

LIGHT *Master*

USER GUIDE

Version 2D-SA
1/1/06

Stand-Alone Version

Class A FCC Device Statement

Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Note: 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 when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.



INTELLIGENT LIGHTING CONTROLS, INC.

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Overview

The LightMaster lighting controller is a microprocessor-based, programmable lighting controller capable of using LightSync™ CAT-5 data line devices (see Section 4). You can program each of the controller inputs to control any or all of the relay outputs.

This User Guide outlines the capabilities of the controller in stand-alone applications.

The LightMaster may also be easily integrated into a network of controllers. Contact Intelligent Lighting Controls (ILC) about networking your stand-alone LightMaster controller.

The LightMaster is UL approved and FCC certified for commercial applications.

Structure

The major components making up the controller are:

- Enclosure
- Control transformers
- CPU board
- I/O board(s)
- Keypad/display
- Lighting relays

Enclosure – The enclosure is rated NEMA 1. It is divided into a line voltage section and a low voltage section. The line voltage section contains the line voltage side of the control transformers and lighting relays. The low voltage section contains the Class 2 side of the lighting relays, transformer secondaries and electronic components. Enclosures are available in 5 sizes to accommodate 4, 8, 16, 24, 32, 40 and 48 inputs, outputs, and lighting relays.

Transformers – A 40 VA multi-tap control transformer (120 or 277/24 VAC) provides the 24 VAC input to power the controller electronics; a second 40 VA transformer supplies power for lighting relay switching.

CPU Board – The CPU board provides the controller's intelligence and memory. Major components include:

- *Power Supply* – converts the 24 VAC input to the +5, -5 and +12 VDC required by the controller logic and communications circuits. A power switch provides the means of energizing/de-energizing all controller electronics.
- *Communications* – on-board modem (if equipped) connection, RS-232 port, LightSync RJ-45 data line connectors, add-on card expansion socket.
- *Microprocessor* – executes the computer code and coordinates all controller functions including the controller real time clock.

- *PROM Chip* – contains the controller operating system and basic tasks.
- *NVRAM Chips* – store the user-entered operating parameters.
- *Real Time Clock* – maintains time and date for up to 30 days without power.

I/O Board(s) – Each I/O board provides eight (8) switch inputs and relay outputs, status pilots and override switches.

Major components include:

- *Switch Inputs* – can accept input from either 2- or 3-wire momentary or maintained dry contact devices. Each input has two associated LEDs (light emitting diodes). The ON LED lights when a closure is sensed between the ON and COMMON terminals. The OFF LED lights when a closure is sensed between the OFF and COMMON terminals. Each switch input features a switch pilot LED, which can be programmed to track the state of a single relay, relay group or preset. The inputs are optically isolated, noise- and surge-resistant. A switch may be located up to 1500 feet from the controller, provided you use a minimum of 18-gauge wire. As an alternative to hardwired switching, relays may be controlled by signals transmitted via a LightSync network. (See Section 4 for details.)
- *Relay Outputs* – Each optically isolated output switches its associated lighting relay ON and OFF. Each output has an associated LED. The LED lights when the output switches the relay ON.
- *Relays* – 20A at 120, 277 or 347 VAC magnetically latching relays maintain their state even with a power outage.
- *Override Switches* – Each relay output is equipped with an ON and an OFF override switch. These switches allow you to turn the associated lighting relay ON or OFF independent of any programming.

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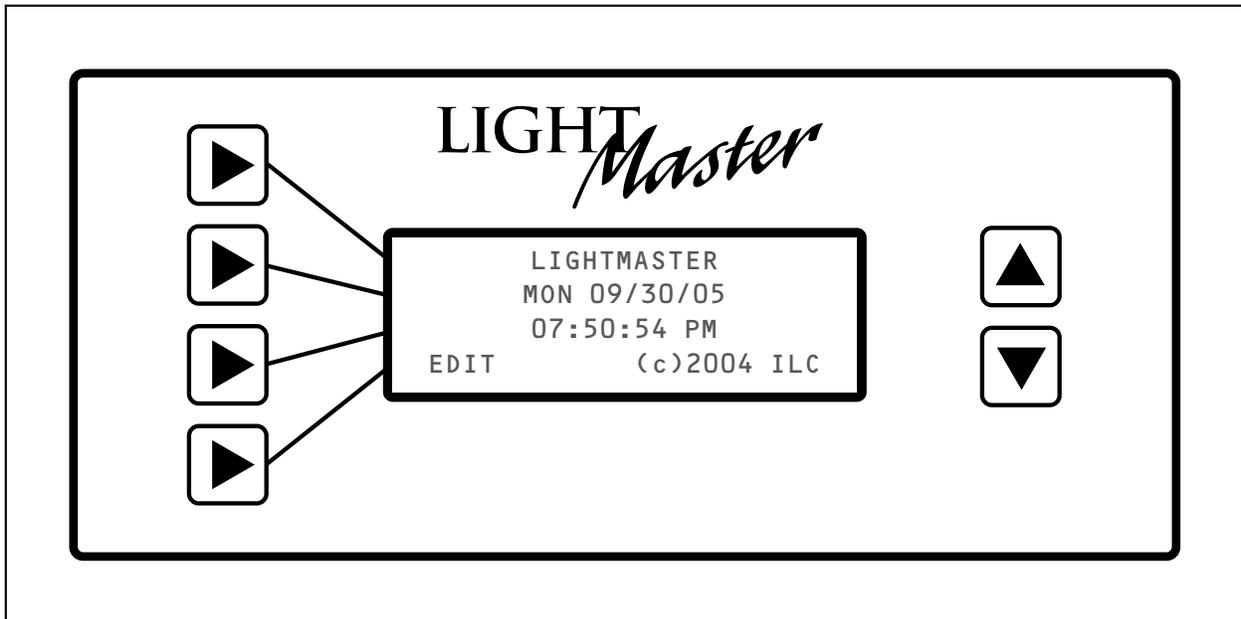
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Section 1

Controller Description



Section 1 Controller Description

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Section 1 – Controller Description

1.0 Section Overview

The LightMaster is a microprocessor-based lighting controller. You can program the LightMaster to control lighting relays in response to switch signals sensed by its inputs and/or by time-based scheduling. The LightMaster is UL approved and FCC certified for commercial applications.

Objectives

In this Section you will learn about the structure and configuration of the LightMaster Controller.

1.1 Controller Architecture

The major components making up the controller are: (See Figure 1.1.)

- Enclosure
- Control transformers
- CPU board
- I/O board(s)
- Display/keypad
- Lighting relays

1.1.1 Enclosure – The enclosure is rated NEMA 1. It is divided into a line voltage section containing the line voltage side of

the control transformers and lighting relays and a low voltage section containing the Class 2 side of the lighting relays, transformer secondaries, and electronic components. Enclosures are available in 5 sizes to accommodate 4, 8, 16, 24, 32, 40 and 48 inputs, outputs, and lighting relays. (See Table 1.1.) The LightMaster is shipped to the job-site as a complete assembly. (See Figure 1.1, which illustrates a LightMaster 8.)

1.1.2 Transformers – A 40 VA multi-tap processor transformer (120 or 277/24 VAC) provides the 24 VAC input to power the controller electronics; a second 40 VA transformer supplies power for lighting relay switching.

Model	# of Relays & I/O Points	Width	Height	Depth
LightMaster 8	1 to 8	18 Inches	15 Inches	4 Inches
LightMaster 16	1 to 16	18 Inches	24 Inches	4 Inches
LightMaster 24	1 to 24	24 Inches	36 Inches	4 Inches
LightMaster 32	1 to 32	24 Inches	36 Inches	4 Inches
LightMaster 40	1 to 40	24 Inches	48 Inches	6 Inches
LightMaster 48	1 to 48	24 Inches	48 Inches	6 Inches
LightMaster 48DS	1 to 48*	20 Inches	28 Inches	6 Inches

*Outputs only

Table 1.1 – LightMaster Configurations

Controller Description



1.1.3 CPU Board – (See Figure 1.2.) The CPU board provides the controller’s intelligence, memory, and communications capabilities. Major components include:

- *Power Supply* – converts the 24 VAC input to the +5, -5 and +12 VDC required by the controller logic and communications

circuits. A power switch provides the means of energizing/de-energizing all controller electronics.

- *Communications* – on-board modem (if equipped), RS-232 port, LightSync™ RJ-45 connectors, add-on card expansion socket.

