Converging Systems Inc.

CS-Bus Controllers

Intelligent Lighting Controller

ILC-100x Family

Version 1.0.g

Intelligent Lighting Controller (ILC-100x Controllers)

Safety Information

The ILC-100 LED Controller and specified associated components are listed under UL File-325 and has been tested by the following safety agency:

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-100x Family

Models:

OEM/embedded application:

ILC-100pcb: Printed circuit board configuration

Standalone/metal enclosure option:

ILC-100m: Output voltage is identical to input, 6.67 amp maximum output.

Ratings:

Input:

ILC-100pcb: 12-28vdc, 15 ma plus current capacity of supported LEDs (printed circuit board option)

ILC-100m: 12-28vdc, 15 ma plus current capacity of supported LEDs (metal enclosure included)

Output Rating

ILC-100pcb: Output voltage is identical to input, 80watts maximum (@12vdc) and 160 watts maximum (@24vdc). Either voltage maximum rated output: 6.67 amp)*.

ILC-100m: Output voltage is identical to input, 80watts maximum (@12vdc) and 160 watts maximum (@24vdc). Either voltage maximum rated output:.6.67 amp)*.

Note: ***The ILC-100 is rated as a Listed Product under UL File 2108. This listing requires that a Class 2 power supply must be utilized. Maximum rating of a Class 2 power supply is 60 watts @12vdc or 100 watts @24vdc.***

Depending upon the AC/DC adapter that is utilized, the ILC-100x 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

Description:
The Intelligent Lighting Controller (ILC-100x) is designed to control monochromatic and tri-colored LED lighting elements.

The ILC-100x 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, 0-10vdc dimmable ballast interfaces, IP (Internet Protocol), and computer-based signaling sources (serial communication) such as those manufactured by AMX, Crestron, Elan Home Systems with RS-232C or RS-485 interfaces.

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

The Intelligent Lighting Controllers (ILC-100x) are designed to support a wide range of LED applications from the simplest systems (comprised of a single ILC-100x controller and a single strip of LED lighting elements 43 feet or less in length), to the most sophisticated system (comprised of up to 65,025 different ILC-100 controllers networked together each supporting LED elements of up to 43 feet in length or 529 miles of LED lamps)! All that is required is the requisite number of ILC-100x controllers, the specific length of 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

The ILC-100x family of controllers support a wide range of LEDs* available in the marketplace. The ILC-100x controllers can support any tri-colored or monochromatic LED rated between 12vDC and 48vDC, **provided that the current requirements of the connected LEDs are less than the rated output of the ILC-100x controller**. In order to determine the specific length of LEDs strips 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 strip to be connected, as these ratings vary depending on the type of LED and the number of LEDs configured on the LED flexible strip per meter. See Appendix 4 for typical ratings of LED strips.

*Note: the ILC-100x controllers have been designed for a common anode (+) connection and multiple (color specific-R, G, B) negative (-) cathode return connections. In the case of monochromatic LEDs, any type of LED can be selected again presuming that it current capacity is less than the rated output for the ILC-100x controller and its anode (+) and cathode (-) connections are properly made.

1.3 Power Supply Requirements

The voltage output of the required power supply must match the voltage requirements of the 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 of the power supply must support the power requirements of the LED lamps being support plus a small additional overhead for the ILC-100x 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-100x controller and fewer than 13 meters of standard (single density) LEDs (30 LEDs per meter,) a single 80-watt power supply is sufficient*. However, when (i) the current capacity is exceeded for a single ILC-100x controller or (ii) when multiple states of LED output are desired (one LED strip set to red while another LED strip is set to yellow for instance), then ***multiple*** ILC-100x controllers need to be added into the system. In such case, a single power supply can be specified to accommodate the current requirements required of ALL ILC-100x controllers within the specific system, provided that the power supply connection to **each** ILC-100x is run as separate home run back to the common power supply. Traditionally though, most installations utilize a correctly sized power supply for each ILC-100x within the system with dedicated power connections running between a single power supply and a single ILC-100x controller

Note:** ***the limitation of a NEC CLASS 2 power supply is 60 watts @12Vdc or 100 watts @24Vdc. Although other power supplies are available with larger wattage outputs, the ILC-100 Controller and associated FLLA linear LED strips should only be used with UL-1310 Listed CLASS 2 power supplies or specific UL-1310 Recognized CLASS 2 power supplies.

