iWorx®
by Taco Electronic Solutions

Application Guide

SLC1 Store Lighting Controller
Self-Contained Interoperable Controller Model UCP-1

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SLC1

The iWorx® SLC1 is a standalone Store Lighting Controller used to enable lighting contactors in response to schedules and light levels.

Overview

The SLC can read up to eight (8) analog light sensor inputs and control eight (8) independent output zones (triac switches). The SLC1 is based on the LonWorks networking technology and can be networked to a higher-level control system for monitoring and control applications.

Features

- Up to 8 light sensor inputs
- Controls up to 8 lighting zone outputs based on any of the inputs.
- Multiple units can be networked together
- Scheduled on and off times
- LONWORKS interface to building automation systems
- Occupancy Inputs for individual zones
- Automatic configuration through the LCI

PURPOSE OF THIS GUIDE

The *iWorx® SLC1 Application Guide* provides application information for the SLC1.

The reader should understand basic logic control concepts, intelligent environmental control automation, and basic LONWORKS networking and communications. This Application Guide is written for:

- Users who engineer control logic
- Users who set up hardware configuration
- Users who change hardware or control logic
- Technicians and field engineers

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APPLICABLE DOCUMENTATION

Table 1: Applicable Documentation

Description	Audience	Purpose
iWorx® SLC1 Application Guide, Document No. 505-041 (this document)	– Application Engineers – Wholesalers – Contractors – Start-up Technicians – End user	Provides instructions for setting up and using the iWorx® SLC1.
iWorx® LCI Application Guide, Document No. 505-002	– Application Engineers – Installers – Service Personnel – Start-up Technicians – End user	Provides instructions for setting up and using the iWorx® Local Control Interface.
http://www.iWorxWizard.com	– Application Engineers – Wholesalers – Contractors	An on-line configuration and submittal package generator based on user input. Automatically generates bill of materials, sequence of operations, flow diagrams, wiring diagrams, points and specifications.
Additional Documentation	*LonWorks FTT-10A Free Topology Transceiver User's Guide,* published by Echelon Corporation. It provides specifications and user instructions for the FTT-10A Free Topology Transceiver. See also: www.echelon.com/support/documentation/manuals/transceivers.	

INSTALLATION INSTRUCTIONS

General

CAUTION: This symbol is intended to alert the user to the presence of important installation and maintenance (servicing) instructions in the literature accompanying the equipment.

CAUTION: Risk of explosion if battery is replaced by an incorrect type. Contains lithium type battery; dispose of properly.

WARNING: Electrical shock hazard. Disconnect **ALL** power sources when installing or servicing this equipment to prevent electrical shock or equipment damage.

Make all wiring connections in accordance with these instructions and in accordance with pertinent national and local electrical codes. Use only copper conductors that are suitable for 167 °F (75 °C).

Static Electricity

Static charges produce voltages that can damage this equipment. Follow these static electricity precautions when handling this equipment.

• Work in a static free area.
• Touch a known, securely grounded object to discharge any charge you may have accumulated.
• Use a wrist strap when handling printed circuit boards. The strap must be secured to earth ground.

FCC Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference. This equipment can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

• Reorient or relocate the receiving antenna.
• Increase the separation between the equipment and the receiver.
• Connect the equipment to a power source different from that to which the receiver is connected.
• Consult the equipment supplier or an experienced radio/TV technician for help.

You are cautioned that any changes or modifications to this equipment not expressly approved in these instructions could void your authority to operate this equipment in the United States.

BEFORE INSTALLING

About this Document

The instructions in this document are for the SLC1 module which controls facility logic.

Inspecting the Equipment

Inspect the shipping carton for damage. If damaged, notify the carrier immediately. Inspect the equipment for damage. Return damaged equipment to the supplier.

What is Not Included with this Equipment

• A power source for the equipment electronics and peripheral devices.
• Tools necessary to install, troubleshoot and service the equipment.
• The screws or DIN rail needed to mount the device.
• Peripheral devices, such as sensors, actuators, etc.
• Cabling, cabling raceway, and fittings necessary to connect this equipment to the power source, FTT-10A network and peripheral devices.

