iWorx by Taco Electronic Solutions

Application Guide

505-028

LCU2 Logic Controller

Self-Contained Interoperable Controller Model UCP-1

SUPERSEDES: April 5, 2011 EFFECTIVE: January 11, 2013

Plant ID: 001-4021

Table of Contents

LCU2 3
- Overview 3
- Features 3

Purpose of This Guide 3

Representations and Warranties 3

Applicable Documentation 4

Installation Instructions 4
- Precautions 4
- General 4
- Static Electricity 4
- Location 4
- FCC Compliance 5

Before Installing 5
- About this Document 5
- Inspecting the Equipment 5
- What is Not Included with this Equipment 5
- Equipment Location 5
- Selecting a Power Source 5

Installation 6
- Mounting the Device 6
- Routing Cabling to the Device 7
- Grounding the Device 8

Wiring Information 8
- Connecting Input Devices 10
- Connecting Output Devices 11
- Other Connections 11

Specifications 11
- Electrical 11
- Mechanical 12

Application Description 13

Sequence of Operation 14

Working with Logic Zones 15
- Logic Zones 15
- Scheduling Logic Zones 15
- Inputs 15
- Outputs 16
- Photosensor Operation 16
- Distributed LCU2 Operation 16
- Local Backup Schedules in Logic Zones 16
- Automatic Configuration 16

Logic Controller Setup Examples 16
- Quick Setup for Scheduled Exhaust 16
- Quick Setup for a Multi-Controller Logic Zone 18

Controller Identification 20
- Inputs 20
- Input Configuration 20
- Outputs 21
- Output Configuration 21
- Alarms 22
- Photosensor 23

Troubleshooting 23
- Diagnostic LEDs 23
- Troubleshooting Tips 24

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505-028, Effective: January 11, 2013

LCU2

The LCU2 is a self-contained device for controlling logic. The unit can control up to eight logic zones and supports up to eight switches that enable occupants to override system control of the logic. The LCU2 also supports a photosensor for control of exterior lighting.

Overview

The LCU2 controls each logic circuit through digital outputs in the form of triacs. Digital inputs from dry contact switches can override automatic control of logic zones. The LCU2 provides a universal input for photosensor input.

Features

- Configurable Logic Zones
- Controls up to 8 logical 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
- Photosensor operation (one per system)

PURPOSE OF THIS GUIDE

The *iWorx® LCU2 Application Guide* provides application information for the Logic Controller.

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

REPRESENTATIONS AND WARRANTIES

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iWorx® products shall only be used for the applications identified in the product specifications and for no other purposes. For example, iWorx® 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 used for such purposes.

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APPLICABLE DOCUMENTATION

Table 1: Applicable Documentation

Description	Audience	Purpose
iWorx® LCU2 Application Guide, Document No. 505-028 (this document)	– Application Engineers – Wholesalers – Contractors – Start-up Technicians – End user	Provides instructions for setting up and using the iWorx® Logic Controller.
iWorx® LCI2 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://iWorxWizard.taco-hvac.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

Precautions

General

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

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.

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.

Location

Avoid locations where corrosive fumes, excessive moisture, vibration or explosive vapors are present.

Avoid electrical noise interference. Do not install near large contactors, electrical machinery, or welding equipment.

This equipment is suitable for indoor use only. Preferably, or as required by National Electrical Code, the unit is intended to be installed within an electrical control enclosure. Operate where ambient temperatures do not exceed 140 °F (60 °C) or fall below 32 °F (0 °C) and relative humidity does not exceed 90%, non-condensing.

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 LCU2 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 outdoors, 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 20 feet of all flow and temperature sensors that will be 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

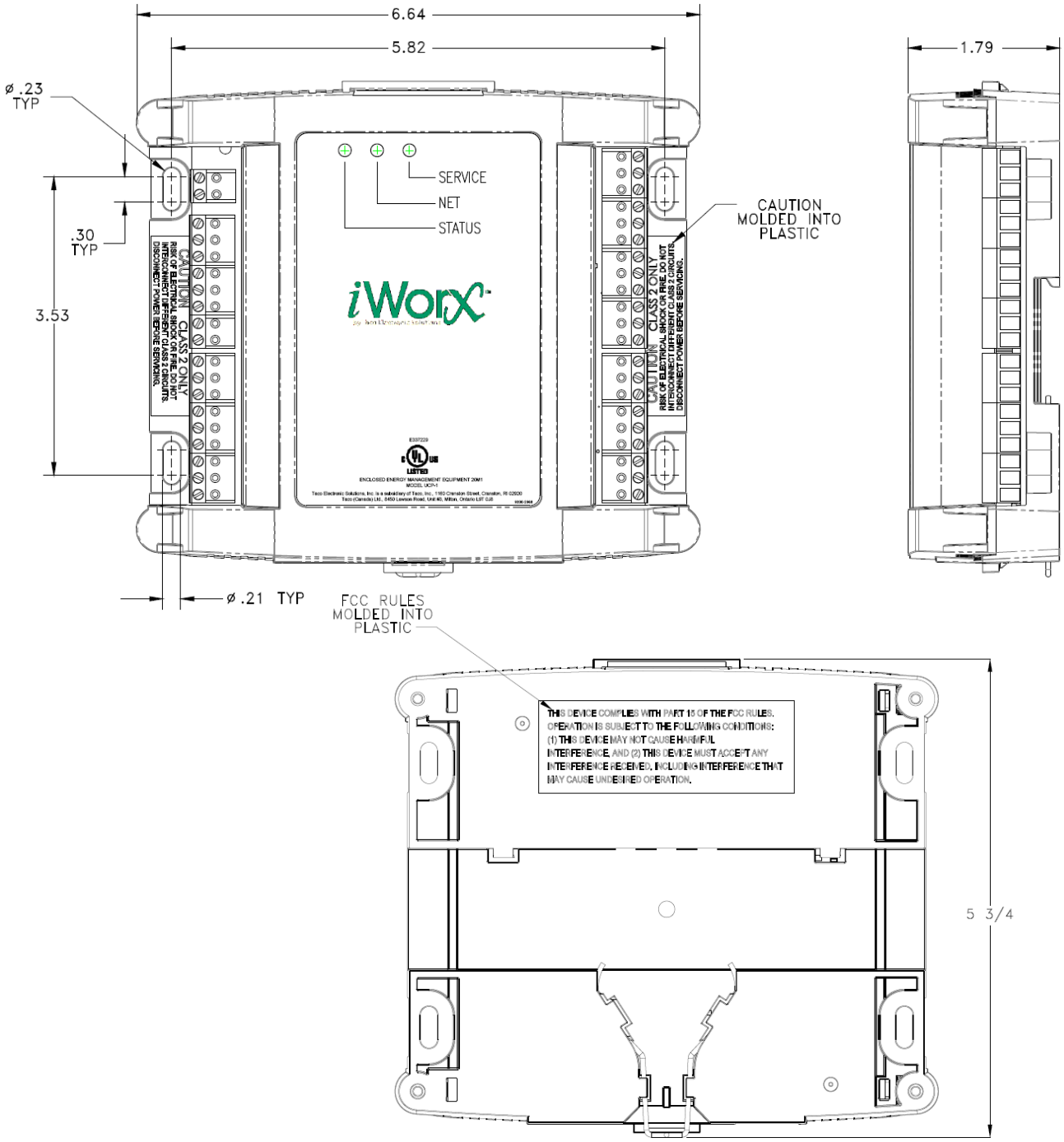
Warning: Electrical shock hazard. To prevent electrical shock or equipment damage, disconnect **ALL** power sources to controllers and loads before installing or servicing this equipment or modifying any wiring.