1.4 Maximum Length of LED Strip Supported

Typically LED elements come in strips up to 5 meters in length (for those rated at 12Vdc). If more than 5 meters of LEDS (regardless if they are of single density or double density type) are desired to be run continuously, ***and they can be supported by the current requirements of a single ILC-100x controller*** *(see section 1.3 above)*, then each 5 meter strip ***must*** be separately connected back to the ILC-100x controller. Technically, the copper connections (etch) within the LED strips **cannot** support a current draw more than required by a strip 5 meters in length (i.e. the "Maximum Run"). In such case there is a risk of fire and the manufacturer's warranty shall be considered void.

1.5 System Design Configuration Table

For system design, it is necessary to review the below table to determine system requirements.

Table 1

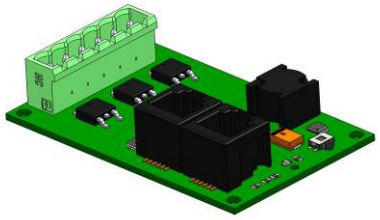
Number of Discrete Lighting Systems that can be individually controlled	Load in Amps of LED elements that can be supported with ***each*** ILC-100x	Length (of typical LED strips with 30 LED lamps per meter) that can be supported with each ILC-100x[1]	Total Length than can be supported with configuration	Recommended Power Supply for System[2]
1	6.67 amps	13 meters per ILC-100x (42.78 ft)	13 meters (42.78ft)	6.67 amps or greater
2	6.67 amps	13 meters per ILC-100x (42.78 ft)	26 meters (85.56ft)	6.67 amps or greater
65,025	6.67 amps	13 meters per ILC-100x (42.78 ft)	845,325 meters 525 miles	6.67 amps x 65,025 units (big number)

Notes:
[1] Standard density (30 LEDs/ meter) consume 1.87 watts per feet or 6.14 watts per meter @ 12vdc

[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-100x controllers come in two versions. One is a pre-configured PCB ready to be device mounted (ILC-100pcb) and the other is the same PCB mounted in a self-contained metal enclosure (ILC-100m). See Figure 1a and Figure 1b below for layout details. If you are utilizing the ILC-100m, please follow the directions below:



ILC-100pcb--Standard PCB mount
Figure 1a

ILC-100m in self-contained metal enclosure
Figure 1b

Directions

a. Determine a suitable mounting location for ILC-100m close to the LED elements that you wish to control.

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

Note: For convenience, the ILC-100m Controller may be mounted with a double gang wall box. If you are mounting the ILC-100m within a double gang junction box, route Low Voltage wires through a separate entry or knockout from any AC supply lines present

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

IMPORTANT: MAKE SURE THAT THE DC POWER SOURCE IS UNPLUGGED FROM THE ILC-100x PRIOR TO CONTINUING.

3.1 DC Power Source Connection

Directions

a. If the AC/DC power supply does not have a pre-installed 2-pin power connected attached, strip 1/4" (6mm) of insulation from DC power cord.
b. Connect wires as shown below:

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

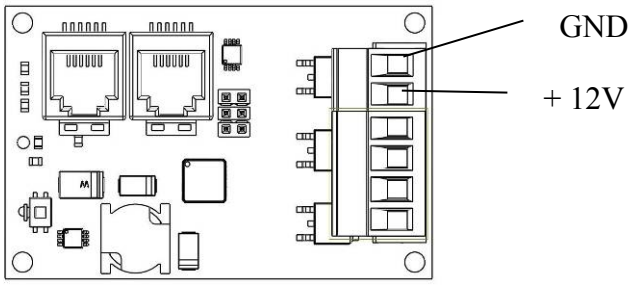


Figure 2

c. Leave AC/DC Power Adapter unplugged until requested to turn plug into AC source.