Equipment Location

Abide by all warnings regarding equipment location provided earlier in this document.

Optimally, the equipment should be installed within a secure enclosure.

If the equipment is to be installed outside, it must be contained within a protective enclosure. The enclosure must maintain internal temperature and humidity within the ranges specified for this equipment.

The equipment must be installed within 500 feet of all input peripherals (smoke detectors, sensors, etc.) that are connected to the equipment.

Selecting a Power Source

This equipment requires a UL recognized Class 2 external power source (not supplied) to operate. The controller power input requires a voltage of 24 Volts AC.

To calculate power source current requirements, add the power consumption of all peripheral devices to that of the controller.

The controller and sensor power supplies can use the same power source. If both are using the same power source, the loads must have EMF protection. This protection can be integral to the load, or installed in the 24 VAC wiring across the load's coil.

To provide necessary RFI and transient protection, the controller's ground (GND) pin (T40) must be connected to earth ground or the earth ground of the packaged unit's enclosure ground. Failure to properly ground the controller may cause it to exceed FCC limits. Excessive noise could also produce inaccurate sensor data. The power source must be capable of operating with this connection to ground.

INSTALLATION

Warning: Electrical shock hazard. To prevent electrical shock or equipment damage, disconnect **ALL** power sources to controllers and loads before installing or servicing this equipment or modifying any wiring.

Mounting the Device

1. Select a mounting location. Enclosure mounting is recommended.
2. Hold the controller on the panel you wish to mount it on. With a marker or pencil mark the mounting locations on the panel.
3. Using a small drill bit pre-drill the mounting holes.
4. Using two #6 pan head screws, mount the controller to the panel.
5. Wire the controller (See Routing Cabling to the Device).

Figure 1: Mounting Dimensions
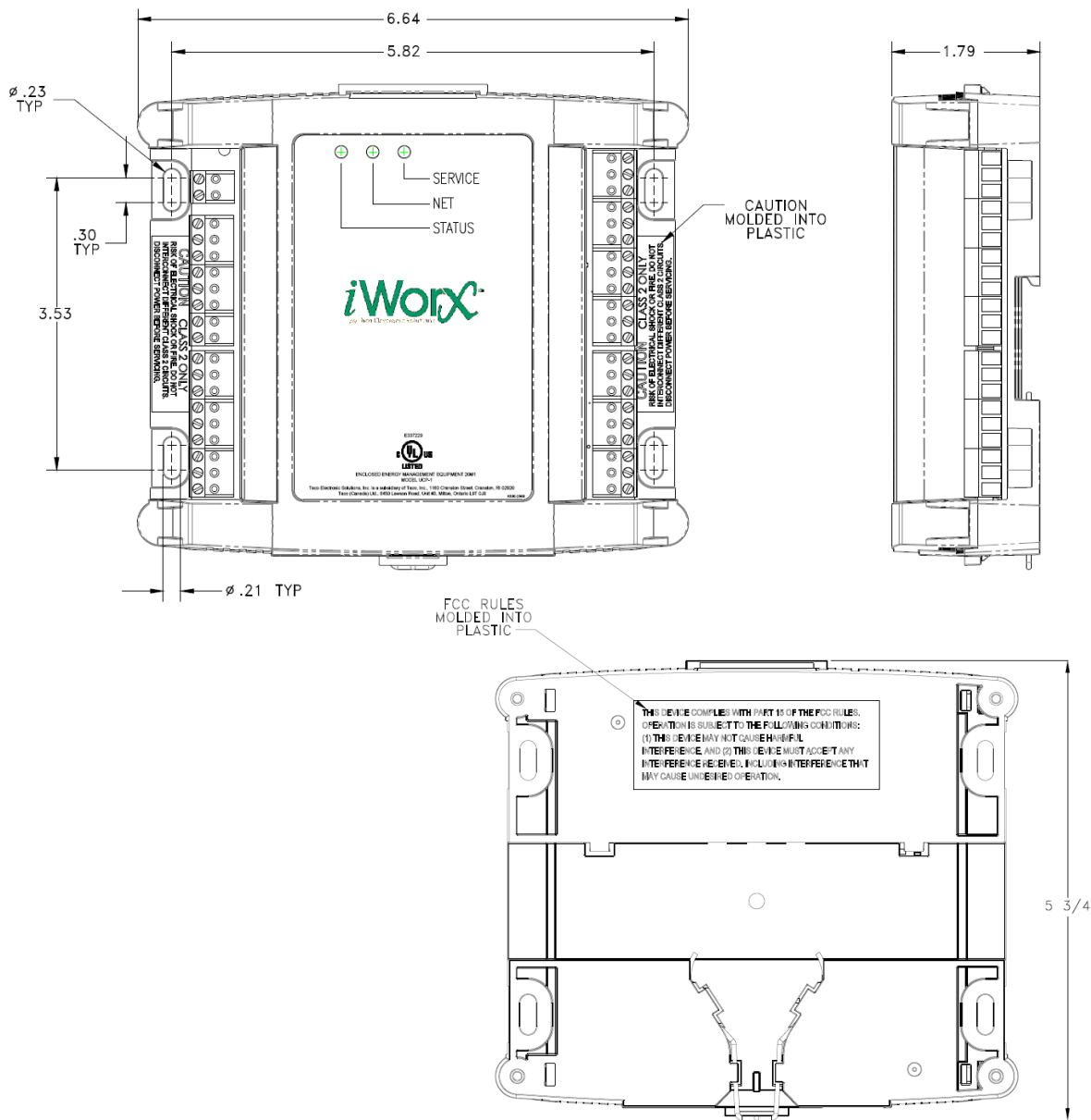
Routing Cabling to the Device