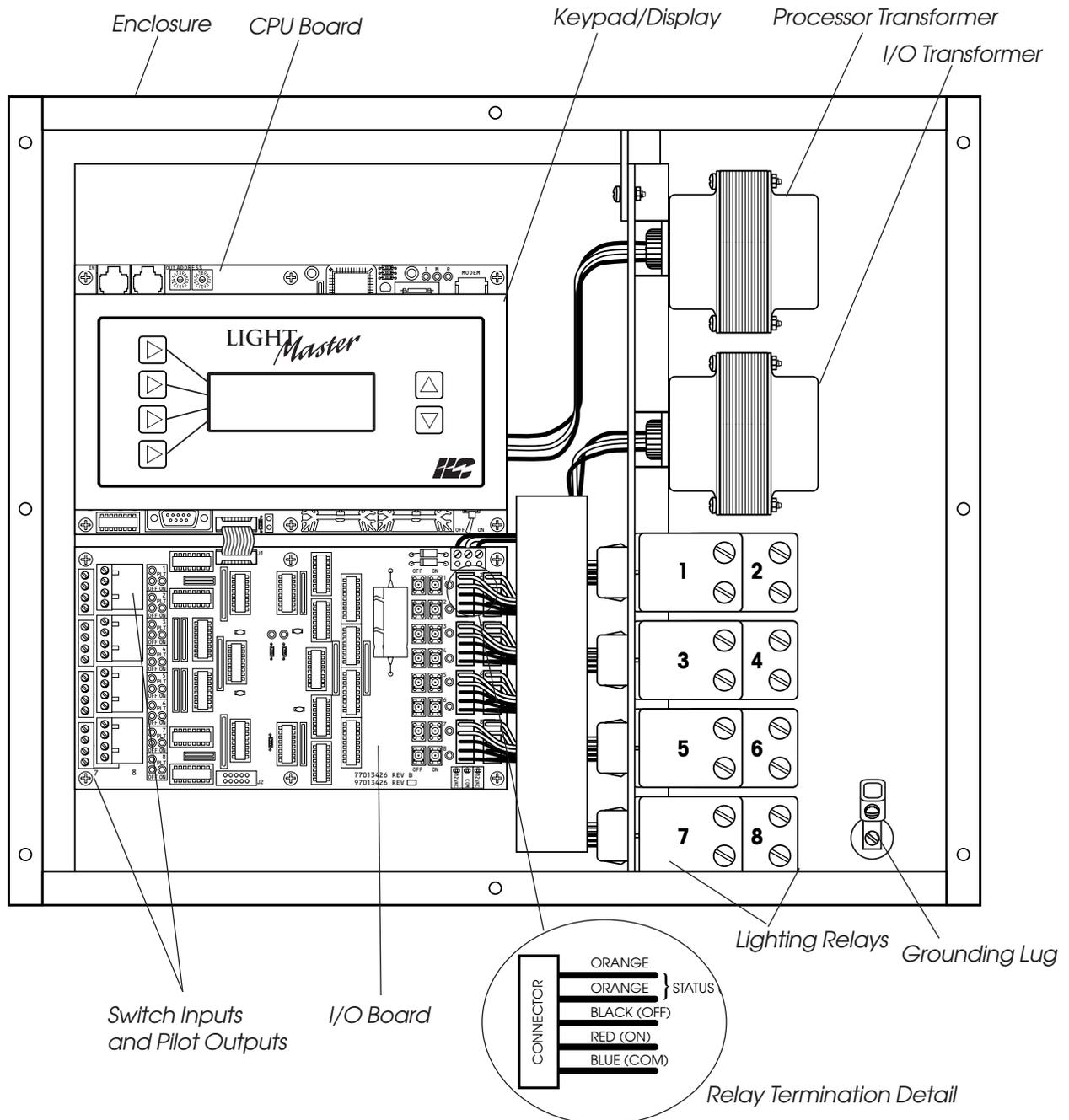


Figure 1.1 – LightMaster 8 Controller

Controller Description



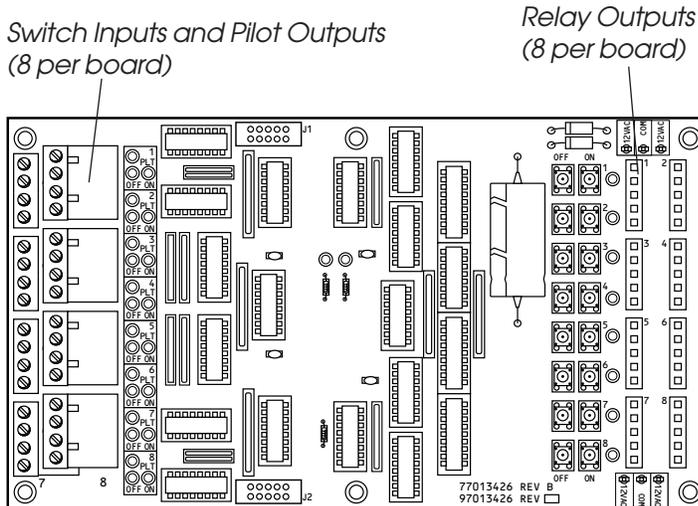
- *Microprocessor* – executes the computer code and coordinates all controller functions including the controller real time clock.
- *PROM Chip* – contains the controller operating system and basic tasks.
- *NVRAM Chips* – store the user-entered operating parameters.
- *Real Time Clock* – maintains time and date for up to 30 days without power.

1.1.4 I/O Board(s) – Each I/O board adds eight (8) switch inputs and relay outputs. The LightMaster double-sided version has 16 relay outputs per board and no switch inputs. Both inputs and outputs are optically isolated. Additional boards can be added to the appropriate size enclosure to provide a controller capacity of up to 48 switch inputs and 48 switch relay outputs. (See Figure 1.3, which illustrates a LightMaster 32 and LightMaster 48DS double-sided controller.) Major components include:

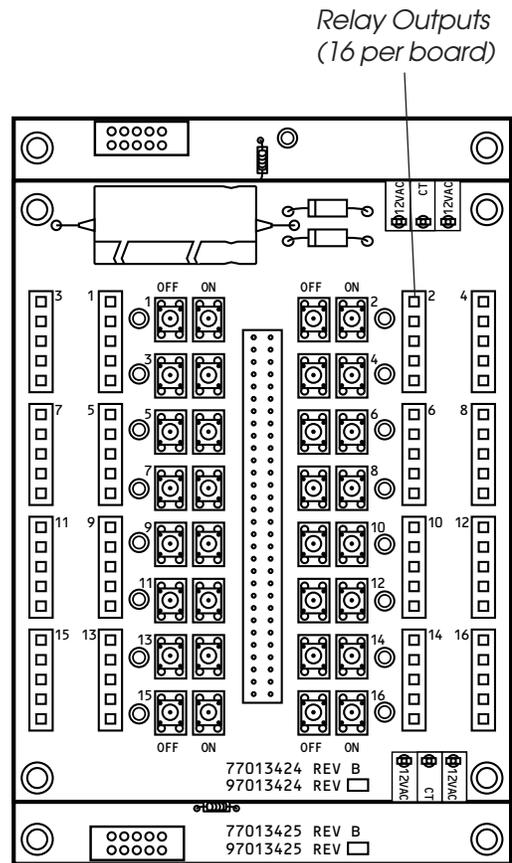
- *Switch Inputs* – The LightMaster is designed to accomplish a wide variety of switch input types. Each switch input features an ON/OFF status pilot LED to indicate contact closure between ON and COMMON and OFF and COMMON. In addition, each switch input has an associated switch pilot LED that can be programmed to track the state of a

selected relay, relay group, or preset. See Table 1.2 (next page) for a description of switch input types. As an alternative to hardwiring switches to the switch inputs, you can control relays via signals transmitted over the LightSync™ data line. (See Section 4 for details.)

- *Relay Outputs* – Each output switches its associated lighting relay ON and OFF. Each output has an associated LED (light emitting diode). The LED lights when the output switches the relay ON.
- *Relays* – 20A at 120, 277 or 347 VAC magnetically latching relays maintain their state without power.
- *Override Switches* – Each relay output is equipped with an ON and an OFF override switch. These switches allow you to turn the associated lighting relay ON or OFF independent of programming parameters.



LightMaster Standard I/O Board



LightMaster Double-Sided I/O Board

Controller Description



<p>Momentary ON/OFF: When momentary contact is made between ON and COM, relay outputs controlled by this input are turned ON. When momentary contact is made between OFF and COM, relay outputs controlled by this input are turned OFF.</p> <p style="text-align: center;">MOMENTARY</p>	<p>Momentary Pushbutton: When momentary contact is made between ON and COM, relay outputs controlled by this input are turned ON and OFF alternately each time contact is made.</p> <p style="text-align: center;">MOMENTARY</p>	<p>Maintained ON/OFF: When contact is made between ON and COM, relay outputs controlled by this input are turned ON. When contact is broken between ON and COM, relay outputs controlled by this input are turned OFF.</p> <p style="text-align: center;">MAINTAINED</p>	<p>Maintained Multi-Way: When contact is either made or broken between ON and COM, relay outputs controlled by this input will be toggled between ON and OFF conditions. This function is similar to that of standard 3- and 4-way switches.</p> <p style="text-align: center;">MAINTAINED</p>	<p>Set Preset: When momentary contact is made between ON and COM, the selected preset will be activated.</p> <p style="text-align: center;">MOMENTARY</p>	<p>Timed ON/Cleaning Switch: When momentary contact is made between COM and ON, relay outputs are turned ON. When contact is broken, a timed ON duration is started from 5-999 minutes. Contact between OFF and COM will turn relays OFF.</p> <p style="text-align: center;">MOMENTARY</p>
<p>Two-Step Group: When the switch is activated, group A (relay outputs) turn ON and group B (relay outputs) turn OFF. When the input is activated again, group A turn OFF and group B turn ON. The pattern repeats with successive switch activations.</p> <p style="text-align: center;">MOMENTARY</p>	<p>Four-Step Group: The first time the switch is activated, group A (relay outputs) turn ON and group B (relay outputs) turn OFF. The second time the switch is activated, group A turn OFF and group B turn ON. The third time, both groups turn ON. The fourth time, both groups turn OFF. The fifth actuation begins a repeat of the 4 steps.</p> <p style="text-align: center;">MOMENTARY</p>	<p>Input Disable: When contact is made between ON and COM, selected input(s) will be ignored.</p> <p style="text-align: center;">MAINTAINED</p>	<p>Timer Disable: While contact is made between ON and COM, selected timer(s) will be ignored.</p> <p style="text-align: center;">MAINTAINED</p>	<p>Output Override: While contact is made between ON and COM, relay outputs controlled by this input are turned ON, OFF or held in their current state and all other control commands are ignored. All inputs/timers are ignored for controlled relay outputs.</p> <p style="text-align: center;">MAINTAINED</p>	<p>Photo Sensor Inputs: LightMaster Controllers can be connected to either momentary or maintained output photo sensors as shown below.</p> <p style="text-align: center;">MOMENTARY Programmed as "Momentary"</p> <p style="text-align: center;">MAINTAINED Programmed as "Maintained ON/OFF input"</p>
<p>Motion Sensor Inputs: LightMaster Controllers can be connected to either momentary or maintained output motion sensors as shown below.</p> <p style="text-align: center;">MOMENTARY Programmed as "Momentary"</p> <p style="text-align: center;">MAINTAINED Programmed as "Maintained ON/OFF input"</p>	<p>Fire Alarm System Inputs: LightMaster Controllers can be easily connected to building Fire Alarm Systems to force selected controlled lighting circuits to the ON, OFF or HOLD state and lock out all other forms of control when a Fire Alarm signal is present (contacts CLOSED).</p> <p style="text-align: center;">MAINTAINED Programmed as "Output Override input"</p>	<p>Dry Contact Interface: Virtually any control system or device can be interfaced to a LightMaster controller through the use of a simple dry contact interface utilizing any of the available switch types. Please consult factory for any special requirements.</p> <p style="text-align: center;">MAINTAINED</p>	<p>Force Timer: A switch input can be mapped to force a LightMaster Timer activation.</p> <p style="text-align: center;">MAINTAINED</p>	<p>HID Bi-Level: Operation of Bi-level HID Ballasts. First contact between COM and ON will turn ON power and High/Low relay. (High/Low relay is locked ON for 15 minutes for warm-up period.) Additional activations of ON terminal will toggle High/Low relay. Contact between OFF and COM will turn relays OFF.</p> <p style="text-align: center;">MOMENTARY</p>	

NOTE: Switch Enable-Disable: Inputs may be enabled or disabled based on time of day.