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).

505-028, Effective: January 11, 2013

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

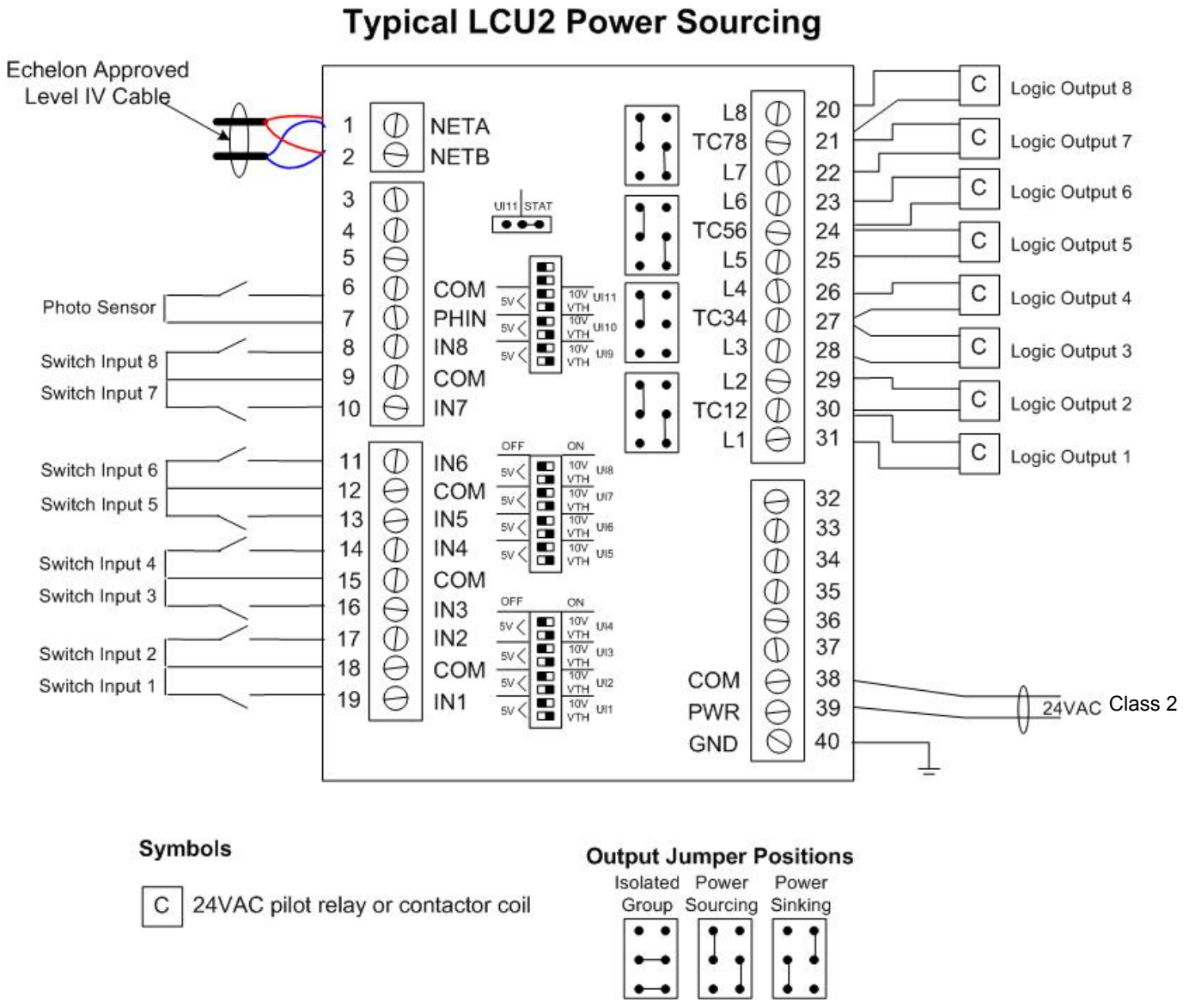
The ground terminal (T40) must be securely connected to earth ground. Failure to properly ground this equipment will result in improper operation. Improper grounding may also increase the risk of electrical shock and may increase the possibility of interference with radio/TV reception.

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 Logic Controller controllers. Disconnect **ALL** power sources when installing or servicing this equipment to prevent electrical shock or equipment damage.