Cabling used to connect the power source and cabling used to connect the FTT-10A network must remain separated within the control enclosure and wiring conduit.

Grounding the Device

The ground terminal (T40) must be securely connected to earth ground. Failure to properly ground this equipment will result in improper operation. Improper grounding may also increase the risk of electrical shock and may increase the possibility of interference with radio/TV reception.

For best performance, connect the power supply common terminal (T38) to the same external point as the ground terminal (T40).

WIRING INFORMATION

WARNING: Terminals 6, 9, 12, 15, and 18 are connected internally on all SLC1 controllers. Disconnect **ALL** power sources when installing or servicing this equipment to prevent electrical shock or equipment damage.

Figure 2: Typical SLC1 Power Sourcing
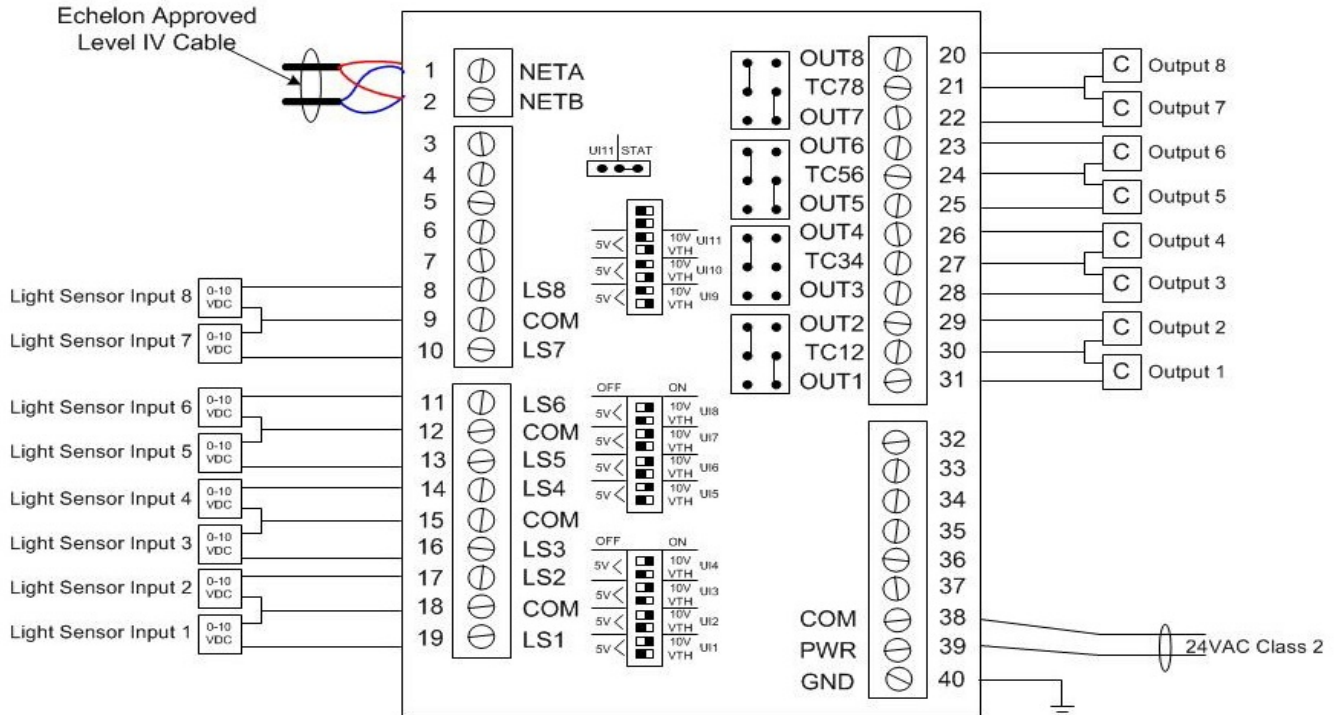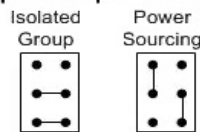
Figure 3: Typical SLC1 Power Isolated
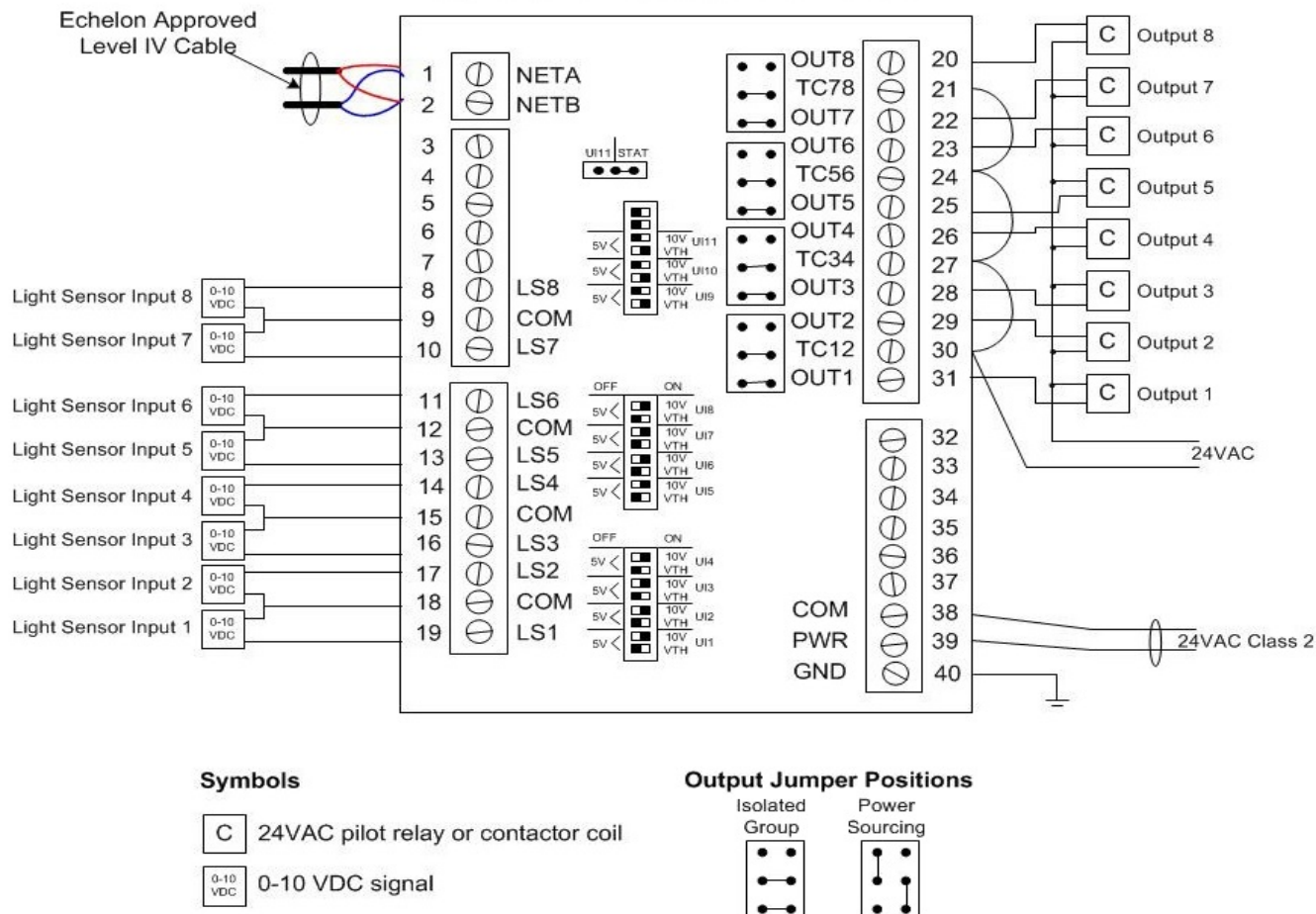
Connecting Input Devices

