Converging Systems Inc.

CS-Bus Controllers

Intelligent Lighting Controller

ILC-xx0 Family

Version 2.0.b

May 11, 2023

Intelligent Lighting Controller (ILC-xx0 Controllers)

SAFETY INFORMATION

The ILC-xx0 LED Controller and FLLA luminaries contained with an approved UL enclosure and specified Class 2 power supplies carry a UL Listing under UL File-2108. The ILC-xx0 Controller as a standalone unit in addition has been approved as a Recognized Component under the same UL File-2108.

For units with provided power cords, this warning needs to be provided.

TO REDUCE THE RISK OF ELECTRIC SHOCK, THIS EQUIPMENT HAS A GROUNDING TYPE PLUG THAT HAS A THIRD (GROUNDING) PIN. THIS PLUG WILL ONLY FIT INTO A GROUNDING TYPE OUTLET. IF THE PLUG DOES NOT FIT INTO THE OUTLET, CONTACT A QUALIFIED ELECTRICIAN TO INSTALL THE PROPER OUTLET. DO NOT CHANGE THE PLUG IN ANY WAY.

POUR REDUIRE LES RISQUES DE CHOC ELECTRIQUE, CET APPAREIL EST QUIPE D'UNE FICHE AVEC MISE A LA TERRE COMPORTANT UNE TROISIEME BROCHE (BROCHE DE TERRE). CETTE FICHE NE PEUT ETRE BRANCE QUE DANS UNE PRISE AVEC MISE A LA TERRE. S'IL N'EST PAS POSSIBLE DE LA BRANCHER DANS LA PRISE, FAIRE POSE UNE PRISE APPROPRIEE PAR UN ELECTRICIEN QUALIFIE. NE PAS MODIFIER LA FICHE.
*UTILISER A L'INTERIEUR SEULEMENT

Models/Ratings-ILC-xx0 Family*

Models:

OEM/embedded application:

Note: all configurations are available in customer OEM/PCB configurations (consult factory)

Standalone/metal enclosure option:

ILC-100c: Output voltage is identical to input, 12Vdc~60Vdc.

Standalone/DIN plastic enclosure option:

ILC-100m: Output voltage is identical to input, 12Vdc~60Vdc.
ILC-300c: Output voltage is identical to input, 12Vdc~60Vdc.
ILC-400: Output voltage is identical to input, 12Vdc~60Vdc.
ILC-450: Output voltage is identical to input, 12Vdc~60Vdc.

Ratings:

Input:

All versions: 12-60Vdc, 15 ma plus current capacity of supported LEDs

Output Rating

All versions: Output voltage is identical to input, UL 2108 specified maximum: (60 watts @ 12Vdc) and 100 watts maximum (@24Vdc~60Vdc). Products tested for intermittent duty to 6.67 amp.

Note**: ***The ILC-xx0 is rated (i) as a Recognized Product under UL 2108 and (ii) as part of a Listed System under UL 2108 comprised of the ILC-xx0 Controller used in conjunction with the FLLA Luminaire(s), a specified Class 2 power supply (or any Listed Class 2 power supply) and a UL approved mounting cabinet/enclosure. Maximum rating of a Class 2 power supply is 60 watts @12Vdc or 100 watts @24Vdc~60Vdc.

Depending upon the AC/DC power supply that is utilized, the ILC-xx0 controllers can be operated in 100-240Vac systems throughout the world.

Documentation Revision History

Revision	Date	Description
1.0.a	6/8/2009	Initial Documentation
1.0.b	6/23/2009	Updates
1.0.c	4/12/2010	Updates
1.0.d	3/30/2011	Updates
1.0.e	4/12/2011	Updates
1.0.f	5/15/2011	Updates
1.0.g	12/20/2012	UL-2108 Updates
2.0	9/4/2019	UL-2108 Updates
2.0.b	5/11/2023	ILC-200bw

Description:

The Intelligent Lighting Controller (ILC-xx0) family are designed to operate in some or all of the following modes:

- Monochromatic
- Bi-White,
- RGB
- RGB + White (RGBW) LED lighting elements.

See the specifications at the end of this manual for particular modes supported.

Mode Description.

Monochrome Mode (ILC-100m/ILC-100e).
Support of single-color output (typically white)

Bi-White Mode (ILC-100bw).
Support of dual channel (warm white/cool white) luminaries. Range of CCT (color temp0) available –typically 1700k ~ 7000K depending upon makeup of LED devices.

RGB Mode (ILC-100c,ILC-300 DIN)
Support of tri-colored luminaries (typically RGB). Range of colors available--16.7 million colors. **RGB** elements are utilized where rich color output is desired but where (i) the brightness (lumen output) possible with **RGB** elements is sufficient for the particular application, and/or where (ii) the lower Color Rendering Index (**CR**I) of the selected **RGB** elements is sufficient for targeted application.

RGBW Mode (ILC-400 DIN, ILC-450)
Support of four-colored luminaries (typically RGB+W). Range of colors available--16.7 million colors. **RGB+W** elements are utilized where the same rich color output is desired but where (i) the higher brightness (lumen output) possible with **RGB+W** elements is necessary for the particular application, and/or where (ii) the higher Color Rendering Index (**CRI**) of the selected **RGB+W** elements is necessary for targeted application. The only tradeoffs with using **RGB+W** LED elements over standard RGB elements is the higher cost and the reduced length of runs possible with a Class 2 rated power supplies (and the ILC-400x lighting controller). **RGB+W** devices consume approximately 80% more current than similarly configured RGB only strips,

1-4 Channel Monochrome Mode (ILC-400, ILC-450
These controllers are designed to handle the intricacies of monochrome lighting seamlessly. There are four independent channels (Channels 1, 2, 3, 4) which can be used where you may wish to have independent control of four different “zones” of LED lighting. Or alternatively, you may simply any number of channels fewer than 4 for your particular application. Simply observe the ratings for the compatible controller and divide up your LEDs any way you wish (i.e. you can consolidate all LEDs onto a single channel or divide those LEDs into branches connected to additional channels provided that in no cases the maximum draw from all LEDS does not exceed the maximum rating for the compatible controller.
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Connectivity:

The ILC-xx0 controller can be controlled through a number of remote control devices, including keypads, dry contact outputs, low-voltage trigger outputs, local and remote Infrared control, IP (Internet Protocol), and RS-232c interfaces from computer-based signaling sources such as those manufactured by AMX, Crestron, Elan, RTI, Savant, Lutron, Vantage, ON-Controls, Key Digital, Kramer Controls. Consult Converging Systems' website for more information.

http://www.convergingsystems.com/inres_atoz.php

TO BE INSTALLED AND/OR USED IN ACCORDANCE WITH APPROPRIATE ELECTRICAL CODES AND REGULATIONS

Important Information:

- Carefully read the instructions appropriate for your needs.
- This control must be installed by a qualified electrician.
- For supply connections, use wires rated for at least 75 C.
- Use Copper or Aluminum Conductors.
- For indoor use only.
- Do not connect Low-Voltage to Line-Voltage Power.
- Article 725-54(a), (1) Exception No. 3 (NEC) or Canadian CE Code Handbook, Rule 16-212, Sub rule (4) requires segregation between line voltage and Class 2 (low voltage) circuits. Low Voltage/network wires should enter enclosure boxes through separated openings. Also, conductors shall be separated by at least ¼" or segregated by barriers. Check with your local electrical inspector or compliance with local/national codes and wiring practices.
- Proper short-circuit and overload protection must be provided at the circuit breaker distribution panel. You can use up to a 20A maximum circuit breaker with adequate short-circuit breaking capacity for your installation.

1 System Configuration and Design

1.1 General Overview

Constant Voltage Support. Intelligent Lighting Controllers (ILC-xx0) are designed to support a wide range of LED applications from the simplest systems (comprised of a single ILC-xx0 controller and supported constant voltage FLLA lighting elements), to the most sophisticated system (comprised of an unlimited number of ILC-xx0 controllers networked together (254 controllers per e-Node) and supported LED devices. All that is required is the requisite number of ILC-xx0 controllers, a communication gateway (IP type/e-Node or RS-232c type/IBT-100),the specific LED elements, interconnect wires/power supplies rated to support the system plus any User Interface devices (keypads, remotes, etc.) with which to control the system.

Constant Current Support. Intelligent Lighting Controllers (ILC-xx0) are designed to support a wide range of LED applications from the simplest systems (comprised of a single ILC-xx0 controller and supported constant current LED lighting elements), to the most sophisticated system (comprised of an unlimited number of ILC-xx0 controllers networked together (254 controllers per e-Node) and supported LED devices. All that is required is the requisite number of ILC-xx0 controllers, a communication gateway (IP type/e-Node or RS-232c type/IBT-100),the specific LED elements, interconnect wires/power supplies rated to support the system plus any User Interface devices (keypads, remotes, etc.) with which to control the system.

1.2 LED Types Supported

Constant **V**oltage (**CV**) Support. The ILC-xx0 family of controllers support a wide range of LEDs* available in the marketplace. The ILC-x00 controllers can support all Constant Voltage (**CV**) monochrome, bi-colored, RGB, or RGBW common positive LEDs rated between 12Vdc ~ 60Vdc, **provided that the current requirements of the connected LEDs are less than the rated output of any Converging Systems CV-type controller.** In order to determine the specific length of LEDs elements that can be supported, please refer to the current requirements of the specific LED strip desired to be supported. It is important to determine the specific current of the specific type of LED element to be connected, as these ratings vary depending on the type of LED. Refer to the specification for the particular LED FLLA strip utilized.

Note: Converging Systems **CV**-type ILC-x00 controllers have been designed for a common anode (+) connection and negative (-) cathode return connections for Bi-White (WW), RGB, and RGBW configuration. In the case of monochromatic LEDs, any type of 12v~60Vdc LED can be selected again presuming that its current capacity is less than the rated output for the ILC-100x controller and its anode (+) and cathode (-) connections are properly made.

Constant **C**urrent (**CC**) Support. Specific monochrome Constant Current LED devices can be supported in addition with ILC-x00 family Constant Voltage LED controllers. Specific models of controllers and/or specific power supplies may be required to properly support multiple LED elements/fixtures to protect individual elements in the event of a lamp burnout. In addition, Constant Current color LED devices can also be supported with unique Constant Current controllers (i.e. ILC-450). See Appendix 4 for models, quantities, and other ratings of supported RGBW and RGBW fixtures.

*__Note__: ILC-xx0 CV-type controllers have been designed for a common anode (+) connection and unique negative (-) cathode return connections for W/W, RGB, and RGBW configuration. In the case of monochromatic LEDs, any type of LED can be selected again presuming that its current capacity is less than the rated output for the ILC-100x controller, it voltage is within the range of the ILC-000 controllers (and within the range of a Class 1 power supply), and its anode (+) and cathode (-) connections are properly made.

1.3 Power Supply Requirements

The ILC-xx0 family of controllers support a wide range of LEDs available in the marketplace.

Select the target LED fixture type from the table below and refer to appropriate section for more information.

Type	Output channels/type	Section
Constant **V**oltage (linear strips)	Monochrome, Bi-White, RGB, and RGBW linear strips	see 1.3.1. below
Constant **C**urrent white/mono. fixtures	Surface mount and Recessed Monochrome fixtures	see 1.3.2 below
Constant **C**urrent color (and monochrome) fixtures	RGB and RGBW fixtures (and monochrome)	see 1.3.3 below

1.3.1 Constant Voltage (CV) Mono/BI-White/RGB/RGBW linear strips (ribbon or FLLA)

The following controllers can support various types of Constant Voltage monochrome, Bi-White (W/W), RGB, or RGBW common + linear strip LEDs as indicated below:

Controller Model	Output type	Channels of Output
ILC-100m (DIN)	Monochrome	1
ILC-100sa	RGB	3
ILC-200bw	Bi-white (2 different CCT)	2
ILC-300din (DIN)	RGB, Monochrome, Bi-White	1~3
ILC-400din (DIN)	RGBW, Monochrome, RGB, Bi-White	1~4

The voltage output of the required power supply must match the voltage requirements of the CV LED lamps being supported (i.e. a 12Vdc LED system will require a 12Vdc power adapter; a 24Vdc LED system will require a 24Vdc power adapter). The current capacity[1] of the power supply must support the power requirements of the LED lamps being supported plus a small additional overhead for the ILC-xx0 controller itself. See the table under Section 1.5 below for more information here. In addition, see Appendix 4 for system requirements for popular LED strips.

For example, for a simple system with one ILC-xx0 controller used in conjunction with a **Class 2** power supply, it is recommended that the maximum current draw of the attached LED elements should be limited to no more than 92% of the rated output of the power supply. Specifically, if a 100-watt 24Vdc **Class 2** power supply is selected, the specified current draw for the connected LEDs should be 92 watts or less.

In cases where multiple ILC-xx0 controllers are in aggregate driving less than the rated output from the Class 2 power (40 watts of load from one ILC-xx0 controller and 40 watts of load from a second ILC-xx0 controller), it is quite acceptable to daisy chain (parallel wire) the DC output from a single power supply to more than one ILC-xx0 controller. However, when the current capacity is exceeded for a single ILC-xx0 controller, then ***multiple*** ILC-xx0 controllers need to be added into the system (with multiple Class 2 power supplies.)

Note: Alternatively, these controllers can also support **C**onstant **C**urrent MONOCHROME fixtures (see 1.3.2 below)

1.3.2 Constant Current Monochrome Fixtures (recessed or surface mount) with Constant Voltage Controllers

The CV (Constant Voltage) controllers specified below can support (in addition to those supported ***Constant Voltage*** outputs specified in section 1.3.1 above), a single or multiple Constant Current monochrome recessed and surface mount fixtures*.