Figure 2: Typical LCU2 Power Sourcing



505-028, Effective: January 11, 2013

Figure 3: Typical LCU2 Power Sinking

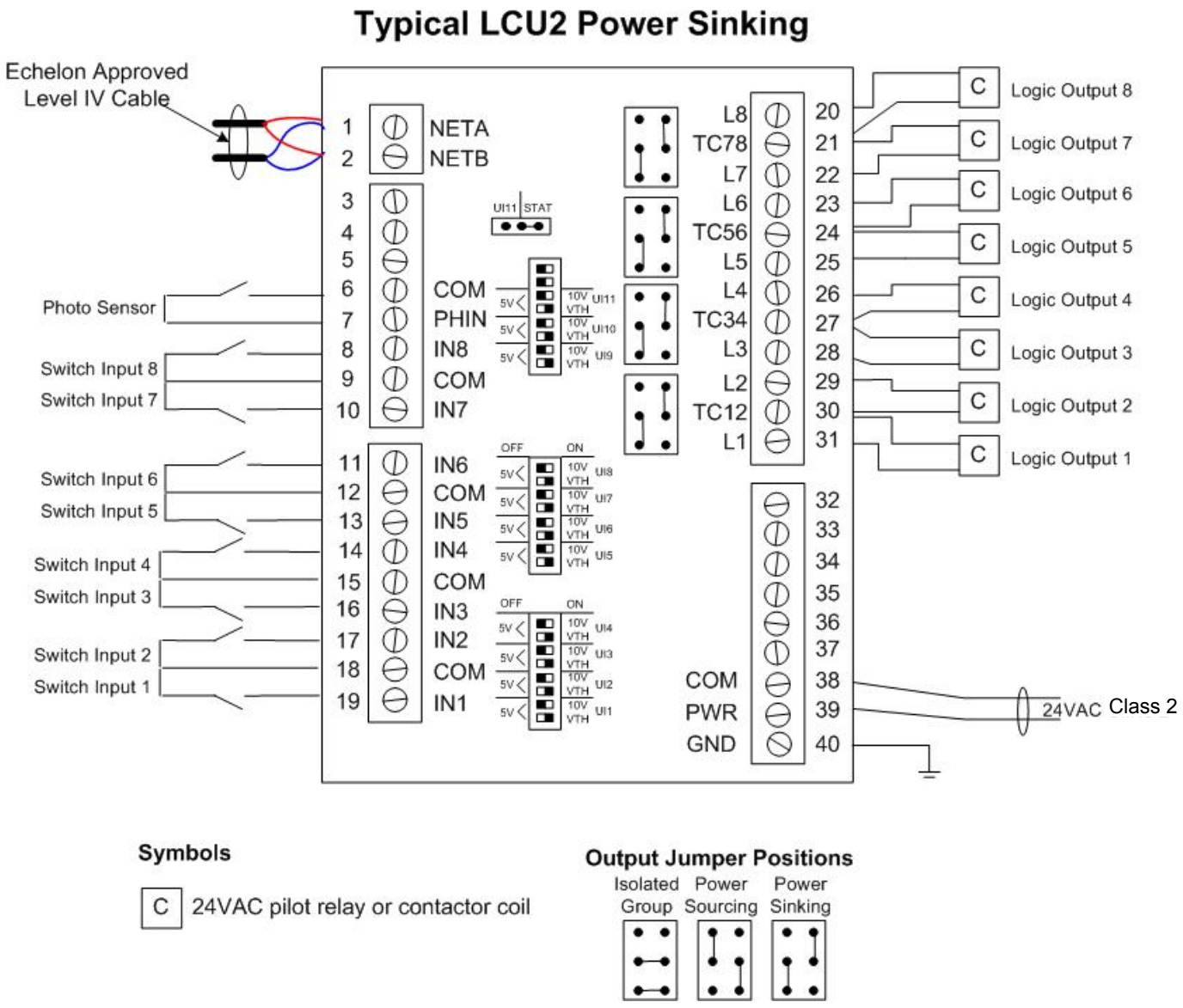
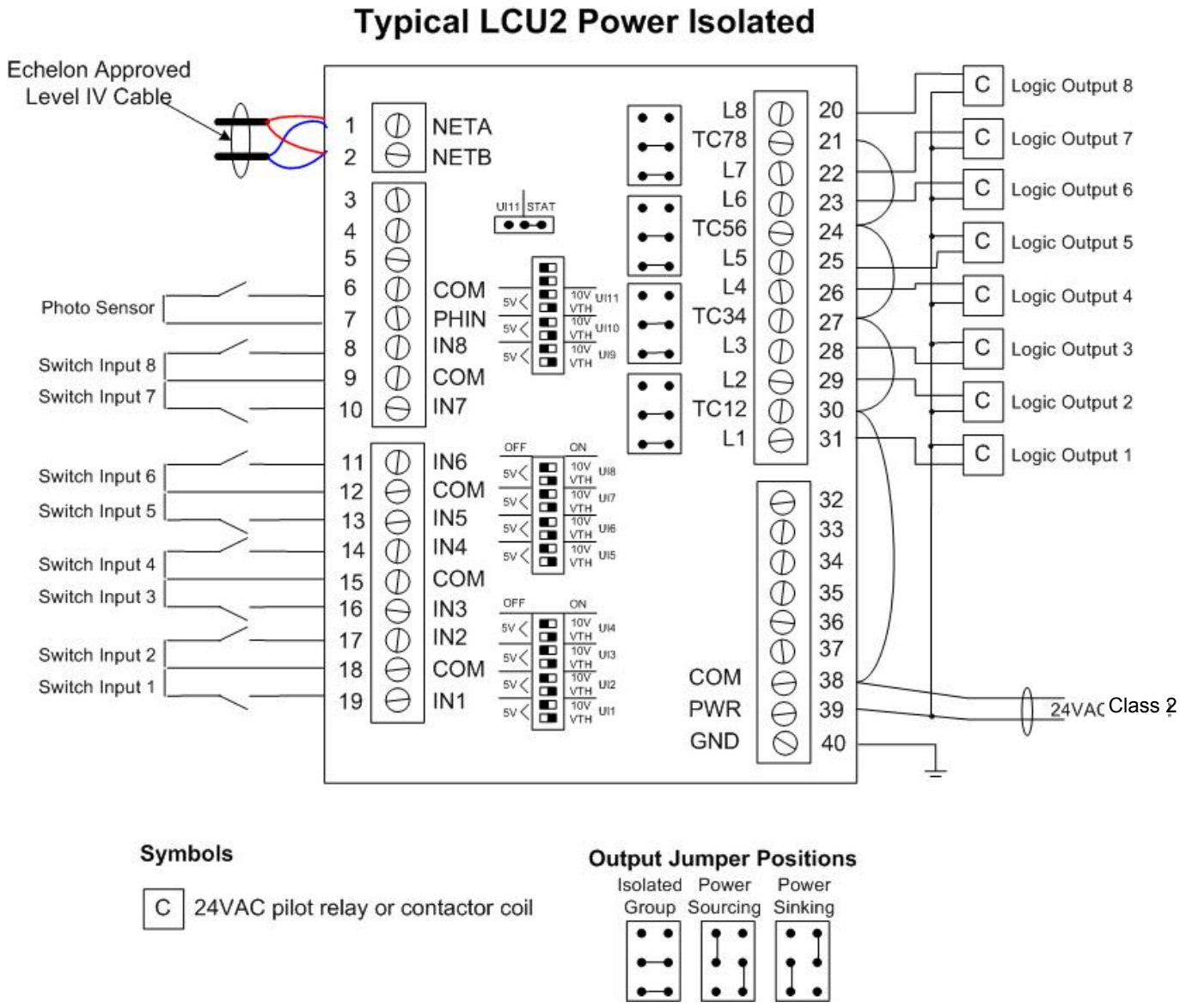