Remote Inputs (LS1, LS2, LS3, LS4, LS5, LS6, LS7, LS8)

Connect each input to an input terminal (T19, T17, T16, T14, T13, T11, T10 and T8) and the adjacent common terminal. Refer to the figures above for details.

Connecting Output Devices

Logic Outputs (OUT1, OUT2, OUT3, OUT4, OUT5, OUT6, OUT7, OUT8)

The outputs must be connected to 24 VAC relays or contactors. Refer to the above figures for details.

Other Connections

Network (LON)

Network wiring must be twisted pair. One network wire must be connected to terminal NETA (T1) and the other network wire must be connected to terminal NETB (T2). Polarity is not an issue since an FTT-10A network is used for communications.

Power (PWR)

Connect one output wire from a 24 VAC power supply to PWR (T39) and the other output wire from the power supply to the adjacent common terminal (T38). T38 must be connected to earth ground.

Ground (GND)

Terminal GND (T40) must be connected to earth ground. Failure to properly ground this equipment will result in improper operation. Improper grounding may also increase the risk of electrical shock, and may increase the possibility of interference with radio and TV reception.

SPECIFICATIONS

Electrical

Inputs

LS1, LS2, LS3, LS4, LS5, LS6, LS7, LS8

• Cabling: twisted shielded pair, 18 AWG recommended—500 feet max. (152 meters)
• 0 - 10V DC

Outputs

OUT1, OUT2, OUT3, OUT4, OUT5, OUT6, OUT7, OUT8

• 24 Volts AC Triac
• 1A @ 50C, 0.5A @ 60C, limited by the Class 2 supply rating

FTT-10A Network

• Speed: 78KBPS
• 42.4 Volts DC max
• Cabling: Maximum node-to-node distance: 1312 feet (400 meters)
• Maximum total distance: 1640 feet (500 meters)

Cable Type	Pairs	Details	Taco Catalog No.
Level 4 22AWG (0.65mm)	1	Unshielded, Plenum, U.L. Type CMP	WIR-022

For detailed specifications, refer to the *FTT-10A Free-Topology Transceiver User's Guide* published by Echelon Corporation (www.echelon.com/support/documentation/manuals/transceivers).