IMPORTANT: Although the CC (Constant Current) controllers specified below with a single ***** can also support Constant Current Monochrome fixtures (one or multiple), support of the following types of fixtures requires the special case directions contained in Section 1.3.3:

- Multiple RGB or RGBW **Constant Current** fixtures.
- Multiple monochrome **Constant Current** fixtures without requiring a special regulated power supply that has built in potentiometers to regulate voltage.

Controller Model	**Type of Output -Constant Voltage (CV) or -Constant Current (CC)**	**Output-Monochrome fixtures**	**Channels of Output**	**Zone/Group/Node (ZGN) control**
ILC-100m (DIN)*****	CV	Yes* (multiple monochrome fixtures wired in parallel) in single zone output channel	1	1 ZGN address
*ILC-100sa**	CV	Although possible, multiple zone control is not possible so alternative controllers are recommended here	3 (but only one zone)	1 ZGN address (must use the separate R/G/B channels to improvise her for multi-output control
ILC-200bw	CV	Yes* (multiple monochrome fixtures wired in parallel) to any or all of the output channels (1~3 output channels)	2 discrete	Up to 2 ZGN addresses (in dual mono mode)
ILC-300 (DIN)*****	CV	Yes* (multiple monochrome fixtures wired in parallel) to any or all of the output channels (1~3 output channels)	3 discrete	Up to 3 ZGN addresses
ILC-400 (DIN)*****	CV	Yes* (multiple monochrome fixtures wired in parallel) to any or all of the output channels (1~4 output channels)	4 discrete	Up to 4 ZGN addresses
ILC-450 (DIN)**	CC	See Section 1.3.3		

Power Supply Background. Constant Current Monochrome fixtures usually carry a marking of their required current (max) and their allowable voltage range. The Converging Systems Constant Voltage controllers specified above (with an asterisk *) can be used with some special considerations when driving multiple LED (monochrome) LED devices. The concept here is that an ILC-400 with 4-channels of output could be used to drive up to 11 x 8-watt fixtures with 1 to 4 zones of control (see Table below).

Example: If all monochrome devices are connected to one output of the ILC-400 (when set to 4-CH Monochrome Mode), then only one zone of output would be possible. Alternatively, if 8 devices were spread out over the possible four zones of output (again if the ILC-400 were placed into Monochrome Mode), then four zones of control would be possible.

Power Supply Selection Criteria

1 A Class 2 adjustable power supply that enables the **voltage** to be limited (usually specified with a “A” in the product name) is required. Contact the factory for specific assistance here.

2. The rated output voltage **range** of the power supply must bracket the rated tolerable voltage range of the Constant Current Monochrome LED. For instance, if the target LED fixture is rated to operate in a 28~36Vdc range, an adjustable power supply that includes that range must be selected. AND PERHAPS MOST IMPORTANTLY, the on-board potentiometer (adjustment mechanism) on the adjustable power supplies should be adjusted to voltage limit its output.

Hint: A DVM can be used to measure under load conditions the output voltage of the targeted power supply and then to set its maximum voltage accordingly (at or below the maximum voltage specified by the LED's specification label).

3. The wattage of the power supply must be sufficient to handle the cumulative wattage of the total number of fixtures to be connected in parallel. See the Table below to calculate that number.

Rated Watts of Monochrome Fixture to be supported[1] **[1]Note: All fixtures must have the same rating if multiple fixtures are to be wired in parallel.**	**Number of Fixtures that can be supported with specified * controllers above (given an 8% derating for a 100-watt power supply @24Vdc~60Vdc)**
8 watts	11
9 watts	10
10 watts	9
11 watts	8
12 watts	7

***Note:** If any controller marked with an "*" above is utilized to drive one or more monochrome fixture(s), a power supply with adjustable voltage output potentiometer is required in order to limit voltage to connected LEDs. This is because these controllers are **Constant Voltage** controllers and when used to drive a **Constant Current** LED, the power supply become critical to support and protect **Constant Current** LEDs from over-voltage damage.

****Note**: Although the ILC-450 constant current controller can support monochrome fixtures, it is required to follow the directions in Section 1.3.3 below for that use case.

1.3.3 Constant Current Color (or monochrome) Fixtures with Constant Current Controllers

The CC (Constant Current) controller(s) specified below can support a variety of Constant Current color (or monochrome) recessed and surface mount fixtures*.

Controller Model	**Type of Output -Constant Voltage (CV) or -Constant Current (CC)**	**Output**	**Channels of Output**	**Zone/Group/Node (ZGN) control**
ILC-450 (in RGBW Mode)	CC	Yes* (1 to 4 compatible RGBW or RGB fixtures wired in series) connected to the 8-pin Output connectors)	RGBW output	1 ZGN addresses
ILC-450 (in 4Ch Mono Mode)	CC	Yes* (multiple monochrome fixtures wired in parallel) to any or all of the output channels (1~4 output channels)	Up to 4 discrete (mono) output channels	Up to 4 ZGN addresses

Converging Systems Constant Current controllers are uniquely different from Converging Systems' Constant Voltage controllers. In this special case with the above specified controller(s), the voltage output of the required power supply is selected based upon (i) the forward voltage requirement of any of the one, two, three or four LED elements designed into the LED fixture, and (ii) the quantity of LED fixtures desired to be driven in series from the output of the constant Current Controller. Please refer to the chart below to help specify the voltage requirement of the power supply.

Table 1: Forward Voltage of the any one of the LED elements-Model ILC-450:700

Number of Fixture to be connected to output channel on CC controller	**12Vdc Fixture (700 ma max per LED element)**	**Reserved**	**Reserved**
1 Fixture	One 12Vdc 60-watt supply*		
2 Fixtures	One 24Vdc 100-watt supply*		

3 Fixtures	One 36Vdc 100-watt supply*		
4 Fixtures (max)	One 48Vdc 100-watt supply*		

Note:** ***the limitation of a UL/NEC CLASS 2 power supply is 60 watts @12Vdc or 100 watts @24Vdc~60Vdc. Although other power supplies are available with larger wattage outputs, the ILC-xx0 Controllers and associated LED elements should only be used with UL Listed CLASS 2 power supplies or specific UL Recognized CLASS 2 power supplies.

1.4. Maximum Lengths/Quantities of LED Strips/Fixtures Supported (FLLA-type linear strips)

1.4.1 Constant *Voltage Devices (Linear Strips/FLLA Devices)*

Typically, flexible FLLA (LED elements) come in strips up to 5 meters (16.4') in length. If more than 5 meters of LEDS are desired to be run continuously, ***and they can be supported by the current requirements of a single ILC-xx0 controller*** *(see section 1.3 above)*, then each 5-meter strip ***must*** be separately connected back to the ILC-xx0 controller. Technically, the copper connections (etch thickness) within the LED strips **cannot** support a current draw more than required by a strip 5 meters in length (i.e. the "Maximum Run") because of voltage drop and color/brightness consistency issues. In such case there is a risk of fire and the manufacturer's warranty shall be considered void.

However, in certain circumstance it may be desirable to run longer than 5 meter runs of LED lighting. In this situation, provided (i) the maximum draw of this longer run is less than or equal to the rated output of the ILC-x00 controller, and (ii) the run is less than or equal to 10 meters, it is permissible to interconnect LED components as one continuous run (hereinafter "Extended Connected Run" or "ECR" provided that the resulting ECR receives two connections from the ILC-xx0 controller – one to the beginning of the ECR and the other (in parallel) to the end of the ECR.

1.4.2 Constant *Current Fixtures (Recessed/Surface Mount Fixtures)*

Unique technology present within the Converging Systems Constant Current controllers (i.e. ILC-450), enable multiple supported **C**onstant **C**urrent LED fixtures to be wired in a daisy-chained format (series wiring). The suffix after the product marking (i.e. ILC-454:**700** indicates the rating in milliamps for the LED element that each output channel is driving (regardless of the number of downstream fixtures which are connected).

Please refer to Table 1 above to determine the maximum number of supported LED fixtures that may be connected using the specified wiring topology specified in Section 3.3.2.

1.5 System Design Configuration Table (for CV FLLA linear LED strips)

For system design, it is necessary to review the below table to determine system requirements. Depending upon the rated wattage of the FLLA linear strips that will be supported, the entries in this table will change. Please use this table as an example

Table 1

Number of Discrete Lighting Systems that can be individually controlled	Load in Amps of LED elements that can be supported with ***each*** ILC-xx0x[1]	Maximum Amp of Class 2 power supply that should be used to support each ILC-x00 CV controller[2]	Length (of typical LED strips with 4.14w/ft of current draw @24Vdc rating)	Length (of typical LED strips with 5.w/ft of current draw @24Vdc rating)	Power supply Requirement (for 24Vdc linear strips)
1	6.3 amps	4.172a	7.36 meters per ILC-xx0 (24 ft)	6.10 meters (20 ft)	24Vdc 100-watt power supply.

Notes:
[1] This is the rated maximum of each Constant Voltage ILC-x00 controller. However, NEC and UL requirements dictate that a maximum of 100 watts @24volts (60 watts @12Vdc) should be utilized for each UL 2108 rated Constant Voltage controller
[2] The limitation of a NEC rated CLASS 2 power supply is 60 watts @12Vdc (or 100 watts @ 24Vdc). Specifically, the load side of the transformer must have a nameplate rating of less than 100VA (or 5 times Vout if output voltage is lower than 20v). Similar standards exist in German (VDE 0100), Canada 9CSA C 22.1), Switzerland (SEV HV1000), Great Britain (BS7671) or as international standards (IED 364-…). Other power supplies are available with larger wattage outputs. However, depending on local electrical requirements, special licenses or certifications may be required to install power supplies that do not carry (NEC) CLASS 2 ratings.

2 Mounting Instructions

The ILC-xx0 controllers come in various versions. These include:
-Type C Custom OEM PCB board mount
-Type M Metal housing box mount
-Type D Plastic DIN rail mount

If your configuration is of Type M, follow the directions in Section 2.1. If your configuration is of Type M, follow the directions in Section 2.2.

Note: For customer configurations (Type C), consult Converging Systems for more information.

2.1 Metal Housing Mount

Figure 1 Metal Mount

Directions

a. Determine a suitable mounting location for ILC-xx0.

b. Utilize the built-in mounting ears and use appropriate screws to affix the unit to a stable surface.

c. For safety and integrity of data communication, connect an earth ground the metal chassis (you may need to strip away some of the powder-coat to maintain a high-quality ground.

Note: For convenience, certain ILC-xx0 Controllers may be mounted within a UL Listed mounting box. If you are mounting the ILC-x00 within such a box, route Low Voltage wires through a separate entry or knockout from any AC supply lines present.

2.2 Din-Rail Mount

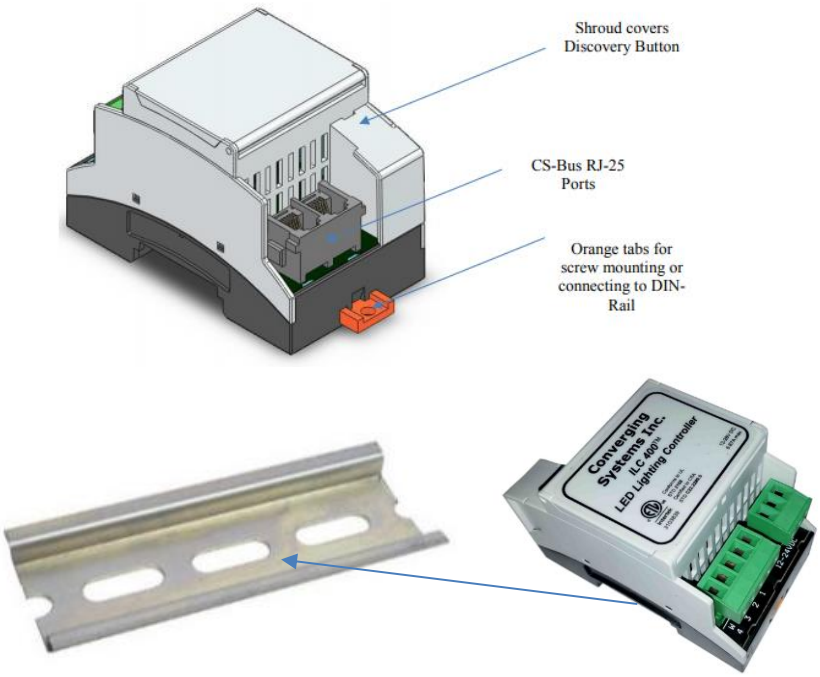

Figure 2 DIN-RAIL Mount

Directions

a. Determine a suitable mounting location for ILC-xx0.

b. Secure sufficient length of DIN-RAIL (not-included) and attach it to your mounting surface.

c. If mounting to a DIN Rail, gently release the orange fingers on the bottom of the ILC-x00 (DIN) in order to enable the device to slide onto or snap onto the DIN RAIL.

If mounting to any other type of flat surface not using a DIN Rail, gently release the bottom orange pair of fingers (on the bottom of the DIN Rail controller) and affix to your substrate using appropriate fasteners and the provided holes in the orange fingers.

Note: For convenience, the ILC-xx0 (DIN) Controller may be mounted into a separately available UL-type enclosure where multiple controllers may be installed for convenience (according to local codes and regulations). If you mount the ILC-400 (DIN) controller within such an enclosure, route the Low Voltage wires through a separate entry or knockout ¼" or more from any Class 1 supply lines.