Table 1.2 – LightMaster Switch Input Types

Controller Description

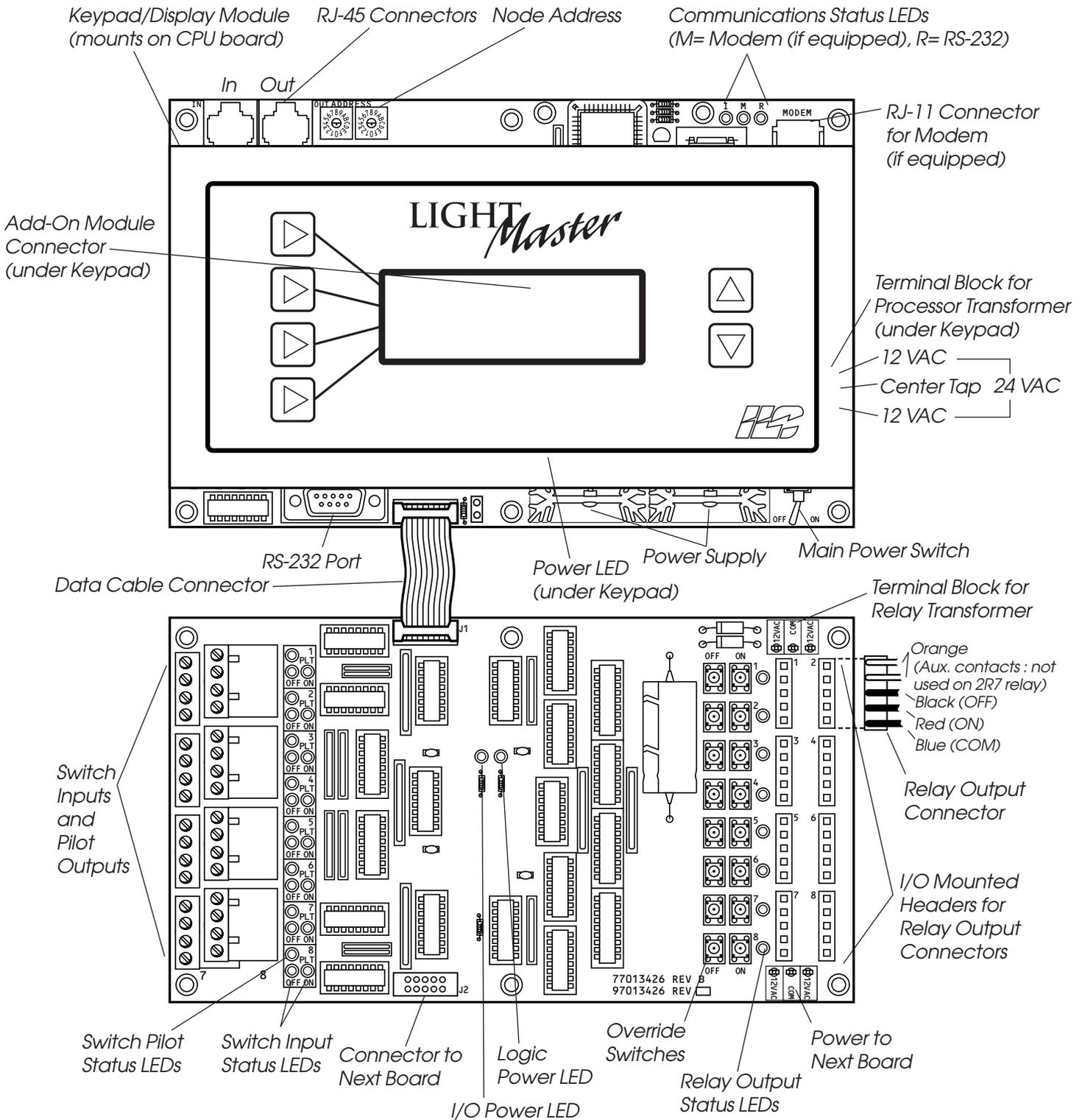


Figure 1.2 – CPU Board and I/O

Controller Description

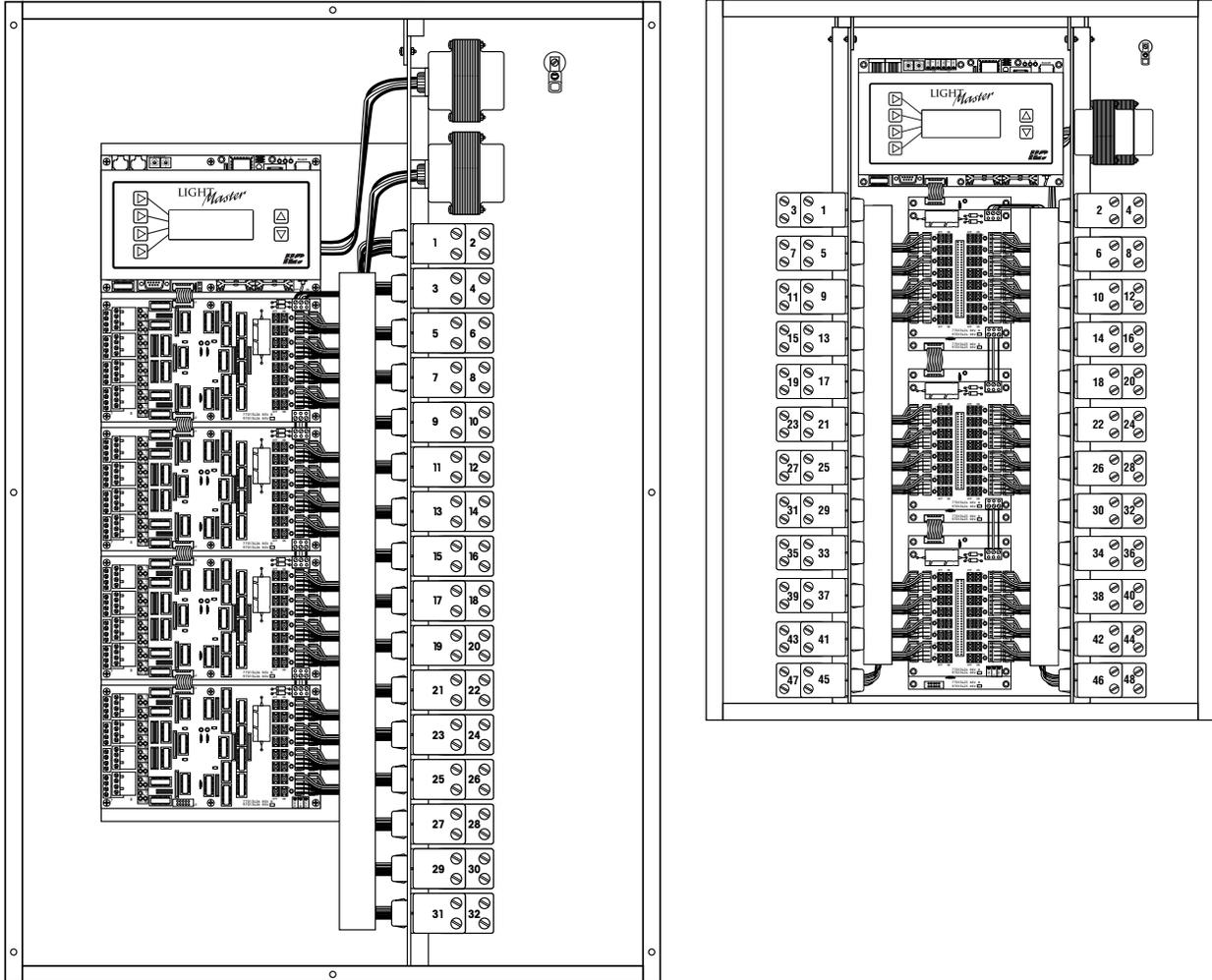
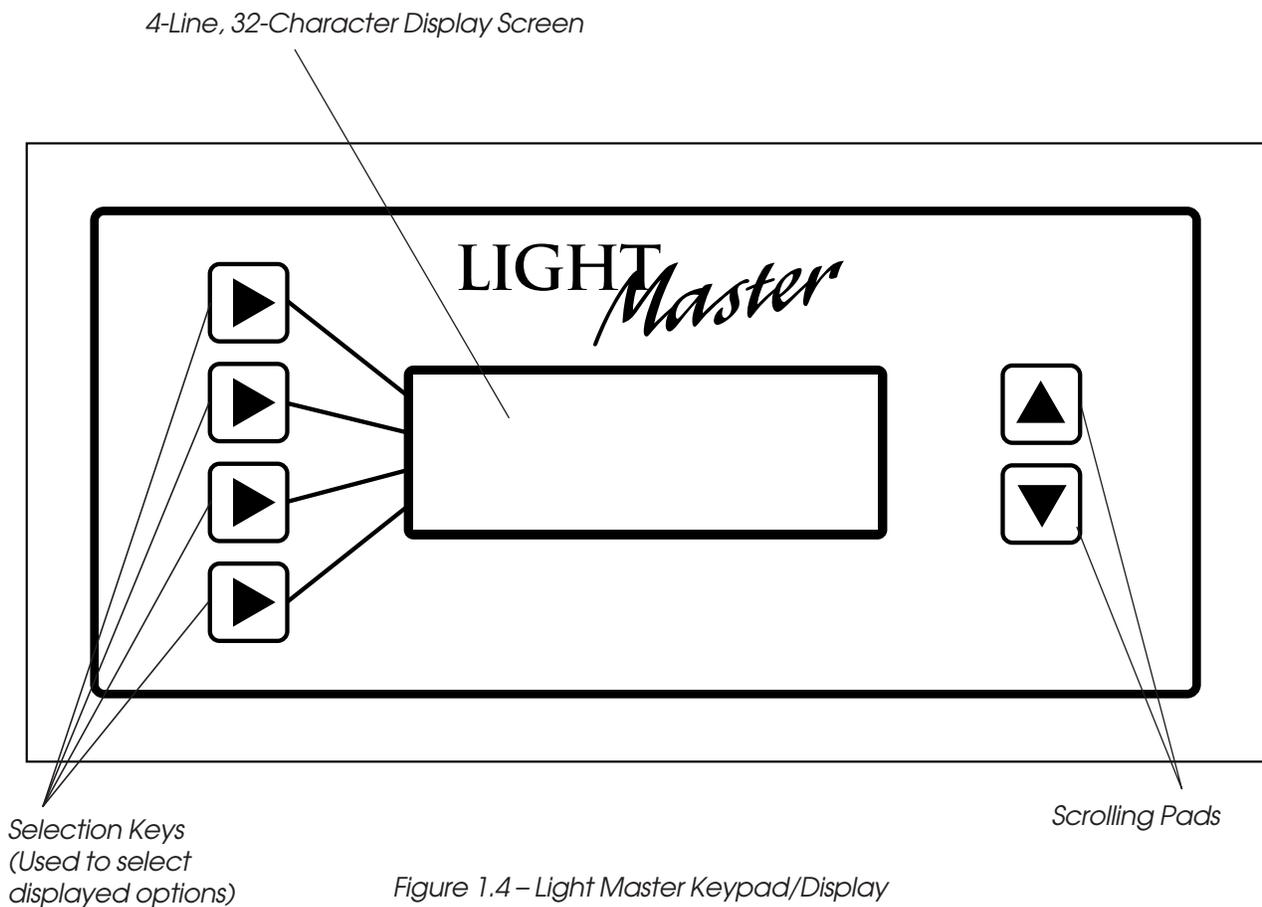


Figure 1.3 – LightMaster 32 and LightMaster 48DS

1.1.5 Keypad/Display Module – (See Figure 1.4.) The programming module provides you with access to program and view controller data. It consists of a tactile response keypad and screen. The programming module is mounted to the CPU board.

1.1.6 Lighting Relays – control the line voltage loads. The lighting relays can control 120 or 277 VAC loads rated up to 20 amps. The Class 2 low voltage control part of each relay is terminated to a relay output on the controller I/O board(s). (See Figure 1.2.) Each relay output controls only one lighting relay.