Figure 4: Typical LCU2 Power Isolated



Connecting Input Devices

Remote Inputs (IN1, IN2, IN3, IN4, IN5, IN6, IN7, IN8)

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.

Photosensor (PHIN)

The photosensor must be a switch-type photosensor similar to “The Watt Stopper” model EM-24A2. To connect the photosensor to the unit, connect one wire from the sensor to PHIN (T7) and the other to the adjacent common (T6). Some photosensors require that you observe polarity while wiring. If the system uses several networked LCU2s, there may only be one photosensor in the entire system, and it must be installed on the first LCU2. See the *LCU2 Application Guide* for more details.

505-028, Effective: January 11, 2013

Connecting Output Devices

Logic Outputs (L1, L2, L3, L4, L5, L6, L7, L8)

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).

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

Photosensor

- Cabling: twisted shielded pair, 18 AWG recommended—500 feet max. (152 meters)
- Dry Contact

Override inputs

- Dry Contact
- Normally Open

Outputs

Logic Zone Outputs

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

FTT-10A Network

- Speed: 78KBPS
- 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

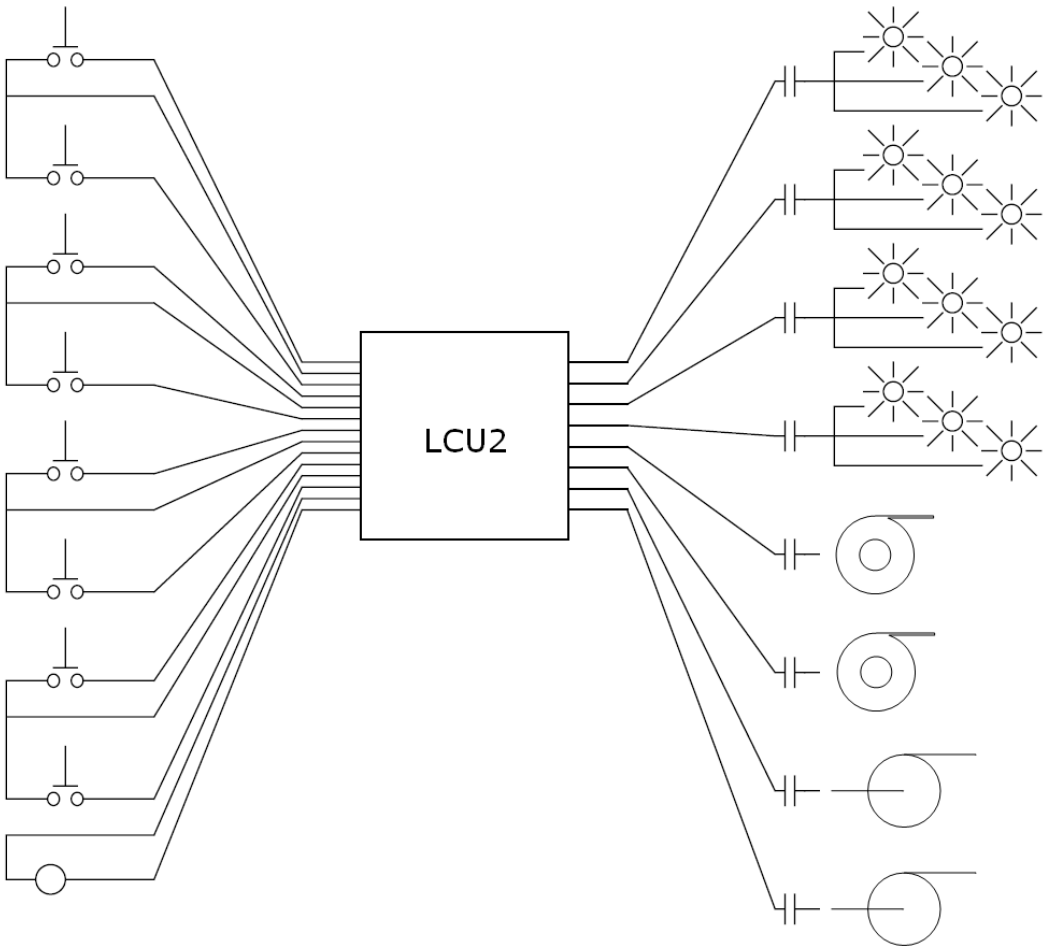
- FCC Part 15 Class A

505-028, Effective: January 11, 2013

APPLICATION DESCRIPTION

The LCU2 controls the state of 8 individual Logic Zones based on the current occupancy mode of the zones and override input activity. Figure 5 illustrates a typical LCU2 application. In this case, the zone outputs are connected to 4 triple pole lighting contactors, 2 exhaust fans and 2 sump pumps.