Power Requirements

• 24VAC (20VAC to 28VAC), requires an external Class 2 supply

Power Consumption

• 7.2W with no external loads, maximum limited by the Class 2 supply rating

Mechanical

Housing

• Dimensions: 5.55" (141mm) high, 6.54" (166 mm) wide, 1.75" deep (44 mm)
• ABS

Weight

• Controller Weight: 0.70 pounds (0.32 kilograms)
• Shipping Weight: 1.0 pounds (0.46 kilograms)

Electronics

- Processor: 3150 Neuron 10 MHz
- Flash: 48 Kilobytes
- SRAM: 8 Kilobytes
- Termination: 0.197" (5.0 mm) Pluggable Terminal Blocks, 14-22 AWG

Environmental

- Temperature: 32 °F to 140 °F (0 °C to 60 °C)
- Humidity: 0 to 90%, non-condensing

Agency Listings

- UL Listed for US and Canada, Energy Management Equipment PAZX and PAZX7.

Agency Compliances

- FCC Part 15 Class A

APPLICATION DESCRIPTION

The Store Lighting Controller is designed to turn lighting zones on and off based on input from light sensors and a pre-determined schedule.

Each Lighting Zone can be associated with one of the SLC1's light sensor inputs.

SEQUENCE OF OPERATION

Operational Mode

The SLC1 reads each lighting sensor input once per second. It scales that input's analog value in according to configurable scaling values.

It then iterates through a logic sequence each output to determine the course of action for that output. The logic sequence is as follows:

If the output zone is currently energized and (is using the occupancy schedule and is occupied) or (is not using the occupancy schedule and the sensor light level is below the turn-off threshold) then the zone remains energized. Otherwise, the zone is de-energized.

If the output zone is currently de-energized and (is using the occupancy schedule and is occupied) or (is not using the occupancy schedule and the sensor light level is below the turn-off threshold) then the zone is energized. Otherwise, the zone remains de-energized.

> **NOTE:** On start-up, all zones are de-energized.

Occupancy Mode

Occupancy status is transmitted to the SLC1 from the LCI with the standard ping message.

Alarms and Events

The SLC1 reports no alarms.

Automatic Configuration

The SLC1 and iWorx® Local Control Interface (LCI) use a self-configuring network management scheme requiring no external tools, binding, or LonWorks knowledge. The LCI recognizes and configures the SLC1 when the controller's service pin is pressed. The controller's status light flashes green until the controller is configured, and is solid green after the controller is configured. Once the service pin has been pressed, no further action is required by the user; the controller is fully accessible to the LCI. Users may bind to SNVTs on the SLC1 with LNS or other LonWorks tools if they wish.

The LCI also provides network supervision of the SLC1. The LCI periodically sends a "ping" message to the SLC1, which elicits a response. If the response fails, an alarm is displayed on the LCI. The LCI also uses the "ping" message to refresh the occupancy mode and other system wide data.

Communications

The SLC1 only communicates with the LCI.

Aside from automatic configuration functions, the LCI sends periodic ping message to let the SLC1 know that it is still on the network, send occupancy information and delivery sensor and zone configuration SNVTs.

If the SLC has not received any communications from the LCI in 30 seconds, i its status LED turns to amber.

CONTROLLER IDENTIFICATION

Once the SLC1 is properly installed and recognized by the Local Control Interface (LCI), the LCI can be used to configure the settings of the controller. This section describes the commands available on the LCI for configuration of the SLC1, and the meanings and default values for controller parameters. For more information on using the LCI, see the *iWorx® LCI Application Guide.*

Network Variables

Output Network Variables

Variable	Range	Description
Sensor Input 1	0-10000 ft cd	Reading from light sensor connect to UI1
Sensor Input 2	0-10000 ft cd	Reading from light sensor connect to UI2
Sensor Input 3	0-10000 ft cd	Reading from light sensor connect to UI3
Sensor Input 4	0-10000 ft cd	Reading from light sensor connect to UI4
Sensor Input 5	0-10000 ft cd	Reading from light sensor connect to UI5
Sensor Input 6	0-10000 ft cd	Reading from light sensor connect to UI6
Sensor Input 7	0-10000 ft cd	Reading from light sensor connect to UI7
Sensor Input 8	0-10000 ft cd	Reading from light sensor connect to UI8
Output Zone Status Bit 1: if 0, zone Off, if 1, zone On Bit 2: if 0, zone Off, if 1, zone On Bit 3: if 0, zone Off, if 1, zone On Bit 4: if 0, zone Off, if 1, zone On Bit 5: if 0, zone Off, if 1, zone On Bit 6: if 0, zone Off, if 1, zone On Bit 7: if 0, zone Off, if 1, zone On	SNVT_state	Bit 0: if 0, zone Off, if 1, zone On
Occupancy Status	SNVT_occupancy	Displays the controller's occupancy status

Input Network Variables

None.