Controller Description

1.2 I/O Options

The LightMaster Controller can be equipped with the following add-on devices:

1.2.1 Voice/DTMF Add-On Module – You can equip the controller with a DTMF (Dual Tone Multi Frequency) interface, which allows you to activate switch inputs via commands from a touchtone telephone. (See Appendix A.)

1.2.2 DMX 512 Module – Provides for direct control of ON/OFF lighting or other loads from any DMX control device. Any of the available 512 DMX control channels may be mapped to control individual relays. (See Appendix E.)

1.2.3 N2 Module – Provides for direct control of control devices in building automation systems using N2 protocol. (See Appendix N.)

1.2.4 MODBUS Module – Provides for direct control of control devices in building automation systems using MODBUS protocol. (See Appendix M.)

1.3 LightMaster LM-4 Controller

The ILC LightMaster-4 (LM-4) lighting controller is a microprocessor-based, programmable lighting controller capable of being a stand-alone panel or connected in a network of LightMaster panels. It is designed to be configured as a distributed lighting controller. In the stand-alone configuration it has four (4) hardwire inputs and is capable of handling four (4) additional LightSync™ data line devices to control any or all relays in the panel. The LM-4 is UL approved and FCC certified for commercial applications.

The major components making up the controller are:

- Enclosure
- High voltage divider
- Control transformers
- CPU board
- Lighting relays

Enclosure – The enclosure is rated NEMA 1. It is divided into a line voltage section and a low voltage section. The line voltage section contains the line voltage side of the control transformers and lighting relays. The low voltage section contains the Class 2 side of the lighting relays, transformer secondaries, and electronic components. Enclosures are available to accommodate four (4) lighting control relays. Width, Height, Depth is 12" x 10" x 4" and is provided a screw-on cover.

High Voltage Divider – A high voltage divider is available to divide the relays up for emergency lighting and 120 VAC from 277 VAC.

Control Transformer – A 20 VA multi-tap (120 or 277 VAC Primary) provides the 16 VAC input to power the controller electronics.

CPU Board – The CPU board provides the controller's intelligence and memory and Input/Output.

Major components include:

- Power Supply – converts the 16 VAC input to the +5, -5 and +24 VDC required by the controller logic, communications circuits, and control circuits. A power switch provides the means of energizing/de-energizing all controller electronics.

- Communications – One input and one output port using RJ-45 connectors for providing connection with the LightMaster panels in a network configuration. (This is not used in a stand-alone configuration.) One RJ-45 connector for supporting up to four (4) local LightSync data line devices. RS-232 communications is available with an optional interface device.
- Microprocessor – executes the computer code and coordinates all controller functions including the controller's real time clock.
- PROM Chip – contains the controller operating system and basic tasks.
- NVRAM Chip – store the user-entered operating parameters.
- Real Time Clock – maintains time and date for up to 30 days without power.
- Input/Output – Provides four (4) switch inputs and relay outputs, status pilots and override switches. Switch Inputs can accept input from either 2- or 3- wire momentary or maintained dry contact devices. Each input has two (2) associated LEDs (light emitting diodes). The ON LED lights when a closure is sensed between the ON and COMMON terminals. The OFF LED lights when a closure is sensed between the OFF and COMMON terminals. Each switch input features a switch pilot LED that can be programmed to track the state of a single relay, relay group, or preset. The inputs are optically isolated, noise- and surge-resistant. A switch may be located up to 1500 feet from the controller, provided you use a minimum of 18-gauge wire. As an alternative to hardwired switching, relays may be controlled by signals transmitted via a LightSync device on the network. Relay outputs are each optically isolated and switches its associated lighting relay ON and OFF. Each output has an associated LED. The LED lights when the output switches the relay ON.

Relays – 20A at 120, 277 or 347 VAC magnetically latching relays maintain their state even with a power outage.

Controller Description

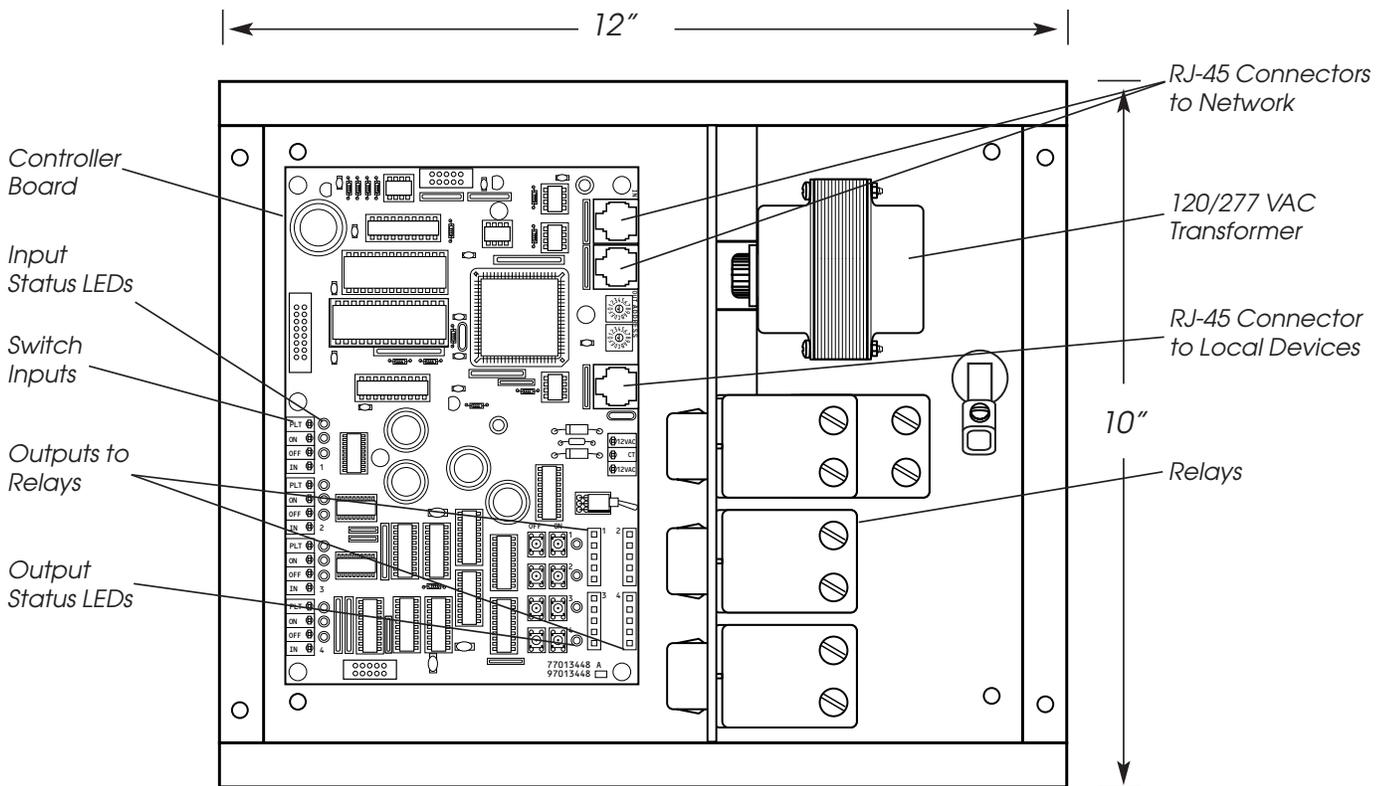
Override Switches – Each relay output is equipped with an ON and OFF override switch. These switches allow you to turn the associated lighting relay ON or OFF independent of any programming.

Optional Add-On Devices:

- Keypad/Display Module – The programming module is a handheld device that connects to the CPU board and provides you with access to program and view controller data. It consists of a tactile response keypad and a 4-line LCD screen.
- Voice/DTMF Add-On Module – You can equip the controller with a DTMF (Dual Tone Multi Frequency) interface, which allows you to activate switch inputs via

commands from a touchtone telephone. (See Appendix A.)

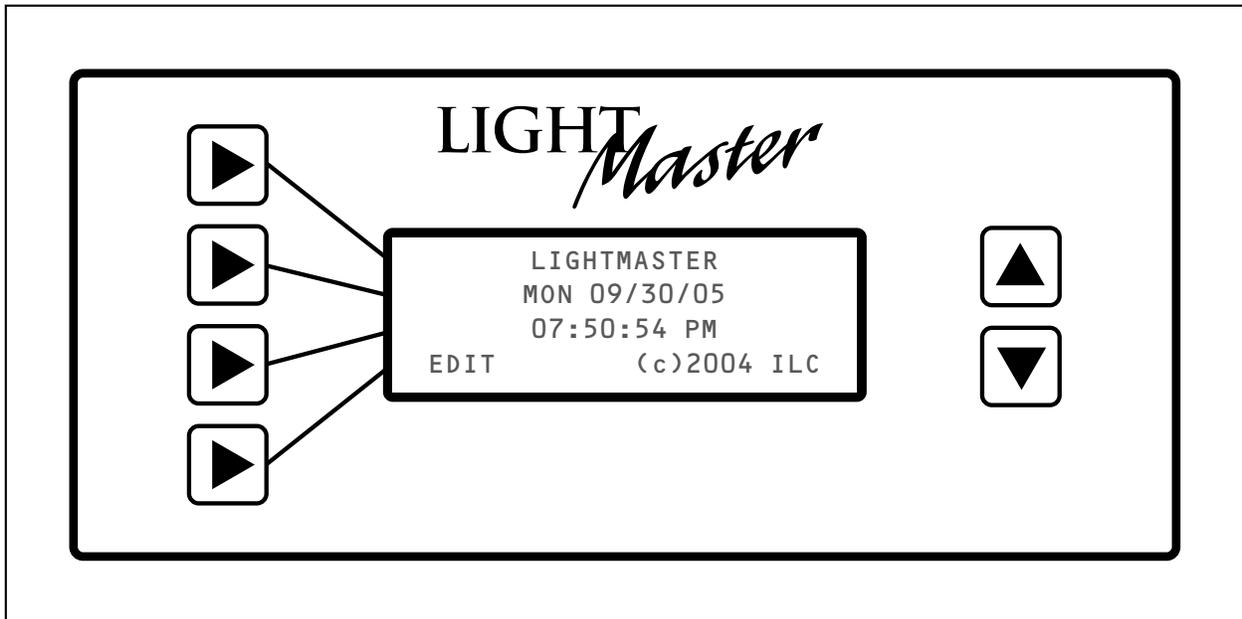
- DMX 512 Module – Provides for direct control of ON/OFF lighting or other loads from any DMX control device. Any of the available 512 DMX control channels may be mapped to control individual relays. (See Appendix E.)
- N2 Module – Provides for direct control of control devices in building automation systems using N2 protocol. (See Appendix N.)
- MODBUS Module – Provides for direct control of control devices in building automation systems using MODBUS protocol. (See Appendix M.)