3.2 LED Connection Block

Directions

a. If the interconnect wire furnished with your LED strip does not have a pre-installed 4-pin power connected attached, strip 1/4" (6mm) of insulation from DC power cord.
b. Connect these wires as shown below:

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

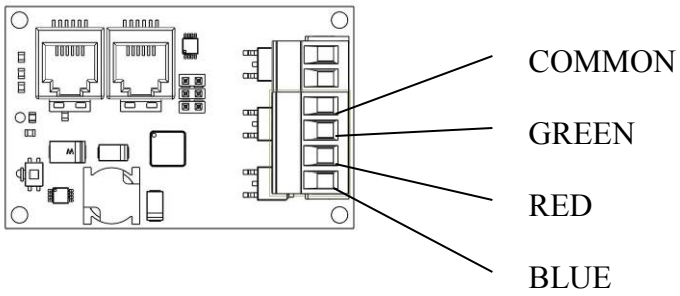


Figure 3

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: Please refer to Appendix A for specific wiring and pin-outs for all interconnection cables.

Refer to Figure 4 above for the location of the two Ports on an ILC-100x LED controller.

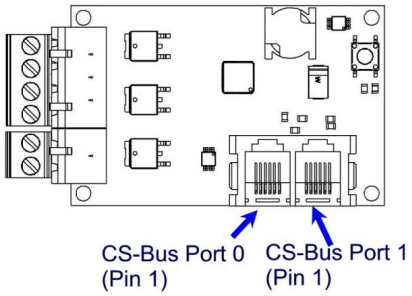


Figure 4

Table 2a—Controllers Information

Model #/Type	CS-Bus Comm. Ports (RJ-25 sockets)	Communication Port(s) Function	External Power Required from CS-Bus to Operate Interface Device	Number of Interface Devices which can be supported directly connected to specific controller device
ILC-100x LED controller	2	Port 0 Powered Port* Port 1 Unpowered Port	NO (device receives power from DC power input connector)	1
IMC-100x motor controller	2		NO (device receives power from AC connector)	2

Table 2b—Interface Devices 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
Lutron Interface Device	IBE-1000	1	Bi-directional communication Interface (I/F)	Yes-mandatory
Light Sensor Device	IBE-1200	1	Bi-directional communication Interface (I/F)	Yes-mandatory
Motion Sensor Device	IBE-1600	1	Bi-directional communication Interface (I/F)	Yes-mandatory
Intelligent Relay Device	IRC-1000	1	Bi-directional communication Interface (I/F)	Yes-mandatory
Ethernet Interface Device	e-Node	2	Bi-directional communication Interface (I/F)	NO (device receives power from AC/DC adapter directly to unit)

*note: an RJ-25 connector is similar to a standard RJ-11 connector except it has 6 contact pins rather than 4 but the housing is identical.

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

- 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 255 Controllers can be implemented on a single leg or branch of a CS-Bus without the need for an IMC Repeater/Router (IMC-RTR) or e-Node.
- Up to 65,025 Controllers can be integrated into a single system with multiple repeaters.
- 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-100 within a double gang 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). (See Figure 5 below.)

Directions

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.

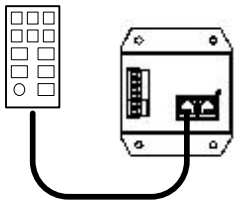


Figure 5

4.2 CS-Bus Wiring Directions (Single Controller to Multiple Interface Devices). (See Figure 6 below.)

Directions

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 2b 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

c. Next, insert a DIM into each Interface Device ***except*** for the last Interface Device. Please refer to Figure 4b below for more information here.

d. 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 4b below.

e. 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).

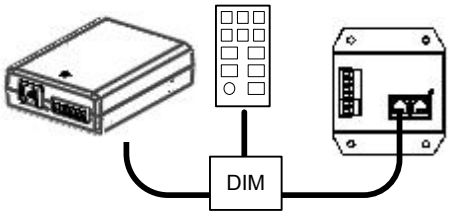


Figure 6

4.3 CS-Bus Wiring Directions (Multiple Controllers connected to each Other). (See Figure 7 below.)

Directions

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).

