AMX Netlinx Interface Guide

Control of Converging Systems e-Node and CS-BUS compatible LED and/or Motor controllers through Ethernet (IP)

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Integration Note

Manufacturer:	**Converging Systems, Inc.**
Model Number(s):	**CS-Bus Motor and Lighting Controllers**
Netlinx Code Base	V3.60.453 and later (for NI2100 or similar)
Driver Developer:	Converging Systems Inc. (AMX Developer Partner)
Document Revision Date:	03/29/2018

Integration Note Table of Contents

Please the following table of contents to help you navigate through this Integration Note.

OVERVIEW AND SUPPORTED FEATURES

The Converging Systems' communication devices (e-Node for IP and IBT-100 for serial) are designed to act as the communication intermediary between an AMX system and Converging Systems' lighting or motor controllers.

The Converging Systems ILC-x00 family of **LED** lighting controllers are networkable devices which can provide support for Converging Systems' Flexible Linear Lighting Arrays (FLEX) RGB, RGBW, and monochrome LED devices.

The Converging Systems IMC-x00 family of **MOTOR** controllers are networkable devices which can provide for third-party motor platforms.

The AMX system is capable of interfacing with MOTOR and LED platforms currently through the e-NODE (IP) communication device. A dealer may decide to alter the existing AMX/CSI communication modules to support legacy RS-2323c communication., The CSI communication modules support normal device commands and in addition supports innovative bi-directional communication feedback for LEDs (color status in RGB, RGBW, or HSB color space) as well as feedback for MOTORs (motor position).

THE FOLLOWING LIGHTIING OPTIONS ARE SUPPORTED BY THE CONVERGING SYSTEMS CS-BUS DRIVER:

- Discrete control of LED states (ON/OFF) including feedback of ON/OFF
- Bi-directional control of Correlated Color Temperature (CCT) (or sometimes referred to as "Dynamic White") settings with RGB, and RGBW devices using Converging Systems FLLA LED elements. Specific CCT settings can be selected as well as CCT UP/DOWN controls for CCT adjustments
- Bi-directional control of Circadian Rhythm (Sunrise to midday sun to Sunset dynamic settings) using Converging Systems RGBW FLLA devices.
- Support of communication utilizing Telnet with or without authentication (Port 23)
- Two-way control of color settings in the RGB, RGBW, or HSB color space.
- Ability to store and recall specific colors set by a user within ILC-x00 controllers.
- Ability to recall specific Effects stored within specific ILC-x00 controllers.
- Ability to change Dissolve Rates (time it takes to transitions from one state to another) (i) for On and Off states, (ii) for Presets to other Presets (color) settings, and (ii) for state to state transitions within Effects. (Schema 11 and later) (WIP)
- Ability to change Sequence Rates (time after any dissolve that a Preset color is maintained before transitioning to the next color in sequence) in Effects 1 and 4. (WIP)
- Ability to store a Color Temperate or a Circadian Sun level setting within a Customizable Scene
- Control via all thin client interfaces (AMX Touchscreen, keypads)

THE FOLLOWING LIGHTING OPTIONS are not supported by CS-Bus driver**:**

- Circadian Tuning settings on third-party DMX fixtures
- Exact color temperature output on third-party DMX fixtures (although a close approximation might be possible

THE FOLLOWING MOTOR OPTIONS ARE SUPPORTED BY THE CONVERGING SYSTEMS CS-BUS DRIVER:

- Motor UP/Down/Stop
- Motor Position Feedback (for CS-BUS motor controllers that provide this level of functionality).
- Store and Recall of presets (for CS-BUS motor controllers that provide this level of functionality)
- Support of communication utilizing Telnet with or without authentication (Port 23)

THE FOLLOWING MOTOR OPTIONS are not supported by CS-Bus driver:

- None at this time

Tabular Summary of Supported 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

Table 1

General CS-Bus Commands	AMX Levels (LV) and Channel (CH) Numbering Convention[1]	ILC-100c	ILC-400	ILC-100m & ILC-400 in mono mode	e-Node DMX
General LED Control Commands					
ON	CH-x32	✓	✓	✓	✓
OFF	CH-x31	✓	✓	✓	✓
EFFECT,n	CH x36/x37/x38/x39	✓	✓		✓
STORE,#	CH x01~x24	✓	✓	✓	✓
RECALL,#	CH x01~x24	✓	✓	✓	✓
DISSOLVE.1=XX	WIP	**	**	**	**
DISSOLVE.2=XX	WIP	**	**		**
DISSOLVE.3=XX	WIP	**	**		**
DISSOLVE.5=XX	WIP	**	**		**
SEQRATE=XX	WIP	✓	✓		✓
SUN_UP	LV x39	✓	✓		✓
SUN_DOWN	LV x39	✓	✓		✓
SUN.S	LV x 39	✓	✓		✓
HSB (HSL) Color Space Commands					
FADE_UP	LV x33	✓	✓	✓	✓
FADE_DOWN	LV x33	✓	✓	✓	✓
SET,L	LV x33	✓	✓	✓	✓
HUE_UP	LV x31	✓	✓		✓
HUE_DOWN	LV x31	✓	✓		✓
HUE,H	LV x31	✓	✓		✓

SAT_UP	LV x32	✓	✓		✓
SAT_DOWN	LV x32	✓	✓		✓
SAT_S	LV x32	✓	✓		✓
STOP	LV x32	✓	✓		✓
COLOR=H.S.L	WIP	✓	✓		N/A
PRESETH.X=XXX.XXX.XXX	Set LED Presets/HLS Color spacer for preset x	✓	✓		✓
RGB Color Space Commands					
RED,R	LV x34	✓	✓		✓
GREEN,G	LV x35	✓	✓		✓
BLUE,B	LV x36	✓	✓		✓
VALUE=R.G.B	???				
WHITE,W	LV x37	✓	✓	✓	✓
RGB,R.G.B	WIP	✓	✓		✓
RGBW,R.G.B	WIP		✓		
PRESET.X=XXX.XXX.XXX (3-color)	Set LED Presets/RGB Color spacer for preset x				
PRESET.X=XXX.XXX.XXX (4-color)					
STOP	CH x34	✓	✓		✓
Correlated Color Temperature (CCT) Commands					
CCT,XXXX	LV x39	✓	✓		✓
CCT_UP	LV x39	✓	✓		✓
CCT_DOWN	LV x39	✓	✓		✓
Bi-Directional Commands					
COLOR=?	Automatic polling within Driver. **Note**: Driver achieves same function with Notify ON	✓	✓	✓	✓
VALUE=?	Automatic polling within Driver **Note**: Driver achieves same function with Notify ON	✓	✓	✓	✓
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:

- Reserved.

** Possible with enhancements to Module

Reserved

Motor Commands

Table 2

General Commands	AMX Levels (LV) and Channel (CH) Numbering Convention[1]	IMC-100 (with e-Node)	BRIC ("Bric Mode") (with e-Node	BRIC II ("IMC-300MKII)
General Motor Control Commands				
GOTO	LV x01		✓ *	✓
UP	Ch x31	✓	✓	✓
DOWN	Ch x32	✓	✓	✓
STOP	Ch x33	✓	✓	✓
MOTOR RIGHT	Ch x34		✓	✓
MOTOR LEFT	Ch x35		✓	✓
RETRACT	Ch x36	✓	✓	✓
TOGGLE	CH x39		✓	✓
STORE,#	Ch x01~24	✓	✓	✓
RECALL,#	Ch x01~24	✓	✓	✓
~~PRESET.X=XX.XX~~				
Bi-Directional Commands				
~~STATUS=?~~				
POSITION=?	Automatic			✓
Accessory Enode Command/Setup Parameters				
Verbose Mode		✓	x	✓
UDP Port 4000/5000		✓	✓	✓
Telnet Login with Authentication (with e-Node		✓	✓	✓
t Login w/o entication		✓	✓	✓

Notes:

- No feedback

INTEGRATION REQUIREMENTS-CONVERGING SYSTEMS CONFIGURATION

NOTE: Converging Systems LED and Motor Controllers REQUIRE a communication device (either an e-Node for Ethernet connectivity or the IBT-100 for serial connectivity). It is not possible to connect CSI LED or Motor controllers to an AMX controller in any other way.

The system will need to be installed and configured according to the Converging Systems documentation, prior to integration with the AMX system. The Converging Systems e-Node Pilot application (required for setup) is available for download for free from the Converging Systems website (http://www.convergingsystems.com/downloads_library.php

IP configuration using the e-Node is possible using both dynamic and static addressing.

NOTE: It is recommended that the Converging Systems controllers as well as the e-Node Ethernet gateway are running the latest version of firmware available at the time of installation

WIRING DIAGRAM (for IP connection)

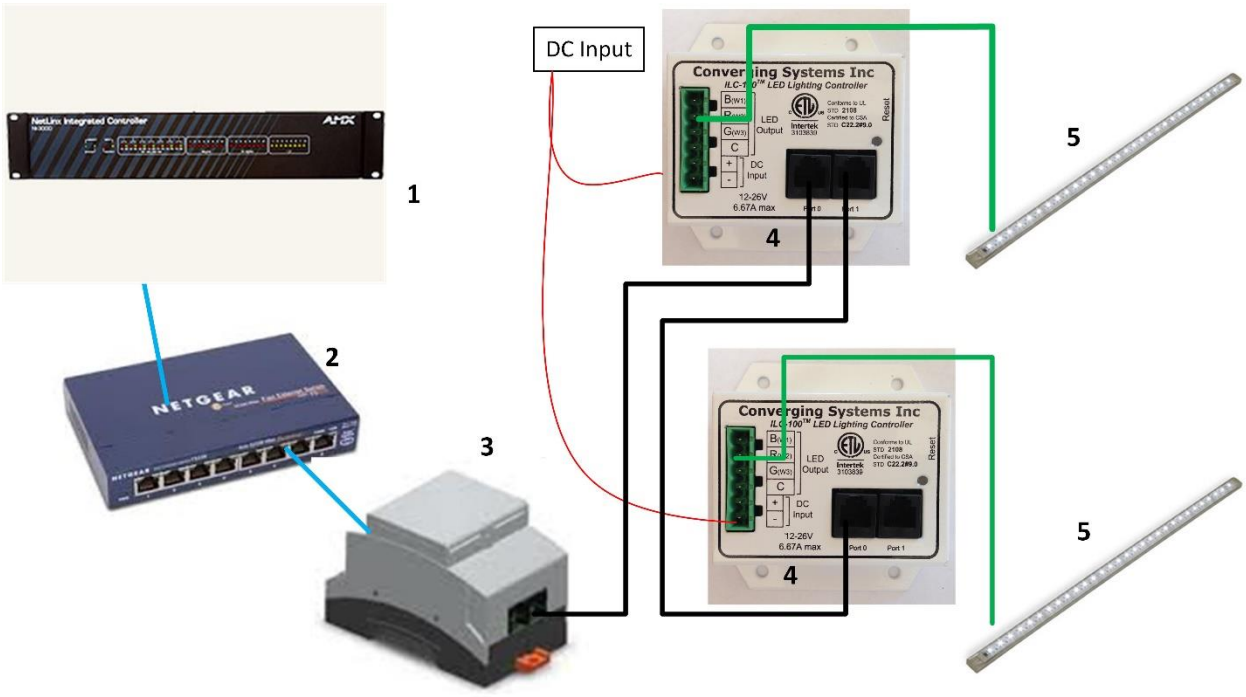


Figure 1

Wiring/Configuration Notes:

1. Maximum length of CS-Bus cabling from e-Node to the last ILC-100/ILC-400 or IMC-x00 controller 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 an AMX system = 254

BILL OF MATERIALS (for IP control)

Table 3

#	Device	Manufacturer	Part Number	Protocol	Connector Type	Notes
1	AMX Netlinx Processor	AMX	Various	Ethernet/Serial/IR	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-x00 or IMC-x00 or (Stewart BRIC)	CS-Bus protocol	RJ-25 for CS-Bus communication	Must terminate beginning and end of bus with 120 ohm 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)

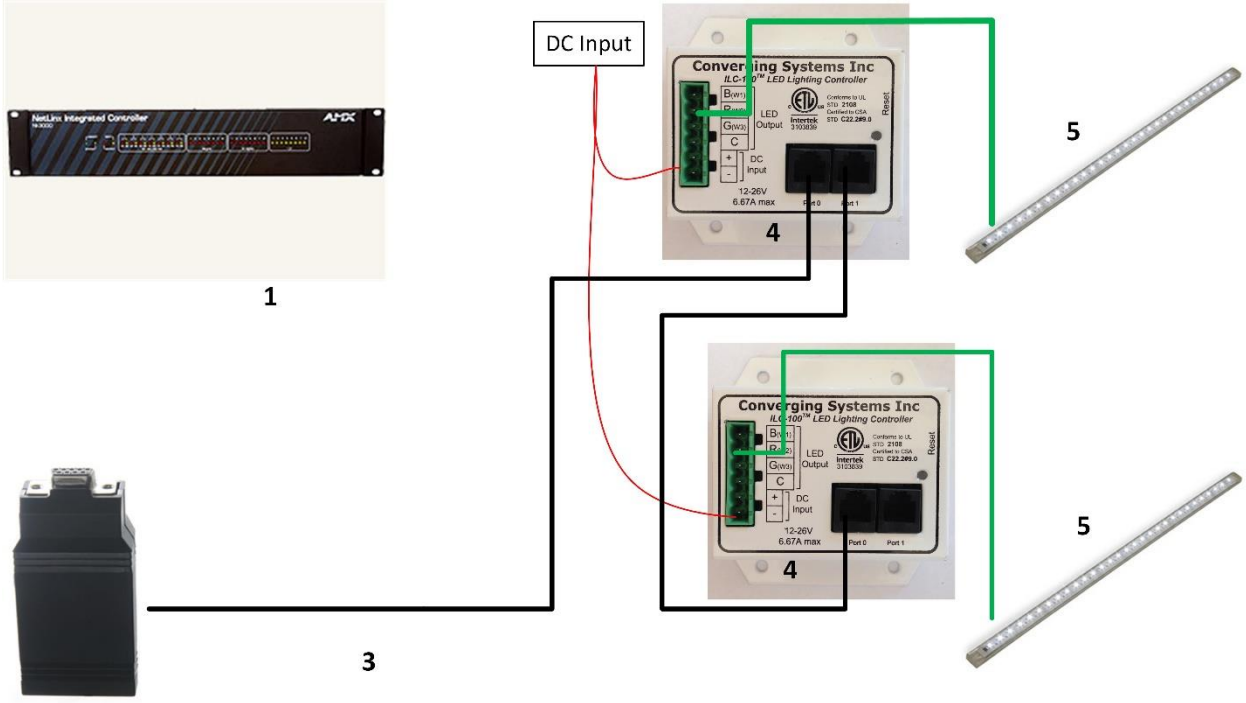


Figure 2

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 an AMX system = 254

BILL OF MATERIALS (for RS-232c connection)