3 Supply (Line Input) and LED (Load Output) Wiring Instructions

The ILC-xx0 controllers may be mounted either (i) close to their intended load or (ii) remotely from their intended load. Because of DC voltage drop issues, it is paramount to utilize the correct gauge of wire for either (i) connecting a power supply to its ILC-x00 controller (remotely), or (ii) connecting the ILC-xx0 controller to its load (remotely).

Please refer to the Voltage Drop reference chart found on Converging Systems website for more information.

http://www.convergingsystems.com/bin/doc/cable_length_DD.pdf

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IMPORTANT: MAKE SURE THAT THE DC POWER SOURCE IS UNPLUGGED FROM THE ILC-xx0 PRIOR TO CONTINUING.

3.1 DC Power Source Connection

Depending upon the model of the ILC-xx0, there may be 2-pin or a 3-pin power connector. Refer to the appropriate section below for your particular configuration

3.1.1 DC Power Source Connection (3-pin connector)

Directions

a. Strip 1/4" (6mm) of insulation from DC power cord.
b. Connect wires as shown below:

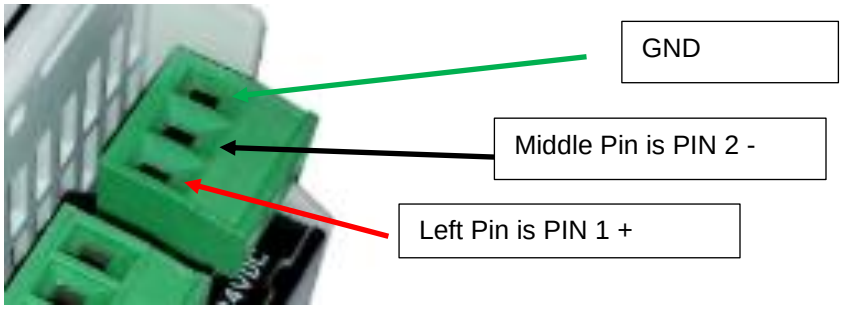


Figure 3 (3-pin power connection)

DC Input Connection Block	DC
Pin 1 (left position on connector)	Positive (+) 12 to 60Vdc (matching LED requirement)
Pin 2 (middle position on connector)	Minus (-) 12~60Vdc
Pin 3 (right position on connector)	Ground

Note: Secure a Ground connection by providing a link to the power supply's earth ground (and feed that to Pin 3 above). Alternatively, if this is not possible, connect a shunt/bridge between Pins 2 and Pins 3 on the connector above, and securely make a ground connection from the Negative output of the feeding power supply to the power supply's incoming earth ground. This eliminates any ground loops that might cause noise or interference especially when there are multiple power supplies feeding multiple ILC-xx0 controllers on a connected network.

3.1.2 DC Power Source Connection (2-pin connector)

a. Strip 1/4" (6mm) of insulation from DC power cord.
b. Connect wires as shown below:

Figure 4 (2-pin power connection w/ chassis ground)

DC Input Connection Block	DC
Pin 1 (left position on connector)	+ 12 to 48Vdc (matching LED requirement)
Pin 2 (right position on connector)	Negative

c. Connect a separate ground wire from an earth ground to the metal chassis on the ILC-x00. You may use a mounting screw affixing the mounting ear as a ground post provided that you ***remove some of the powder-coat material*** from the chassis to insure a good ground connection to the metalwork of the ILC-100c.

3.2 LED Connection Block (Output Terminal)

Depending upon the model of the ILC-xx0, there may be 2-pin, 4-pin, 5-pin or 8-pin LED ***output*** connector. Refer to the appropriate section below for your particular configuration

Controller Model	Connector Block Directions	FLLA/Fixture Connections
ILC-100m (DIN)	Section 3.2.1	Section 3.2.1
ILC-100sa/ILC-100c	Section 3.2.2	Section 3.2.1
ILC-200bw	Section 3.2.2	Section 3.2.1
ILC-300 (DIN)	Section 3.2.4	Section 3.2.1
ILC-400 (DIN)	Section 3.2.5	Section 3.2.1
ILC-450 (DIN)	Section 3.2.6	Section 3.2.2

3.2.1 2-Pin Connection Block (ILC-100m)

Directions

a. Strip 1/4” (6mm) of insulation from each lead of the leader (feeder) cable running to the LED elements.
b. Connect these wires as shown below:

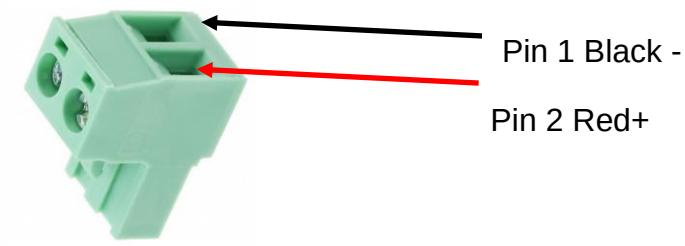


Figure 5 (2-pin plug)

LED output block	LED strip
Pin 1 (left position on connector)	BLACK (-)
Pin 2 (right position on connector)	Common (+) **POSITIVE ANODE**

3.2.2 3-Pin Connection Block (ILC-100e/ILC-200bw)

Directions

a. Strip 1/4” (6mm) of insulation from each lead of the leader (feeder) cable running to the LED elements.
b. Connect these wires as shown below:

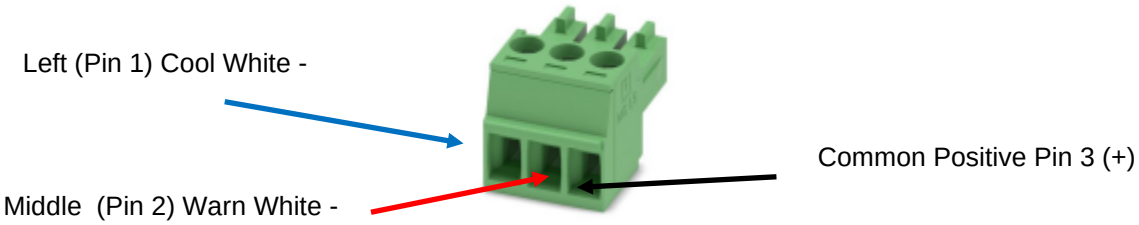


Figure 6a (3-pin plug)

Note: the markings on the ILC-100e/ILC-200bw may be different, obey the wiring specifications here.

LED connector plug	Single Channel Mode	Bi-White mode
Pin 1 (left position on plug)	NA	Cool White (-)
Pin 2 (middle position on plug)	Mono LED - lead	Warm White (-)
Pin 3 (right position on plug)	Anode (+) of Mono LED	Cool White & Warm White + (tied together

3.2.3 4-Pin Connection Block (ILC-100c/ILC-100sa/ILC-300)

Directions

c. Strip 1/4" (6mm) of insulation from each lead of the leader (feeder) cable running to the LED elements.
d. Connect these wires as shown below:

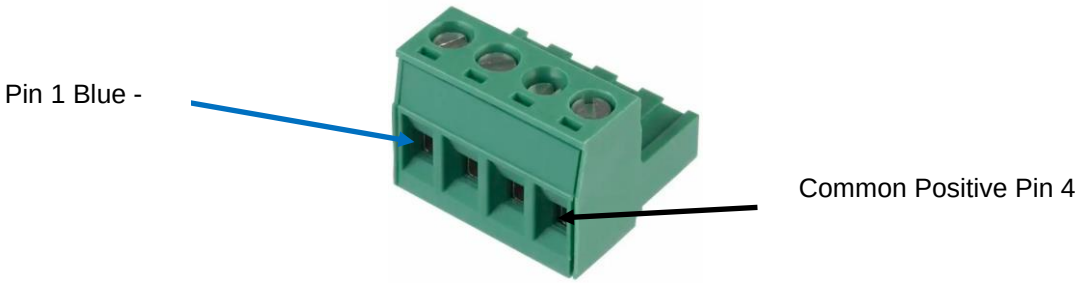


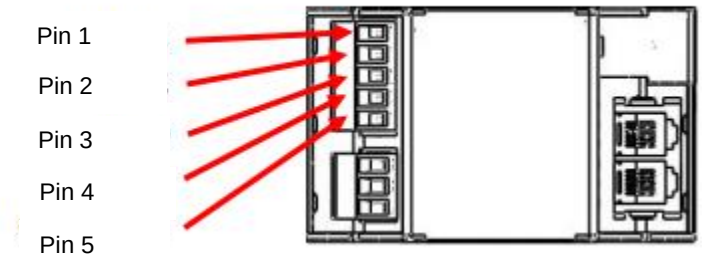
Figure 7b (4-pin plug)

LED output block	LED strip
Pin 1 (left position on connector)	BLUE (-)
Pin 2	RED (-)
Pin 3	GREEN (-)
Pin 4	Common (+) **POSITIVE ANODE**

3.2.4 5-Pin Connection Block (ILC-400)

Directions (Refer to applicable table below depending upon your configuration)

a. Strip 1/4" (6mm) of insulation from each lead of the leader (feeder) cable running to the LED elements.
b. Connect these wires as shown below:



FOR RGBW MODE

Figure 8 (5-pin plug)

For RGBW Mode

LED output block	LED strip
Pin 1 (left position on connector)	WHITE (-)
Pin 2	BLUE (-)
Pin 3	RED (-)
Pin 4	GREEN (-)
Pin 5	Common (+) **POSITIVE ANODE**

FOR 4-CH MONO MODE

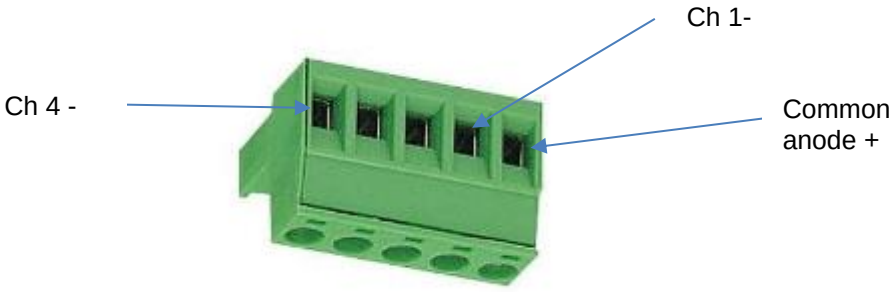


Figure 9 (wiring for monochrome)

For 4-Channel Mono Mode

LED output block	LED strip
Pin 1 (left position on connector)	W 4th channel (-)
Pin 2	W 3rd channel (-)
Pin 3	W 2nd channel (-)
Pin 4	W 1st channel (-)
Pin 5	Common (+) **POSITIVE ANODE**

FOR BI-WHITE MODE

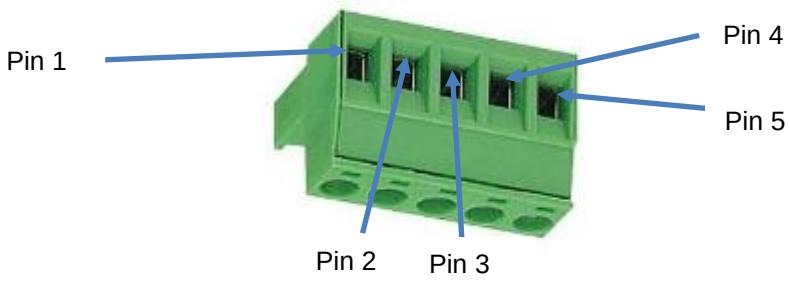


Figure 10 (wiring for Bi-White)

For Dual Bi-White Mode (currently Channels 1 and 2 are common and not unique)

LED output block	LED strip
Pin 1 (left position on connector)	W cool white Ch 1 (-)
Pin 2	W-warm white Ch 1 (-)
Pin 3	Duplicate of Pin 1
Pin 4	Duplicate of Pin 2
Pin 5	Common (+) **POSITIVE ANODE**

3.2.5 8-Pin Connection Block (ILC-450/ILC-460)

Directions (Refer to applicable table below depending upon your configuration)

a. Create a jumper cable using 20/8 awg SOLID wire that will go from the ILC-450 controller to each supported downstream fixture.
b. Strip 1/4" (6mm) of insulation from each solid lead of the interconnect wire and insert each color (as shown in the drawing in Section 3.3.2 below) into the circular hole on the connector. Pay attention to the camber/notch on the connector as shown below to maintain correct polarity.
c. Make sure all wires are connected 1-1, 2-2, 3-3,4-4,.. 8-8 with no crosses or missing connections.

