adoption rate has grown in other areas where colored lighting is desired. DMX 3-color lighting fixtures utilize the Red, Green, Blue (RGB) color space which although practical for theatrical uses and the trained lighting designer is quite limited for traditional dimming application ***for the technology inherently lacks the most basic dimming slider*** which would preserve a specific hue while lowering the brightness to full off. But that has all changed now...

Converging Systems' e-Node/dmx. Converging Systems has developed an adaptation of its lighting/dimming technology currently available within its ILC-x00 line of LED controllers and has re-purposed that technology into a separate product known as the e-Node/dmx. The existing Bitwise drivers and Modules compatible with the ILC-x00 LED controllers can also drive directly the e-Node/dmx (color engine/dmx translator), and the e-Node/dmx makes the necessary color adjustments within its own processor to translate incoming commands to outgoing DMX commands **and transmits those directly onto *a DMX bus***. What is unique about this implementation is that the Converging Systems' hue-accurate dimming technology (with a built-in dimmer slider) can now drive DMX fixtures by using Bitwise device drivers and Modules already in existence for other Converging Systems' products. (See the listing of commands that are supported with the e-Node/dmx device which are listed in the front of this Integration Note.)

Please follow the directions which follow to drive DMX fixtures from a Bitwise System

<u>e-Node Programming/Device Programming</u>

Minimum requirements for this operation

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-e-Node/dmx with power supply
-Necessary cabling to connect e-Node/dmx to first DMX fixture (see “e-Node Interfacing with DMX Guide”). For reference the pin-outs on the e-Node/dmx are as follows:

Pin	Signal
1	Not Used
2	DMX Ground
3	RS485 -
4	RS485 +
5	Not Used
5	Not Used

Note: Even though Converging Systems recommends that RJ-25 6P6C plugs should be used for most CS-Bus wiring, the DMX wiring can utilize a 4P4C RJ11 plug.

e-Node/dmx Programming

Step	Setting	Choices
DMX-1	e-Node/dmx setup	Follow the directions under e-node Programming at the beginning of this Integration Note **Step EN-1** and **EN-2**.

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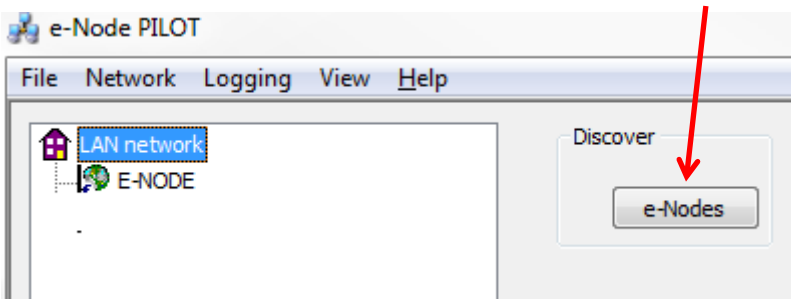
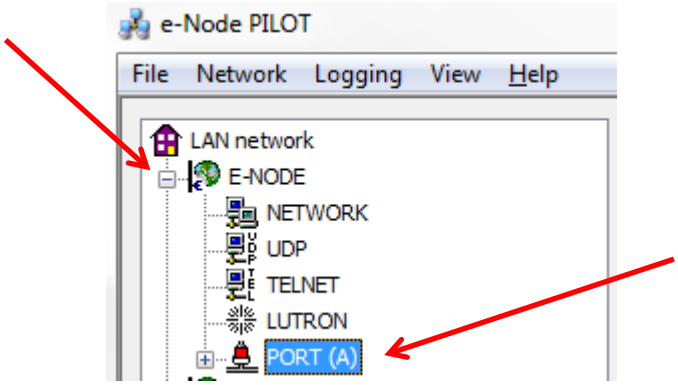
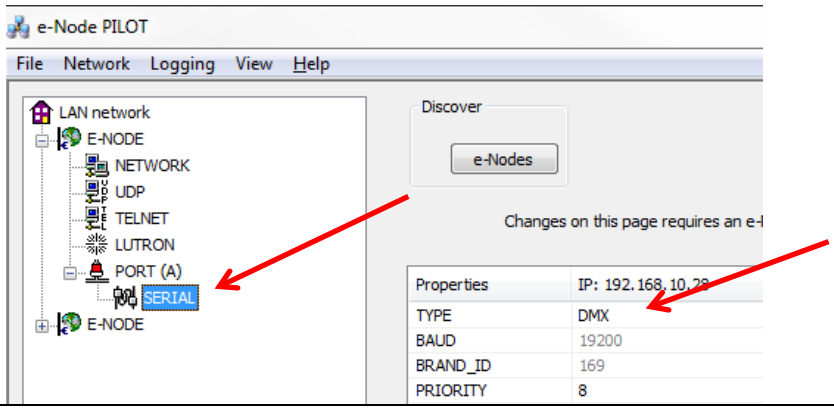
DMX-2	Verify the e-Node DMX is set to communicate to DMX fixtures	-Select the **View e-Node** tab and select the Discover **e-Node** button**.** Any e-Node(s) connected on the same network will appear as shown.  -Select the + mark in front of the **e-Node/dmx** that you wish to program to expose the sub-tabs.  -Expand the **PORT(A)** tab and then expand the **Serial** tab. 