Configuration Network Variables

Setting	Range	Default	Description
Sensor # 1 Cfg	N/A	Structure	Describes Scaling For Sensor Input
Sensor # 2 Cfg	N/A	Structure	Describes Scaling For Sensor Input
Sensor # 3 Cfg	N/A	Structure	Describes Scaling For Sensor Input
Sensor # 4 Cfg	N/A	Structure	Describes Scaling For Sensor Input
Sensor # 5 Cfg	N/A	Structure	Describes Scaling For Sensor Input
Sensor # 6 Cfg	N/A	Structure	Describes Scaling For Sensor Input
Sensor #7 Cfg	N/A	Structure	Describes Scaling For Sensor Input
Sensor #8 Cfg	N/A	Structure	Describes Scaling For Sensor Input
LZone # 1 Cfg	N/A	Structure	Describes Configuration for Turning each output on or Off
LZone # 2 Cfg	N/A	Structure	Describes Configuration for Turning each output on or Off
LZone # 3 Cfg	N/A	Structure	Describes Configuration for Turning each output on or Off
LZone # 4 Cfg	N/A	Structure	Describes Configuration for Turning each output on or Off
LZone # 5 Cfg	N/A	Structure	Describes Configuration for Turning each output on or Off
LZone # 6 Cfg	N/A	Structure	Describes Configuration for Turning each output on or Off
LZone # 7 Cfg	N/A	Structure	Describes Configuration for Turning each output on or Off
LZone # 8 Cfg	N/A	Structure	Describes Configuration for Turning each output on or Off

Sensor #[1-8] Config

Setting	Range	Default	Description
Min Light	0-6,088 ft cd (0-65535 Lux)		Light Value when input as at 0V
Max Light	0-6,088 ft cd (0-65535 Lux)	750 ft cd	Light Value when input is at 10V

LZone #[1-8] Config

| Setting	Range	Default	Description
Occupancy-type	Always occupied, Use system occupancy	Use System occupancy	Always occupied indicates the zone is always occupied. Use system occupancy configures the zone to follow the associated scheduled occupancy.
Sensor index	1-8	1	Index of light sensor input associated with this output zone.
On Light	0-6,088 ft cd (0-65535 Lux)	300	Light Level at which zone turns on.
Off Light	0-6,088 ft cd (0-65535 Lux)	350	Light level at which zone turns off.
Min On Time			Minimum amount of time the zone is allowed to be on before it responds to an "off" command.

TROUBLESHOOTING

Diagnostic LEDs

The controller has 3 LED indicators. These indicators can aid in troubleshooting equipment operation problems. The following table lists the functions of the controller's LEDs in the order they appear from left to right on the unit.

LED	Indication
Status	– Solid green when running and configured by an LCI (networking) – Flashing green when running and NOT configured by an LCI (stand-alone) – Solid red when a fault condition exists (control shut down) – Blinking Red - the controller has a device failure – Solid Amber - The controller has not received a LCI ping message in over 10 minutes and is part of a network.
Network	– Yellow while the controller is transmitting data onto the FTT-10A network – Green when there is network activity – Off when there is no network activity
Service	– Illuminated when the service pin is depressed or when a controller gets configured by the LCI.