Table 4

#	Device	Manufacturer	Part Number	Protocol	Connector Type	Notes
1	AMX Netlinx Processor	AMX	Various	Ethernet/Serial/IR	various	
2						
3	IBT-100	Converging Systems	IBT-100	RS-232c	DB-9 (for Serial) RJ-25 for local bus	

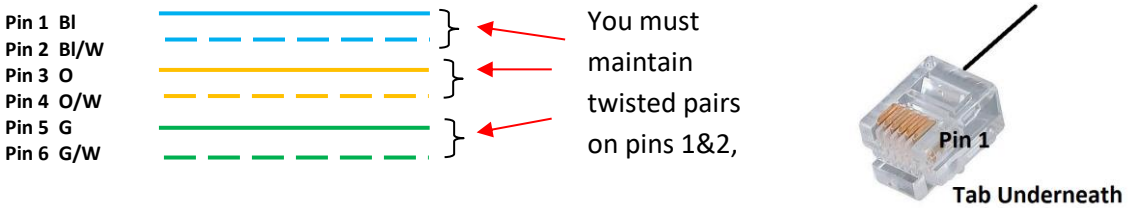
4	Lighting Controller (or Motor Controller)	Converging Systems	ILC-100 or IMC-100 or (Stewart BRIC)	CS-Bus protocol	RJ-25 for CS-Bus communication	Must terminate beginning and end of bus with 120 ohm terminating resister on pins 3/4
5	Flexible Linear Lighting (FLLA) RGB or RGBW luminaries	Converging Systems	FLLA-RGB-xxx FLLA-RGBW-xxx		3-color 4 pin 4-color 5 pin 1-color 4 pin	

COMPONENT HARDWARE SETUP

1. Connect each LED lighting controller (and/or Motor controller) sequentially using Port **1** of the previous device to Port **0** of the next sequential device. Use **CS-BUS Color Standard** for your wiring.

> **NOTE**: The CS-BUS uses standard RJ-25 (RJ-11 6P6C) connectors available at Home Depot, and all electrical distributors). The mandatory pinout is 1-1, 2-2, 3-3, 4-4, 5-5, and 6-6 with twisted pairs on 1&2, 3&4 and 5&6). **You cannot use standard flat telephony cable for telephony cable does not use twisted pairs and the wiring topology is swapped (1-6, 2-5, 3-4, etc.). Failure to follow the CS-BUS wiring standard will void your warranty**. If you return a unit to Converging Systems with its communication chip destroyed this is a telltale sign that you used Telephone cabling. REPEAT--DO NOTUSE TELEPHONY CABLE. Also, do not attempt to use standard Ethernet cabling (568B or 568A) and simply chop off the browns for this will leave the twisted pairs inconsistent with our CS-BUS Wiring Standard (the middle two lines will not be a twisted pair and data integrity will be lost). If you do not have 6P6C RJ11RJ-25 modular connectors and wish to proceed, refer to Appendix A for a workaround.

CS-BUS WIRING STANDARD (using RJ-25/RJ-11 6P6C)



2. Connect an available CS-BUS port on the first or last LED Lighting or Mo available CS-BUS port on the e-Node or the single CS-BUS port on the IBT-100. Power on all units.

Note: The CS-BUS by design is a modified IEEE-485 bus which requires termination on the beginning and the end of the CS-Bus. Please be advised that in most cases, termination is not required but if you do experience communication issues, it would be wise to turn on termination (in software using the Pilot software) on the first unit of the chain. If the e-Node or the IBT-100 is used as the last item in the chain, those units have built-in termination. It is important, however, not to turn on any other termination features on any other unit.

COMPONENT SOFTWARE SETUP (using e-Node and e-Node Pilot app):

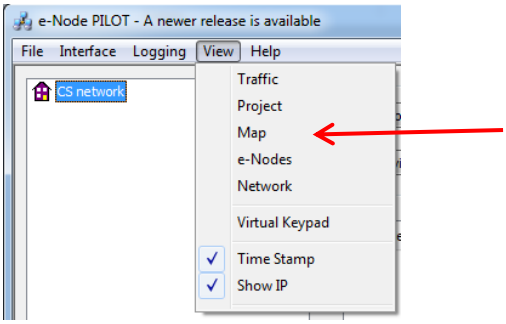
NOTE: Converging Systems LED and Motor Controllers REQUIRE a preliminary amount of initial setup/commission which requires the e-Node Ethernet adapter. This is required to set **Z**one/**G**roup/**N**ode addressing as well as to turn specific types of bi-directional communication necessary to have AMX dimmer sliders react to color state changes. This section is an abridged version of necessary steps which need to be followed. For more information, consult Appendix A and more detailed documentation available on the Converging Systems' website including

-e-Node Commissioning Guide (long version)
-ILC-x00 Intelligent Lighting Controller
-IMC-x00 Motor Controller Manual

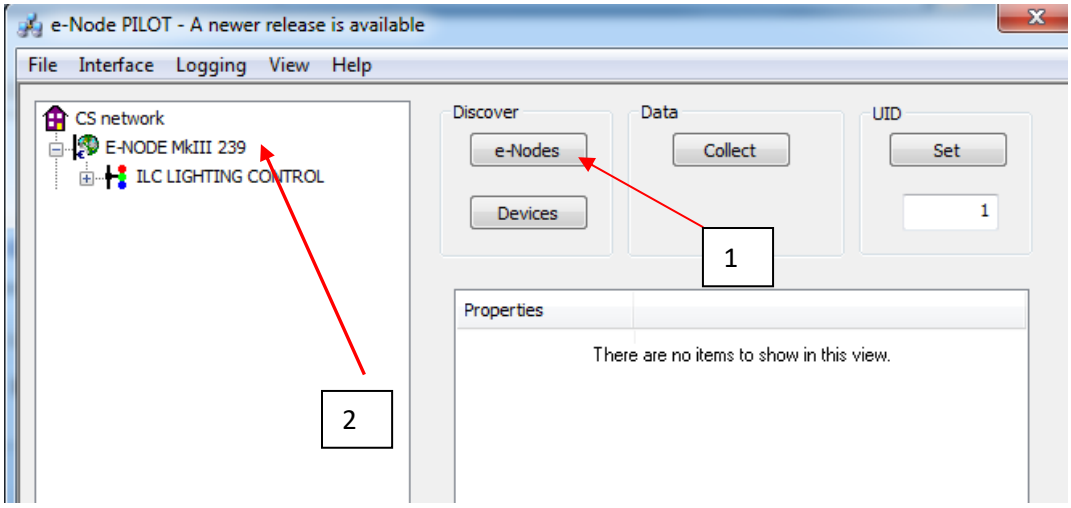
1. Launch the (PC compatible) e-Node Pilot application available from the Converging Systems website .

   Note: It is highly advised to make a ***hardwired*** Ethernet connection from the e-Node to your network switch and another ***hardwired*** Ethernet connection from your switch to your computer running the Pilot application. Data may be lost or corrupted otherwise.

2. Select the **View/Map** window.

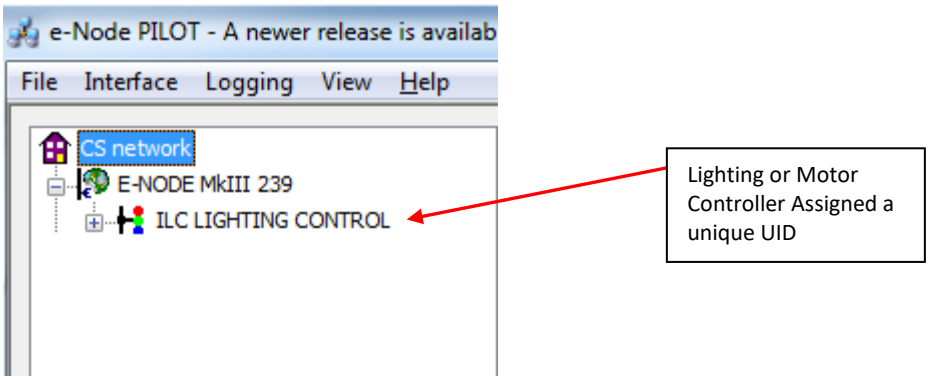


Then select the Discover e-Node button and any e-Nodes that have been powered-up and which exist on the same subnet as your computer will be populated on the left window.



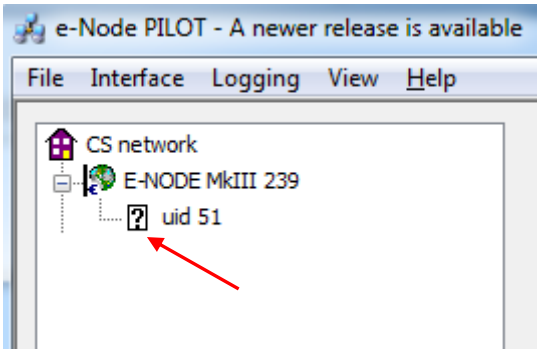
3. Next, assign an unused **UID** (unique ID) to each LED and Motor controller to be addressed. Generally, start with the UID value of "1" and work up sequentially. To do so, enter the first unused UID address into the UID window and select

Then press for ½ second the discovery/reset button on your ILC-x000 LED controller or your IMC-x000 motor controller using a paperclip or similar item (the on-board PCB LED will blink off for a moment then re-light which indicates this operation was successful). As soon as you do this, the discovered LED lighting controller or motor controller will appear on the left window.

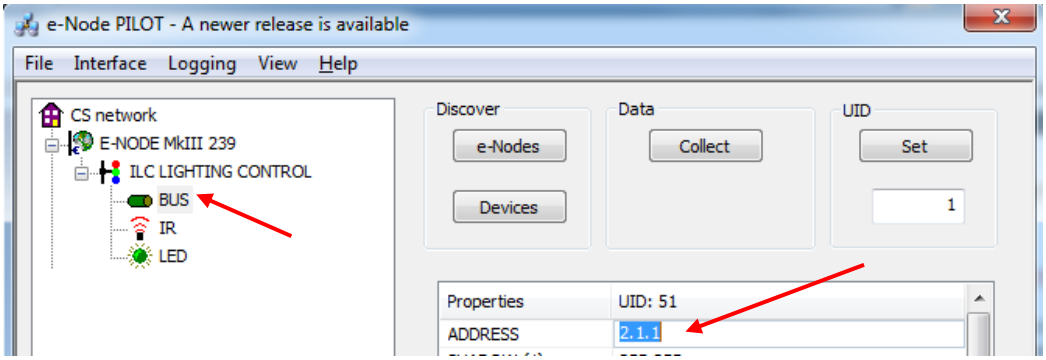


NOTE: If you by chance enter duplicate UIDs for two controllers, the system will fail to work. In this case since you may not know which unit was the original and which was the duplicate, you must **reset both units** according to documentation found for the respective controller on the Converging Systems website and then assign unique UIDs to each one again (i.e. "Unique" IDs).

4. Enter a discrete **Z**one/**G**roup/**N**ode address for each Lighting or Motor Controller identified within step #4 above. To do so, click on the "**?**" mark and/or the "**+**" mark in front of the targeted controller to expand its data fields. For more information on Zone/Group/Node address, review the detailed explanation of Zone/Group/Node addressing within the Background on Addressing section of this document.

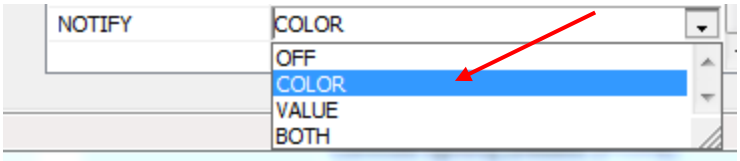


After the selected motor or lighting controller is expanded, a number of data fields with icons will appear. Select the **BUS** tab, to expose the BUS properties windows.

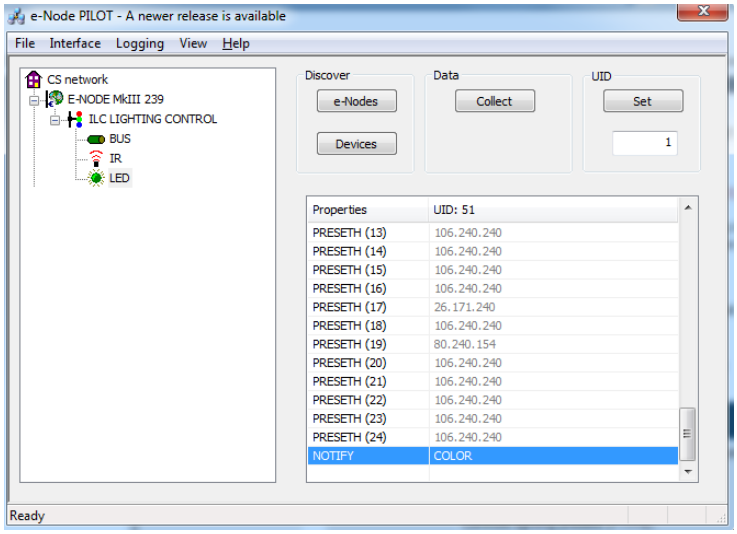


Enter the Zone/Group/Node address separated by **PERIODs** and hit **ENTER**. When the field turns BLUE you know the data has been successfully entered.

6. In order to invoke bi-directional communication for the ability for AMX's dimmer sliders to automatically respond to changes in color states (a really cool feature), set the **NOTIFY** Flag to either **COLOR** (for the HSV or Hue, Saturation, Value color space) or to **VALUE** (for the old school Red, Green, Blue color space—***old school because there is no dimmer in this color space***). If you want to have both sets of sliders (not really recommended in larger systems where bus traffic may become excessive), set the flag to **BOTH**.



Here is an example of NOTIFY set to COLOR in enable Hue/Saturation/Brightness sliders to operate.



The system will need to be installed and configured according to the Converging Systems documentation, prior to integration with the AMX system. The Converging Systems e-Node Pilot application (required for setup) is available for download for free from the Converging Systems website

(http://www.convergingsystems.com/downloads_library.php). IP configuration using the e-Node is possible using both dynamic and static addressing.