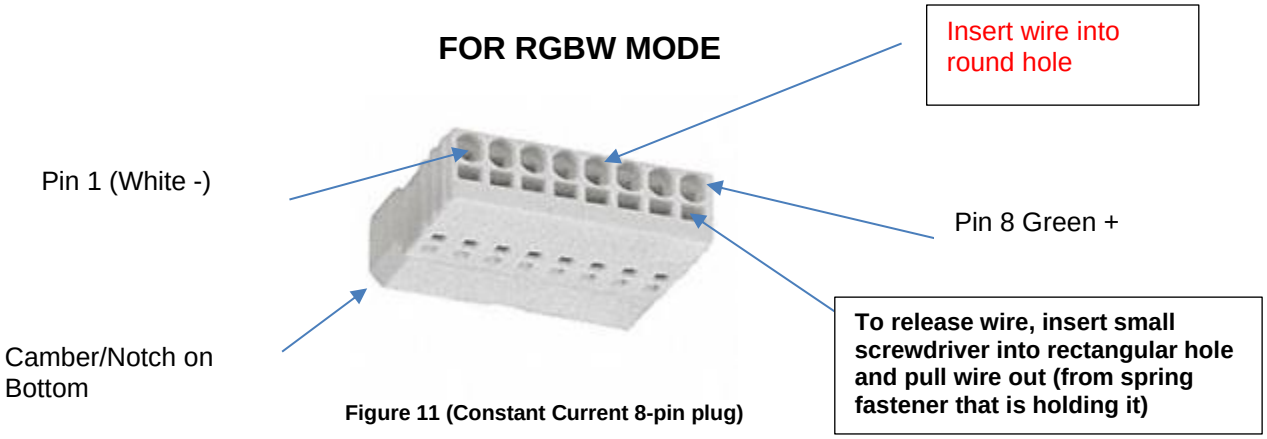


Figure 11 (Constant Current 8-pin plug)

For RGBW Mode (**Note no common Anode**)

LED output block	LED strip
Pin 1 (left position on connector)	White (-)
Pin 2	White (+)
Pin 3	Blue (-)
Pin 4	Blue (+)
Pin 5	Red (-)
Pin 6	Red (+)
Pin 7	Green (-)
Pin 8	Green (+)

FOR 4-CH MODE

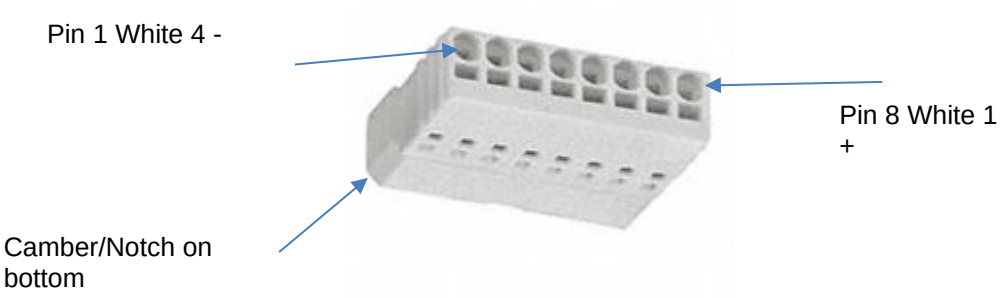


Figure 12 (for 4 CH-White)

For 4-Ch Mono Mode (**Note no common Anode**)

LED output block	LED strip
Pin 1 (left position on connector)	White 4 (-)
Pin 2	White 4 (+)
Pin 3	White 3 (-)
Pin 4	White 3 (+)
Pin 5	White 2 (-)
Pin 6	White 2 (+)
Pin 7	White 1 (-)
Pin 8	White 1 (+)

FOR 2-CH BI-WHITE MODE

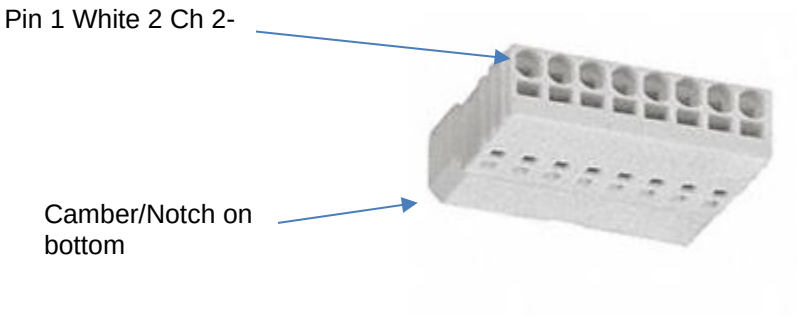


Figure 13 (for Bi-White)

2-CH Bi-White Mode (**Note no common Anode**)

LED output block	LED strip
Pin 1 (left position on connector)	White 2 Ch 2(-)
Pin 2	White 2 Ch 2 (+)
Pin 3	White 1 Ch 2 (-)
Pin 4	White 1 Ch 2 (+)
Pin 5	White 2 Ch 1 (-)
Pin 6	White 2 Ch 1 (+)
Pin 7	White 1 Ch 1 (-)
Pin 8	White 1 Ch 1 (+)

3.3 LED Connection (FLLA linear strips and fixtures)

Please refer to following sections for wiring directions for
-FLLA linear strips (Section 3.3.1)
-Surface Mount of recessed Fixtures (Section 3.3.2)

3.3.1 FLLA Linear Strips

Directions

c. Connect the Common (12+ or 24+) common lead from the FLLA strip to the “C” or “+” connector on the ILC-xx0 controller

c. Connect the remaining connections (i.e. W, or WW, or RGB, or RGBW) to the matching connector pin on the ILC-x00 connector.

For example, the wires connecting the RGBW version of FLLA would connect to its 5-pin connector as shown below

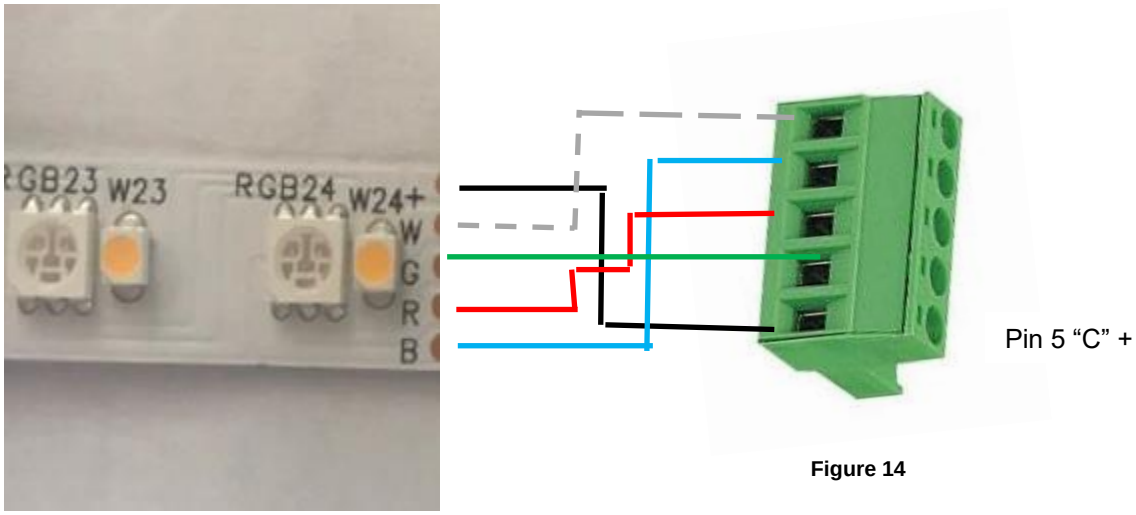


Figure 14

3.3.2 Surface Mount or Recessed Fixtures (for use with ILC-450)

a. Using 20/8 awg solid wire, make a direct connection from the ILC-450 to the first fixture as shown below (see Figure 14 and Figure 15 below).

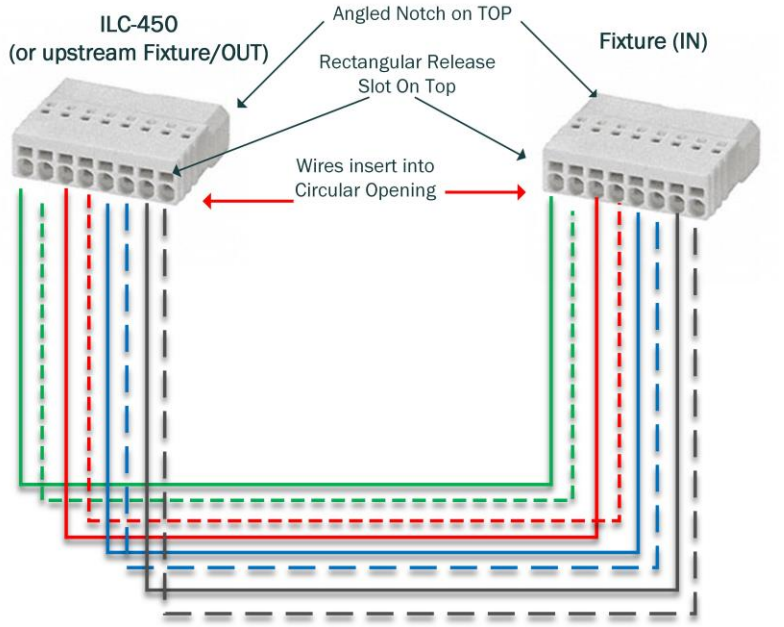


Figure 15

b. Make a connection from the "OUT" connector on the 1st LED fixture to the second LED fixture and to subsequent LED fixtures according to diagram below:

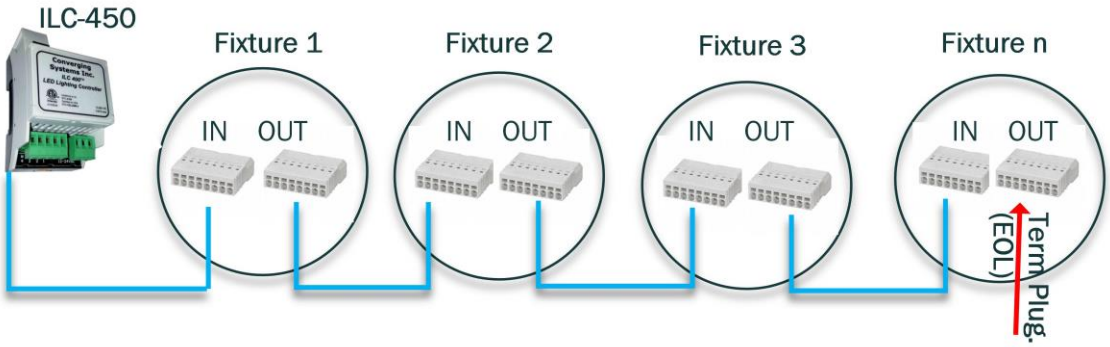


Figure 16

c. Insert an EOL (end-of-line) terminator as supplied with the fixture into the last "OUT" of the chain of fixtures.

WARNING: Each fixture must have connectors into both "IN" and "OUT" ports or else none of LED fixtures will illuminate.

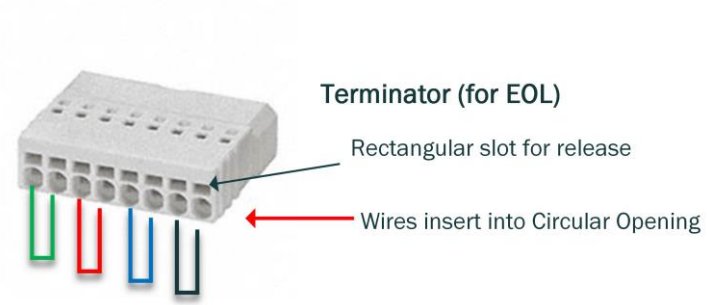


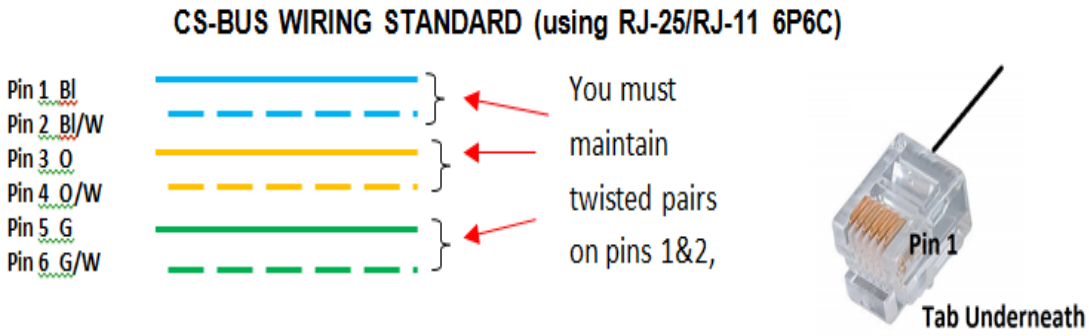
Figure 17

4 CS-Bus Wiring Instructions

Background. All CS-Bus compatible devices have either one or two RJ-25* communication connector(s) with which to interconnect the device to other compatible devices. Controllers (motor or lighting controllers) have two RJ-25 connectors while keypads and interconnect devices typically have just a single RJ-25 connector. Refer to the two tables below which describe the number of RJ-25 connectors available on various (i) CS-Bus Controllers and (ii) Interface Devices as well as their function and other specifics. Please note that on the CS-Bus Controller devices listed below which are configured with **two** (2) RJ-25 sockets, one socket is a ***Powered*** connector (Port 0) which provides DC power to connected Interface Devices while the other socket (Port 1) is an ***Unpowered*** connector which ***does not provide external power*** to other devices connected to it.

*Note: an RJ-25 is a tradename for a RJ-11 type connector that is configured as a 6P6C device.

CS-Bus Wiring Diagram

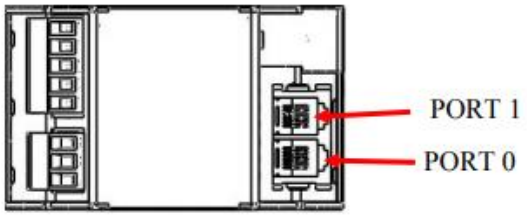


Note: The **CS-Bus** uses standard RJ-25 (RJ-11) 6P6C connectors available at Home Depot, and all electrical distributors. **You cannot use standard flat telephony cable for telephony cable (i) does not have twisted pairs and (ii) utilizes typically a swapped wiring pinout (1-6, 2-5, 3-4, etc. which is not compatible with the CS-Bus). 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 NOT USE 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).