Figure 5: Typical LCU2 application



The LCU2's logic control algorithms support the following applications or schemes:

- Exterior logic (signage and parking lot logic)
- Conventional interior logic
- Energy saving interior logic
- Energy saving upgrades to interior logic
- Scheduled exhaust fans
- Scheduled outputs

Exterior logic is typically controlled by a photosensor so that the logic turns on at dusk and off at dawn. Using the LCU2, a schedule can be added to this scheme to shut off the logic automatically at a scheduled time. Physical override inputs can also force the logic on or off on demand.

Conventional interior logic operates from a schedule. The logic turns on and off according to the scheduled times. Physical override inputs enable occupants to override the schedule.

Energy saving interior logic is similar to conventional interior logic in that the zones turn off according to a schedule, but will remain off until turned on with an override input. This mode of operation can be compliant with ASHRAE 90.1-1999 and California's Title 24.

Energy saving interior logic upgrades minimize the rewiring required for logic control. Control outputs are wired into the logic circuits. The control system makes the logic available during the “on” times but requires the users to manually turn the logic on. The LCU2 turns the logic off when scheduled. Occupants can turn the logic back on from the inputs.

Exterior lighting logic zones can be controlled by schedule or by a photosensor. Override inputs can be used to manually actuate the zone's output as well.

Scheduled Exhaust Fans can be controlled by a schedule. Override inputs can be used to manually actuate the exhaust fan outputs as well.

Scheduled Outputs can be controlled by a schedule. Override inputs can be used to manually actuate the outputs as well.

Retail store logic is schedule driven. The logic outputs turn on and off at scheduled times. The schedule can be overridden on or off by an override input. When in unoccupied mode and overridden to “ON,” the logic outputs stay on for a fixed amount of time before going off again.

Office logic zones can operate the same way as retail logic zones. In addition, office logic zones can be configured so that they go on during occupancy only if the corresponding override input is activated for that zone. The zone will stay on until overridden off or until the end of occupied time occurs. The unoccupied override operates as described for the retail model. This scheme meets the energy saving requirements of California and several other states.

An optional blink warning can be enabled so that the occupants of a zone can choose to override the upcoming OFF command. The blink warning will flash the logic outputs off and on at the scheduled OFF time. The user then has five minutes to override the schedule before the LCU2 turns the logic outputs off. If the blink warning is not enabled for an output, then the logic output will go off immediately when commanded off. The blink warning is disabled when a photosensor is enabled for a zone.

Each output controlled by the LCU2 can be assigned to a logic control zone or to any combination of the control zones, from none to all. If an output is not assigned to a zone, it will be powered on continuously. The default mode of operation has the Local Control Interface (LCI) controlling all zones. The LCI will send zone occupancy status to the LCU2 (Occupied or Unoccupied), the status of a photosensor (light or dark) and global override information. The LCU2 uses the zone's occupancy status and the programming options selected for that zone to determine which outputs should be on and which should be off. If a logic output is assigned to multiple zones, then it will be on or off based upon the last change of state.

The LCU2 keeps a backup schedule in non-volatile memory for each zone, in case it cannot communicate with the LCI. The local time is kept by the LCU2 and must be set for the backup schedule to run. The LCU2 will switch to the backup schedules when it does not receive a message from the LCI within 10 minutes. If the time or backup schedule is not set, and the LCU2 has not heard from the LCI in over 10 minutes, the LCU2 will turn all of the outputs on. Backup schedules are set when defining logic zones.

The LCU2 exposes SNVTs for monitoring and control purposes. The status of each output is available as a snvt_state variable. The current operating condition of each zone is available as snvt_count. Each override input is exposed as a snvt_switch. Input network variables can be used to control the LCU2. There are snvt_occupancy input variables for each zone. There is also a snvt_level_discrete for the photosensor input. The input network variables are all initialized to “unused”. Writing to a network variable input enables it, overriding the LCI.

SEQUENCE OF OPERATION

The LCU2 employs a “zone” system to control logic circuits. A logic system can contain up to eight zones. Logic outputs are assigned to particular zones, and when a zone changes state, all of the outputs for that zone are energized or de-energized. Each zone has its own schedule that defines when a zone is occupied or unoccupied. In general, the logic in an occupied zone is ON, and the logic in an unoccupied zone is OFF. Input and photosensor inputs are also assigned to zones, and any input assigned to a zone can override the occupancy status of a zone.

505-028, Effective: January 11, 2013

WORKING WITH LOGIC ZONES

Logic zones allow you to group one or more outputs from one or more LCU2 logic controllers into a single control unit. All of the outputs within the logic zone are controlled by the schedule of the group to which the zone is assigned, or by the override controls assigned to the zone.

Logic Zones

Zones are virtual groupings of inputs and outputs that are an abstract way of looking at the physical hardware that makes up the logic system. Inputs and outputs that are connected to separate LCU2s can be linked together by grouping them into zones. When a zone changes status from occupied to unoccupied, all of the logic outputs assigned to that zone turn OFF. Any physical override input assigned to a zone can override the occupancy of the zone. Inputs and outputs can also be assigned to multiple zones.

> **NOTE:** After initial zone setup or when changing an existing zone, you must press **`Save`** for the changes to take affect.

Scheduling Logic Zones

In an iWorx® environment, you define schedules by creating groups in the Local Control Interface (LCI) and configuring when those groups are to be occupied and unoccupied. For HVAC control, you assign individual controllers to groups. For logic control, you assign *logic zones* to groups. A group's schedule will instruct the LCU2s in the system to turn the logic outputs in a zone ON when the group to which that zone belongs is scheduled to be occupied, and OFF when it is unoccupied.

You must program schedules for the LCU2 through the Local Control Interface (LCI) groups to define when a zone is supposed to become occupied and unoccupied. A group's schedule will instruct the LCU2 to turn the logic output in that zone ON when the zone is scheduled to be occupied, and OFF when it is unoccupied.

If the blink warning is enabled for a zone, the zone's logic outputs flash off and on at the scheduled OFF time. The user then has five minutes to override the schedule before the zone's outputs turn off. Activating an override input during those five minutes will cause the zone's logic output to stay on for the configurable "override runtime" period.