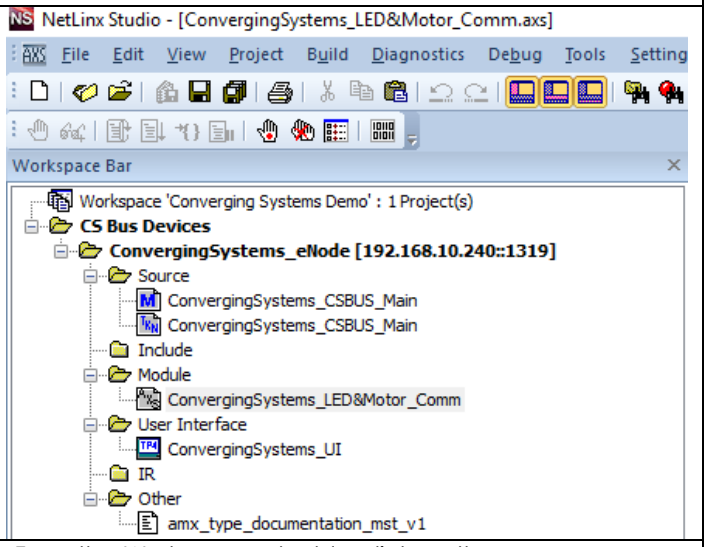
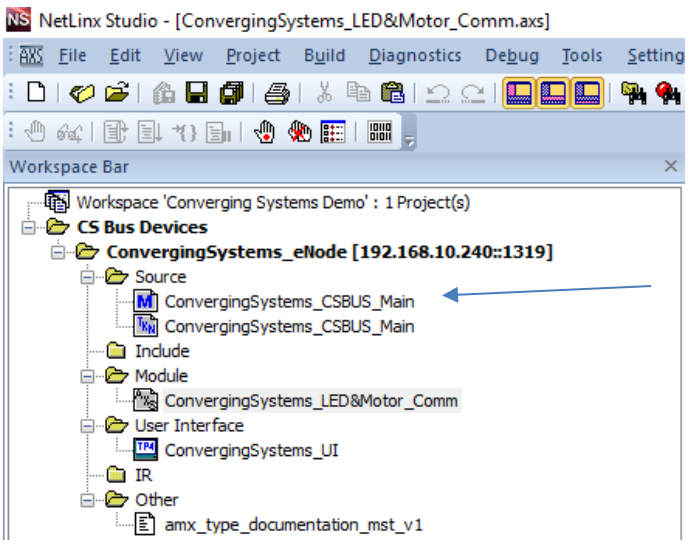
NOTE: It is recommended that the Converging Systems LED controllers (ILC-x00 controllers as well as the e-Node Ethernet gateway) are running the latest version of firmware available at the time of installation.

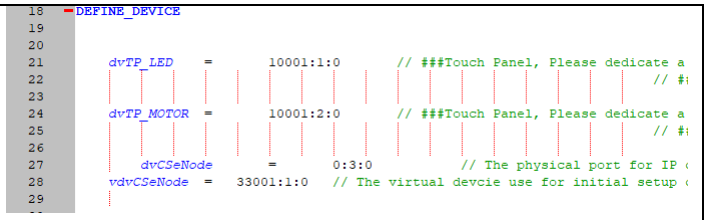
Modifying the Netlinx Program

The configuration process will involve (i) loading an applicable communication Module (for LEDs and MOTORs) and adjusting particular entries within those modules customized for your environment and (ii) copying key entries within the **ConvergingSystems** Main Master.

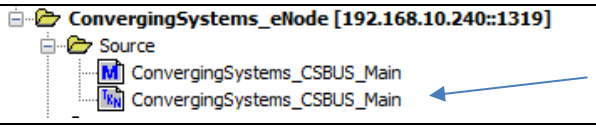
Programming Steps

1. Modify your Master Source file as follows:

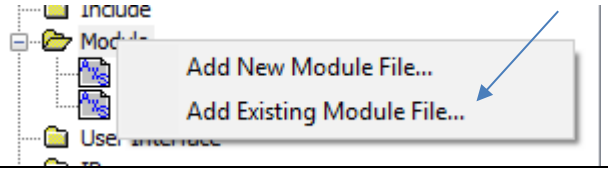
Step	Step	Detail
1a	Download the **Converging Systems Demo.AXW** file and open it within Netlinx	
1b	Open the **ConvergingSystems_CSBUS_Main** non-compiled **Source** File.	-From the Workspace, double-click on the **ConvergingSystems_CSBUS_Main** Source file.  - -
1c	Copy and paste relevant elements within the **DEFINE_DEVICE** section into your Master Source File.	-Scroll down to the **DEFINE_DEVICE** section. You will need relevant elements within this section to be copied and pasted into you existing source file (and modified as appropriate).

		 a) **dvTP_LED**: You need 1 of these for each physical e_Node that is controlling lighting elements in your system (i.e. if you have one e-Node controlling CS-Bus elements and another e-Node/dmx for controlling third-party DMX fixtures you would two of these) b) **dvTP_MOTOR**: You need 1 of these for each phyical e-Node controlling motor devices in your system (including the built-in e-Node within the IMC-300 MKII motor controller) c) **dvCSeNode**: You need this for IP communication. d) **vdvCSeNode**: You need this virtual device for initial setup communication to COMM module provided. Select the appropriate DEFINE as below. If you are using both Motor and Lighting control from one e-Node, you will need both of these defines LED Lighting Control: **dvTP_LED** Motor Control: **dvTP_MOTOR**
1d	Copy and paste relevant elements within the **DEFINE_VARIABLE** section.	Scroll down to the **DEFINE_VARIABLE** section. You will need relevant elements within this section to be copied and pasted into you existing source file (and modified as appropriate).
1e	Copy and paste relevant elements within the **DEFINE_MODULE** section.	Copy entries within this section to include the ConvergingSystems_LED&Motor_Comm module.

1f	Copy and paste relevant elements within the **DATA_EVENT** section.	-Copy entries within this section for all entries provided.
		
		-Make any modifications here to match your system. You must enter the IP address of the target Converging Systems controller (whether you have an ***e-Node***, ***e-Node/dmx*** or ***alternative motor controller device with built-in e-Node functionality***) and any updated usernames and passwords as appropriate.
		
		`ONLINE:`
		`{`
		`SEND_COMMAND data.device,'PROPERTY-Ip_Address,192.168.10.239'`
		`SEND_COMMAND data.device,'PROPERTY-Port,23'`
		`SEND_COMMAND data.device,'PROPERTY-User_Name,Telnet 1'`
		`SEND_COMMAND data.device,'PROPERTY-Password,Password 2'`

		Note: the e-Node (or e-Node equipped motor controller) has 4 separate IP sockets so you can choose to communicate with that controller from up to 4 automation systems provided you use a separate Socket and Username/Password combination with each. -Copy entries within this section for the relevant LED and MOTOR Modules. Provide address that you have previously set up using e-Node Pilot or web-Pilot application. If you only have Motors in your system, disregard the entries for LEDs. If you have only LEDs in your system, disregard the entries for Motors. -Update and add any additional Devices within this section including their Zone/Group/Node "ZGN" address for connected LED or Motor controllers that you previously set up using the Pilot application (see Appendix 1 here). Make sure the number of entries does not exceed the "max_devices" setting in the **ConvergSystems_LED&Motor_Comm** module.  **Note**: A Wildcard address of a "0" is a special address that transmits commands to all controllers that have a non-zero address entered within that position. The demo file shows a wildcard entry for LED[3].
1g	Copy the **ConvergingSystems_CSBUS_Main** compiled file into your existing (Source) Workspace	

2. Import ConvergingSystems_LED&MOTOR_Comm Module into your own Workspace

<table>
<tr><th>Step</th><th>Step</th><th>Detail</th></tr>
<tr><td>2a</td><td>With your existing Netlinx Workspace open, import all relevant Converging Systems Module(s).</td><td>-Right-click on Modules and import Converging Systems Modules as required
 
</td></tr>
<tr><td>2b</td><td>LED&Motor Module Modifications</td><td>- Typically, no modifications to the module are required.

Note: Even though an e-Node will support up to 254 devices the structure of AMX's TPDesign4 is as follows:

<table>
<tr><th>Function within AMX</th><th>Used for</th><th>Limitation</th></tr>
<tr><td>Channels</td><td>On/Off/Presets/ Effects</td><td>4000 levels which corresponds to 400 Converging Systems devices

Note: we use 100 channels per controller.</td></tr>
<tr><td>Levels</td><td>Sliders for LED levels and Motor Dynamic movement</td><td>600 levels which corresponds to 60 Converging Systems devices. Note: we use 10 levels per controller.</td></tr>
</table>

You will find that within the LED&Motor module, there is a setting for maximum number of devices. This by default is set to 40. You can from the above, that could if needed increase this limit to 60. Beyond that number you will need to secure an additional e-Node for the next 60 devices.</td></tr>
</table>

3. Set-up your User Interface to implement useful LED and or MOTOR controls.

Step	Step	Detail
3a	Background on Channel and Level Ports	Within the **ConvergingSystems_LED&Motor_Comm** module, one port is dedicated to LED communication (in the default driver this is set to"1" and a second port is dedicated to MOTOR communication (in the default driver this is set to "2"). These settings are entered in the DEFINE_DEVICE entries in the primary source.

<table>
<tr><td></td><td></td><td>

```
DEFINE_DEVICE

dvTP_LED    =    10001:1:0
dvTP_MOTOR  =    10001:2:0
```

Note: ***Make sure that when you assign Channel or Level buttons, sliders or other UI entries, you select the appropriate Channel or Level address for each entry of your UI may inadvertently control the wrong device.***</td></tr>
<tr><td>3b</td><td>Background on Lighting Devices</td><td>Depending upon the type of lighting functionality desired with your project (i.e. Slider, On/Off buttons or Scene select buttons) you must select the appropriate AMX Channel or Level index shown in Table 1 and Table 2 of this document.

The following sample UI shows the various types of Levels and Channels used within AMX to address the targeted UI type. The letter references are explained in the next table.

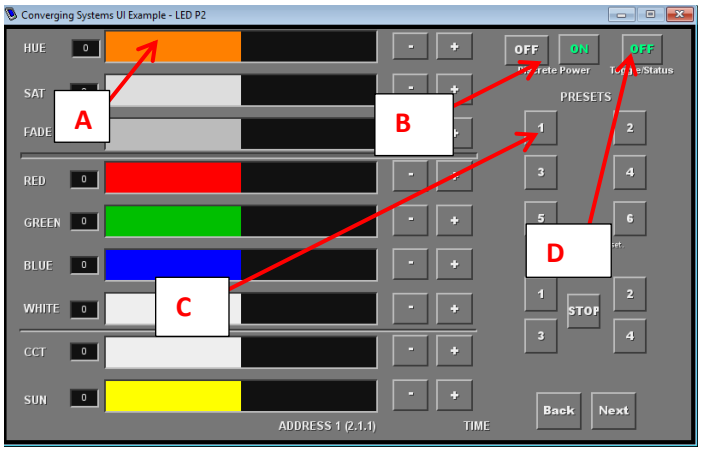
 

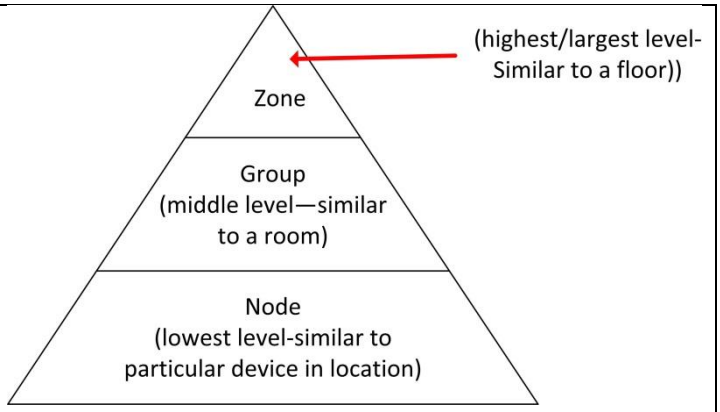
Figure 3

Currently, the available functions supported by these Device Types relevant to Converging Systems LED products are as follows:

Table 5
<table>
<tr><th>Ref. to above Figure</th><th>UI Type</th><th>AMX Controls</th><th>Application</th></tr>
</table></td></tr>
</table>

		A	Slider (Hue,Sat, Brightness,Red, Green, Blue, CCT, SUN) ***Level #s*** *Levels x1 for HUE, x2 for SAT, x3 for Fade, etc. First controller with FADE is 13, second controller for FADE is 23*	AMX Level control **Note**: A separate Level Code must be entered for each Controller targeted.	**Light Dimmer Control** (Slider) for -Hue, -Sat -Brightness -Red -Green -Blue, -White -Color Temp-erature -Circadian Rhythm	
		B	On/Off button ***Channel #s*** *Channel x31 for OFF and x32 for ON.. First controller with OFF is 131, second controller for Off is 231*	AMX Channel control **Note**: A separate Level Code must be entered for each Controller targeted.	**Button (Standard**) -On -Off	
		C	Recall/Store buttons ***Channels #s*** *Channel x01 to x24 with "x" being the Address number. First controller with Recall,1 is 101, second controller for Recall,3 is 203*	AMX Channel Control **Note**: A separate Level Code must be entered for each Controller targeted.		
		D	Toggle button (either ON/OFF or UP/DOWN) ***Channels #s*** *Channel x31 for Toggle type. First controller with Toggle is*	AMX Channel Control **Note**: A separate Level Code must be entered for each	**Button (Toggle)** -ON/OFF -UP/DOWN	

			131.Second controller for Toggle is 231	Controller targeted.		
3c	Background on Addressing	This information is only relevant for when you ***start*** adding buttons and sliders within the GUI section of your AMX NL Studio project. All Converging Systems' devices (loads or controllers as opposed to communication devices) that are connected to a communication device (e-Node or IBT-100) will be addressed using a unique **Z**one/**G**roup/**N**ode addressing scheme (**Z**/**G**/**N**). Those addresses are referred to within Netlinx Studio as **Zone, Group and Node Addresses.** **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. From the factory, all lighting devices have a default address of **Zone**=2, **Group**=1, **Node**=0 ("0" refers to an undefined unit). **Range of Z/G/N Addresses**: Enter a number between 1 and 254 for **Z**one numbers, **G**roup numbers, and **N**ode numbers. Please note -- no two controllers should be assigned the same Z/G/N address. **Background on Bi-Directional Feedback**: Once a load device (CS-Bus controllers) is programmed using the e-Node Pilot application to a non-zero value, then **AND ONLY THEN** can those devices can be queried or monitored for state data (color or motor position) which is quite useful in auto-updating sliders and numerical readouts. The figure below describes this hierarchy.				