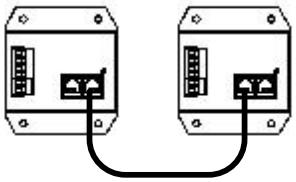


Figure 7

4.4 CS-Bus Wiring Directions (Multiple Controllers to a Single Interface Device). (See Figure 8 below.)

Directions

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

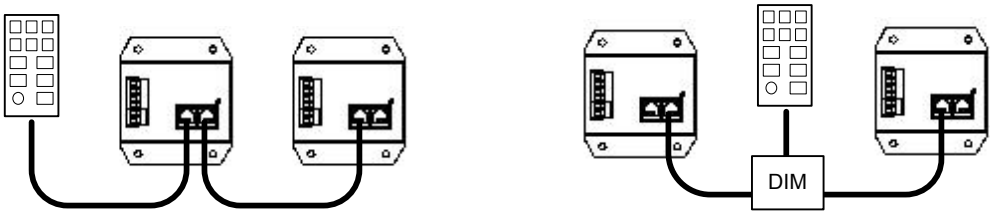


Figure 8

4.5 CS-Bus Wiring Directions (Multiple Controllers to Multiple Interface Devices). (See Figure 9 below.)

Directions

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.

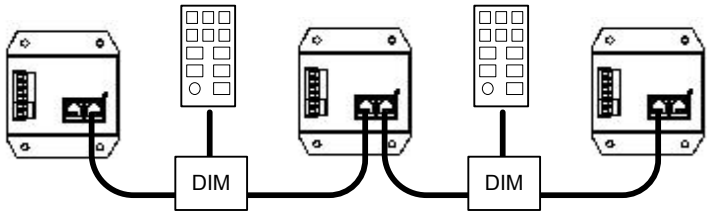


Figure 9

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

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.

c. Power on all ILC-100x Controllers by providing DC power to all components.

d. Verify each ILC-100x Controller has powered up properly by examining its status LED indicator. Depending upon the configuration of each ILC-100x 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 Yellow LED operation
DC power applied	●Yellow LED illuminates continuously
Other Programming and Reset States	●Yellow LED blinks

6 Controlling the ILC-100x

6.1 Overview.

The ILC-100x Controllers contain a sophisticated color computer that can be used to select any "color" from a palette of nearly 16 millions 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-100x 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-100x 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; degree of difference from a gray of the same lightness or brightness. There are two controls available with this operator—UP and DOWN. Selecting UP, increases the ***Hue***, while selecting the DOWN, decreases the ***Hue***.

.

Lightness Control: 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; degree of difference from a gray of the same lightness or brightness. 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-100x 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 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 Select 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-100x series of Controllers. Please consult any other user documentation that may have come with your system before calling customer service for more assistance.

APPENDIX 1-Specifications ILC-100

Feature	Specification	Detail
Product Code	OEM Configuration Standalone Version	ILC-100m ILC-100pcb
Features	Function	LED Lighting Controller. Compatible Luminaries (LEDs) -Full Color-RGB (Red, Green, Blue) positive anode, R/G/B cathode (-) -Monochrome-Single color (Monochrome) formats
	Processing	-Built-in color computer selects a single color (hue) from over 16 million available -Network compatible/auto discovery/network ID/diagnostics
Controls /Interfaces	Control Type	Connectivity to CS-Bus peripherals (i.e. keypads, Ethernet adapter, Serial interface adapter, 0-10vcd dimmable ballast interface)
	LED Connection	-4-pin detachable connector (for RGB lamps). -4-pin detachable connector (for monochrome LEDs)* *Note: the separate R, G, B outputs can be wired to three separate monochrome strips to balance the load and maximize the output of the controller.
	Control	Hue- Ramp Up/Down/Stop Saturation- Ramp Up/Down/Stop Brightness- Ramp Up/Down/Stop Presets 1-8 recall* Store Levels, 1-8* On Off Effect-Recall Effect 1 *number dependent upon User Interface utilized
	Screen Trigger Interface	Available through separate IBE-1000 adapter
	Low-Voltage Trigger	Available through separate IBE-1000 adapter
	Light-sensor control	Available through separate IBE-1200 adapter
	Motion- sensing control	Available through separate IBE-1600 adapter
	Motor Control	Dependent operations available with networked IMC-100 controller(s)
	IR Input	Through remote IR receiver (using CS-Bus interface socket) or through networked intelligent keypads
	Bus Specification	CS-Bus compatible. Up to 4000 foot runs using twisted pair wiring.4 conductor wiring required for standard communication, 6 conductor wiring required for intelligent peripherals
Connections	LED Connector	4-pin detachable LED connector
	Power Connector	2-pin DC detachable power connector
	Network Connection	CS-Bus connection (input, output). Port 0-powered, Port 1-non-powered
General	Dimension (length x width x depth) OEM Configuration Standalone Configuration	 2.882 x 1.723 x 0.76 in (73.2 x 43.76 x 19.3mm) 3.01 x 2.21 x 0.9” (76.34 x 56.13 x 22.86mm) without mounting ears 3.01 x 3.4 x 0.9” (76.45 x 86.36 x 22.86mm) with mounting ears
	Weight OEM Configuration Standalone Configuration	 0.7 oz (14 gm) 5.7 oz (155 gm)
	Form Factor	OEM Configuration-PCB mount Standalone Configuration-integrated metal enclosure
	Housing (Standalone conf)	Metal-formed customized mounting box with mounting ears.
	Power Requirements	Power supply should be selected depending upon voltage of LEDs to be supported. Controller requires at minimum 40ma @5Vdc. Maximum voltage 48Vdc. Maximum load of 6.67 amps requires a