Additional Note: If you do not have 6P6C RJ11/RJ-25 modular connectors/plugs and still wish to proceed, in an emergency you can use 2 pairs of a CAT5 cable and a 4P4C RJ11 plug. You must wire this cable with the first twisted pair for pins 2 & 3 (middle two pins) and the second twisted pair for pin 1 & 4 for data integrity. The reason this is not recommended is that if you have any CS-Bus peripherals which require bus power (which is provided by the 5th and 6th pins on an RJ-25 plug) those peripheral will fail to operate.

Refer to Figure below for the location of the two Ports on an ILC-100x LED controller on various configurations of ILC controllers.

DIN Rail Configuration



Metal Box Configuration

Port 0 Powered port
("Left Port")

Port 1 Non-powered port
("Right Port")

Figure 18 (CS-Bus Ports)

Table 2a—Controller Information

Model #/Type	CS-Bus Comm. Ports (RJ-25 sockets)	Communication Port(s) Function	Number of Interface Devices which can be supported directly connected to specific controller device
ILC-100m ILC-100c ILC-400	2	Port 0 Powered Port Port 1 Unpowered Port	2
ILC-450x ILC-300din	2	Port 0 Powered Port Port 1 Unpowered Port	1

Table 2b—Interface Device Information

Device Family	Model Numbers	CS-Bus Commun. Ports (RJ-25 sockets)	Comm Port Function	External Power Required on CS-Bus to Operate Specific Device
Keypad Devices	BSKP-2XXX	1	Bi-directional communication Interface (I/F)	Yes-mandatory
Serial Interface Devices	IBT-100	1	Bi-directional communication Interface (I/F)	Yes-mandatory
Ethernet Interface Device	e-Node (MKII)	2	Bi-directional communication Interface (I/F)	NO (device receives power from AC/DC adapter directly to unit)
Ethernet Interface Device	e-Node (MKIII)	1	Bi-directional communication Interface (I/F)	NO (device receives power from AC/DC adapter directly to unit)

Types of Connections. Depending upon the number and type of devices that are desired to be interconnected, specific directions are application. Refer to the table below to select the wiring instructions applicable to your specific configuration.

Table 2c-Types of Connections

Type of Connection	Reference
Single controller connected to single interface device	Section 4.1
Single controller connected to multiple interface devices	Section 4.2
Multiple controllers connected to each other	Section 4.3
Multiple controllers connected to a single interface device	Section 4.4
Multiple controllers connected to multiple interface devices	Section 4.5

General Information

- Straight (1-1, 2-2, 3-3, 4-4, 5-5, 6-6) wiring is required for all CS-Bus wiring. Note, typically phone patch cabling with 4P4C connectors should not be used for it is often swapped or reversed. Utilization of phone patch cable that has wires swapped or reversed will void your warranty.
- Use 22-24 AWG CAT5 (or CAT3) interconnection wires with maximum length of bus less than 4000 feet (if using 4 pair wire, simply do not use the Brown and Brown/White of 4th pair wires).
- Up to 254 Controllers can be implemented on a single leg or branch of a CS-Bus without the need for an additional e-Node.
- Up to 65,025 addresses can be issued on one CS-BUS (connected to a single gateway).
- CS-Bus is based on the RS-485 protocol which may require terminating resistors (120 ohm between the two RS-485 signals) at both ends of CS-Bus if sporadic communication is experienced (See Appendix 3 A3-3.2).
- If you are mounting the ILC-xx0 within a UL listed junction box, route Low Voltage wires through a separate entry or knockout from any AC supply lines present.

4.1 CS-Bus Wiring Directions (Single Controller to Single Interface Device)

Directions *(See Figure Below)*

a. Prepare communication wire with RJ-25 (6P6C) connectors on each end.
b. Connect the CS-Bus Controller's RJ-25-***Port 0*** (Powered Port 0) to the single RJ-25 port on the Interface Device.

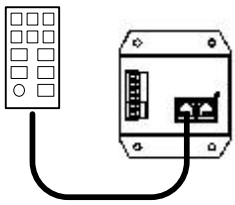


Figure 19 (Keypad connection)

4.2 CS-Bus Wiring Directions (Single Controller to Multiple Interface Devices)

Directions *(See Figure Below)*

a. Prepare the specific number of communication wires with RJ-25 (6P6C) connectors on each end necessary to connect all targeted devices together.
b. Refer to Table 2a above to determine how many Interface Devices can be connected to each targeted Controller. **Note--You may not connect more than the specified number of Interface Devices to a specific Controller.** If you attempt to connect more than the recommended number,

one or more connected Interface Devices may fail to operate or their operation may be intermittent.

c. You will need to secure a specific number of Device Insertion Modules (DIMs) that can be used to effectively "Y" or split the communication signal between a local Interface Device and the next Interface Device located "downstream." Please refer to the following formula to determine the number of DIMS which will be required for your specific application.

Number of DIMS= (# of Single Port Interface Devices) - 1

d. Next, insert a DIM into each Interface Device ***except*** for the last Interface Device. Please refer to Figure below for more information here.

e. Connect one end of the communication wire prepared above in Step "a" into Port 0 (Powered Port) on the CS-Bus Controller and the other end into either of the available RJ-25 sockets in the DIM inserted into the first Interface Device. Again, see Figure below.

f. Finally, continue connecting each subsequent Interface Device to the previous Interface Device as specified in Step "d" above. Where the connection is to a DIM, utilize the open RJ-25 connector to complete the circuit. Note--the connection to the last Interface Device will be to the on-board RJ-25 connector on the Interface Device itself (rather than to a DIM device which is not needed here).

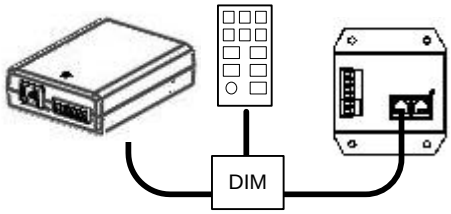


Figure 20 (DIM diagram)

4.3 CS-Bus Wiring Directions (Multiple Controllers connected to each Other)

Direction *(See Figure Below)*

a. Prepare the specific number of communication wires with RJ-25 (6P6C) connectors on each end necessary to connect all targeted devices together.

b. Connect the first CS-Bus Controller's RJ-25-***Port 0*** (Powered Port 0) to the next sequential CS-Bus Controller's RJ-25 connector ***Port 1*** (Unpowered Port 1).

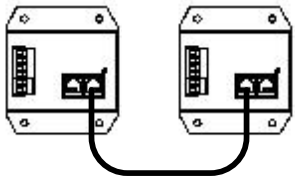


Figure 21 (CS-Bus device connections)

4.4 CS-Bus Wiring Directions (Multiple Controllers to a Single Interface Device)

Direction *(See Figure Below)*

a. Prepare the specific number of communication wires with RJ-25 (6P6C) connectors on each end necessary to connect all targeted devices together.

b. If you wish to connect the single Interface Device ***to the last*** CS-Bus Controller on the CS-bus, connect all CS-Bus Controllers according to the directions in Section 4.3, and then connect the single Interface Device to the last CS-Bus Controller according to Step "b" in Section 4.1.

c. If you wish to connect the single interface device ***between two*** CS-Bus Controllers, then obtain a Device Insertion Module (DIM) and inset that DIM into the selected Interface Device ("***Inserted Device***").

c1. Follow the instructions in Section 4.3 to connect all sequential CS-Bus Controller to each other (until such time as a User Interface will be "inserted").

c2. Then, connect one end of a communication wire prepared above in Step "a" into Port 0 of the last sequential CS-Bus Controller device and the other end into one of the RJ-25 ports on the DIM plugged into the ***Inserted Device***.

c3. Next, connect another communication wire prepared above in Step "a" into the remaining RJ-25 port on the DIM in the ***Inserted Device*** and the other end into Port 1 (Unpowered Port) on the next CS-Bus Controller downstream from the Inserted Device.

c4. Continue connecting each subsequent CS-Bus Controller downstream of the Inserted Device to each other following the instructions in Section 4.3

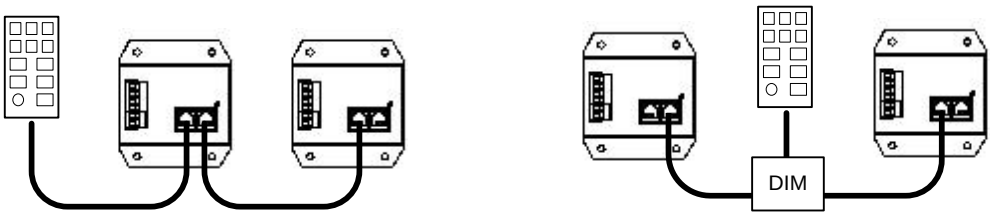


Figure 22 (CS-Bus Wiring)

4.5 CS-Bus Wiring Directions (Multiple Controllers to Multiple Interface Devices)

Directions *(See Figure Below)*

a. Prepare the specific number of communication wires with RJ-25 (6P6C) connectors on each end necessary to connect all targeted devices together.

b. If you wish to connect a second Interface Device ***immediately downstream from a 1st Interface Device at the very end of a CS-Bus network, follow the below steps***

b1 Proceed through the directions in Section 4.4, Steps "a" and "b."

b2. Add the 2nd Interface by following the directions in Section 4.2, Step "e"

c. If you wish to connect a second Interface Device immediately downstream from a 1st Interface Device ***between two*** CS-Bus Controllers, follow the steps below:

c1. Obtain a Device Insertion Module (DIM) and inset that DIM into the selected second Interface Device ("***Second Inserted Device***").

c2. Follow the directions in Section 4.3, Steps "a" and "b" to interconnect all CS-Bus Controllers prior to the first Inserted Device.

c3. Then follow the directions in Section 4.2, Step "e" to connect the 2nd Interface Device to the 1st Interface Device.

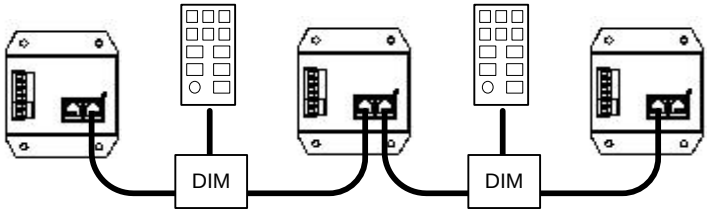


Figure 23 (Multi-DIM devices)

5 Power On/Testing

IMPORTANT: MAKE SURE THAT THE DC POWER TO ALL CONTROLLERS IS TURNED OFF PRIOR TO CONTINUING.

Directions

a. Make sure that you have installed at least one ILC-xx0 Controller and one User Interface Module (keypad, IR receiver) or have connected your CS-Bus to a remote computer through either the (i) e-Node (Ethernet to ILC-100x Controller interface) or the (ii) IBT-100 (RS-232-C serial interface) with a compatible device driver.

Note: Standalone IR devices are not compatible with the ILC-400x. If you desire to control the unit with IR, it is required that you secure a BSKP-2110L keypad and place a low-cost IR emitter in proximity of the IR receiver on the front of the keypad. No standalone IR receivers are compatible with the ILC-400x.

b. Verify that if are setting up and testing Infrared connections that you ***do not*** have a supported Infrared remote keypad device and a remote IR sensor connected to the same Controller. You can have multiple IR receivers within a system but they cannot be located near each other such that they might receive the same IR single concurrently.

Note: If you locate one IR receiver in the front of a room and another one in the back of the room such that when a user points an IR transmitter at one receiver, the second receiver is not "seen," there is no problem. Positioning the two receivers next to each other is a problem.

b. Make sure that you have installed at least one LED load to your ILC-xx0 Controller.

c. Power on all ILC-xx0 Controllers by providing DC power to all components.

Note: If you are upgrading from a 2-pin power connection on an ILC-100c type controller to a 3-pin connector found on various DIN controllers, please note the polarity of the power connector has changed. Failure to observer proper polarity will void your warranty.

d. If your controller supports different output modes, it is necessary to configure your unit for correct output.

ILC-400. Configure your ILC-400 for either ***RGB/RGBW*** mode or ***1-4 channel Monochrome*** Mode

Note: The factory default for the ILC-400x is RGB/RGBW Mode. If you wish to use this mode, please proceed to Step e. below; otherwise follow the appropriate directions in Step f. below.

e. **1-4 Channel Monochrome Mode**. In order to proceed with 1-4 channel Monochrome testing and operation, you will need to reboot the ILC-400x into 1-4 channel Monochrome Mode. To do so, remove the small plastic shroud on the ILC-400 using your finger nail in the top slot of the shroud (see Figure 1) and depress and hold the Discovery Button for two (2) complete flash cycles (i.e. LED cycles OFF immediately, then turns ON 1st time, then a LONG OFF, and when turns ON 2nd time, quickly release button and LED turns OFF). Within a few seconds the Green on-board LED will once again illuminate and you will be in the 1-4 Channel Monochrome Mode. Should you wish alternatively to change the repurpose the ILC-400x later to be in RGB/RGBW mode, proceed to Step f. below.

Note: If you perform this operation, any dealer programmed variables within the ILC-400x will be erased ii.

f. **RGB/RGBW Mode/Factory Default Mode**. This is the factory default mode. If you for some reason you wish to reboot the ILC-400x back to the default factory RGB/RGBW Mode, perform the following operation: Remove the small plastic shroud (if needed). Now depress the Discovery Button for three (3) complete flash cycles (i.e. LED cycles OFF immediately, then turns ON 1st time, then a LONG OFF, turns ON 2nd time, then a LONG OFF, then when turns ON 3rd time, quickly release button and LED turns OFF. Within a few seconds the Green onboard LED will once again illuminate and you will be in the factory default RGB/RGBW Mode.

d. Verify each ILC-xx0 Controller has powered up properly by examining its status LED indicator. Depending upon the configuration of each ILC-xx0 Controller and its current operational status, a colored LED will indicate the Controller's status. Please refer to the following two configuration cases below for the specific information for your installation.