YOU MUST HAVE PRE-ASSIGNED Z/G/N ADDRESSES TO ALL LOADS BEFORE PROCEEDING WITH Netlinx PROGRAMMING. See the Converging Systems' documentation on the e-Node Pilot application for more information here.

At this point after you assigned **Z/G/N** address to all loads (ILC-100 or ILC-400 controllers) it would be useful to write down a "map" of all interconnected loads and their re-assigned **Z/G/N Addresses** for use when programming within Netlinx Studio.

Example: If you have a device with a Z/G/N address of **2.1.1**, then the AMX system can monitor 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. See **Appendix 3** for more information.

Example: If you have a device with a Zone/Group/Node ("**Z/G/N**") address of **2.1.1**, then the AMX 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.

Specifically, if you had more than one ILC-100/ILC-400 controllers, you could give them (through the e-Node Pilot application) addresses as follows:

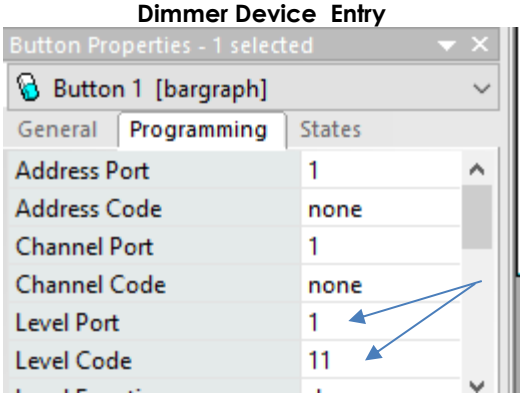
Table 6

ILC unit	Zone/Group/Node Address
First Unit	2.1.**1**
2nd unit	2.1.**2**
nth unit	2.1.**3** or some other number up to **254**

3d	Reserved	

3e	Sample Lighting Devices added to enable specific UI controls	These sample projects show a combination of above available **Device Types**. These Device Types are also summarized in the table below for completeness. **Example 1**: If you have one ILC-100 LED controller with a **Z/G/N** address of 2.1.1 and you wanted a **Hue/Sat/Brightness** set of sliders, and an **ON/OFF** control, you would need to create the following: **Table 7** **Deisred button or slider** / **Device Type** / **Address (Z/G/N)** / **Implemented** Hue Slider / LEVEL control x1 / **Z/G/N** : 2.1.1 **AMX Address**:TBD / **yes** Sat Slider / LEVEL control x2 / **Z/G/N** : 2.1.1 **AMX Address**:TBD / **yes** Fade Slider / LEVEL control x3 / **Z/G/N** : 2.1.1 **AMX Address**:TBD / **yes** RED Slider / LEVEL control x4 GREEN Slider / LEVEL control x5 BLUE Slider / LEVEL control x6 WHITE Slider / LEVEL control x7 CCT Slider / LEVEL control x8 Circadian (SUN) Slider / LEVEL control x9 ON/Off Toggle / Channel control x33 Discrete ON / Channel control x32 / **Z/G/N** : 2.1.1 **AMX Address**:TBD / **yes** Discrete OFF / Channel control x32 / **Z/G/N** : 2.1.1 **AMX Address**:TBD / **yes** The entry for the **Hue** slider with a Z/G/N address of 2.1.1 (first address programmed in this demo for AMX) would be as follows:

Dimmer Device Entry



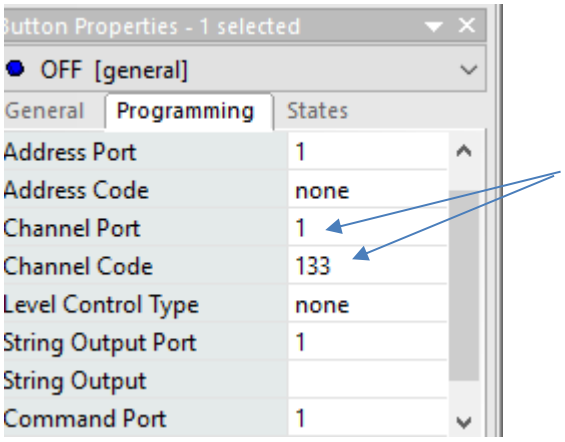
Example 2: If you have one ILC-100 LED controller with a **Z/G/N** address of **2.1.1** and you wanted a **Hue/Sat/Brightness** set of sliders along with a **Red/Green/Blue** set of sliders, and an **ON/OFF** TOGGLE control, you would need to create this following:

Table 8

Deisred button or slider	**Device Type**	**Address (Z/G/N)**	**Implemented**
Hue Slider	LEVEL control 11	**Z/G/N** : 2.1.1 **AMX Address**:1	**yes**
Sat Slider	LEVEL control 12	**Z/G/N** : 2.1.1 **AMX Address**:1	**yes**
Fade Slider	LEVEL control 13	**Z/G/N** : 2.1.1 **AMX Address**:1	**yes**
RED Slider	LEVEL control 14	**Z/G/N** : 2.1.1 **AMX Address**:1	**yes**
GREEN Slider	LEVEL control 15	**Z/G/N** : 2.1.1 **AMX Address**:1	**yes**
BLUE Slider	LEVEL control 16	**Z/G/N** : 2.1.1 **AMX Address**:1	
WHITE Slider	LEVEL control 17	**Z/G/N** : 2.1.1 **AMX Address**:1	
CCT Slider	LEVEL control 18	**Z/G/N** : 2.1.1 **AMX Address**:1	
Circadian (SUN) Slider	LEVEL control 19	**Z/G/N** : 2.1.1 **AMX Address**:1	
ON/Off Toggle	Channel control 133	**Z/G/N** : 2.1.1 **AMX Address**:1	**yes**
Discrete ON	Channel control 132	**Z/G/N** : 2.1.1 **AMX Address**:1	**yes**
Discrete OFF	Channel control 131	**Z/G/N** : 2.1.1 **AMX Address**:1	**yes**

The entry for the **Toggle** button with a Z/G/N address of 2.1.1 (first address programmed in this demo for AMX) would be as follows:

Toggle Button Entry



Example 3: If you have one ILC-100 LED controller with a **Z/G/N** address of **2.1.1** [AMX First Address] and a second ILC-100 LED controller with a **Z/G/N** address of **2.1.2** [AMX 2nd Address] **AND** you wanted a **Hue/Sat/Brightness** set of sliders, an **ON/OFF** control, a **Recall, 1** button as well as an **Effect 1 button** (which cycles through Preset Colors 1 through 8 in an infinte loop for both controllers in unision) for both controlllers, you would need to create this following:

Table 9a for first Controller (address 1)

Deisred button or slider	Device Type	Address (Z/G/N)	Implemented
Hue Slider	LEVEL control 11	**Z/G/N** : 2.1.1 **AMX Address**:1	**yes**
Sat Slider	LEVEL control 12	**Z/G/N** : 2.1.1 **AMX Address**:1	**yes**
Fade Slider	LEVEL control 13	**Z/G/N** : 2.1.1 **AMX Address**:1	**yes**
RED Slider	LEVEL control 14	**Z/G/N** : 2.1.1 **AMX Address**:1	
GREEN Slider	LEVEL control 15	**Z/G/N** : 2.1.1 **AMX Address**:1	
BLUE Slider	LEVEL control 16	**Z/G/N** : 2.1.1 **AMX Address**:1	
WHITE Slider	LEVEL control 17	**Z/G/N** : 2.1.1 **AMX Address**:1	
CCT Slider	LEVEL control 18	**Z/G/N** : 2.1.1 **AMX Address**:1	
Circadian (SUN) Slider	LEVEL control 19	**Z/G/N** : 2.1.1 **AMX Address**:1	
ON/Off Toggle	Channel control 133	**Z/G/N** : 2.1.1 **AMX Address**:1	

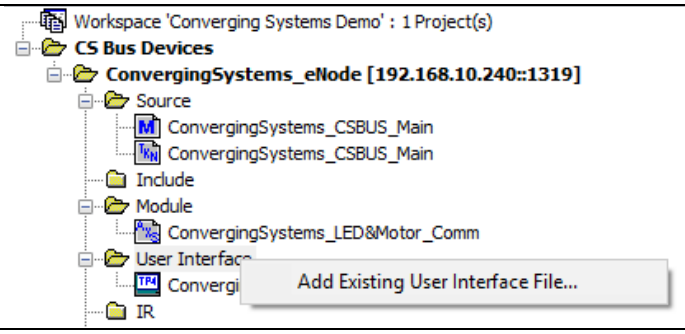
Discrete ON	Channel control 132	**Z/G/N** : 2.1.1 **AMX Address**:1	**yes**	
Discrete OFF	Channel control 131	**Z/G/N** : 2.1.1 **AMX Address**:1	**yes**	
Recall,1	Channel control 101	**Z/G/N** : 2.1.1 **AMX Address**:1	**yes**	
Effect,1	Channel control 136	**Z/G/N** : 2.1.1 **AMX Address**:1	**yes**	

Table 10b for 2nd Controller (address 2)

Deisred button or slider	**Device Type**	**Address (Z/G/N)**	**Implemented**
Hue Slider	LEVEL control 21	**Z/G/N** : 2.1.2 **AMX Address**:2	**yes**
Sat Slider	LEVEL control 22	**Z/G/N** : 2.1.2 **AMX Address**:2	**yes**
Fade Slider	LEVEL control 23	**Z/G/N** : 2.1.2 **AMX Address**:2	**yes**
RED Slider	LEVEL control 24	**Z/G/N** : 2.1.2 **AMX Address**:2	
GREEN Slider	LEVEL control 25	**Z/G/N** : 2.1.2 **AMX Address**:2	
BLUE Slider	LEVEL control 26	**Z/G/N** : 2.1.2 **AMX Address**:2	
WHITE Slider	LEVEL control 27	**Z/G/N** : 2.1.2 **AMX Address**:2	
CCT Slider	LEVEL control 28	**Z/G/N** : 2.1.2 **AMX Address**:2	
Circadian (SUN) Slider	LEVEL control 29	**Z/G/N** : 2.1.2 **AMX Address**:2	
ON/Off Toggle	Channel control 233	**Z/G/N** : 2.1.2 **AMX Address**:2	
Discrete ON	Channel control 232	**Z/G/N** : 2.1.2 **AMX Address**:2	**yes**
Discrete OFF	Channel control 231	**Z/G/N** : 2.1.2 **AMX Address**:2	**yes**
Recall,1	Channel control 201	**Z/G/N** : 2.1.2 **AMX Address**:2	**Yes**
Effect,1	Channel control 236	**Z/G/N** : 2.1.2 **AMX Address**:2	**yes**

4. Create (or Modify) Various User Interface (UI) Controls for (i) Hue/Sat/Brightness or Red/Green/Blue adjustments, (ii) ON/OFF adjustments, and (iii) Scene adjustments.

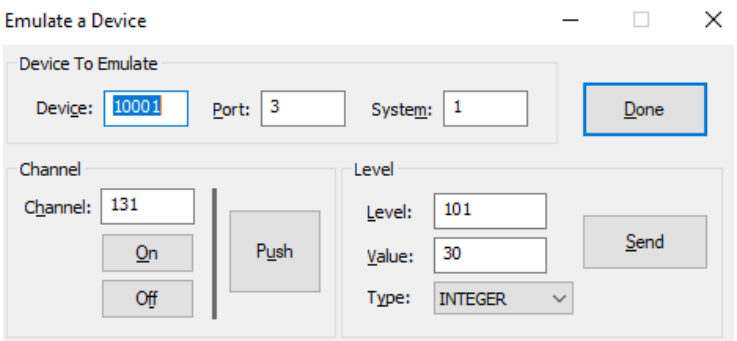
Step	**Step**	**Detail**
4a	With your existing Netlinx Workspace open, import the **Converging Systems User Interface** Module to enable quick setup of working buttons and sliders	If you have not already done so, import our UI module by Right-clicking ON the User Interface tab and import Converging Systems UI

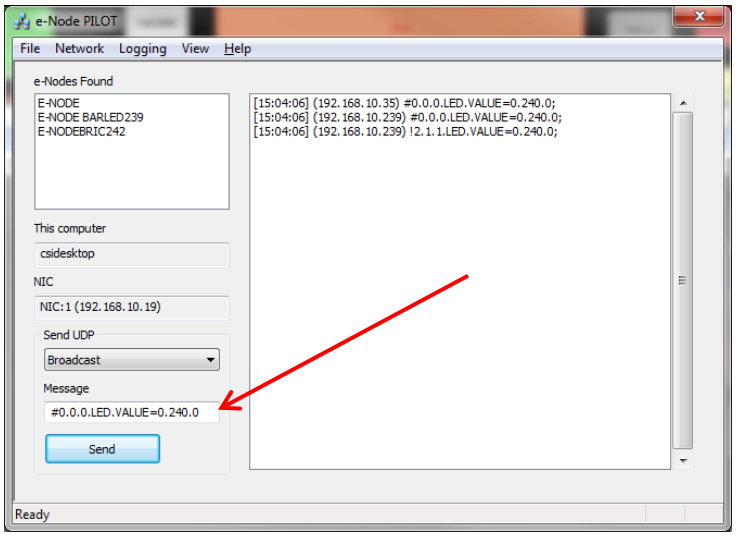
		
4b	Edit the provided UI controls or add your own using our template as a guide	Have fun.
4c	Finish up your User Interface	Continue modifying and customizing your user interface as required. When you are done just hit **Apply** to upload all code changes to your AMX processor.

5. Test

5a	Test using programmed Touchscreen for Netlinx /Diagnostics **Emulate a Device** feature.	-Verify if all programmed buttons are operating properly. If not proceed to the next section.

6. Troubleshooting

6a	Test using NS/Diagnostics **Emulate a Device**	-To test if programmed buttons within Netlinx Studio are having the desired effect on connected CS-BUS controllers, open the **Emulate a Device** Feature within Netlinx and enter relevant addressing information and **Channel** or **Level** numbers and click Send. Verify if connected controllers are working. 
6a	Launch the Converging Systems' Pilot application which communicates with the Converging Systems' e-Node Ethernet bridge.	Within the Pilot application, select the **View Map** Tab and discover e-Nodes and Devices. Then go to the Traffic Tab and enter the following command to see if your e-Node and connected LED controllers are properly functioning. **#0.0.0.LED.VALUE=0.240.0**

		 The connected LEDS should turn GREEN (for LED devices). For Motor devices, enter **#0.0.0.MOTOR=UP** All connected MOTORs should move upwards. Consult the e-Node documentation or see Appendix 6 for more troubleshooting information.