LightMaster LM-4

Section 2

Installation



Section 2 Installation

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2.0 Section Overview

This section shows you how to install the LightMaster Controller and how to perform required power-up verification checks. This section covers standard installation of a LightMaster Stand-Alone controller. For information on optional features or communication/LAN systems, consult the factory.

NOTE: Consult Section 4 for information for installation of LightSync™ switching devices.

This section covers the following topics:

- Pre-installation checks
- Mounting the controller
- Wiring the controller
- Pre-power-up checks
- Power-up and checkout
- Troubleshooting

2.1 Pre-Installation Checks

Do the following before beginning the installation:

1. Verify that you have received the proper equipment. Check the packing slip against the materials you ordered and verify that the material is appropriate for the project. Check to ensure that the voltages of the controller(s) transformers match the available power. Report any discrepancies or visible damage at once.
2. Review electrical prints and other relevant project documentation.
3. Ensure that you have a digital multi-meter.

2.2 Mounting the Controller

Consider the following when selecting a site for the LightMaster. **NOTE:** See Section 2.7 for LightMaster LM-4 installations.

2.2.1 Location – Typically, the LightMaster Controller is mounted near the breaker panel containing the circuits to be controlled by the lighting relays. The enclosure is manufactured with predrilled mounting holes located near the four corners of the rear wall of the enclosure. Secure the enclosure to the mounting surface with hardware appropriate for the application.

2.2.2 Environmental Considerations – The LightMaster is designed to operate in temperatures between 0 and 50 degrees C (32°-112°F) and 10%-90% humidity non-condensing.

CAUTION

THE LIGHTMASTER CONTROLLER IS HOUSED IN A NEMA 1 ENCLOSURE. DO NOT INSTALL IN SITUATIONS REQUIRING SPECIAL PURPOSE ENCLOSURES OR IN AREAS WHERE THE CONTROLLER WILL BE SUBJECT TO CONDITIONS OUTSIDE ITS DESIGNED OPERATING RANGES.

2.2.3 Distance From Control Devices

Switches and other control devices can be located up to 1500 feet from the LightMaster Controller using 18-gauge wire.

2.3 Wiring the Controller

Perform the following procedures to wire the line and control circuits of the LightMaster. Do **NOT** apply power to any circuits until instructed to do so. Document all terminations.

2.3.1 Wire the Control Transformers – Run a dedicated 120 or 277 VAC circuit, including grounding conductor, and terminate it to the primaries of the LightMaster processor and I/O transformers. Cap the unused lead. (See Figure 2.1.)

2.3.2 Connect Line and Load – Connect line and load wires of the line voltage circuits to the lighting relays.

2.3.3 Wire Switch Inputs – Wire the Class 2 switch circuits. (See Figure 2.2.) **NOTE:** If the project requires LightSync™ switching, consult Section 4.

1. Run the required wiring between the controller and the field-installed switches. Consult project documentation to determine the type and quantity of required switch circuits. Check each switch run to ensure that there are no shorts between conductors or to ground. Also verify that there are no opens.
2. Make the connections at the switch end.
3. Make the connections to the controller switch input terminals.

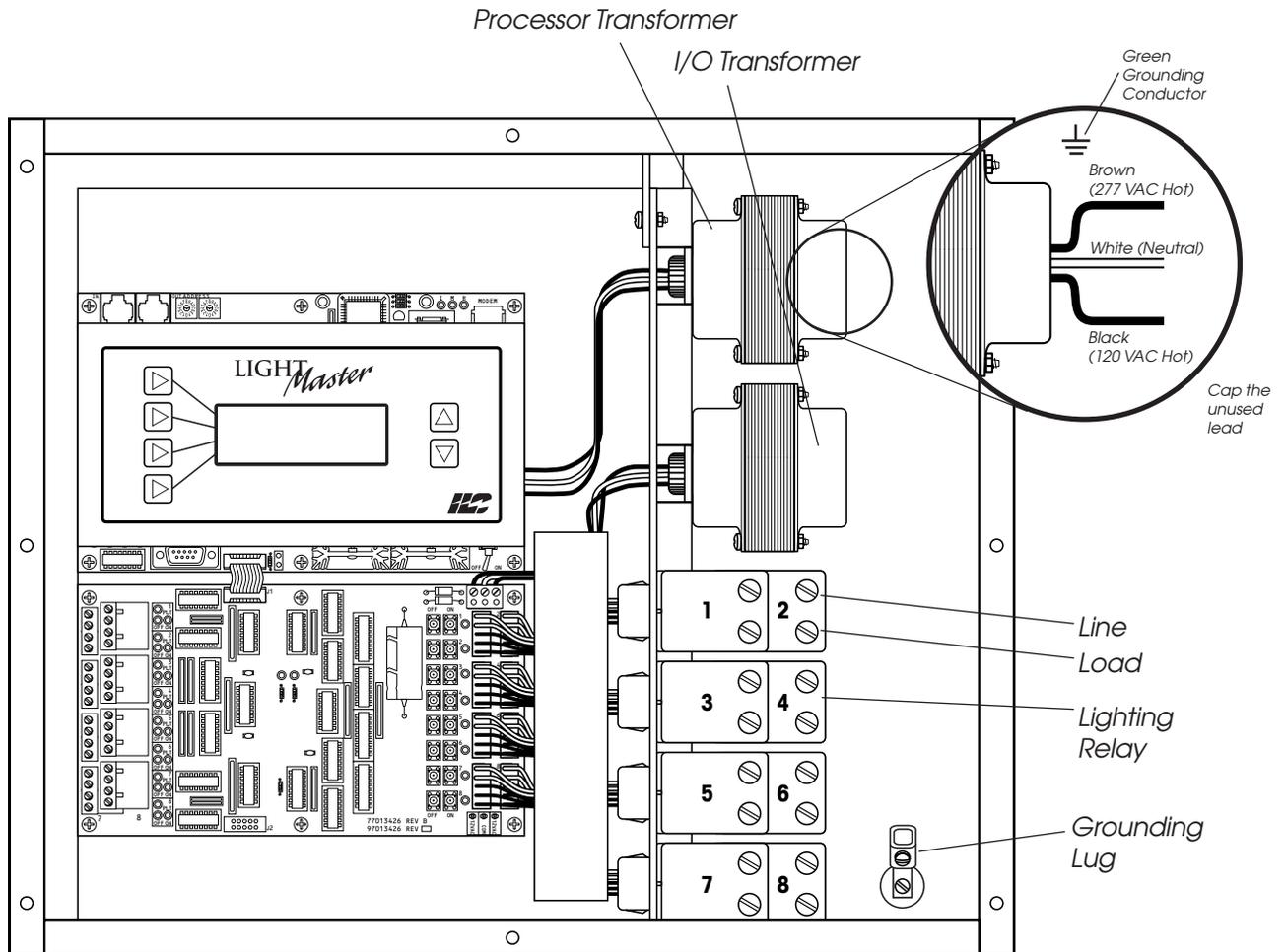


Figure 2.1 – Terminate Line to Control Transformer Primaries

Typical Maintained Switch

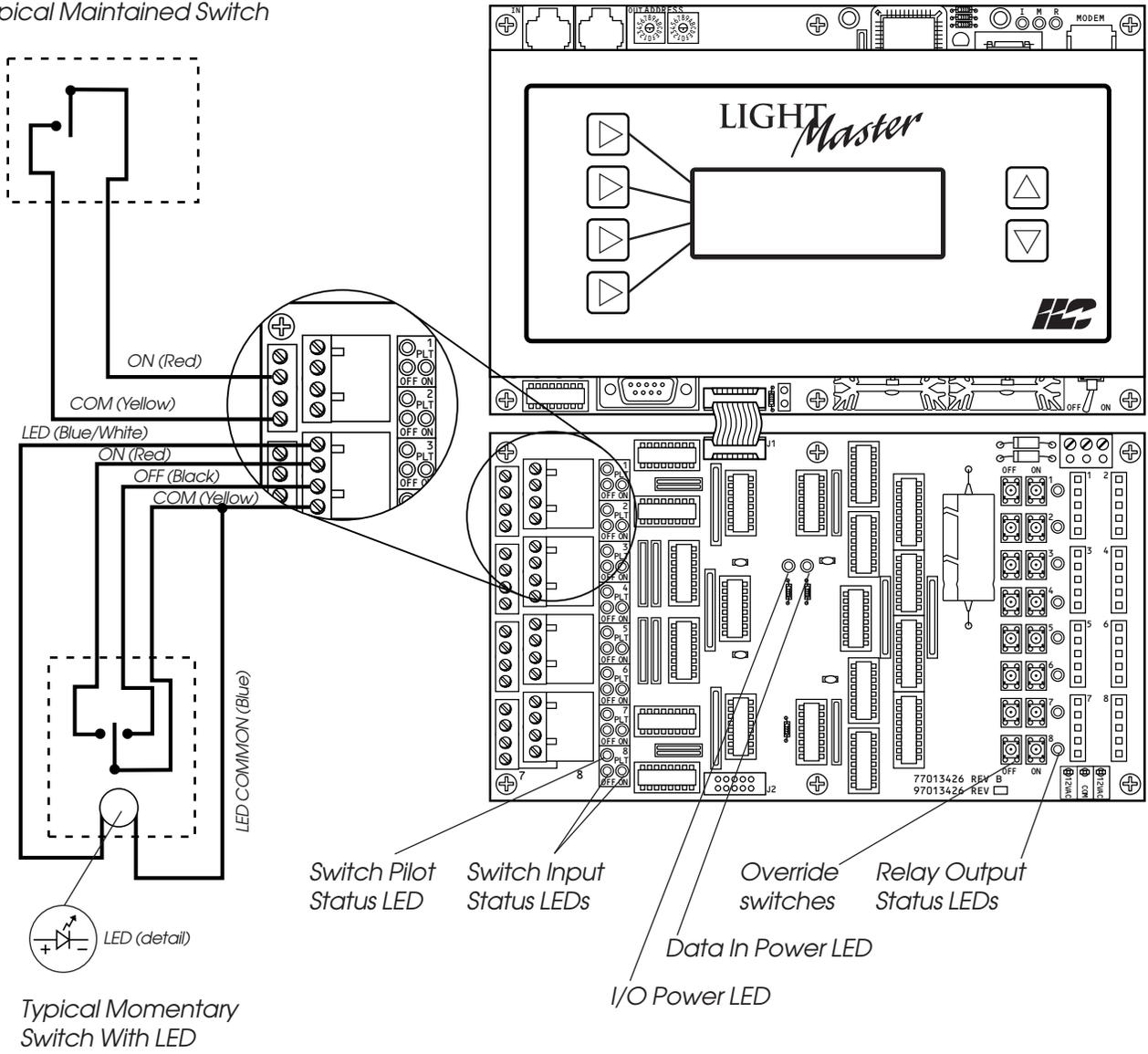


Figure 2.2 – Wire Class 2 Switch Circuits

2.4 Pre-Power Checks

Complete the following checks BEFORE applying power to the LightMaster Controller.