State	**On-board LED indicator power on status**	**LED Connected LOAD power on status**					
	PCB LED	RGB Load	RGBW Load	Ch1 Mono Strip	Ch. 2 Mono Strip	Ch. 3 Mono Strip	Ch. 4 Mono Strip
Unprogrammed Controller -as provided from factory, or -state after a field factory reset (See Section 5.d i)	**GREEN** [1]	RGB all one (so bluish white)	RGBW all on (so white LEDS are ON and RGB LEDs appear bluish)	Ch. 1 Mono LEDs on (White)	Ch. 1 Mono LEDs on (White)	Ch. 1 Mono LEDs on (White)	Ch. 1 Mono LEDs on (White)
Dealer Programmed Controller -state after programmed by dealer with local address set to a non-zero address (i.e. 2.1.**1** rather than the factory address of 2.1.**0**)	**YELLOW** [2]	RGB all one (so bluish white)	RGBW all on (so white LEDS are ON and RGB LEDs appear bluish)	Ch. 1 Mono LEDs on (White)	Ch. 1 Mono LEDs on (White)	Ch. 1 Mono LEDs on (White)	Ch. 1 Mono LEDs on (White)

Notes:

[1]: Indicates that the unit has **not** been previously assigned a **Z**one, **G**roup, **N**ode address and still carries the factory default address of (i.e. 2.1.**0**)

[2]: Indicates that the unit has been previously assigned a non-zero in any field (**Z**one, **G**roup, **N**ode) address (i.e. 2.1.**1**)

6 Controlling the ILC-xx0 Controller

6.1 Overview.

The ILC-xx0 Controllers contain a sophisticated color computer that can be used to select any "color" from a palette of nearly 16 million possible choices. Rather than expecting the user to be a seasoned color scientist who well understands how to precisely mix the three primary colors of ***Red***, ***Green***, and ***Blue***, (the constituent components from which all color of light can be created), the ILC-xx0 Controller implements a unique color selection tool similar to that which is integrated within a color television.

On each of User Interface Controls that can be used to choose, save and recall a color within the ILC-x00 Controllers, there are three basic controls that must be understood in order to proceed. These controls are as follows:

Hue Control: Saturation is typically synonymous with the vividness of hue or color. There are two controls available with this operator—UP and DOWN. Selecting UP, increases the ***Hue***, while selecting the DOWN, decreases the ***Hue***.

.

Brightness Control: Brightness/Lightness is typically synonymous with the relative darkness or lightness of a color. There are two controls available with this operator—UP and DOWN. Selecting UP increases the ***Lightness***, while selecting DOWN, decreases the ***Lightness.***

Saturation Control: Saturation is typically synonymous with the vividness of hue. There are two controls available with the operator—UP and DOWN. Selecting UP increases the ***Saturation***, while selecting DOWN, decreases the ***Saturation***.

Note: Typically, with most User Interface Controls such as keypads, simply releasing a ramp UP or ramp DOWN button, stops the ramping process at the moment the button is released.

6.2 Steps to Select a "Color"

Directions

a. ***Check Proper Operation***. To quickly determine if your newly set-up ILC-xx0 system is working, hit the Preset button using any of the specified User Interface Controls documented in Appendix 2 and select one of the six presets (i.e. P1, P2, P3, P4, P5, or P-6) from a User Interface Device (keypad or remote). The connected LEDs should change color from their current setting to a factory programmed default for that particular Preset. If the LEDs do not illuminate, check your wiring, and make sure that your power supply is properly connected. If you may have inadvertently written over a "no" color (or "OFF" setting) to a particular Preset, try each additional Preset until the LEDs come alive. Now proceed to the next step.

b. ***Select Hue.*** Provided that there is some illumination being generated from the LEDs, depress the ***Hue + button*** and you should see a distinct color shift over the next 10-15 seconds which will automatically circle around the entire color wheel. Once you have found a "color" which is roughly what you desire, release the ***Hue +*** button and the newly discovered color will "freeze." You can alternatively push the ***Hue –*** button and see the colors sequence the opposite direction over the next 10-15 seconds until they come full circle to the original color. Once you have "rediscovered" the original "color" that you previously selected, proceed to the next step.

c. ***Select Brightness/Lightness.*** Next, to alter the Lightness of the previously selected "color," depress the ***Lightness + button*** and you should see a distinct brightening of the previously selected "color." Alternatively, select the ***Lightness – button,*** and you should see a distinct darkening of the previously selected "color." You can always return to a previously selected "color" by either selecting the ***Lightness + button or the Lightness – button.*** Once you have "rediscovered" the original "color" that you previously selected proceed to the next step.

d. ***Select Saturation.*** Next, to alter the Saturation of the previously selected "color," depress the ***Saturation + button*** and you should see a distinct change in the saturation of the color. Alternatively, select the ***Saturation – button,*** and you should see a distinct de-saturation of the previously selected "color." You can always return a previously selected "color" by either selecting the ***Saturation + button or the Saturation – button.*** Once you selected the correct Saturation value, you can now save the chosen "color" made of up discrete parameters relating to ***Hue. Lightness***, and ***Saturation.*** If you decide at any time that you wish to tweak your newly discovered "color," simply revisit steps b, c or d once again.

6.3 Steps to Save a "Color"

a. ***To Save a Color.*** Refer to Appendix 2 for your particular User Interface Device for specific directions for how to save the "color." Once you have saved your "color," you can recall that specific "color" by following the directions again in Appendix 2 for your particular User Interface Device.

7 Additional Programming Options

Numerous other programming options exist for the ILC-xx0 series of Controllers. Please consult any other user documentation that may have come with your system before calling customer service for more assistance. You may also wish to consult the most recent Converging Systems Third-Party Device Driver Toolkit – Programmers Guide available at

http://www.convergingsystems.com/inres_programmingdesignkit.htm

APPENDIX 1 Specifications ILC-XX0 Family of Lighting Controllers

Feature	Specification	Model				
Product Code	OEM Configuration Standalone Version	ILC-100m	ILC-100sa/ ILC-100c	ILC-300 DIN	ILC-400 DIN	ILC-450 DIN
Features	Function	LED Lighting Controller .001% low-end dimming/no flicker/bi-directional control				
Output Channels	Monochrome	yes	Yes (limited)	Yes	Yes	Yes
	Bi-White	No	No	Yes	Yes	Yes
	RGB	No	Yes	Yes	Yes	Yes
	RGBW	No	No	No	Yes	Yes
Output Type	Constant Voltage	Yes	Yes	Yes	Yes	No
	Constant Current	No	No	No	No	Yes
Features	Color Control	-Built-in color computer selects a single color (hue) from over 16 million available -Network compatible/auto discovery/network ID/diagnostics				
	Dimming Levels	64000 dimming levels				
	Bi-Directional Feedback	Yes				
	Color Temperature Control	The CCT of the supported LED	1800~7000K	1700K~7000K	1700K~7000K	1700K~7000K
	Circadian Tuning	No	No	Yes	Yes	Yes
	Gamma Correction	Yes				
	Hue Accurate Dimming	N/A	Yes			
	Color Temperature Accurate Dimming	N/A	Yes			
Controls /Interfaces	Control Type	Connectivity to CS-Bus peripherals (i.e. keypads, Ethernet adapter, Serial interface adapter)				
	LED Connection (detachable connector)	-2 pin	-3 pin	-2 pin	-2 pin	-2 pin
	HSB control	B only (for mono)	HSB Full Control			
	RGB control	No	RGB Full Control			
	Store/Recall locations	24	24	24	24	24
	Effects	1	1,2,3,4	1~4	1~6	1,3,4
	IR Input	Through remote IR receiver (using CS-Bus interface socket) or through networked intelligent keypads				
	Bus Specification	CS-Bus compatible. Up to 4000’ runs using twisted pair wiring.4 conductor wiring required for standard communication, 6 conductor wiring required for intelligent peripherals. Pin Out (P1-Blue, P2-BW, P3-Orange, P4-OW, P5-Green, P6-GW)				
Connections	LED Connector (detachable connector)	2-pin	4-pin	4-pin	5-pin	8-pin
	Power Connector (detachable)	3-pin	3-Pin	3-pin	3-pin	3-pin

	Network Connection	CS-Bus connection (input, output). Port 0-powered, Port 1-non-powered				
General	Dimension	l:4.125” x w:1.40” x h:2.375” (104.78 x 35.56 x 28.58mm)	l:3.44 x w:3.00 x h:0.92” (87.38 x 76.20 x 23.37mm)	l:4.125” x w:2.125” x h:2.375” (104.78 x 56.13 x 22.86mm)	l:4.125” x w:2.125” x h:2.375” (104.78 x 56.13 x 22.86mm)	l:4.125” x w:2.125” x h:2.375” (104.78 x 56.13 x 22.86mm)
	Dimension w/o DIN Mounting Ears	l:3.500” x w:1.40” x h:2.375” (88.90 x 35.56 x 60.33mm)	N/A	l:3.500” x w:2.125” x h:2.375” (88.9 x 60.33 x 53.98mm)	l:3.500” x w:2.125” x h 0.375” (88.9 x 60.33 x 53.98mm)	l:3.500” x w:2.125” x h:2.375” (88.9 x 60.33 x 53.98mm)
	Weight	2.1 oz (59.3 gm)	6.2 oz (175 gm)	3.0 oz (85.0gm)	3.1 oz (88.16 gm)	2.9 oz (82 gm)
	Form Factor (standalone version)	DIN-Rail type Housing	Metal	DIN-Rail type	DIN-Rail type	DIN-Rail type
	Form Factor (OEM standalone conf)	PCB type mount				
	Power Requirements (UL/NEC requires a Class 2 power supply)	Power supply should be selected depending upon voltage of LEDs to be supported. Controller requires at minimum 40ma @5Vdc. Maximum voltage 60Vdc. Maximum load of 6.67 amps				Varies depending upon number of connected fixtures. Maximum voltage 60Vdc. Maximum wattage 100 watts.
	Manufacturing	Made in the U.S.A.				
	Temperature Range	32-130° F (0-54° C)				
	Humidity	< 90% RH, non-condensing				
Compliance	Safety Approvals	UL 2108. Listed system with FLLA, ILC-x00 controller and specified Class 2 power supplies.				
	RoHS	RoHS compliant				
	EMI Testing	FCC Class B (home and office)				

APPENDIX 2-Accessory Information

A2-1 Wall pad 11-Button Switch (Standalone Model IMC-BSKP-2011L)

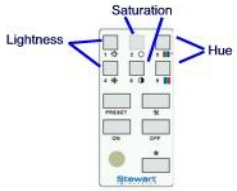


Figure A2-1

Infrared Receiver. This is a build-in Infrared Receiver to be used with compatible Infrared remote.

H--Hue (UP/DOWN). Hue is typically synonymous with the feature of the color that allows an observer to classify it as red, orange, yellow, green, blue, indigo, and violet, etc. as determined by the dominant wavelength of the light. The TOP button of the pair increments the ***Hue*** *(red to yellow to green, etc.)* while the LOWER button decrements the ***Hue*** *(red to magenta to blue, etc.).* Tap the respective button once and the ***Hue*** increments/decrements by a step factor 4 (over a range of nearly 240 steps), hold the button and it will increment/decrement the value until released.

L—Brightness/Lightness (UP/DOWN). Lightness is typically synonymous with the relative darkness or lightness of a color. TOP button of the pair increases the ***Lightness***, while the LOWER button decreases the ***Lightness.*** Tap the respective button once and the ***Lightness i***ncrements/decrements until released. Tap the respective button once and the ***Lightness*** increments/decrements by a step factor 4 (over a range of nearly 240 steps), hold the button and it will increment/decrement the value until released.

S--Saturation (UP/DOWN). Saturation is typically synonymous with the vividness of hue; degree of difference from a gray of the same lightness or brightness. TOP button of the pair increases the ***Saturation***, while the LOWER button decreases the ***Saturation.*** Tap the respective button once and the ***Saturation*** increments/decrements by a step factor 4 (over a range of nearly 240 steps), hold the button and it will increment/decrement the value until released.

Preset. To save a desired color setting, press this button before selecting any one of the six numbered buttons (1-6) and continue to hold that specific numbered button for 5 seconds until a beep is heard from the keypad. At that point, the color preset has been saved under that specific number. Alternatively, to recall a specific color setting, press this button before selecting any one of the six numbered buttons (1-6) and that particular previously set Preset will be displayed.

Color Adjustment Tool. Press this button before selecting any one of the Hue (up/down), Saturation (up/down) and Lightness (up/down) buttons, and the appropriate adjustment available under that specific referenced buttons, will be activated.

ON. Depress this button anytime and the lights will turn fully ***ON*** (HSL value of 240, 240, 240).

OFF. Depress this button anytime and the lights will turn fully ***OFF*** (HSL value of 0, 0, 0).

*. Invokes an automated sequence by illuminating each of 6 user configured presets (P1, P2, P3, P4, P5 and P6) plus two additional lighting presets (P7 and P8) each for a programmed amount of time and then recycles through the entire sequence continuously (until either the OFF button is depressed or some operation is invoked.

Note: Presets 1 through 6 can be programmed with the ILC-100 while Presets 7 and 8 can be programmed with the e-Node.