Inputs

Physical inputs enable a zone's occupants to override the scheduled state of the zone. Activating a zone input when the zone is occupied forces the zone's state to change to unoccupied until the next scheduled occupied period. Activating a zone input when the zone is unoccupied forces the zone's occupancy status to change to occupied for the configurable "override runtime" period.

Three types of inputs can be used with the LCU2.

SPDT Momentary

Typically, this input looks like a rocker input. This type of input actually consists internally of two inputs, and both are used to provide input to the LCU2. The odd input of an SPDT input is a signal to turn the zone's logic ON and the even input is a signal to turn the zone's logic 'OFF'.

SPST Momentary

This input is usually a "normally open" pushbutton. Pushing the button changes the zone's occupancy status.

SPST Continuous (Toggle)

Continuous inputs usually resemble regular toggle-style light inputs. Every change of input state between "closed" and "open" toggles the zone to its opposite state, like a 3-way input.

Outputs

Each output can be configured as Normally Open or Normally Closed. In addition, you can specify whether the output should use a timed photosensor or perform a blink warning before changing its state. As previously described, a blink warning momentarily changes the status of the output 5 minutes before it is scheduled to change. See the next section for more information on photosensor operation.

Photosensor Operation

If a photosensor is connected to the system through an LCU2, it must be connected to the first LCU in the system. The photosensor input will not be recognized by any other LCU. The polarity of the photosensor can be switched to match various photosensor hardware types.

A zone can also use a schedule along with the photosensor. If a zone is set to use a timed photosensor, then the zone's logic will be ON only if *both* the current time is in between the zone's start and stop times **AND** the photosensor indicates that it is dark. The schedule used for timed photosensor operation is the LCU2's local backup schedule, not the group's schedule.

A photosensor zone's output may be overriden by an associated input. Once overriden, the zone stays in the new state until the zone's schedule or light level dictates a change in the output or is again overidden by an associated input.

Distributed LCU2 Operation

All status and input information is shared among all LCU2s on the network. This adds flexibility to the system as several physically separated circuits can be controlled as one zone. Remote override inputs can also be located farther from the zones they control, using a local LCU2 to transmit commands through the network. In addition, any zone can be controlled by the photosensor, even though only one photosensor can be installed on the network.

Local Backup Schedules in Logic Zones

The LCI normally determines the operating mode. However, if communication is lost between the LCI and a controller for a period longer than ten minutes, the controller's local backup schedule is enabled. Once the local backup schedule is enabled, the logic zones operate as configured in that schedule. If the local backup schedule is not configured (set to zeros), the controller and logic zones default to occupied mode. Normal LCI scheduling resumes after communication with the LCI is restored.

Automatic Configuration

The LCU2 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 LCU2 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 LCU2 with LNS or other LonWorks tools if they wish.

The LCI also provides network supervision of the LCU2. The LCI periodically sends a "ping" message to the LCU2, 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.

LOGIC CONTROLLER SETUP EXAMPLES

This section provides several examples of common logic configurations for the LCI2 with one or more LCU2 controllers.

Quick Setup for Scheduled Exhaust

This example shows how to set up the LCU2 to turn exhaust fans on and off.

505-028, Effective: January 11, 2013

Due to the size of the table the points have been abbreviated as described below. If there is an X in the column, the point is part of the Logic Zone in the left column.

Table 2: Point Reference for LCU2

LCU2 Terminal Reference	Example Point Description
IN1	Exhaust Fans OR
IN2	not used
IN3	not used
IN4	not used
IN5	not used
IN6	not used
IN7	not used
IN8	not used
L1	Exhaust Fan 1
L2	Exhaust Fan 2
L3	Exhaust Fan 3
L4	Exhaust Fan 4
L5	not used
L6	not used
L7	not used
L8	not used
PHIN	not used

Table 3: Logic Zone Configuration

	IN1	IN2	IN3	IN4	IN5	IN6	IN7	IN8	L1	L2	L3	L4	L5	L6	L7	L8	Mode
LZ1	x								x	x	x	x					Sched

Creating Logic Zone 1 (LZ1)

From the home screen on the LCI2, select *LZones* and then press **Add New**. A Logic Zone is created and is named Logic Zone 1 by default. Select the newly created Logic Zone. Once selected, press **Points** and add the inputs (Exhaust Fans OR) and outputs (Exhaust Fans 1 thru 4) found in the table. Since these exhaust fans will follow a schedule, select the **Mode** field and choose the *SCHED* option. The Logic Zone has now been configured, so press **Save**.

Creating a Schedule for the Exhaust Fans

From the home screen on the LCI2, select **Schedule** and then press **Add New**. A schedule is created and is named Schedule 1 by default. Select the newly created Schedule. Once selected, press **Monday** and add your desired occupied times for the fans. Press **Save M-F** to set the schedule for the fans for Monday through Friday. Press **Save** again.

Creating a Group for the Exhaust Fans

A group is a collection of iWorx® controllers and Logic Zones that follow a common schedule.

From the home screen on the LCI2, select *Groups* and then press **Add New**. A Group is created and is named Group 1 by default. Select the newly created Group. Once selected, press **Members** and add Logic Zone 1. You will notice the Logic Zone is now shown in red in the list. Press **Prev** and then **Schedule**. From the list of schedules, select the “schedule 1” that was previously created. Press **Save**.

LZ1 operation

Logic Zone 1 takes care of the Exhaust fans and has its mode defined as scheduled. When the current time matches the scheduled start time, the exhaust fans will automatically turn on. Likewise, when the current time matches the scheduled end time, the exhaust fans will automatically turn off. If the exhaust fans are currently off and desired to be on, the occupant may switch the Exhaust Fans OR button to activate the fans for the amount of time defined in the Logic Zones Override time. If the occupant desires to turn the Fans off prior to the override expiring, the Exhaust Fans OR may be switched once again canceling the OR. If the Fans are desired to be off during scheduled occupancy, the occupant may switch the Exhaust Fans OR and the fans will be turned off until the Exhaust Fans OR is switched again (turning the fans back on) or until the next scheduled start time.

Quick Setup for a Multi-Controller Logic Zone

This example shows how to set up the LCU2 to turn ON/OFF points from several controllers. Please refer to the above sections detailing how to create a Logic Zone, Schedule and Group.