2.4.1 Check Controller Power Input

1. Verify that the controller power switch is OFF.
2. After verifying that the processor and I/O transformers' leads are properly connected and that the source voltage is 120 or 277 VAC (whichever is appropriate), power up the circuit.
3. Verify correct line voltage on the primary of the transformer.

2.4.2 Verify Controller's Supply Voltage

Verify that there is approximately 24 VAC on processor and I/O transformers' secondaries and approximately 12 VAC between each leg and the center tap. (See Figure 1.2.)

2.4.3 Double-Check Connections

1. Verify that all connections are secure (including all ribbon cables between boards, power connections between boards, and all relay and input connections).
2. Verify integrity of all internal and external wire/cabling terminations (including all CAT-5 cables, phone lines, inputs, and high voltage terminations).

2.4.4 External Monitoring and Control

If control of the LightMaster via a PC is desired, consult the appendix for instructions regarding the appropriate port (on-board modem or RS-232).

2.5 Power-Up and Checkout

Complete the following procedures to power-up and checkout the LightMaster Controller.

2.5.1 Power-Up the Controller

1. Turn the main power switch, located on the CPU board, ON. (See Figure 1.2.)
2. Verify that the Controller Keypad screen displays the default time and date.
3. Verify that both power lights on each I/O board are lit. (See Figure 1.2.)
4. If remotely controlling with a PC, verify that the appropriate communications port status indicator is lit. (See Figure 1.2.)

2.5.2 Verify the Lighting Relays

Switch each relay ON and OFF, pushing the override switches located on the I/O board(s). There are separate ON and OFF switches for each lighting relay. (See Figure 2.2.) Verify that the relay status LED goes ON and OFF and that the relay itself changes state. Verify that the relay controls the proper circuit.

2.5.3 Perform Initial Programming Procedures (See Section 3.)

1. Clear memory.
2. Set the correct date and time on the controller.
3. Program the switch inputs and timers.

2.5.4 Verify the Switching Function

1. Operate each switch.
2. Verify that each switch controls the correct lighting relays in the manner you have programmed.

2.5.5 Verify the Timer Functions

Using Demo Clock x10 feature (see Section 3):

1. Verify that the relays respond as programmed.
2. Reset the controller clock to the correct date and time.

2.6 Troubleshooting

In the event of trouble, use the following procedures to identify the problem.

2.6.1 Controller Will Not Power-Up

1. Verify that there is 120/277 VAC on the primary and 24 VAC on the secondary of the control transformers.
2. Verify that the power LED on the CPU is lit.
3. If there is proper primary and secondary voltage on the transformer but the power LED is not lit and the keypad screen does not come up, consult the factory.

2.6.2 Lighting Relay(s) Will Not Function

1. Verify that there is 24 VAC on I/O transformer secondary. (See Figure 1.1.)
2. Make sure that relay wiring is landed properly on the relay output of the I/O board(s). (Blue is COMMON, red is ON, black is OFF, orange is STATUS.) (See Figure 1.1.)
3. Override the affected relay(s) ON/OFF with the override switches located on the I/O board. (See Figure 1.2.)
4. If the relay does not respond, consult the factory.

2.6.3 Switch Input Will Not Function

1. Check your programming.
2. Verify proper connections at field and controller end.
3. Verify that there is only one maintained switch connected per input.
4. Unhook field connections from affected input. Connect test switch of same type as field switch.
5. Work the test switch. Observe whether the switch input status LED lights when it senses a switch closure.

6. If the switch input LED lights and the relays function properly, there is likely a problem with the field wiring.
7. Verify that the CPU is seeing the switch input by *viewing the current switch status*. This can be done with the keypad by going to the *Switch Status* screen and scrolling to the individual input or scanning all of the inputs to verify that a switch closure is being seen by the controller. (See Section 3-4.) Also the outputs of the I/O board(s) can be tested through the keypad. Relays can be forced individually or all swept ON or OFF using the keypad. (See Section 3-3.)
8. If the switch input or affected relay does not respond (or no response is viewed through the keypad), consult the factory.

2.6.4 Timers Will Not Function Properly

1. Check your programming.
2. Verify the affected output integrity by mapping a switch input to the output and triggering it with a test switch. If the relay does not react, consult the factory.

2.6.5 Entire I/O Board(s) Doesn't Work

1. Check to ensure that the data and power cables linking the I/O boards are connected properly and are free of opens and shorts.
2. Check to ensure that both of the power LEDs on each I/O board are lit.
3. Verify that the CPU sees the I/O boards using the keypad. This can be done by going to the Relay Status screen and scrolling through the outputs to see if the CPU sees all of the outputs. (See Section 3-3.)
4. If the I/O board is not recognized by the CPU, consult the factory.

2.7 LM-4 Installation

This section shows you how to install the LM-4 Controller and how to perform required power-up verification checks. See Section 2.1 for all other LightMaster installations.

- **Mounting the LM-4 Controller**
- **Wiring the LM-4 Controller**
- **Pre-power-up checks**
- **Power-up and checkout**
- **Troubleshooting**

2.7.1 Mounting the LM-4 Controller

Typically, the LM-4 controller is mounted in the distributed lighting circuits at the room level controlling local lighting loads. The enclosure is manufactured with predrilled mounting holes located near the four corners on the rear wall of the enclosure. Secure the enclosure to the mounting surface with hardware appropriate for the application.

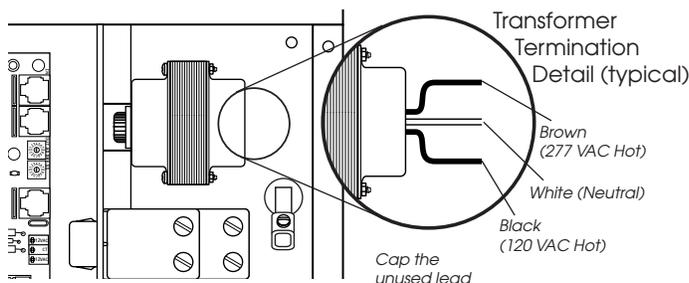
Environmental Considerations – The LM-4 is designed to operate in temperatures between 0 and 50 degrees C (32°-112°F) and 10%-90% humidity non-condensing.

CAUTION: THE LIGHTMASTER CONTROLLER IS HOUSED IN A NEMA 1 ENCLOSURE. DO NOT INSTALL IN SITUATIONS REQUIRING SPECIAL PURPOSE ENCLOSURES OR IN AREAS WHERE THE CONTROLLER WILL BE SUBJECT TO CONDITIONS OUTSIDE ITS DESIGNED OPERATING RANGES.

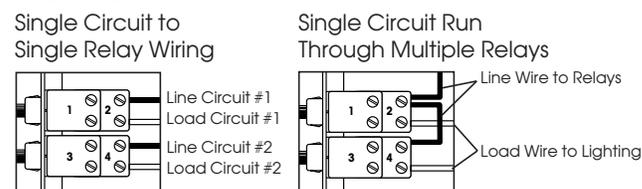
2.7.2 Wiring the LM-4 Controller

Perform the following procedures to wire the line and control circuits of the LM-4. Do NOT apply power to any circuits until instructed to do so. Document all terminations.

- **Wire the Control Transformer** – Connect 120 or 277 VAC circuit to the primaries of the LM-4 processor transformer including the grounding lug provided in the high voltage compartment. Cap the unused lead.

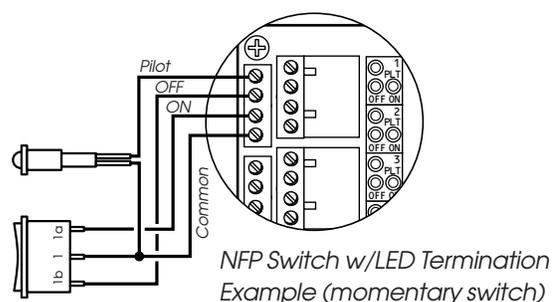


- **Connect Line and Load** – Connect line and load wires of the line voltage circuits to the lighting relays.



- **Wire Hardwire Switch Inputs** – Connect any Class 2 switch circuits. Distance from control devices (switches and other hardwired control devices) can be located up to 1500 feet from the LM-4 Controller using 18-gauge wires.

1. Run the required wiring between the controller and the field installed switches. Consult project documentation to determine the type and quantity of required switch circuits. Check each switch run to ensure that there are no shorts between conductors or to ground. Also verify that there are no opens.
2. Make the connections at the switch end.
3. Make the connections to the controller switch input terminals.



- **Wire LightSync™ Local Data Line Devices** – Wire from the RJ-45 connector marked "Local LS" out to the LightSync™ devices. **Note:** The local LightSync™ port on the LM-4 cannot exceed 4 devices with a total accumulated distance of 200 feet. Local LightSync™ switches must be addressed 01, 02, 03 or 04 only. Be sure to test all of the cables with a proper CAT-5 cable tester prior to connecting.

2.7.3 Pre-Power Checks

Complete the following checks BEFORE applying power to the LM-4 Controller.

Address Controller

The panel address is adjusted using the two rotary switches located near the RJ-45 ports.

Check Controller Power Input

1. Verify that the controller power switch is OFF.
2. Verify that the processor transformer source voltage is 120 or 277 VAC (whichever is appropriate).
3. Power-up the circuit.

Verify Controller's Supply Voltage

Verify that there is 16 VAC (between the red wires) on the processor transformer secondary and 8 VAC between each leg and the center tap (between each red wire and the yellow wire).

2.7.4 Power-Up and Checkout

Complete the following procedures to power-up and checkout the LM-4 Controller.

• Power-Up the Controller

1. Turn the power switch, located on the right side of the CPU board, to ON.
2. Verify that the Controller Keypad Screen displays the default time and date (if using a handheld keypad).
3. Verify that the power LED on the board is lit.

Verify the Lighting Relays

Switch each relay ON and OFF by pushing the override switches located near the relay connectors. There are separate ON and OFF switches for each lighting relay. Verify that the relay status LED goes ON and OFF and that the relay itself changes state. Verify that the relay controls the proper circuit.

Perform Initial Programming Procedures

1. Clear memory.
2. Set the correct date and time on the controller.
3. Program the switch inputs and timers.

Verify the Switching Function

1. Operate each switch.
2. Verify that each switch controls the correct lighting relays in the manner you have programmed.

Verify the Timer Functions

Set the clock to 5 minutes prior to timer settings.

1. Verify that the relays respond as programmed at the time programmed.
2. Reset the controller clock to the correct date and time.

2.7.5 Troubleshooting

In the event of trouble, use the following procedures to identify the problem.

Controller Will Not Power-Up

1. Verify that there is 120/277 VAC on the primary and 16 VAC on the secondary of the control transformer.
2. Verify that the power LED on the CPU is lit.
3. If there is proper primary and secondary voltage on the transformer but the power LED is not lit and the Keypad screen does not come up, consult the factory.