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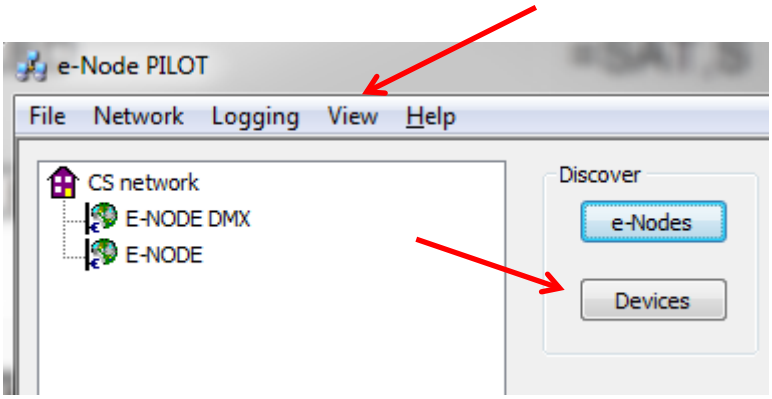
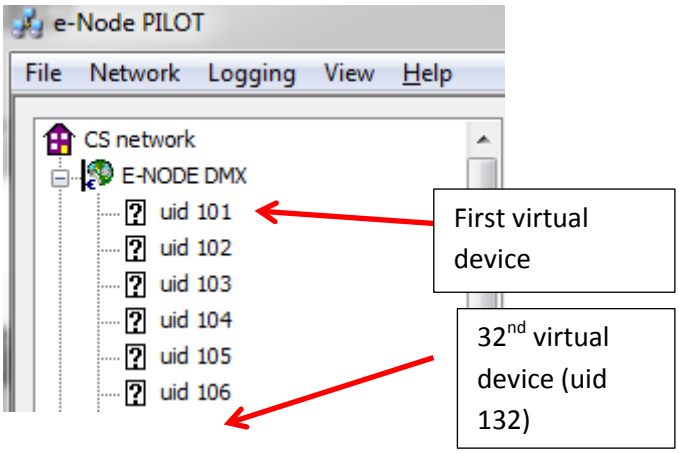
		-Verify that after the **TYPE** entry, the data field indicates **DMX**. If it does not indicate **DMX**, select **DMX** from the pull down menu and reboot the e-Node/dmx in order to make this setting active. **Note**: the e-Node/dmx can also be configured to communicate with standard CS-Bus devices (ILC-100, ILC-400) and therefore only when this entry is set to DMX, will the e-Node/dmx properly communicate to DMX fixtures.
DMX-3	Device Discovery	-Select the **View Map** tab and select the Discover **e-Node** button**.** Any e-Node(s) connected on the same network will appear as shown. -Select the Discover **Devices** button.  -Immediately 32 virtual "DMX Devices" will appear as follows:  **Note**: this picture shows the first 6 devices discovered. In a real example, all 32 virtual devices will appear.