		similar power supply (+40 ma).
	Manufacturing	Made in the U.S.A
	Temperature Range	32-130° F (0-54° C)
	Humidity	< 90% RH, non-condensing
Compliance	Safety Approvals	UL PCB/Power Supply UL Rated. Typically interfaced to Category 2 power supply.
	RoHS	RoHS compliant
	EMI Testing	FCC Class B (home and office)

APPENDIX 2-Accessory Information

A2-1 Wall pad 5-Button Switch (Standalone Model IMC-BSKP-2050)

The ILC-100x controllers are designed to operate either in a standalone manner or in conjunction with one or more separate lighting controllers (ILC-100x) or intelligent motor controllers (IMC-100x). In the case where one more ILC-100x controllers have been integrated with one or more IMC-100 controllers, specific buttons on some IMC-100 peripherals, notably the BSKP-2050, can also control specific operations on a networked ILC-100x system. See the directions below for a description of such possible interactions.

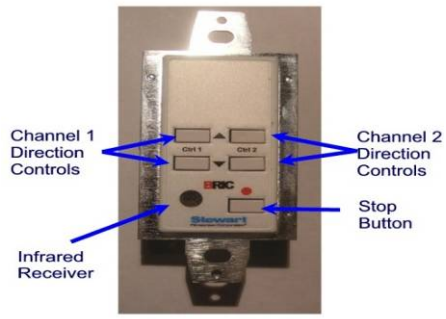


Figure A2-1

IMC-100T

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

IMC-100T

Specific Activity Buttons-Channel 1 (UP/DOWN). The right pair of UP/DOWN buttons activates one or connected IMC-100x Controllers *designated as Channel 1* to move motor in the selected direction. In the factory default settings, if you tap the switch once in one of the applicable directions (UP or DOWN) and then release, the IMC Controller will activate a connected bi-directional motor to travel in that appropriate direction until it reaches its desired (fully UP or fully DOWN) position.

In addition, when Channel 1 UP button is depressed, a signal is sent to a specific ILC-100x to activate ***Lighting*** Preset 1. If no Preset 1 had previously setup within the targeted ILC-100x system, then no triggering will occur. In addition, when Channel 1 DN button is depressed, a signal is sent to a specific ILC-100x to activate ***Lighting*** Preset 2. If no Preset 2 had previously setup within the targeted ILC-100x system, then no triggering will occur.

IMC-100T

Specific Activity Buttons-Channel 2 (UP/DOWN). The right pair of UP/DOWN buttons activates one or connected IMC-100x Controllers *designated as Channel 2* to move motor in the selected direction. In the factory default settings, if you tap the switch once in one of the applicable directions (UP or DOWN) and then release, the IMC Controller will activate a connected bi-directional motor to travel in that appropriate direction until it reaches its desired (fully UP or fully DOWN) position.

In addition, when Channel 2 UP button is depressed, a signal is sent to a specific ILC-100x to activate an additional Preset which can be programmed by your dealer. In addition, when Channel 2 DN button is depressed, a signal is sent to a specific ILC-100x to activate yet another Preset which can be programmed by your dealer.