Due to the size of the table, the points have been abbreviated as described below.

If there is an X in the column, the point is part of the Logic Zone in the left column. The LCU2 terminal reference below differentiates between controllers using the notation Cx, where x identifies each separate controller. IN1_C1 represents input 1 on controller 1; L1_C2 represents Logic Output 1 on Controller 2.

Table 4: Point Reference for LCU2 #1

LCU2 Terminal Reference	Example Point Description
IN1_C1	Office Light Switch
IN2_C1	Hall Light Switch
IN3_C1	Mfg Light Switch
IN4_C1	Lighting and Fan OR Switch
IN5_C1	not used
IN6_C1	not used
IN7_C1	not used
IN8_C1	not used
L1_C1	Office Lights Zone 1
L2_C1	Office Lights Zone 2
L3_C1	Office Lights Zone 3
L4_C1	Hall Lights
L5_C1	Reception Lights
L6_C1	Mfg Main Lights
L7_C1	Mfg Night Lights
L8_C1	Toilet Exhaust Fan
PHIN_C1	not used

Table 5: Point Reference for LCU2 #2

LCU2 Terminal Reference	Example Point Description
IN1_C2	Fan Only OR
IN2_C2	not used
IN3_C2	not used
IN4_C2	not used
IN5_C2	not used
IN6_C2	not used

505-028, Effective: January 11, 2013

LCU2 Terminal Reference	Example Point Description
IN7_C2	not used
IN8_C2	not used
L1_C2	Receiving Area Fan
L2_C2	Mfg Fan 1
L3_C2	Mfg Fan 2
L4_C2	Hall Lights
L5_C2	not used
L6_C2	not used
L7_C2	not used
L8_C2	not used
PHIN_C2	not used

Table 6: Logic Zone Configuration

LZ1																	**Mode**
																	Sched
C1	**IN1**	**IN2**	**IN3**	**IN4**	**IN5**	**IN6**	**IN7**	**IN8**	**L1**	**L2**	**L3**	**L4**	**L5**	**L6**	**L7**	**L8**	
	x			x					x	x	x	x	x	x	x	x	
C2	**IN1**	**IN2**	**IN3**	**IN4**	**IN5**	**IN6**	**IN7**	**IN8**	**L1**	**L2**	**L3**	**L4**	**L5**	**L6**	**L7**	**L8**	
									x	x	x						

LZ1 operation

Logic Zone 1 takes care of the Lights (controller 1), Toilet Exhaust Fans (controller 1), Receiving Area Fan (controller 2), and Mfg Fans 1 & 2 (controller 2) and has the mode defined as scheduled. When the current time matches the scheduled start time, the outputs will automatically turn on and when the current time matches the scheduled end time, the outputs will automatically turn off.

If the outputs are currently off and desired to be on, the occupant may toggle the Lighting and Fan OR switch to activate the outputs for the amount of time defined in the Logic Zones Override time. If the occupant desires to turn the outputs off prior to the override expiring, the Lighting and Fan OR switch may be toggled once again to cancel the OR. If the outputs are desired to be off during scheduled occupancy, the occupant may toggle the Lighting and Fan OR switch and the fans will be turned off until the OR is toggled again (turning the outputs back on) or until the next scheduled start time.

CONTROLLER IDENTIFICATION

Once the Logic Controller 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 Logic Controller, and the meanings and default values for controller parameters. For more information on using the LCI, see the *iWorx® LCI Application Guide.*

Inputs

The Inputs screen displays the current values of the LCU2's override inputs. A value of NA indicates that no input signal is expected given the zone's configuration These values can be observed but not changed from this screen.

Input	Range	Description
Input_1_Name	On, Off, NA	Status of the specified input.
Input_2_Name	On, Off, NA	Status of the specified input.
Input_3_Name	On, Off, NA	Status of the specified input.
Input_4_Name	On, Off, NA	Status of the specified input.
Input_5_Name	On, Off, NA	Status of the specified input.
Input_6_Name	On, Off, NA	Status of the specified input.
Input_7_Name	On, Off, NA	Status of the specified input.
Input_8_Name	On, Off, NA	Status of the specified input.

Input Configuration

This section allows the user to name the individual input overrides and configure how the LCU2 interprets override input signals.

The first column, Input Name, is a text box allowing the user to assign a name to each input override. Each name can be up to 20 characters long.

The second column, Input Type, is a pull-down menu allowing the user to select the type of a given override Input. The options are Pushbutton (SPST), Pushbutton (SPDT) and Toggle. See “Inputs” on page 15 for more detail on each input type.

Input	Input Type
Input_1_Name	Pushbutton (SPST), Pushbutton (SPDT), Toggle
Input_2_Name	Pushbutton (SPST), Pushbutton (SPDT), Toggle
Input_3_Name	Pushbutton (SPST), Pushbutton (SPDT), Toggle
Input_4_Name	Pushbutton (SPST), Pushbutton (SPDT), Toggle
Input_5_Name	Pushbutton (SPST), Pushbutton (SPDT), Toggle

505-028, Effective: January 11, 2013

Input	Input Type
Input_6_Name	Pushbutton (SPST), Pushbutton (SPDT), Toggle
Input_7_Name	Pushbutton (SPST), Pushbutton (SPDT), Toggle
Input_8_Name	Pushbutton (SPST), Pushbutton (SPDT), Toggle

Outputs

The Outputs screen displays the current values of the LCU2's outputs.

Output	Range	Description
Output_1_Name	On, Off	Status of the specified output.
Output_2_Name	On, Off	Status of the specified output.
Output_3_Name	On, Off	Status of the specified output.
Output_4_Name	On, Off	Status of the specified output.
Output_5_Name	On, Off	Status of the specified output.
Output_6_Name	On, Off	Status of the specified output.
Output_7_Name	On, Off	Status of the specified output.
Output_8_Name	On, Off	Status of the specified output.

Output Configuration

This section allows the user to name the individual outputs and configure how the LCU2 interprets override input signals.

The first column, Output Name, is a text box allowing the user to assign a name to each output. Each name can be up to 20 characters long.