DMX-4	Set up Device Addressing	The DMX data packet is mapped to CS messages by assigning a unique Zone. Group. Node number to three successive DMX channels. These are mapped as shown in the following table:

Fixture	DMX Channel Allocation	CS-Zone.Group. Node
1	1-3	2.1.1
2	4-6	2.2.1
3	7-9	2.3.1
4	10-12	2.4.1
5	13-15	2.5.1
6	16-18	2.6.1
7	19-21	2.7.1
8	22-24	2.8.1
9	25-37	3.1.1
10	28-30	3.2.1
11	31-33	3.3.1
12	34-36	3.4.1
13	37-39	3.5.1
14	40-42	3.6.1
15	43-45	3.7.1
16	46-48	3.8.1
17	49-51	4.1.1
18	52-54	4.2.1
19	55-57	4.3.1
20	58-60	4.4.1
21	61-63	4.5.1
22	64-66	4.6.1
23	67-69	4.7.1
24	70-72	4.8.1
25	73-75	5.1.1
26	76-78	5.2.1
27	79-81	5.3.1
28	82-84	5.4.1
29	85-87	5.5.1
30	88-90	5.6.1
31	91-93	5.7.1
32	94-96	5.8.1

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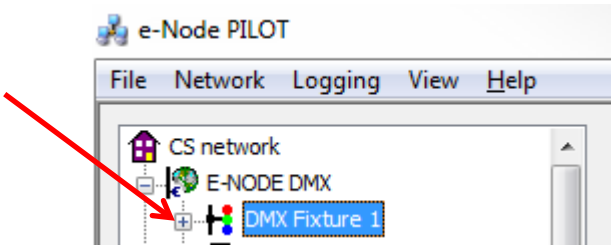
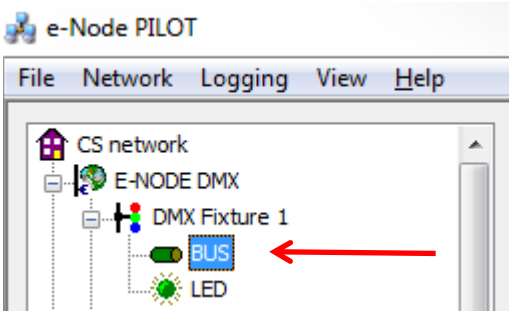
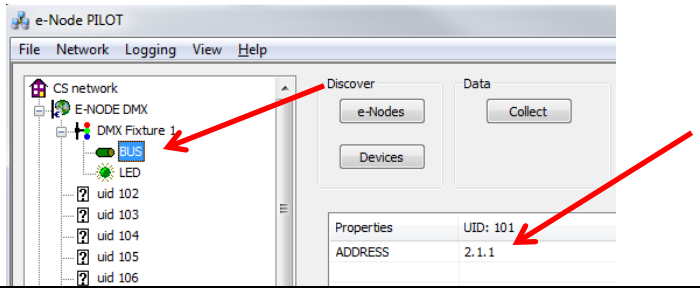
		-To see these entries, click on the **?** in front of any particular **uid** listing which will expand its directory.  -After the directory is expanded, you will see these entries:  -If you desire to change any Zone/Group/Node address, click on the **BUS** entry, and change the address as appropriate. 
DMX-4	Proceed through standard Bitwise Programming.	In this case, you will not be programming ILC-100 or ILC-400 devices, so you can skip the ILC-100/400 section (**Steps DV-1 and DV-2**). -Proceed to standard Bitwise Programming (**Steps 1** onwards above in the main body of this Integration Note). Note: the e-Node/dmx takes care of everything else!!!

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