COMMON MISTAKES

1. Forgetting to set TELNET credentials for Converging Systems e-Node device within the **ConvergingSystems_LED&Motor_Comm** module. Typically, Telnet sessions require a LOGIN ID. Currently within the AMX setup, Telnet 1/Password 1 are used for credentials (***cap for first letter and space before the number***). Make sure that the settings within the e-Node match these settings.
2. Forgetting to update Zone/Group/Nodes addresses within the default serial or IP driver for specific controllers. The default driver from Converging Systems is set to **2.1.0** for lighting devices, and **1.1.0** for motor devices. The "0" in the last location refers to a wildcard setting which causes all devices with a Node address from 1 to 254 to respond. If you have a setup with uses specific addresses other than **2.1.1** for instance (i.e. **2.1.2** for the second controller, **2.1.3** for the third controller, etc.) you must update the serial or IP driver accordingly.
3. Using commas between the Zone/Group/Node entries instead of periods (within the Address Tag)
4. Reserved.

Appendix 1

Converging Systems System Setup/Configuration

Before proper operation between the Converging Systems' controllers and the AMX 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 (Ethernet communication device). In addition, communication parameters within the AMX Netlinx Studio software are also required. In case you have not previously configured a Converging Systems controller product, please refer to the extended instructions in this Appendix.

Background

The Converging Systems e-Node is an Ethernet communication device which can be used to connect the AMX 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 an AMX processor in situations where Ethernet communication is not desired (but where bi-directional feedback is still required).

However, regardless of whether you desire to interface ***more than one*** lighting controller (or motor controller) each with its own controllable operation (i.e. its own **Z**one/**G**roup/**N**ode or **Z/G/N** address) with either the e-Node (Ethernet) or the IBT-100 (RS-232c communication), and/or you desire ***bi-directional communication/feedback*** between your user interface (UI) and a particular motor or lighting controller, **you must still follow the directions below under (i) e-Node Programming** and **(ii) ILC-100/ILC-400 Programming** in order to establish **unique ZGN address(es) for connected loads** and **turn on the NOTIFY command** which provides for that bi-directional communication.

Note: If you plan on utilizing the IBT-100 for serial communication and (i) ***you will not need*** more than one address other than the factory default **ZGN** address of 2.1.0 for lighting controllers or 1.1.0 for motor controllers, and (ii) ***you do not need bi-directional communication*** between the lighting load or the motor load and your User Interface, then you can proceed to the IBT-100 Set up Section and you may skip the (i) e-Node Programming section as well as (ii) the ILC-100/ILC-400 Programming sections below.

Settings that can be implemented using this setup are as follows:

Communication Device Programming/Device Programming

Min 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 568A or 568B wiring and simply chop off the browns because this does not preserve twisted pairs on pins 1 / 2, 3 /4 , and 5/ 6 which is required**).

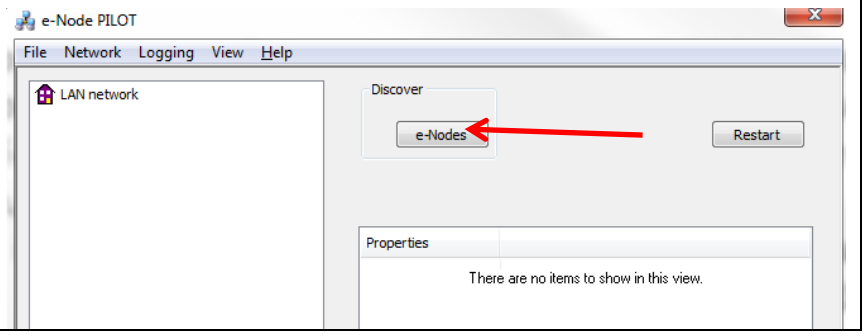
Recommended RJ-25 6P6C connections 6 wires		
e-Node Side	**ILC-x00 side**	**Color of wire**
Pin 1	**Pin 1**	**blue**
Pin 2	**Pin 2**	**Blue/white**
Pin 3	**Pin 3**	**Orange**
Pin 4	**Pin 4**	**Orange/white**
Pin 5	**Pin 5**	**Green**
Pin 6	**Pin 6**	**Green/white**

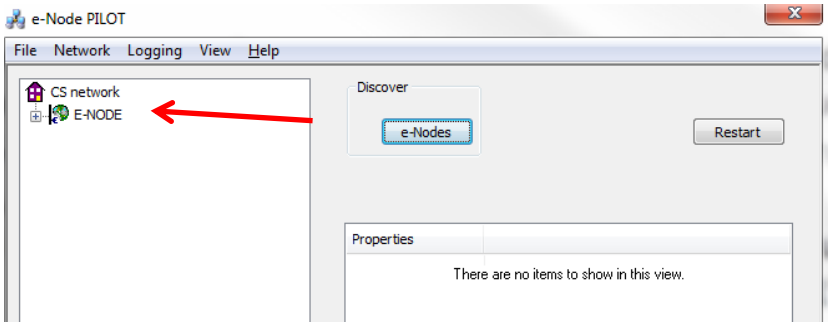
Suboptimal RJ-11 4P4C connection 4 wires		
e-Node Side	**ILC-x00 side**	**Color of wire**
Pin 1	**Pin 1**	**Orange**
Pin 2	**Pin 2**	**Blue**
Pin 3	**Pin 3**	**Blue/white**
Pin 4	**Pin 4**	**Orange/white**

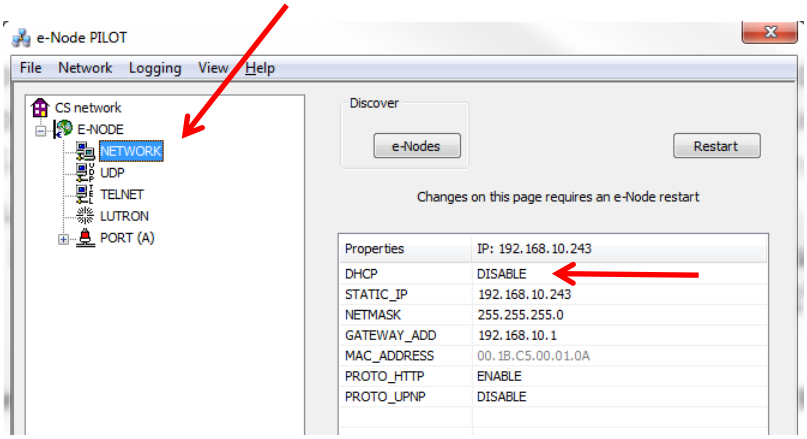
Note: For the purposes of commissioning if *you do not have* 6P6C RJ-25 connectors, you can use standard 4-pin RJ11 connectors, but follow the wiring directions above preserving twisted pairs on Pin 2/3 and Pins 1 /4. **This cable will not work for keypad communication or IBT-100 communication**.

Please follow the below steps under "**e-Node Programming**" when using the e-Node for Ethernet communication or to set-up specific loads (lighting or motor) with unique, non-zero, **Z**one/**G**roup/**N**ode or **Z/G/N** addresses.

e-Node Programming

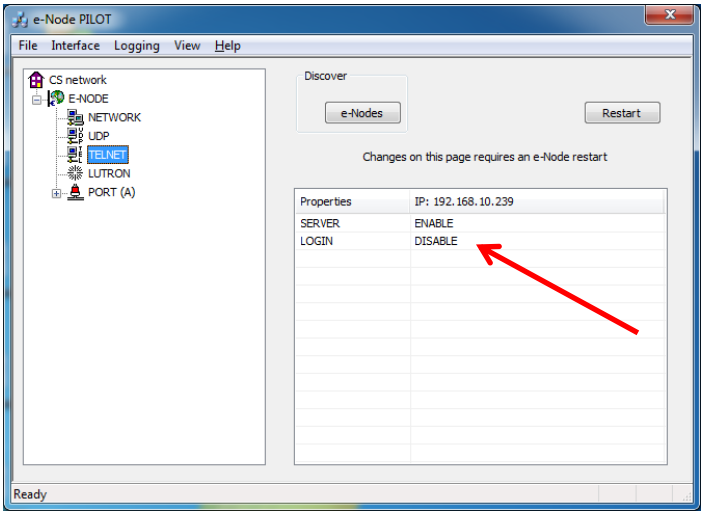
Step	Setting	Choices
EN-1	**e-Node IP Address** setting Set up the e-node with an appropriate Static or Dynamic IP address. Refer to the separate "e-Node Quick Start Guide" on how to make such settings.	Static or Dynamic Addressing -Launch the e-Node Pilot application. 

<table>
<tr>
<td></td>
<td></td>
<td>
-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 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 AMX processors.
</td>
</tr>
<tr>
<td>EN-2</td>
<td>TELNET Port (transmit and receive)</td>
<td>Depending upon the functionality of the AMX driver and the installer's specific settings, the suggested communication protocol between AMX and the e-Node is Telnet Port 23 communication (with or without Login). You will need at minimum (i) to turn on Telnet within the e-Node, and (ii) to adjust secondarily the setting for Login as required by the AMX driver.</td>
</tr>
</table>

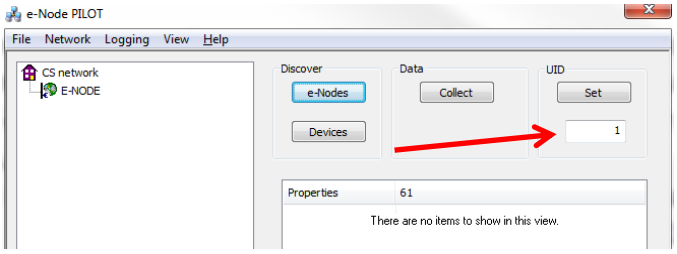
		1) Select the **View e-Node tab** and select the **Telnet tab**. Set **SERVER** to **ENABLE**. 2) Login Settings. With the new device drivers, Telnet communication with Login ***is supported***, Within Pilot, set **LOGIN** to **ENABLE** and select the **Restart** button for the particular e-Node that you are utilizing to communicate with the AMX system. 

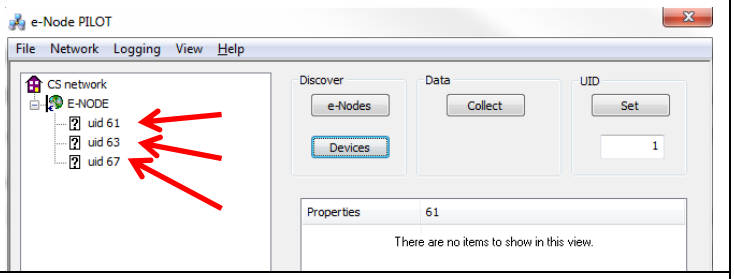
IBT-100 Programming (WIP currently)

All of the communication parameters to support the IBT-100 are built into the AMX driver and therefore no special programming is required of the IBT-100 serial adapter. However, certain features of the ILC-100/ILC-400 with respect to **NOTIFY** (which permits automatic signaling of color status upon color state changes) described above will need to be programmed using the e-Node. But in this case, after the specific lighting controllers are programmed, the e-Node will no longer be required for AMX to Converging Systems communication using the IBT-100.

RS-232C Interfacing Note: If you plan on simply using the IBT-100 for serial communication and desire to have multiple lighting loads (more than one ILC-100 with a unique **Z**one/**G**roup/**N**ode address you must set up your system using the e-Node as specified above as well as the particular lighting load as specified below. However, if you do not care about bi-directional feedback or support of multiple controllers, no further set-up is required. However, this is not recommended.

ILC-100/ILC-400 Programming (Motor control is similar and this set of directions can be used for guidance. For more information, consult the Quick Start Guides for Motors

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. Background. 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 AMX 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 AMX 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 as well as **Appendix 2** for more information on **Z**one/**G**roup/**N**ode addressing.) Process. (1) Power on the e-Node and any connected ILC-x00 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.

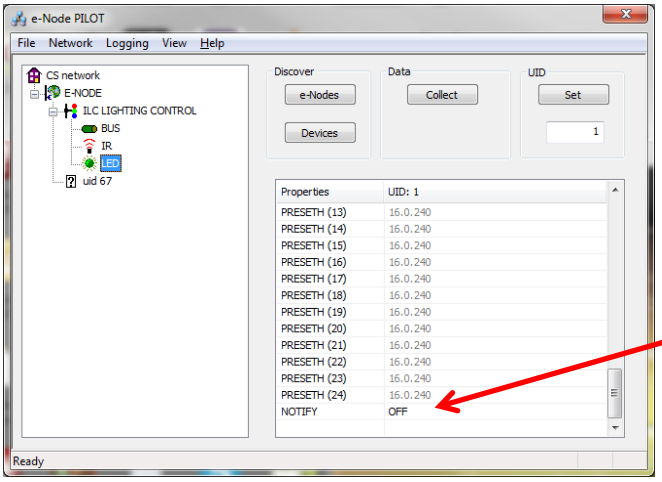
<table>
<tr><td></td><td></td><td>
ILC-400. Remove the white plastic protective shroud to the left of the dual RJ-25 connectors with your finger nail or a small flat-headed to expose a push button mounted to the PCB. Depress the pushbutton for ½ second and then release. The existence of the ILC-400 will appear under the e-Node entry within Pilot
-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.


</td></tr>
<tr><td>DV-2</td><td>Notify Mode</td><td>
<u>Background</u>. Should you be implementing Color and Dimmer sliders within your project, the AMX system needs to receive color data back from the Converging Systems' controllers in order to update AMX's resources to automatically move the sliders and/or provide data within a data field. Converging Systems' lighting controllers can automatically notify the AMX system whenever there is a color/lighting state change (recommended).