Lighting Relay(s) Will Not Function

1. Verify that there is 16 VAC on the transformer secondary.
2. Make sure that relay control wiring is landed properly on the relay outputs. (Blue is COMMON, red is ON, black is OFF, orange is STATUS.)
3. Override the affected relay ON/OFF with the override switches located on the controller board.
4. If the relay does not respond, consult the factory.

Hardwire Switch Input Will Not Function

1. Check your programming.
2. Verify proper connections at field and controller end.
3. Verify that there is only one maintained switch connected per input.
4. Unhook field connections from affected input. Connect a test switch of same type as field switch.
5. Work the test switch. Observe whether the switch input status LED lights when it senses a switch closure.

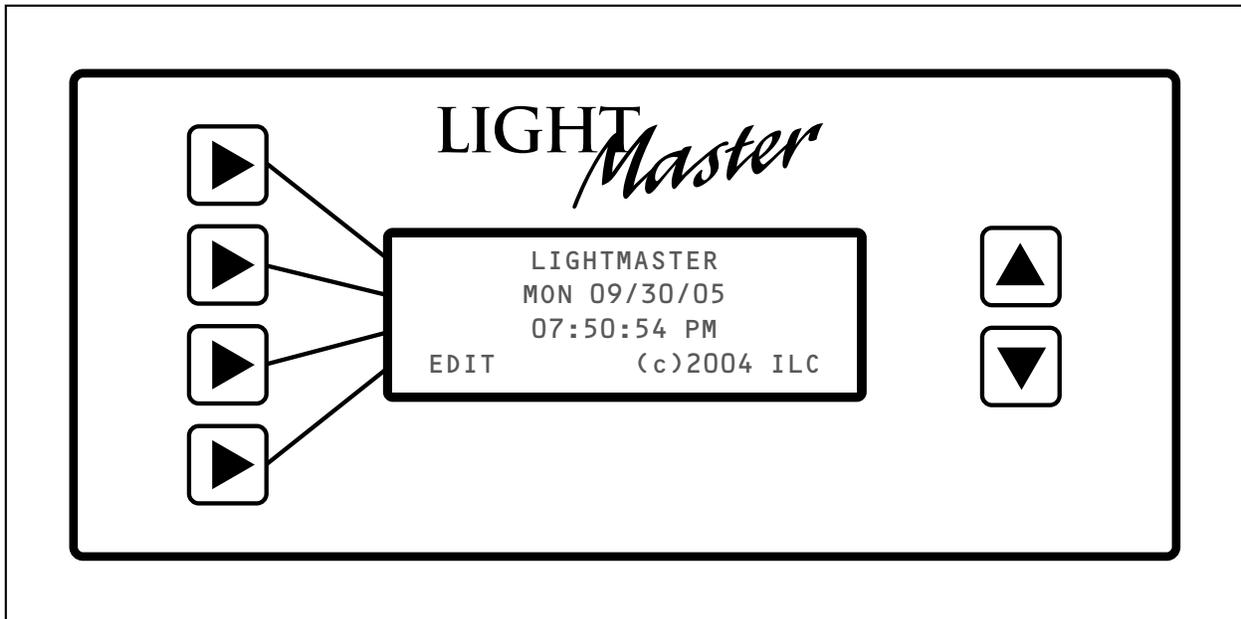
6. If the switch input LED lights and the relays function properly, there is likely a problem with the field wiring.
7. Verify that the controller is seeing the switch input by viewing the current switch status. This can be done with the keypad by going to the Switch Status screen and scrolling to the individual input or scanning all of the inputs to verify that a switch closure is being seen by the controller. Also the outputs of the I/O board can be tested through the keypad. Relays can be forced individually or all swept ON or OFF using the keypad.
8. If the switch input or affected relay does not respond (or no response is viewed through the keypad), consult the factory.

Timers Will Not Function Properly

1. Check your programming.
2. Verify the affected output integrity by mapping a switch input to the output and triggering it with a test switch. If the relay does not react, consult the factory.

NOTE: Programming of relay control can be found in Section 3. The LM-4 is slightly different than other LightMaster panels as it has a port designated for four (4) local LightSync devices. Each device must only be programmed as LightSync node address 01, 02, 03, and 04. Refer to Section 4 "LightSync Switching" for more information on configuring and programming.

Section 3 Programming



Section 3 Programming

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3.0 Section Overview

In this section you will learn how to program the LightMaster Controller.

Conventions/Definitions

Actual keystrokes/entries appear as arrows: for example, ► followed (if applicable) by the appropriate keyword. For example, to leave the Home screen, the entry is ► EDIT. (See Figure 3.1)

The term default appears in this section. **Default** means the value or entry preprogrammed at the factory. In many cases the default may be appropriate for your application, making field programming unnecessary. For example, momentary ON/OFF is the default switch type; therefore, if 3-wire momentary switches are used exclusively at your facility, you may not need to make entries defining the SWITCH OPTION.

Another term used often is **Home screen**. The Home screen is the top level screen of the controller. It features the controller name, the date and the time. (See Figure 3.1.) The controller displays this screen after power-up and when you are not programming.

Information Presentation

The information for each programming task is presented in the following way: First, a screen flow diagram or diagrams illustrating the relevant data entry screens. (This may be all the information that is required by the experienced user.) Second, a more detailed explanation of the relevant concepts and programming procedures will be presented. Third, specific sample operations will be displayed.

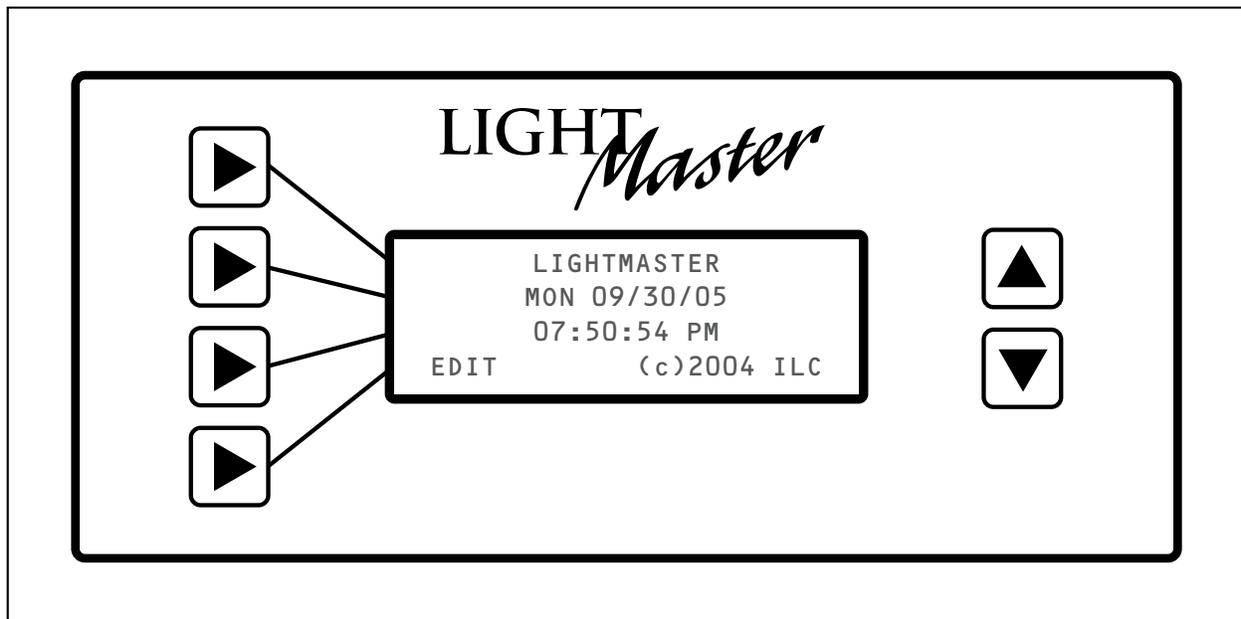


Figure 3.1 - LightMaster Home Screen

Automatic Timeout/Data Saving

If you do not press any keys for 5 minutes while you are programming, the controller will automatically return to the Home screen. To ensure programming is properly saved, enter the proper keyword – usually ► EXIT or ► SAVE.

Clear Memory

Always perform the Clear All Memory function prior to programming.

3.1 “Hidden” Menu Choices

There are three operations you can perform from the “Hidden” Menu: **CLEAR ALL MEMORY**, **DEMO CLOCK (10X)** and **RELAY DRIVE**. **CLEAR ALL MEMORY** allows you to clear the programmed memory that has been entered and resets the parameters to their default values. **DEMO CLOCK (10X)** speeds up the controller clock to run 10 times faster than normal and can be used to test the operation of time-based operations. **To reset the clock to normal operation, power-down the controller.** The third operation duration concerns changing the relay output pulse duration.