A2-2 Handheld 10-button Infrared Remote (ILC-IR-10W1)

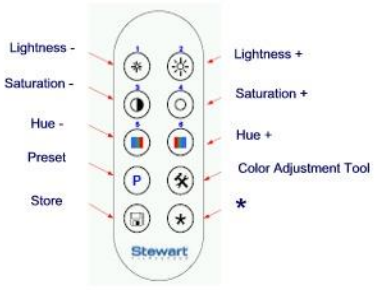


Figure A2-2

H--Hue (UP/DOWN). Hue is typically synonymous with the feature of the color that allows an observer to classify it as red, orange, yellow, green, blue, indigo, and violet, etc. as determined by the dominant wavelength of the light. The TOP button of the pair increments the ***Hue***, while the LOWER button decrements the ***Hue.*** Tap the respective button once and the ***Hue*** increments/decrements by a step factor 4 (over a range of nearly 240 steps), hold the button and it will increment/decrement the value until released.

L--Lightness (UP/DOWN). Lightness is typically synonymous with the relative darkness or lightness of a color. TOP button of the pair increases the ***Lightness***, while the LOWER button decreases the ***Lightness.*** Tap the respective button once and the ***Lightness i***ncrements/decrements until released. Tap the respective button once and the ***Lightness*** increments/decrements by a step factor 4 (over a range of nearly 240 steps), hold the button and it will increment/decrement the value until released.

S--Saturation (UP/DOWN). Saturation is typically synonymous with the vividness of hue; degree of difference from a gray of the same lightness or brightness. TOP button of the pair increases the ***Saturation***, while the LOWER button decreases the ***Saturation.*** Tap the respective button once and the ***Saturation*** increments/decrements by a step factor 4 (over a range of nearly 240 steps), hold the button and it will increment/decrement the value until released.

Preset. To recall a specific color setting, press this button before selecting any one of the six numbered buttons (1-6) and that particular previously set Preset will be displayed.

Color Adjustment Tool. Press this button before selecting any one of the Hue (up/down), Saturation (up/down) and Lightness (up/down) buttons, and the appropriate adjustment available under that specific referenced buttons, will be activated.

Store. Alternatively, to save a desired color setting, press this button before selecting any one of the six numbered buttons (1-6) and that particular color setting will be saved under that specific Lighting Preset number.

*. Invokes an automated sequence by illuminating each of 6 user configured presets (P1, P2, P3, P4, P5 and P6) plus two additional lighting presets (P7 and p8) each for a programmed amount of time and then recycles through the entire sequence continuously (until either the OFF button is depressed or some operation is invoked.

> **Note**: Presets 1 through 6 can be programmed with the ILC-100 while Presets 7 and 8 can be programmed with the e-Node.

A2-3 Serial Interface /Firewall (IBT-100)

The ILC-100x controllers can be integrated to work with third-party automation systems that employ RS-232-C communication. A single IBT-100 serial interface adapter/firewall can handle an entire network of ILC-100 controllers even with one or more separately attached User Interfaces such as keypads or IR receivers. The IBT-100 is self-powered and receives its power form the CS-BUS Port 0 (from any other IMC-100, ILC-100 or similar controller). The IBT-100 requires 6 conductor CS-Bus communication wire from a Powered Port (Port 0) from a CS-Bus compatible controller.

See the separate instructions that come with the IBT-100 for programming information.

Figure A2-3

A software toolkit included with the IBT-100 allows easy set-up and testing of CS-Bus systems using a simple on-screen graphical user interface.

Figure A2-4
V-pad Application

A2-4 e-Node (Ethernet Connectivity solution)

The ILC-100x controllers can be integrated to work with third-party automation systems that employ Ethernet (IP) connectivity. A single e-Node can handle an entire network of ILC-100x controller even with separately attached User Interfaces such as keypads or IR receivers. The e-Node receives power from an attached AC/DC power supply. The e-Node has two (2) CS-Bus connectors that can be used to attach to separate CS-Bus networks together. Neither CS-Bus connectors on the e-Node is a Powered Port.

See the separate instructions that come with the e-Node for programming information.

Figure A2-5
e-Node

A software toolkit included with the e-Node, referred to as e-Node Pilot, allows almost an infinite number of commissioning tasks to be performed (setup) as well as network testing and remote diagnostics.

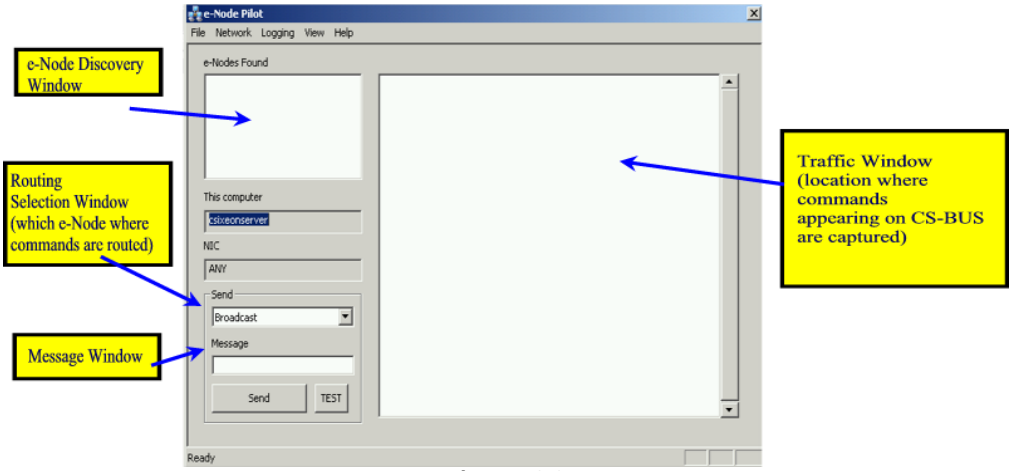


Figure A2-6
e-Node Pilot Application

In addition, recent versions of the e-Node permit web-page commissioning as well.

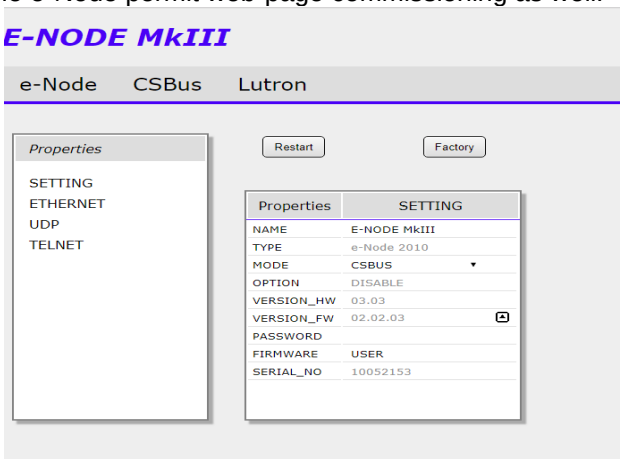


Figure A2-7
e-Node Web-Server Setup

Appendix 3 Technical Information-Low Voltage Wiring Diagrams

The ILC-100 has both power connections and output LED connections as well as CS-Bus connections. Refer to following diagram to understand location of Pin 1 on all connectors.

Figure A3-1

Refer to the following tables for pin-outs on each of the two RJ-25 connectors when making connections within the following sections.

Table A3-1

CS-Bus RJ-12 Connection (on CS-Bus Controller) (LEFT or "OUTPUT" PORT 0) (see Figure A3-1)	CS-Bus RJ-25 Connection (on CS-Bus Controller) (RIGHT or PORT 1) (see Figure A3-1)
#1 (left) IR	#1 *no connect*
#2 GND	#2 GND
#3 485-	#3 485-
#4 485+	#4 485+
#5 5V DC (regulated)	#5 *no connection*
#6 9V DC (unregulated)	#6 *no connection*

A3-1 Infrared Connections

A3-1.1 CS-Bus to Standalone Remote IR Receiver Module (IMC-RIR)

Model Notes: The ILC-100x series Controllers has a multi-purpose RJ-25 connector that can be used for bus communication as well as for the attachment of an optional IR receiver device.

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Warning: Typical 3 wire IR receivers available from Xantec are not compatible. You will damage your unit is you connect these devices. Please refer to your dealer for a compatible device.

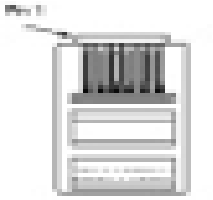


Figure A3-2

IR Receiver Compatibility Warning: **This connection provides a custom IR connection port for a remote IR receiver device. UNDER NO SITUATION SHOULD EXTERNAL IR SIGNALS SUCH AS THOSE AVAILABLE FROM XANTECH SYSTEMS OR OTHERS BE CONNECT TO THIS PORT AS THE VOLTAGES AND SIGNALS ARE INCOMPATIBLE. You will damage your unit is you connect these devices. Please refer to your dealer for a compatible device.**

Table A3-2

CS-Bus Connection (on IMC-100x Controller). (LEFT Port "0" or "OUTPUT" port ONLY) (see Figure A3-1)	IMC-RIR (4 pin terminal connector) (see Figure A3-2)
#1 (left) IR	Connection-pin 1
#2 GND	Connection-pin 2
#3 485-	
#4 485+	
#5 5V DC (regulated)	Connection-pin 3
#6 9V DC (unregulated)	

A3-2 Intelligent Peripheral Connections

A3-2.1 CS-Bus TO IMC-BSKP-5, IMC-BSKP-11 (Intelligent Keypads)

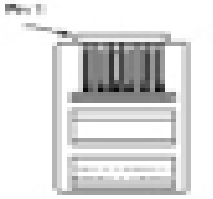


Figure A3-3

Table A3-3

CS-Bus RJ-12 Connection (on CS-Bus Controller) (LEFT or "OUTPUT" PORT 0) (see Figure A3-3)	IMC-BSKP-xx Keypad (RJ-25 connector) Pin #1 on RJ-25 plug is as marked above) (see Figure A3-3)	Suggested Color Coding*
#1 (left) IR	#1 (left) IR	Blue
#2 GND	#2 GND	Blue-White
#3 485-	#3 485-	Orange
#4 485+	#4 485+	Orange-White
#5 5V DC (regulated)	#5 5V DC (regulated)	Green
#6 9V DC (unregulated)	#6 9V DC (unregulated)	Green-White

***IMPORTANT:** maintain twisted pairs for pins 1/6, pins 2/5, and pins 3/4.

A3-3 CS-Bus Connections

A3-3.1 IMC-100x Controller to IMC-100x Controller Communication Wiring

Wiring Note: The preferred method of connection between multiple CS-Bus devices is to connect the "***Output***" *Port 0* of one unit to the "***Input***" *Port 1* of the next unit (see directions under Section 4.1 above). As long as you ***do not plan on adding any devices*** onto the CS-Bus such as IR receivers, RS-232C-RS485 adapter or intelligent keypads (which all require power), you may freely interconnect one CS-Bus Controller to another similar CS-Bus Controller without regard to the

"***Output"*** or ***"Input"*** port designation. You should routinely use 8-conductor CAT5 wire and simply cut 1 pair (the Brown and Brown/White wires) and therefore populate the RJ-25 connectors that are used to interconnect the CS-Bus devices with 3 twisted pairs (6 wires).

Pinouts: The wiring configuration is 1-1, 2-2, 3-3, 4-4, 5-5, 6-6. (straight-thru). ***Do not use standard telephone pre-configured patch cords for these are REVERSED and will DAMAGE your equipment***. Preserve twists on pairs (1 and 2), on pairs (3 and 4) and pairs (5 and 6). For shorter runs you can use flat 6-conductor telephone line cord and appropriate RJ-25 connectors.

Table A3-4

CS-Bus Connection (on IMC-100x Controller) (LEFT or "OUTPUT" Port 0) (see Figure A3-3)		CS-BUS Connection (on IMC-100x Controller) (Right or "INPUT" Port 1) (see Figure A3-3)	Suggested Color Coding*
#1 No Signal		#1 *No Signal*	Blue
#2 GND		#2 GND	Blue-White
#3 485-		#3 485-	Orange
#4 485+-		#4 485+	Orange-White
#5 5V DC (regulated)		#5 *No Signal*	Green
#6 9V DC (unregulated)		#6 *No Signal*	Green-White

***IMPORTANT:** maintain twisted pairs for pins 1/6, pins 2/5, and pins 3/4.

A3-3.2 RS-485 Terminators

Applicability Note: RS-485 communication is designed around end-of-bus resistor termination. This guarantees error-free communication despite external noise and other sources of interference. It is highly advised that when more than one ILC-100x Controller is interconnected, one terminator is placed on one end of the bus and another terminator is placed on the other end of the bus. It does not matter into which CS-Bus port these terminators are connectors so long as they are at the very beginning of the bus and the very end of the bus.

Table A3-5

RJ-25 connector terminator wiring
#1 ---
#2 ---
#3 120-ohm resistor connection
#4 120-ohm resistor connection
#5 ---
#6 ---

Note: The IBT-100 has a built-in terminator so no additional terminating resistors are needed if the IBT-100 is utilized. The IBT-100 should be located for best results at the END OF THE BUS. Intelligent keypad (BSKP-2020, BSKP-2050x, BSKP-2110x) have a built-in jumper on the back of the device with a factory default setting of TERMINATION ON. If you plan on locating an intelligent keypad at a location other than at the end of the bus, ***it is important to remove the terminating jumper of just simply shift it off one of its pins to remove local termination***. Other peripherals such as keypads and IR receivers do not have built-in terminating resistors, so a terminating resistor is required.

A3-3.3 CS-Bus (RS-485) to Remote External (RS-232-C) Control Device ("Intelligent Bus Translator) or IBT-100)

Example: ILC-100x to IBT-100 Intelligent Bus Translator

Note: Two alternative connection schemes can be used to connect the IBT-100 to your IMC-100x Controller network. Both work similarly (see Alternative #1 and Alternative #2 for wiring diagram).