In order to activate this NOTIFY feature within Converging System's controllers, it is necessary to first turn on the appropriate NOTIFY function within the targeted controller (under the LED entry). By default from the factory, NOTIFY is set to OFF to reduce the amount of bus traffic. It is recommended that one of these NOTIFY functions is utilized in any integration with AMX's products. These choices are as follows:

<table>
<tr><td>HSB color data</td><td>NOTIFY=COLOR</td></tr>
<tr><td>RGB color data</td><td>NOTIFY=VALUE</td></tr>
<tr><td>HSB and RGB color data</td><td>NOTIFY=BOTH*</td></tr>
</table>

*Note: this feature is newly added in V3.14 of ILC-100 firmware. However, if is recommended to reduce bus traffic, that either HSB sliders (with NOTIFY=COLOR chosen), or RGB sliders (with NOTIFY=VALUE chosen) should be used on a user interface. If it is absolutely required that both RGB and HSD sliders are implemented within the Customer User Interface (and NOTIFY=BOTH is chosen), there may be cases where the preponderance of bus traffic received from the LED controller might interfere with valid commands transmitted onto the bus. Although this rare, it may occur.
</td></tr>
</table>

		Process. 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 **OFF.** This will prevent the selected controller from broadcasting its status after every state change therefore reducing CS-Bus traffic.  **Note:** Prior to V 3.15 of the ILC-100 firmware, it is necessary to reboot the ILC-100 for this new setting to become active after it is changed. For versions 3.15 or later, simply changing this value within Pilot is sufficient. **Legacy Firmware Note**: Earlier version of Converging Systems' color controllers did not support the **NOTIFY** function. In those cases, it will be necessary to either update those controllers or accept having no bi-direction control from AMX. Contact Converging Systems for more information.

Appendix 2

COLOR SPACE ISSUES

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 4

Appendix 3

ADVANCED AMX PROGRAMMING

AP Topic 1

1.0 How to set up group control of loads using sliders with feedback available to sliders.

Addressing Background CS-Bus controllers can be address with a unique **Z**one/**G**roup/Node (ZGN) address. Up to 254 entries can be used for each field. The first field is the **Zone** (or largest range), the middle field is the **Group**, and the last field is the **Node**. No two loads can share the same **Z/G/N** address. As an example, if you will be populating a pair of two controllers within each of two rooms on two floors of a building here would be the suggested addressing that could be used.

	Floor One	**Floor Two**
Room 1	2.1.1 for first controller in room. 2.1.2 for second controller in this room	
Room 2	2.2.1 for first controller in room. 2.2.2 for second controller in this room	
Room 3		3.1.1 for first controller in room. 3.1.2 for second controller in this room
Room 4		3.2.1 for first controller in room. 3.2.2 for second controller in this room

Group Addressing. In certain cases, it is desirable is simply send a wildcard address for a group of controllers to all respond in unison rather than programming each individually to respond through macros. There are two problems with macros in general. One is that often they are executed serially which means that if you had two hundred loads referenced within a macro, the timing of the execution of the last command sent out might be delayed from the first command sent out. In this case, not all LEDs would turn on or OFF at the same time, potentially. The second issue involves the actual programming time required to program scores or even hundreds of commands for a simple ALL OFF button.

Within the CS-Bus software protocol is the concept of utilizing a "0" within any address field as a surrogate for defined numbers ranging from 1 to 254 within that same field. Thus, if you issued a command of #2.1.0.LED=ON:<cr>, all units with addresses of 2.1.1 to 2.1.254 would immediately respond. Please see the table below for an example of how various wildcards could be used.

Specific controller address	**Specific command that will trigger targeted controller**
2.1.1	2.1.0 or 2.0.0 or 0.0.0
2.1.2	2.1.0 or 2.0.0 or 0.0.0
2.1.3	2.1.0 or 2.0.0 or 0.0.0
2.2.1	2.2.0 or 2.0.0 or 0.0.0
2.2.2	2.2.0 or 2.0.0 or 0.0.0
2.2.254	2.2.0 or 2.0.0 or 0.0.0
5.254.4	5.254.0 or 5.0.0 or 0.0.0

NOTIFY Command Background Converging Systems has a **NOTIFY** function which automatically provides color state feedback (from the targeted controller) provided a unique **Z**one/**G**roup/**N**ode (**Z/G/N**) address is provided with an action/argument payload to that specific controller. Specifically, if a command to invoke a color change is directed to a controller that has a **Z/G/N** address of 2.1.1, that specific controller with that address will respond back to the automation system as to its specific color state if and only if there is a color state change impacted on that specific controller.

In some cases, as has been discussed above, there might be a requirement to send a group command or all hail command to more than one controller. In this case, the group command would be directed not to a single controller or load but to a series of controllers. To reduce bus traffic when a series of controllers is given the same command, ***the status of the first controller whose node number is 1 greater than the wildcard command of "0" will respond and will be automatically remapped to the wildcard address of "0" from which the command emanated**** (which reduces bus traffic by up to 243 messages). The logic here is that if 254 controllers are all told to turn **Red**, only the surrogate for that group of controllers will respond and within the CS-Bus messaging logic that surrogate is the controller with a node of "1." So, for example, if a **#2.1.0.LED.VALUE=240.0.0:<cr>** command is transmitted to 254 controllers, they will all turn to **Red**, but only the controller with an address of **2.1.1** will respond with its new color status. In this case, a command on the bus from that surrogate controller would come back as follows: **!2.1.1.LED.VALUE=240.0.0** (the exclamation mark indicates that it is a message from CS-Bus device rather from an automation controller). Please see the diagram on the next page for the theory of operation here.

*Note: this is in 2018 updates to our ILC-400 firmware initially

Initial State of Light Output
(on Off condition)

Argument/Action Issued to a specific Z/G/N address of 2.1.1 to go to Red
#2.1.1.LED.VALUE=240.0.0;<cr>

RGB Command received by a unique Z/G/N address (2.1.1). Controller recognizes a color state change and transmits back its color state as
!2.1.1.LED.VALUE=240.0.0

3rd Party control system receives response beginning with "**!**" and updates its applicable color slider or other registers to received value

RGB Command received by a unique Z/G/N address (2.1.1). Controller recognizes that this was not a color state change and no response is provided (to reduce bus traffic since no new status needs to be provided)

Argument/Action Issued to a specific Z/G/N address of 2.1.1 to go to Red (again)
#2.1.1.LED.VALUE=240.0.0;<cr>

Nothing transmitted back to 3rd party control system

RGB Command received by a group Z/G/N address (2.1.0). All loads turns green but since command was transmitted to Group address, only Controller with first Node address greater than 0 (i.e. "1") within wildcard range will respond (i.e. 2.1.1 responds, but 2.1.2 to 2.1.254 do not respond)

Argument/Action Issued to a **Group** Z/G/N address of 2.1.0 to go to Green
#2.1.1.LED.VALUE=0.240.0;<cr>

!2.1.1.LED.VALUE=0.240.0 is received, but no other Z/G/N messages are received
Note: !2.1.0 LED.VALUE =0.240.0. is never received.

Appendix 4

DMX Functionality (using e-Node/dmx) and the new e-Node Web Pilot Setup Application for MKIII e-Nodes

Backgrounder 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). The DMX 512 protocol is based on the EIA/TIA-485 standard (commonly known as Recommended Standard 485 or RS-485) which uses asynchronous, differential data transmission. This standard supports 32 devices or fixtures on one network at a distance of up to 4000 feet. 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. Popular DMX 3-channel lighting fixtures utilizing Red, Green, Blue (RGB) illuminants (and 4-color derivatives utilizing Red, Green, Blue, White (RGBW) illuminants), which although practical for theatrical applications by the trained lighting designer are often impractical for general lighting and general automation adaptations because of interfacing, compatibility and basic functionality issues. Specifically, most DMX fixtures with channels dedicated to particular colors (i.e. Red, Green, Blue, etc.) lack a slider or control for dimming and through this inherent structural weakness lack the capability for hue accurate dimming without color shifts (because linear movement of color sliders cannot dim accurately). ***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. Existing third-party automation and lighting control software drivers for Converging Systems' product line also enable support for the e-Node/dmx (color engine/dmx translator) controller. Unique to the e-Node/dmx is its ability to perform color adjustments within its own processor to enhance hue accurate dimming without colors shift along with the added benefit of light level stores and recalls as well bi-directional communication. In addition, the robust color engine embedded within the e-Node/dmx offloads DMX support from the lighting or automation platform. (See the listing of commands that are supported with the e-Node/dmx device see supported LED command section with any specific Integration Note for a third-party platform.)

NOTE: DMX cannot be split reliably by making T-connectors or Y-cables. Third-party splitter/repeaters typically use optical isolation to protect each segment from electrical faults on other branches. These can be used to increase the number of devices on one network beyond the limit of 32. However, each branch of a splitter/repeater can support only 32 devices. Converging Systems maintains that limitation of 32 devices or fixtures per e-Node/dmx.

Please follow the directions which follow to drive DMX fixtures utilizing the e-Node/dmx and a host automation or lighting controller.

DMX Channels/Compatibility and Interfacing Issues

The e-Node/dmx has been designed to adapt to a tremendous breadth of DMX interfacing scenarios. It is important to understand however, the methodology on how interfacing works. Device drivers from third-party platform manufactures are based upon two kinds of models- one is the single channel monochrome type scenario (1-channel) and the other is a multi-channel RGB or RGBW scenario (3-channel or 4-channel). For both of these type of devices, setup and programming is quite straightforward. In some cases, however, DMX fixtures may come with upwards of 7 or 15 or even 57 channels of control (that is they occupy 7 or 15 or 57 channels of the 512 possible DMX channels in a universe controlling pan, tilt, other motion and even 16-bit color addressing). No standard automation or lighting systems would have ever imagined driving 57 different parameters within a lighting fixture and that is why specialized theatrical apparatus devices have come into existence.

Converging Systems' recognizes though that from time-to-time that some of these fully functional DMX fixtures may by necessity or convenience be desired to be interfaced with traditional lighting and automation systems. It is here that Converging Systems has become creative and has developed procedures thus enabling this type of adoption of a theatrical device into a traditional lighting or automation system.

Steps to plan out next steps for interfacing.

<table>
<tr><th>Step</th><th>Topic</th><th>Detail</th></tr>
<tr><td>1</td><td>- Document (i) all channels numbers of the DMX fixture available and (ii) their channel name (i.e. RED, GREEN, PAN, etc.). Transcribe this information on the table on the right in the first and second column.

-Determine which channels of the N-channel DMX device that you wish to actually control and which channels that you wish to bypass (and not control). Note that information on the table in the third column.

Note: Think about Red, Green Blue and White as virtual placeholders understood by the automation system but which could have varying meaning to the outside world. Specifically, if your device has a PAN mode that Pan mode could be driven by a virtual RED slider regardless of its functionality.</td><td>
<table>
<tr><th>DMX channel assignment on fixture</th><th>Channel name or functionality (i.e. Red, Green, Pan, etc.)</th><th>Control (Y) or Bypass (N)</th></tr>
<tr><td>N (base DMX address for that fixture)</td><td>(fill in)</td><td></td></tr>
<tr><td>N+1</td><td></td><td></td></tr>
<tr><td>N+2</td><td></td><td></td></tr>
<tr><td>N+3</td><td></td><td></td></tr>
<tr><td>N+4</td><td></td><td></td></tr>
<tr><td>N+5</td><td></td><td></td></tr>
<tr><td>N+6</td><td></td><td></td></tr>
<tr><td>N+7</td><td></td><td></td></tr>
<tr><td>N+8</td><td></td><td></td></tr>
<tr><td>N+9</td><td></td><td></td></tr>
<tr><td>N+10</td><td></td><td></td></tr>
<tr><td>N+11</td><td></td><td></td></tr>
<tr><td>(expand this table as appropriate to any length)</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>2</td><td>Review the table created in Step 1 above,</td><td></td></tr>
</table>

<table>
<tr><td></td><td>-If you have anywhere from 2-4 channels to be supported (with variable control) and your DMX fixture has no more than 15 channels available, proceed to Step 2a

-If you have more than 5 channels to be supported (with variable control) or if you DMX fixture has more than 15 channels available regardless if you want to support more than 5 of those channels, proceed to Step 2b.</td><td></td></tr>
<tr><td>2a</td><td>Background: Automation and lighting systems currently support up to 4 controls within their Converging Systems drivers. The existing names for these controls are Red, Green, Blue and White. Think about these name as virtual names which could be mapped to anything (i.e. Pan, Tilt, Zoom, Move CCW, Move CW, Vibrate, etc.)

Here for environments where you wish to provide variable control for up to four controls on the DMX fixture (for any fixture than has up to 15 discrete DMX channels), map each channel to one of the following variables (V) or binary (B) options:

-RED (V)
-GREEN (V)
-BLUE (V)
-WHITE (V)
-FULL (B)
-OFF (B)

Note: From time to time additional placeholder names may be added for convenience, however, regardless of the virtual names added, only four operational names can be used for variable control (V) in addition to the two static names for binary control (B) which includes “FULL (ON)” and “OFF”.

-Given the above, map all channels to be controlled to the four Variable and two Binary names

-See the example to the right for more information here.

-When completed refer to this programming information when programming in Step DMX-WP3 below</td><td>
<table>
<tr><th>Actual DMX channel assignment on fixture</th><th>Channel mapping (from available mapping choices)</th></tr>
<tr><td>N (base DMX address for that fixture)</td><td>(choose)</td></tr>
<tr><td>N+1</td><td></td></tr>
<tr><td>N+2</td><td></td></tr>
<tr><td>N+3</td><td></td></tr>
<tr><td>N+4</td><td></td></tr>
<tr><td>N+5</td><td></td></tr>
<tr><td>N+6</td><td></td></tr>
<tr><td>N+7</td><td></td></tr>
<tr><td>N+8</td><td></td></tr>
<tr><td>N+9</td><td></td></tr>
<tr><td>N+10</td><td></td></tr>
<tr><td>N+11</td><td></td></tr>
<tr><td>(expand this table as appropriate to any length)</td><td></td></tr>
</table>

Example. Here is an example where there is a dimmer channel (low-tech channel that will not be used) on DMX Channel 1, and R, G, B, W controls on Channels 6,7,8,9 on a 10 channel DMX fixture. Other channels although available on the DMX fixture are not relevant here and will be disabled (bypassed).

<table>
<tr><th>Actual DMX channel assignment on fixture</th><th>Channel mapping (from available mapping choices)</th></tr>
<tr><td>1 (base DMX address for that fixture)</td><td>FULL (to keep brightness on full such that the R/G/B/W components can be controlled separately</td></tr>
</table>
</td></tr>
</table>

<table>
<tr>
<td></td>
<td></td>
<td>
<table>
<tr><td>2</td><td>OFF (for this is an irrelevant channel for our example)</td></tr>
<tr><td>3</td><td>OFF (for this is an irrelevant channel for our example)</td></tr>
<tr><td>4</td><td>OFF (for this is an irrelevant channel for our example)</td></tr>
<tr><td>5</td><td>OFF (for this is an irrelevant channel for our example)</td></tr>
<tr><td>6</td><td>RED</td></tr>
<tr><td>7</td><td>GREEN</td></tr>
<tr><td>8</td><td>BLUE</td></tr>
<tr><td>9</td><td>WHITE</td></tr>
<tr><td>10</td><td>OFF (for this is an irrelevant channel for our example)</td></tr>
</table>
</td>
</tr>
<tr>
<td>2b</td>
<td>In the event that you wish to control more than 4 channels with variable output on a single DMX fixture, this step provides a procedure to link together more than one virtual e-Node/dmx “fixture” to provide more than 4 channels of variable output and up to a possible128 channels of variable control.