Figure 4: SLC1 Controller LEDs
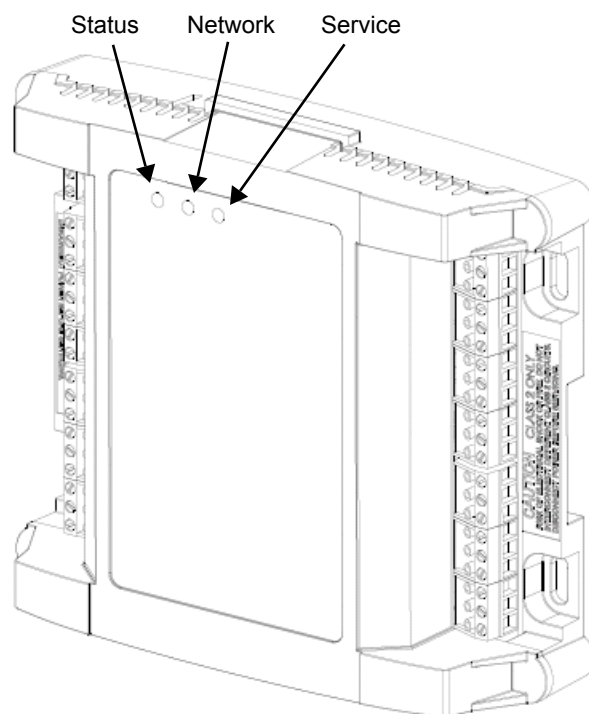
Troubleshooting Tips

The following table provides tips on resolving common issues.

Problem	Solution
Controller is not running and Status LED is not illuminated.	No power to controller. Verify the voltage on the controller's power connector (24 VAC).
How do I reset the controller?	The controller can be reset by the LCI, or you can cycle power to the controller. Refer to the LCI documentation for more information on resetting the controller using the LCI.
The output zones do not turn on, though the LCI indicates they are on.	Ensure that the controller has been powered with 24 VAC and the outputs have been correctly wired to the coils of the output contactors. Also ensure that the contactors have 24 VAC coils.
Lighting zones do not come on as scheduled.	There are several reasons the lighting may not cycle on and all should be checked. – Is the controller part of a group, and is the group occupied? – Is a light sensor controlling the zone and is it bright outside?
Lighting zones are on when they should be off and off when they should be on.	Check that the Light ON and Light Off values are not reversed. Check if the zone is scheduled or always enabled.

Getting Help

Components within an iWorx® controller, sensor, or power supply cannot be field repaired. If there is a problem with a unit, follow the steps below before contacting your local TES representative or TES technical service.

1. Make sure controllers, sensors, and power supplies are connected and communicating to desired devices.
2. Record precise hardware setup indicating the following:

   Version numbers of application software.

   Device and/or firmware version number.

   A complete description of difficulties encountered.

Notes

LIMITED WARRANTY STATEMENT

Taco Electronic Solutions, Inc. (TES) will repair or replace without charge (at the company's option) any product or part which is proven defective under normal use within one (1) year from the date of start-up or one (1) year and six (6) months from date of shipment (whichever occurs first).

In order to obtain service under this warranty, it is the responsibility of the purchaser to promptly notify the local TES stocking distributor or TES in writing and promptly deliver the subject product or part, delivery prepaid, to the stocking distributor. For assistance on warranty returns, the purchaser may either contact the local TES stocking distributor or TES. If the subject product or part contains no defect as covered in this warranty, the purchaser will be billed for parts and labor charges in effect at time of factory examination and repair.

Any TES product or part not installed or operated in conformity with TES instructions or which has been subject to accident, disaster, neglect, misuse, misapplication, inadequate operating environment, repair, attempted repair, modification or alteration, or other abuse, will not be covered by this warranty.

TES products are not intended for use to support fire suppression systems, life support systems, critical care applications, commercial aviation, nuclear facilities or any other applications where product failure could lead to injury to person, loss of life, or catastrophic property damage and should not be sold for such purposes.

If in doubt as to whether a particular product is suitable for use with a TES product or part, or for any application restrictions, consult the applicable TES instruction sheets or in the U.S. contact TES at 401-942-8000 and in Canada contact Taco (Canada) Limited at 905-564-9422.

TES reserves the right to provide replacement products and parts which are substantially similar in design and functionally equivalent to the defective product or part. TES reserves the right to make changes in details of design, construction, or arrangement of materials of its products without notification.

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CONTROLS MADE EASY®

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