IMC-100T

Button. Depress this button anytime while a motor moving and the motor will stop.

A2-2 Wall pad 11-Button Switch (Standalone Model IMC-BSKP-2011L)

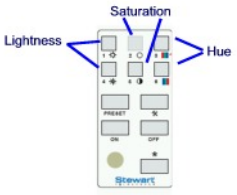


Figure A2-2

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--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.

A2-3 Handheld 10-button Infrared Remote (ILC-IR-10W1)

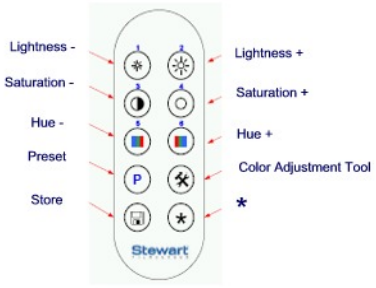


Figure A2-3

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.

A2-4 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 A2-4

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.

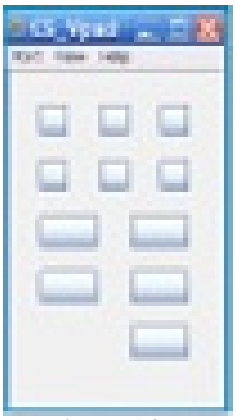


Figure A2-5
V-pad Application

A2-5 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 A2-6
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.

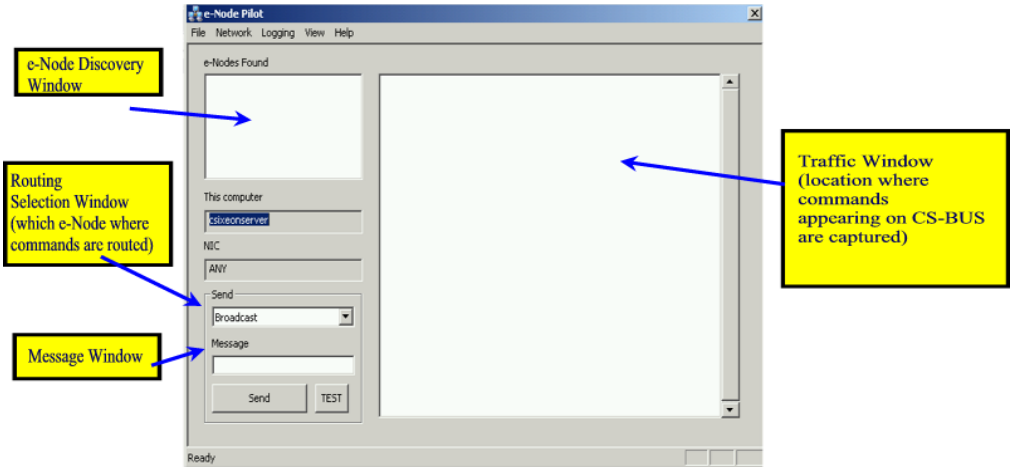


Figure A2-7
e-Node Pilot Application

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.

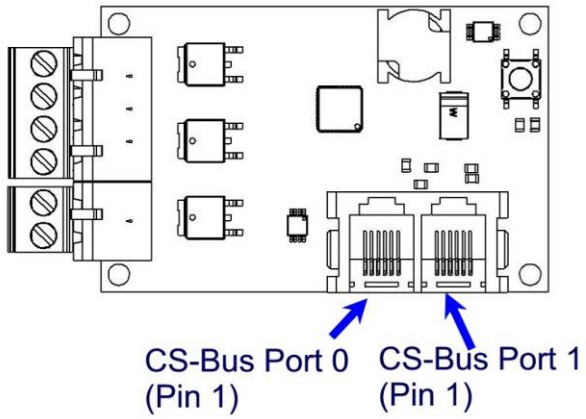


Figure A3-1

Refer to the following tables for pin-outs on each of the two RJ-25 connectors when makng 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.

.

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.