-Follow the procedure in Step 2a for the first set of 4 DMX channels to be controlled (Variable). Then, add up to 4 additional DMX channels to be variably controlled on that same DMX fixture to a second e-Node DMX Fixture,

-Continue until all variable controls have been allocated to subsequent e-Node DMX Fixtures

-See the example to the right for more information

-When completed refer to this programming information when programming in Step DMX-WP3 below</td>
<td>Example
A DMX fixture with 25 channels (base DMX channel 1) is desired to be supported with offers the following relevant channels that are desired to be controlled

-RED (Channel 1)
-GREEN (Channel 2)
-BLUE (Channel 3)
-WHITE (Channel 4)
-PAN LEFT (Channel 21)
-TILT (Channel 22)
-ZOOM (Channel 23)

There is also a DIMMER channel available (DMX Channel 11) that only moves R/G/B/W sliders on a proportional basis and which we want to disable so that the e-Node/dmx’s Pure Mode HUE ACCURATE DIMMING color computer is utilized alternatively for dimming.

All other channels for this example are irrelevant and will be set to 0 (not controlled or bypassed). Bypassing them (setting them to 0) in this case will not cause any negative impact on the remaining channels to be controlled.

<table>
<tr><td>DMX Fixture 1</td><td>DMX Fixture 2</td></tr>
<tr><td>ALIAS Virtual DMX Fixture A-1</td><td>ALIAS Virtual DMX Fixture A-2</td></tr>
<tr><td>ADDRESS 2.1.1</td><td>ADDRESS 2.1.2</td></tr>
<tr><td>NOTIFY BOTH</td><td>NOTIFY BOTH</td></tr>
<tr><td>CHANNELS 13</td><td>CHANNELS 11</td></tr>
</table>
</td>
</tr>
</table>

		BASE DMX CH 1	**BASE DMX CH 14**
		ASSIGN CH 1 (1) RED	**ASSIGN CH 1 (14)** OFF
		BASE DMX CH 2 (2) GREEN	**BASE DMX CH 2 (15)** OFF
		BASE DMX CH 3 (3) BLUE	**BASE DMX CH 3 (16)** OFF
		BASE DMX CH 4 (4) WHITE	**BASE DMX CH 4 (17)** OFF
		BASE DMX CH 5 (5) OFF	**BASE DMX CH 5 (18)** OFF
		BASE DMX CH 6 (6) OFF	**BASE DMX CH 6 (19)** OFF
		BASE DMX CH 7 (7) OFF	**BASE DMX CH 7 (20)** OFF
		BASE DMX CH 8 (8) OFF	**BASE DMX CH 8 (21)** OFF
		BASE DMX CH 9 (9) OFF	**BASE DMX CH 9 (22)** OFF
		BASE DMX CH 10 (10) OFF	**BASE DMX CH 10 (23**) OFF
		BASE DMX CH 11 (11) FULL	**BASE DMX CH 11 (24)** OFF
		BASE DMX CH 12 (12) OFF	**BASE DMX CH 11 (25)** OFF
		BASE DMX CH 13 (13) OFF	

Now that you understand the breath of control available with the e-Node/dmx you are ready to proceed.

WIRING DIAGRAM (for DMX control using e-Node/dmx and Internet Protocol-IP)

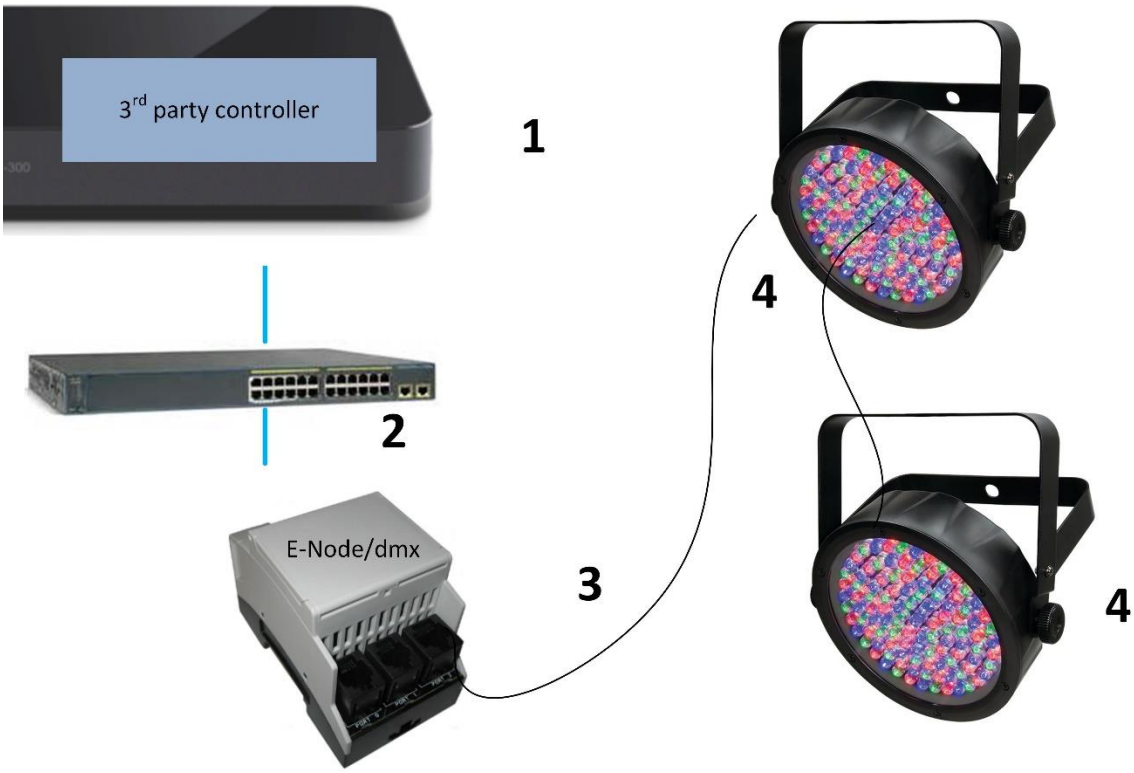


Figure 5

Wiring/Configuration Notes:

1. Maximum length of CS-Bus cabling from e-Node to the last DMX fixture using DMX cabling = 1200 meters (3,900 feet). This theoretically limit may be reduced with some fixtures. Consult individual fixture documentation for more information here
2. Maximum number of DMX fixtures connected to a single e-Node/dmx device = 32. If more than 32 fixtures are required, implement additional e-Node/dmx devices.
3. Maximum number of e-Nodes that can exist on a typical lighting or automation platform = 254 generally. Consult automation platform documentation for more information here.

BILL OF MATERIALS (for IP control)

#	Device	Manufacturer	Part Number	Protocol	Connector Type	Notes
1	Automation family processors	Various	Various	Ethernet	various	
2	Network Switch	Various	Various	Ethernet	RJ-45	
3	e-Node/dmx	Converging Systems	e-Node/dmx	Ethernet	RJ-45 (for Ethernet)	

					RJ-25 for local DMX bus	
4	Third party DMX fixtures	Various	Various	DMX512	RJ-25 for DMX communication	Must terminate final OUT or THRU connector on last DMX fixture using a 120 ohm resistor

e-Node Programming/Device Programming

Minimum requirements for this operation.

-e-Node/dmx with power supply. (If using power supply not provided by factory, DC voltage provided should be between 12v and 24v with output current of at least 90ma.)
-CAT cable to connect e-Node/dmx to local switch or network.
-Necessary cabling to connect e-Node/dmx **PORT 2** to first DMX fixture (see "e-Node Interfacing with DMX Guide"). For reference the pin-outs for **PORT 2** on the e-Node/dmx as well as popular pin-outs for DMX fixtures are included below as well.

Note: The Data**+** signal on one connector should be connected to the Data**+** signal on the other connector. Similar connections for Data**-** and Signal Ground should also be made.

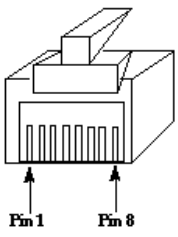
E-Node RJ-45	XLR connector	Std RJ-45 DMX*	Philips RJ-45
Pin 1 (485+)	Pin 3	RJ-45 Pin 1	RJ-45 Pin 2
Pin 2 (485-)	Pin 2	RJ-45 Pin 2	RJ-45 Pin 1
Pin 7 (Gnd)	Pin 1	RJ-45 Pin 7	RJ-45 Pin 7
(all other pins)	N/C	*Std wiring	N/C

e-Node/dmx (MkIII) PORT 2
RJ-45 connector

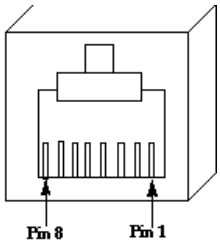
Pin	Signal
1	Data +
2	Data -
3	Do not connect
4	Do not connect
5	Do not connect
6	Do not connect
7	Signal Common/Ground
8	Do not connect

Typical DMX 3-pin XLR connector

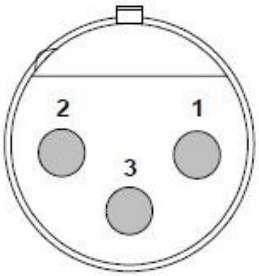
Pin	Signal
1	Signal Common
2	Data -
3	Data +



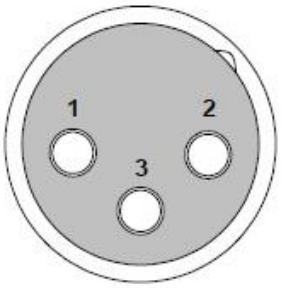
RJ-45 Jack Plug



RJ-45 Jack Face



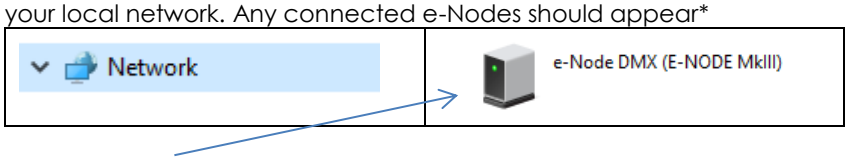
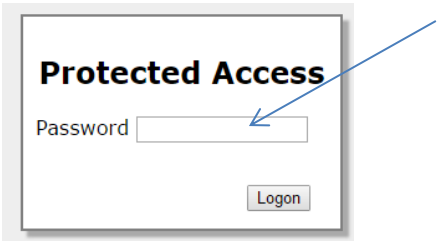
FEMALE

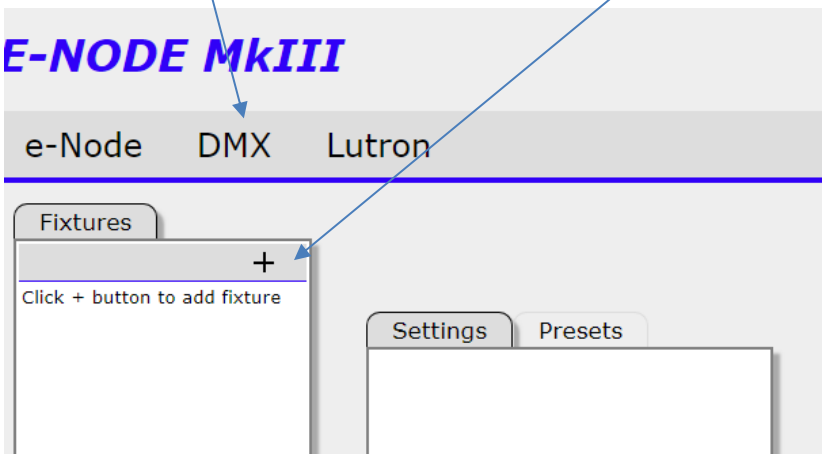
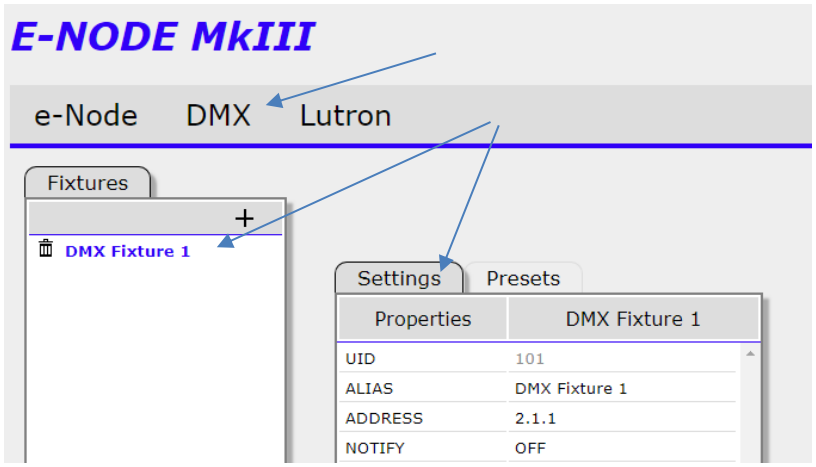


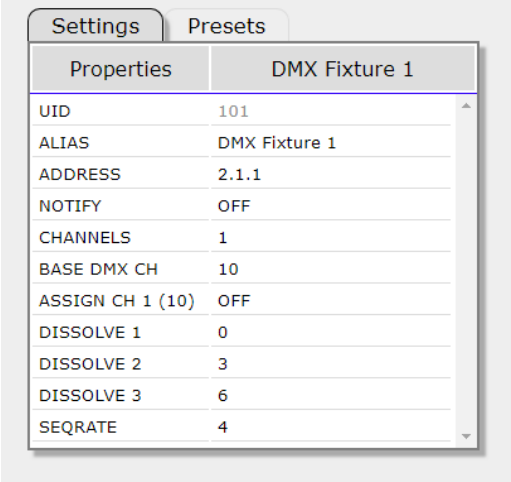
MALE

e-Node/dmx Programming (using new Web Pilot application)

Note: The MK**III** hardware release of e-Node/dmx is required for this level of functionality operating with firmware versions 2.01.14 or later. If you have a previous version of your e-Node MKIII hardware please review to legacy directions for "e-Node Interfacing with DMX (MKIII version) version 1.04"

Step	Setting	Choices
DMX-WP1	e-Node/dmx setup	-Power on e-Node/dmx and connect its Ethernet cable to your switch. -Use a Windows computer connected to the same switch and open your Microsoft **File Explorer** (or **Windows Explorer)**  and search for the **Network** tab to expand it to see available uPnP devices on your local network. Any connected e-Nodes should appear*  -Double click on the icon representing your newly discovered e-Node/dmx and the Web Pilot Home Page will appear (as picture below).  -Click on the triple dash menu icon on that home page (above) and you will be asked for a **Password**. Unless this Password has been changed, enter ADMIN and select **Logon**.  ***Note on uPnP Troubleshooting**: You may have to turn on (Microsoft) Discovery or load the **uPnP** service on your respective computer depending upon the version or settings of Windows loaded. Make sure that your router or switch has **UPnP** turned on which in some cases is turned OFF by default. Before you waste too much time resolving **uPnP** issues on your computer, you can always load the standalone e-Node Pilot application and follow the steps (WP5) below to find the IP address of your e-Node dmx. After you have found that address, simply type that address into your address bar on your browser and continue onto the next step.