See "IBT-100 to PC" for the wiring diagram from this device to a PC or an automation controller.

Table A3-6
Alternative #1

CS-Bus Connection (on IMC-100x and ILC-100x Controller) (LEFT or "OUTPUT" PORT 0 ONLY) (see Figure A3-1)	Intelligent Bus Translator (IBT-100) with RJ-25 connector	Suggested Color Coding*
#1 No Signal	#1 No Signal	Blue
#2 GND	#2 GND	Blue-White
#3 485-	#3 485-	Orange
#4 485+-	#4 485+	Orange-White
#5 5V DC (regulated)	#5 5V DC (regulated)	Green
#6 9V DC (unregulated)	#6 9V DC (unregulated)	Green-White

***IMPORTANT:** maintain twisted pairs for pins 1/6, pins 2/5, and pins 3/4.

Table A3-7
Alternative #2

CS-BUS Connection (on IMC-100x Controller and ILC-100x Controller)) (see Figure A3-1)	Intelligent Bus Translator (IBT-100) with RJ-25 connector RJ-25 connector (RS-485 only)	Suggested Color Coding*
#1 No Signal	#1 No Signal	Blue
#2 GND	#2 GND	Blue-White
#3 485-	#3 485-	Orange
#4 485+-	#4 485+	Orange-White
#5 No Connect	#5 No Connect	Green
#6 9V DC (unregulated)	#6 9V DC (unregulated)	Green-White

***IMPORTANT:** maintain twisted pairs for pins 1/6, pins 2/5, and pins 3/4.

Table A3-8
IBT-100 to PC Serial Port Wiring

CS-BC-232/485 Module (DB-9 Connector)	Computer RS-232C Connector (DB-9) (see Figure A3-5)
1 Not required	1 Not required
2 Controller Tx	2 PC Rx
3 Controller Rx	3 PC Tx
4 Not required	4 Not required
5 GND	5 GND
6 Not required	6 Not required
7 Not required	7 Not required
8 Not required	8 Not required
9 Not required	9 Not required

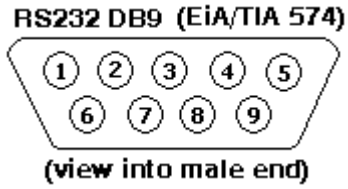


Figure A3-5

A3-3.4 ILC-100x Controller to e-Node (Internet Protocol Adapter)

A straight-thru 6-conductor wire (RJ-25 to RJ-5) should be used to connect any one CS-Bus controller to the e-Node. This will in effect interconnect all CS-Bus controllers to the e-Node. You do not need to obey any wiring restrictions relating to ***Input*** or ***Output*** connectors on the CS-Bus Controller because the e-Node has its separate power source.

Appendix 4 Supported Constant Voltage Fixtures

1.0 Monochrome elements

Manufacturer	LED Element	
Cree	.3a to .7a per element	
Light and Green	8-watt and 9-watt Monochrome Fixtures	

2.0 RGB/RGBW elements

Vendor	LED Element	
Clarte Lighting	Absolute compatible fixtures	

Appendix 5 Termination Options with ILC-xx0 Controllers

All Converging Systems CS-Bus devices utilize a derivative of a RS-485 bus. In order in ensure accurate bus communication it is imperative to observe proper termination procedures especially if your connections involve longer runs or if those runs may be running across or proximate to noisy electrical conditions. The RS-485 bus also is a daisy-chain topology which does not permit spurs (or offshoots) from the main bus, unless those offshoots are shorter than 8 inches. In those situations, we have specified the Device Insertion Module (see Section 4.2 of the main document for more information). At the beginning of the RS-485 bus should be placed a 120-ohm terminating resistor on pins 3 / 4 of the CS-Bus. And similarly, another 120-ohm resistor should be placed at the end of the bus. These locations shall be referred to as “Termination Locations.”

Review the table below to understand those CS-Bus devices which have the option or capability of providing auto-termination, that is termination without providing for an external terminating resistor, then the use of that CS-Bus component makes system design even easier. If, however, you cannot locate a terminating type device at those specified locations (i.e. beginning and end of CS-Bus), then you must resort to obtaining or simply building and installing your own terminating resistor (120-ohm resistor connected to pins 3 and 4 only of CS-Bus).

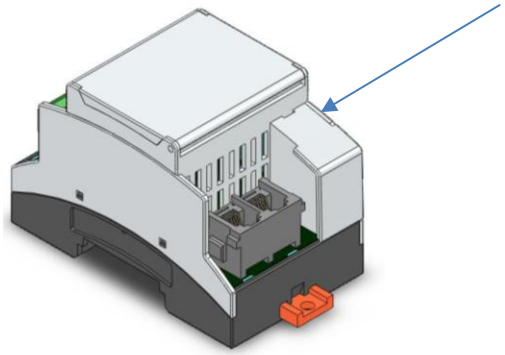
Device	**Built-in Terminating Resistor Option**	**How invoked**
ILC-400 lighting controller	Yes	Power on Sequence (see below for directions to invoke)
BSKP-2110K keypad		Jumper connected to Terminating location on back of keypad
BSKP-2020 keypad	No	
ILC-100 lighting controller	No	
e-Node	No	
IBT-100	No	

1. Directions for Turning ON the Built-in Terminating Resistor on the ILC-400 Controller

Activation of this feature can be performed in two ways. **Step a** below specifies a procedure available if you do not have access to the e-Node and the e-Node Pilot Application. **Step b** below is the recommended approach which requires a connected e-Node and the utilization of the e-Node Pilot Application. Choose the procedure that is appropriate for your situation.

Note: If following **Step a** below, then it is recommended that you perform this operation *in advance of any dealer programming within the ILC-400 controller to ensure that such dealer programming is not disturbed.*

a. Direct Sequence on the ILC-400 itself.



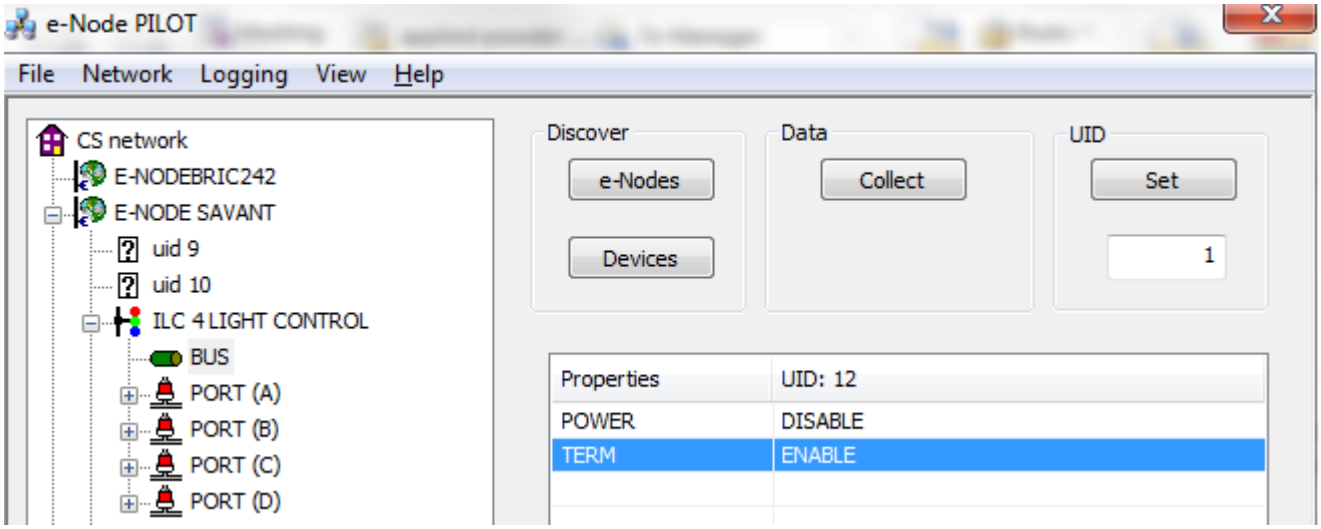
Remove the small plastic shroud on this controller using your finger nail in the top slot of the shroud (see Figure above) and depress and hold the **Discovery Button** for four **(4**) complete flash cycles (i.e. LED cycles **OFF** immediately, then turns **ON** 1st time, then a **LONG OFF**, turns **ON** 2nd time, then a **LONG OFF**, then turns **ON** 3rd time, then a **LONG OFF,** then when turns **ON** 4th time, quickly release

button and LED turns **OFF**). Within a few seconds the **Green** on-board LED will once again illuminate and you will have turned **ON** internal Termination.

Note: *If you perform this operation before you have programmed the ILC-400, the on-board LED will turn on GREEN, if you perform this operation after you have programmed the ILC-400x, the on-board LED will turn on YELLOW.*

b. **e-Node and e-Node Pilot Programming.**

-Discover the e-Node and the provide a unique UID to the ILC-400 (see separate instructions within the e-Node Commissioning Guide
http://www.convergingsystems.com/bin/doc/ilc/ILC_legalsize_SNScheme(v2.4).pdf
-Open the **BUS tab** and set **TERM** to **ENABLE**. See screen shot below for more information



2. Directions for Turning OFF the Built-in Terminating Resistor on the ILC-400x

Deactivation of this feature can be performed in two ways. **Step a** below specifies a procedure available if you do not have access to the e-Node and the e-Node Pilot Application. **Step b** below is the recommended approach which requires a connected e-Node and the utilization of the e-Node Pilot Application. Choose the procedure that is appropriate for your situation.

Note: If following **Step a** below, then it is recommended that you perform this operation *in advance of any dealer programming within the ILC-400 to insure that such dealer programming is not disturbed.*

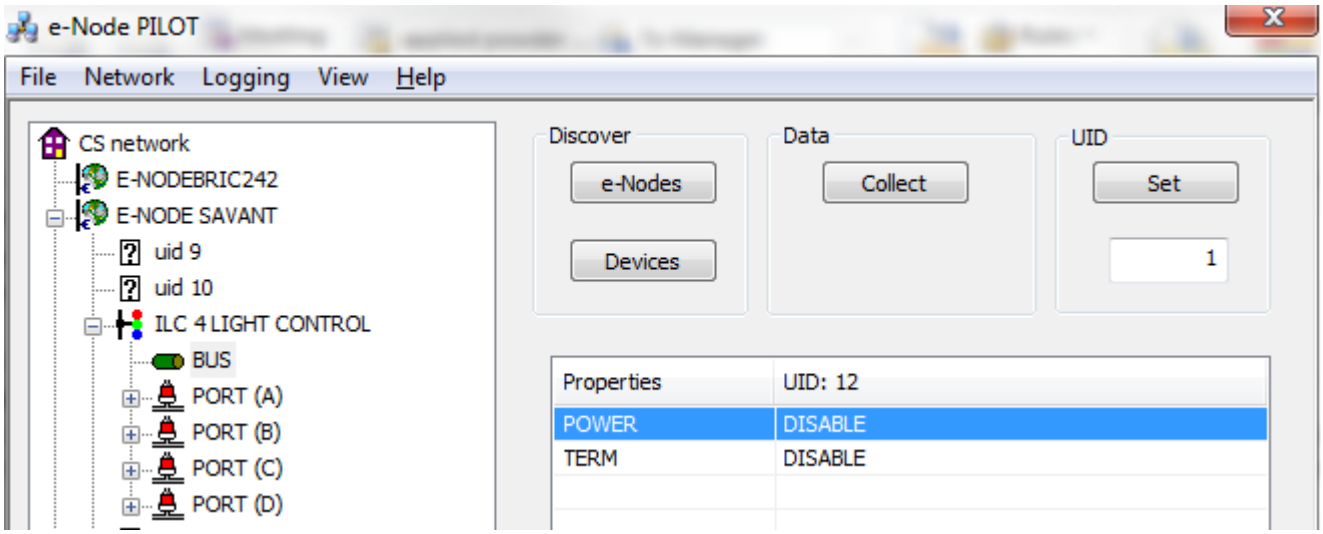
a. Direct Sequence on the ILC-400x itself.

Remove the small plastic shroud on the ILC-400 using your finger nail in the top slot of the shroud (see Figure above) and depress and hold the **Discovery Button** for five **(5)** complete flash cycles (i.e. LED cycles **OFF** immediately, then turns **ON** 1st time, then a **LONG OFF**, turns **ON** 2nd time, then a **LONG OFF**, then turns **ON** 3rd time, then a **LONG OFF,** then turns **ON** 4th time, then a **LONG OFF** then when turns **ON** 5th time, quickly release button and LED turns **OFF**). Within a few seconds the **Green** on-board LED will once again illuminate and you will have turned **OFF** internal Termination.

Note: *If you perform this operation before you have programmed the ILC-400x, the on-board LED will turn on GREEN, if you perform this operation after you have programmed the ILC-400x, the on-board LED will turn on YELLOW.*

b. **e-Node and e-Node Pilot Programming.**

-Discover the e-Node and the provide a unique UID to the ILC-400 (see separate instructions within the e-Node Commissioning Guide
http://www.convergingsystems.com/bin/doc/ilc/ILC_legalsize_SNScheme(v2.4).pdf
-Open the **BUS tab** and set **TERM** to **DISABLE**. See screen shot below for more information


e-Node PILOT
File
Network
Logging
View
Help
CS network
E-NODEBRIC242
E-NODE SAVANT
uid 9
uid 10
ILC 4 LIGHT CONTROL
BUS
PORT (A)
PORT (B)
PORT (C)
PORT (D)
Discover
e-Nodes
Devices
Data
Collect
UID
Set
1
Properties
UID: 12
POWER
DISABLE
TERM
DISABLE