The second column, Output Type, is a pull-down menu allowing the user to select the type of a given output. See "Outputs" on page 16 for more information on Output types.

Output	Output Type
Output_1_Name	NO, Blink Warning On; NO, Blink Warning Off; NO, Timed Photosensor; NC, Blink Warning On; NC, Blink Warning Off; NC, Timed Photosensor
Output_2_Name	NO, Blink Warning On; NO, Blink Warning Off; NO, Timed Photosensor; NC, Blink Warning On; NC, Blink Warning Off; NC, Timed Photosensor
Output_3_Name	NO, Blink Warning On; NO, Blink Warning Off; NO, Timed Photosensor; NC, Blink Warning On; NC, Blink Warning Off; NC, Timed Photosensor
Output_4_Name	NO, Blink Warning On; NO, Blink Warning Off; NO, Timed Photosensor; NC, Blink Warning On; NC, Blink Warning Off; NC, Timed Photosensor
Output_5_Name	NO, Blink Warning On; NO, Blink Warning Off; NO, Timed Photosensor; NC, Blink Warning On; NC, Blink Warning Off; NC, Timed Photosensor
Output_6_Name	NO, Blink Warning On; NO, Blink Warning Off; NO, Timed Photosensor; NC, Blink Warning On; NC, Blink Warning Off; NC, Timed Photosensor
Output_7_Name	NO, Blink Warning On; NO, Blink Warning Off; NO, Timed Photosensor; NC, Blink Warning On; NC, Blink Warning Off; NC, Timed Photosensor
Output_8_Name	NO, Blink Warning On; NO, Blink Warning Off; NO, Timed Photosensor; NC, Blink Warning On; NC, Blink Warning Off; NC, Timed Photosensor

Alarms

There are no alarms.

505-028, Effective: January 11, 2013

Photosensor

This section allows the user to specify the type of PhotoSensor used or to disable it. See “Photosensor Operation” on page 16 for more information on using PhotoSensors.

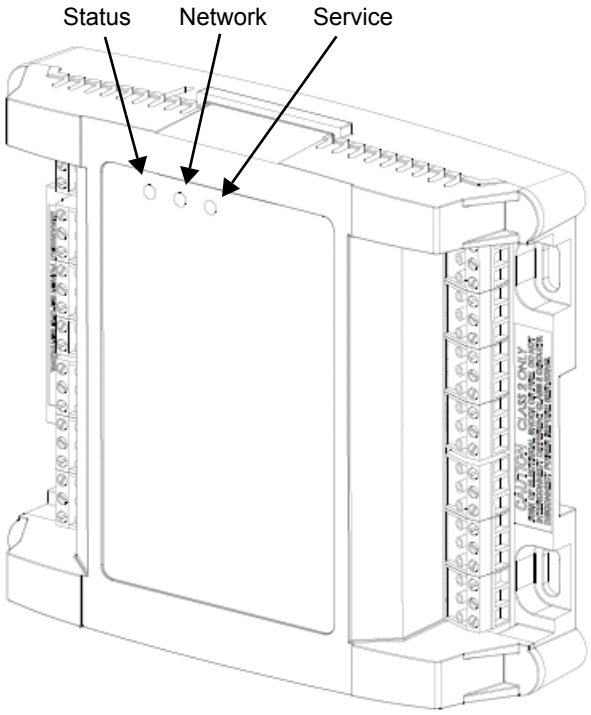
TROUBLESHOOTING

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 6: LCU2 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.
Status LED flashing even after the LCU2 is recognized by the LCI.	Even after the LCU2's service pin has been pressed and the signal has been received by the LCI, the Status LED of the LCU2 will continue to flash green until at least one logic zone has been configured through the LCI, and the LCU2 has been added to a logic zone. Once the configuration is saved in the LCI and the LCI sends zone information to the LCU2, the LED will display normal status.
The logic zones do not turn on, though the LCI indicates they are on.	Ensure that the controller has been powered with 24 VAC and the logic outputs have been correctly wired to the coils of the logic contactors. Also ensure that the contactors have 24 VAC coils.
Logic zones do not come on as scheduled.	There are several reasons the logic may not cycle on and all should be checked. – Is the logic zone part of a group, and is the group occupied? – Is a photosensor controlling the logic zone and is it bright outside? – Is a timed photosensor in use? Zones set to use a timed photosensor use the backup schedule that is stored in the LCU2, not the group's schedule.
Logic will not turn off, even using input overrides.	– If no backup schedule was set in the LCU2 and communication with the LCI is lost for more than 10 minutes all logic default to ON. Verify communication between the LCI and LCU2, and that the LCU has a backup schedule. – Is the Status LED blinking Green? If so, the LCU has not been configured by the LCI and the default state for the outputs is ON. – Verify that the switches are configured properly and are each part of a logic zone. – If the controller has an improper system time setting, the logic will automatically be turned ON. An improper system time is most often caused by a power outage. The time is usually reset by the LCI, but if the LCU2 cannot communicate with the LCI, it will have the incorrect time. – Is the zone override enabled on the LCI? This network override forces all contactors in the zone to ON, which is useful for testing purposes.
Logic zones are on when they should be off and off when they should be on.	Check the contactor polarity through the device setup page of the LCI. Use that page to change the polarity, if necessary.
I don't understand the difference between the three types of switches.	– SPDT Momentary - Uses 2 inputs (switches) to control a logic circuit. Odd input switches turn the zone 'ON' and even input switches turn the zone 'OFF'. – SPST Momentary - Pressing the switch changes the zone's occupancy state. – SPST Continuous - Every change of state toggles the zone to its opposite state, like a 3-way switch.
Photosensor Problems	The photosensor must be a switch-type photosensor similar to "The Watt Stopper" model EM-24A2. If you are experiencing problems with the photosensor input verify the following: – Have you installed more than one photosensor? Only 1 photosensor is allowed for the entire system. – Is the photosensor enabled? – Is the polarity inverted on the configuration screen? – Is a zone configured to use the photosensor? – Is a contactor in the photosensor controlled zone and is it configured for photosensor operation?

505-028, Effective: January 11, 2013

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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Printed in the USA