DMX-WP2	Opening the DMX Fixture Wizard	-Select the DMX tab on the top to access the DMX Wizard. By default, no DMX fixtures are initially installed or present under **Fixtures.** Click on the + button to add first fixture.  -After first (or subsequent) DMX Fixture(s) are installed, each will populate under the **Fixtures** tab. Select that fixture and all of its properties will be displayed using **Settings**. 
DMX-WP3	Enter settings for DMX Fixture	-A number of programmable fields appear that are necessary to fill out in order to establish connection with any connected DMX fixture(s). The entries and available choices are presented below.

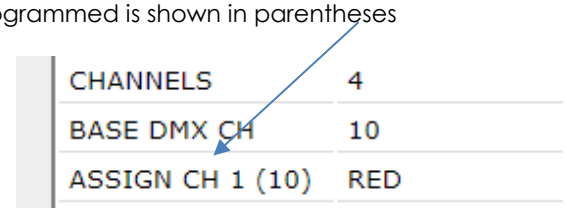


UID	This is an auto-programmed unique ID for each fixture being added. The number cannot be altered. **Note**: no two fixtures can have the same UID.
Alias	You may enter a description for the DMX fixture to make it easier to identify especially if you will be adding multiple fixtures. Click on field to change.
ADDRESS	-Enter a Zone/Group/Node (**ZGN**) address separated by periods that will be used to control this particular Fixture from any supported third-party automation and lighting systems. See information on ZGN Addressing found in any Converging Systems Third-Party Integration document under "Background for Addressing."
NOTIFY	This is a pulldown selector that selects the type of bi-directional feedback which will be provided from the e-Node/dmx back to a supported automation or lighting system. ***Any value other than OFF is required to enable the integration system to able to update its sliders or status buttons when there are color state changes.*** -Mouse select on the current entry and right click to expose available choices. Select desired entry from choices below.

COLOR	This enable Hue/Saturation/ Brightness (HSB) feedback (Preferred for most systems)
VALUE	This enables Red/Green/Blue (RGB) or RGBW feedback. (Useful for legacy systems where just RGB or RGBW control is desired.)
BOTH	This enables both HSB and RGB (RGBW if selected) feedback
OFF	This turns off bi-directional feedback **Note:** for large networks sometimes OFF is preferable to reduce amount of back-

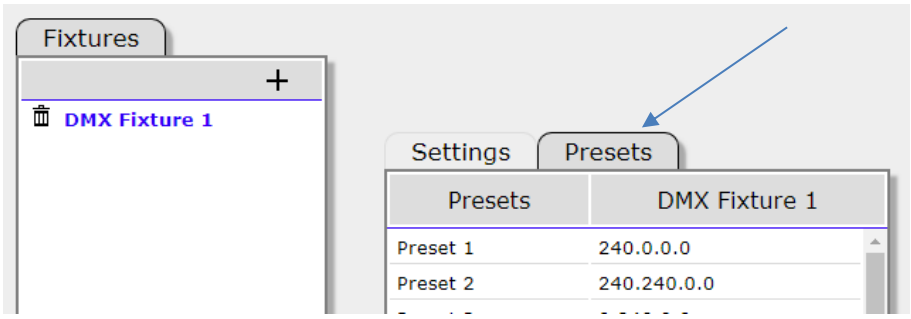
				channel data (but in such case no feedback is provided).
		CHANNELS	-Select the number of channels that the e-Node/Pilot wizard will help you program. **Note:** For each **UIDn/DMX** Fixture it is important to select the appropriate # of Channels in order for the embedded software to be able to properly adapt itself for the target output device. Channels 1 to 15 are currently supported. See note on DMX Channels/Compatibility and Interfacing Issues for cases where you require more.	
		BASE DMX CH	-Select the starting DMX Universe address for the targeted fixture. Typically fixtures have 1, 3, 4 or n-channels available. If your DMX fixture has more than 4 channels available that you wish to control, see DMX Channels/Compatibility and Interfacing Issues.	
		ASSIGN CH 1(n)	Depending upon the number selected under **Channels** above, the operation of that channel can be programmed here. Drop down boxes permit various "commands" to be assigned to each Channel. Below is a table showing standard Commands available	

Option	Notes
RED	Standard for 3 and 4 color devices which provide Red as an available color
GREEN	Standard for 3 and 4 color devices which provide Green as an available color
BLUE	Standard for 3 and 4 color devices which provide Blue as an available color
WHITE	For 4 channel RGBW fixtures, use White for the W channel
MONO	For monochrome DMX fixtures (single color) select MONO
FULL	Typically use this setting if the fixture has a simple dimming channel (that just varies the RGB(W)sliders on a linear basis). Set this channel to FULL and use the e-Node/dmx's embedded HUE ACCURATE DIMMING enhanced dimming function available within the e-NODE to dim the fixture properly.

<table>
<tr><td></td><td></td><td></td><td>
<table>
<tr><td>OFF</td><td>For DMX fixtures that typically have more than 4 channels, set each non-applicable channel to OFF that you choose not to control (the e-Node will simply send out a “0” to each set channel). For more information see DMX Channels/Compatibility and Interfacing Issues.</td></tr>
</table>
Note: For convenience, the DMX Universe channel associated with the specific channel being programmed is shown in parentheses


</td></tr>
<tr><td>DMX-WP4</td><td>Continue adding all required DMX Fixtures using the e-Node web application</td><td colspan="2">Once completed with all DMX Fixture additions, you are now ready to start integrating the e-node/dmx into your third-party automation system.

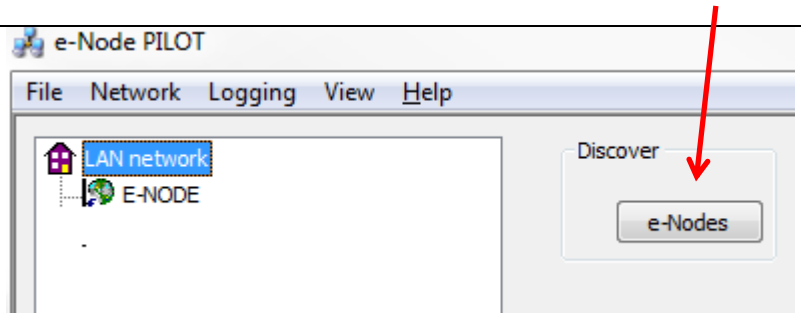
The relevant items that need to be considered are as follows:
-IP address and any passwords for e-Node/dmx
-The Zone/Group/Node address for each DMX fixture
-The type of control available for each DMX fixture (i.e. monochrome using the FADE command, RGB/RGBW commands or HSB brightness commands)</td></tr>
<tr><td>DMX-WP5</td><td>Additional (optional) settings available</td><td colspan="2">Typically, automation and lighting systems support the e-Node/dmx’s built-in STORE and RECALL functions. Some system designers prefer to pre-set their own presets (i.e. RECALLS) and not make the storing of such presets available to the end-user. In such event, you can enter information within the Preset tab to overwrite the factory settings (and simply not expose the saving of presets t to the end-user through your automation platforms UI pages).

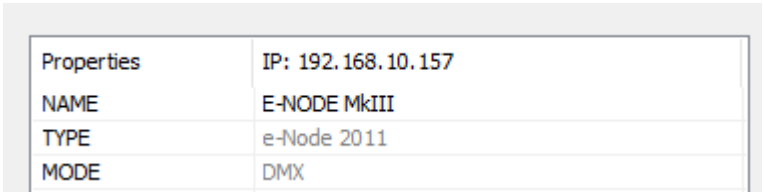
 

Depending upon the Number of Channels setting (previously made, the syntax for entering color or brightness data dynamically changes.</td></tr>
</table>

<table>
<tr><td></td><td></td><td>Available color space choices are shown below:
<table>
<tr><th>If Channel is set to</th><th>Color Space</th><th>Settings available)</th></tr>
<tr><td>1</td><td>Monochrome Mode (brightness is only option)</td><td>Level of brightness from 0 to 255 for DMX can be entered.</td></tr>
<tr><td>3</td><td>RGB Mode (3-color mode)</td><td>Separate Red, Green and Blue entries separated by periods
(i.e. 255.255.255 for all colors on. The 1st entry represents Red, the 2nd entry represents Green, and the 3rd entry represents Blue)</td></tr>
<tr><td>4</td><td>RGBW Mode (4-color mode)</td><td>Separate Red, Green, Blue and White entries separated by periods
(i.e. 255.255.255.255 for all colors on. The 1st entry represents Red, the 2nd entry represents Green, the 3rd entry represents Blue and the 4th entry presents White)</td></tr>
<tr><td>>4</td><td></td><td>It is assumed that the Channels is set to >4, that some unused or non-varying channels will be set (see DMX Channels/Compatibility and Interfacing Issues). Regardless, the maximum variable color space (RGBW) is still preserved (regardless of what those RGB and W entries control. Therefore, enter preset color data in the RGBW virtual format with whatever is in the first field controlling the virtual “Red” channel, and whatever is in the 2nd filed controlling the virtual “Green” channel and so on.</td></tr>
</table></td></tr>
<tr><td>DMX-WP6</td><td>Using Pilot application (on a PC) to determine IP address of e-Node/dmx</td><td>Note: In the unlikely event that your computer’s network discovery (uPnP) is not functional and your e-Node/dmx cannot be found with Network Scanners, download and unzip the e-Node Pilot application from the Converging Systems website http://www.convergingsystems.com/downloads_library.php

-Launch the desktop Pilot application and from the View e-Node tab select the Discover e-Node button. Any e-Node(s) connected on the same network will appear as shown. Simply click on the targeted e-Node/dmx and you will find its IP address under the Properties window</td></tr>
</table>





-If e-Node Pilot cannot find your targeted e-Node/dmx, it may have been given a static IP address outside your existing Subnet. In such event, you can reset the e-Node/dmx to Dynamic DHCP Addressing such that Pilot will once again Discover the device. To do so, remove the shroud to the right of the 2-pin power connector and depress the reset button and hold it until **three** sets of flashes on the on-board LED are observed. Immediately, release the button and the on-board PCB LED will go out and then start flashing fast. If it secures a DHCP address in a short period of time, it will start flashing slowly. Then once again try to discover it with the **Discover e-Node button** within Pilot.

Appendix 5

Sample User Interfaces

AMX 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.

Figure 6

Note: Hue/Saturation/Brightness control. Individual power controls for two loads. (stored) Scenes (Presets 1-6) Color Temperature Sliders. Circadian Sliders. Discrete color temperature buttons.

MOTOR CONTROL ENVIRONMENTS

The following illustrations provide some sample UI for motor control interfaces. Future updates to the AMX/CSI drivers will be made available supporting these screens.

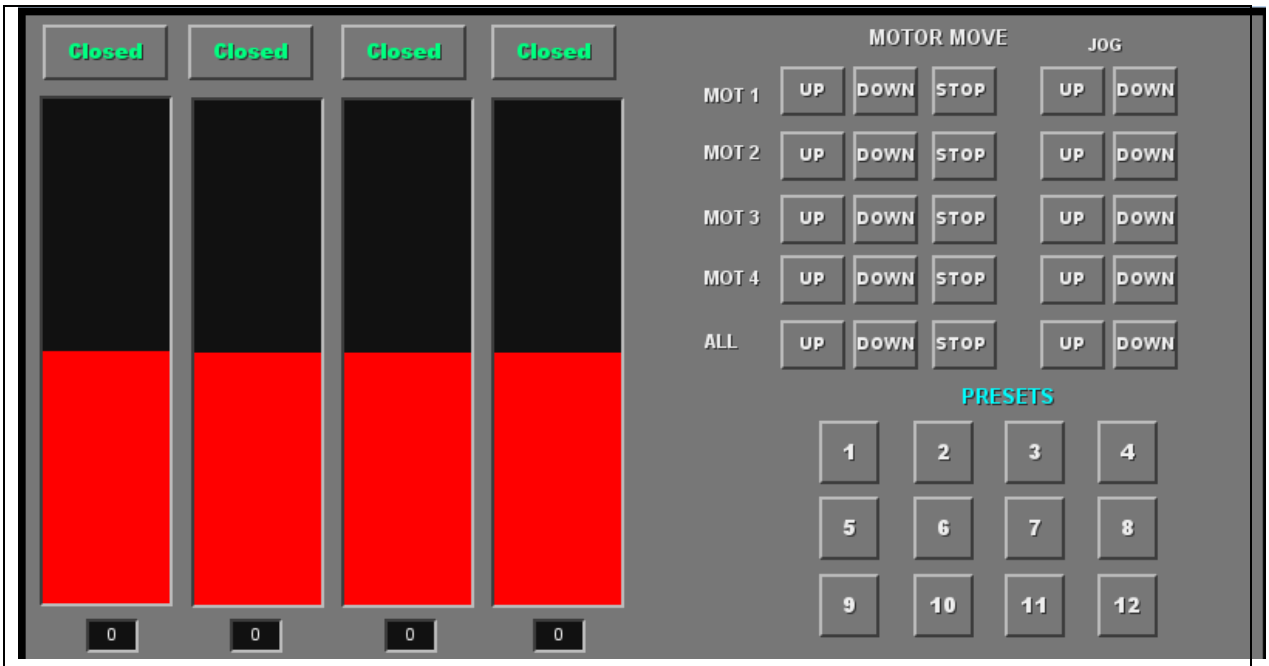


Figure 7

Note: (Motor Control UP/Stop/Down for up to 4 motors. Preset Recall positions for up to 10 presets. Store Preset positions for up to 9 presets.)

Appendix 6

Troubleshooting/System Monitoring

(reserved)