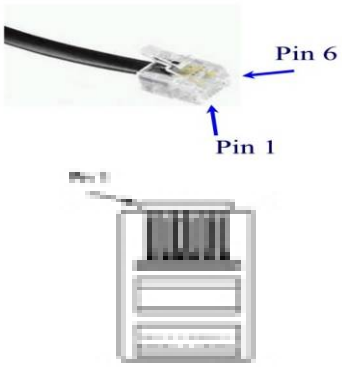


Figure A3-2

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)

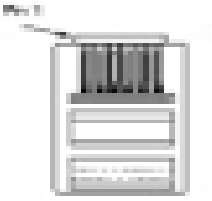


Figure A3-3

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.

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 A3-4

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

Figure A3-4

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 A3-5
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 A3-6
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 A3-7
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

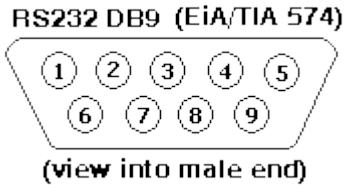


Figure A3-5

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 Power Requirements of Popular LED Strips

1.0 This is a power requirements chart for standard 4-wire tri-colored LEDs with 30 elements per meter (i.e. "single density strips").

Sections	Length mm	Meters	Inches	Feet	LEDs	Current (amps) @12volts	Wattage	Notes
1	100 mm	.1 M	3.94	.33	3	.05	.60	
2	200	.2 M	7.87	.66	6	.10	1.20	
3	300	.3 M	11.81	.98	9	.15	1.80	
4	400	.4 M	15.75	1.31	12	.20	2.40	
5	500	.5 M	19.69	1.64	15	.25	3.00	
6	600	.6 M	23.62	1.97	18	.30	3.60	
7	700	.7 M	27.56	2.30	21	.35	4.20	
8	800	.8 M	31.50	2.63	24	.40	4.80	
9	900	.9 M	35.43	2.95	27	.45	5.40	
10	1000	1.0 M	39.37	3.28	30	.50	6.00	
20	2000	2.0 M	78.74.	6.56	60	1.0	12.00	
30	3000	3.0 M	118.11	9.84	90	1.5	18.00	
40	4000	4.0 M	157.48	13.12	120	2.0	24.00	
50	5000	5.0 M	196.85	16.40	150	2.5	30.00	Maximum length of single run of this type of LED strip
130*	13000	13.00	511.81	42.65	390	6.65	79.76	Maximum length of multiple home runs of this type of LED

*__Note__: Typical strips of 5 meters cannot be extended because the circuitry lack the internal current handling capacity to add additional loads to their back end. The alternative here to support longer than 5 meter strips is to run a separate "home run" connection from each 5 meter strip back to the power connector on the ILC-100x, provided the total current requirement of the LED load is less than or equal to the rated capacity of the ILC-100x controller.

2.0 This is a power requirements chart for ultra-bright (double density) 4-wire tri-colored LEDs with 60 elements per meter

Sections	Length mm	Meters	Inches	Feet	LEDs	Current (amps)	Wattage	Notes
1	100	.1	3.94	.33	6	.10	1.20	
2	200	.2	7.87	.66	12	.20	2.40	
3	300	.3	11.81	.98	18	.30	3.60	
4	400	.4	15.75	1.31	24	.40	4.80	
5	500	.5	19.69	1.64	30	.50	6.00	
6	600	.6	23.62	1.97	36	.60	7.20	
7	700	.7	27.56	2.30	42	.70	8.40	
8	800	.8	31.50	2.63	48	.80	9.60	
9	900	.9	35.43	2.95	54	.90	10.80	
10	1000	1.0	39.37	3.28	60	1.0	12.00	
20	2000	2.0	78.74.	6.56	120	2.0	24.00	

.

30	3000	3.0	118.11	9.84	180	3.0	36.00	
40	4000	4.0	157.48	13.12	240	4.0	48.00	
50	5000	5.0	196.85	16.40	300	5.0	60.00	Maximum length of single run of this type of LED strip
65*	6500	6.5	255.91	21.32	480	6.65	79.76	Maximum length of multiple home runs of this type of LED

***Note**: Typical strips of 5 meters cannot be extended because they lack the internal current handling capacity to add additional load to their back end. The alternative here to support longer than 5 meter strips is to run a separate “home run” connection from each 5 meter strip back to the power connector on the ILC-100x, provided the total current requirement of the LED load is less than or equal to the rated capacity of the ILC-100x controller.

.