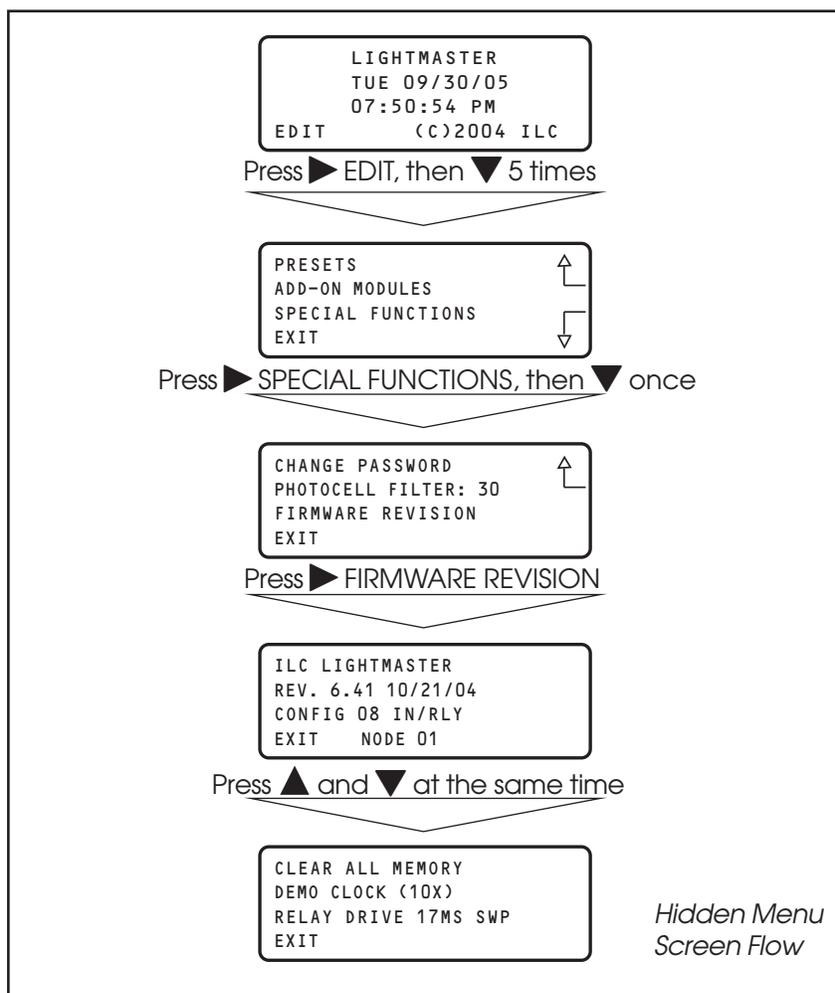
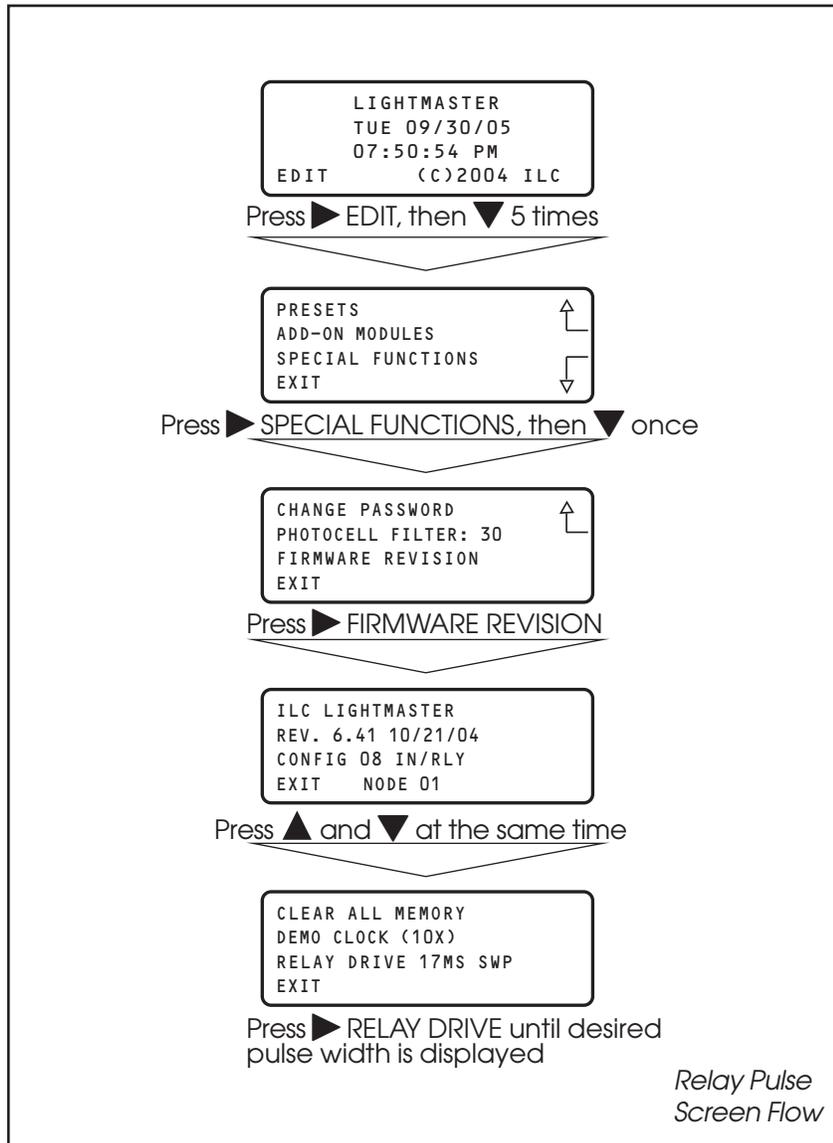


Figure 3.2 - Hidden Menu Screens

3.2 Setting Relay Pulse Width – Fast Track



3.2 How to Change the Relay Pulse

DURATION CONCEPTS AND PARAMETERS

This function allows you to set the relay drive characteristics for the LightMaster Controller. The pulse width is the time duration the relay is activated for a change of state. The options are 17ms sweep pulse (default) for each relay in succession, 50ms sweep pulse for each relay in succession, 17ms pulse with instant pulse for all the relays, and 50ms instant pulse for all the relays.

SAMPLE OPERATION:

Change the Relay Output Pulse to 50ms

1. From the Firmware Revision screen, press ▲ and ▼ at the same time to access the Hidden screen.
2. Press ► RELAY DRIVE until the 50ms pulse width appears.
3. Press ► EXIT 4 times to leave the Hidden Menu screen and return to the Home screen.

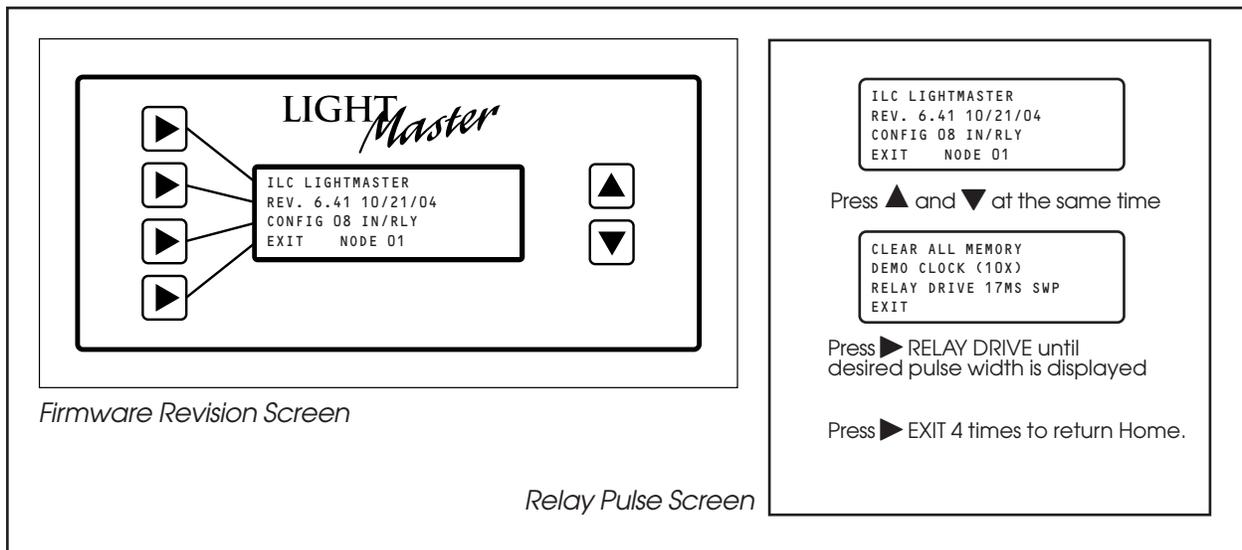
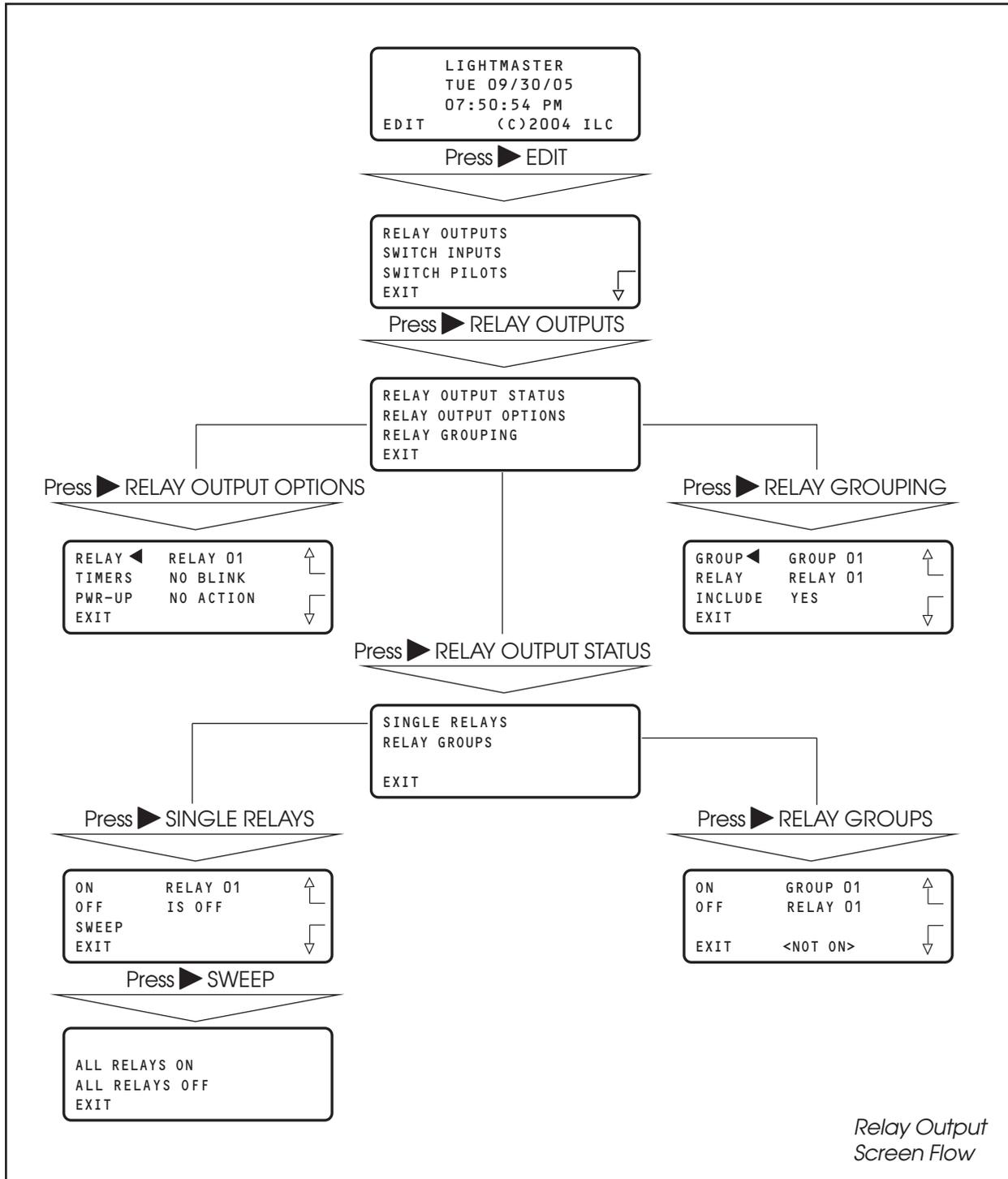


Figure 3.3 - Change Relay Pulse Width

3.3 Relay Output Operations Overview – Fast Track



3.3 Relay Output Operations

CONCEPTS AND PARAMETERS

You can use RELAY OUTPUTS to view the current ON/OFF Status of the relay outputs. You also have the option of switching individual relays, user-defined relay groups or all the controller relay outputs ON/OFF from the keypad. In addition, you can define certain relay output parameters (See Tables 3.1, 3.2) and form relay groups.

Parameter Key:

RELAY: 1 of 48 possible relay outputs.

RELAY OUTPUT STATUS:
ON = Turn Relay Output or Relay Group ON
OFF = Turn Relay Output or Relay Group OFF
SWEEP = Turn all of the controller relays ON or OFF

RELAY OUTPUT OPTIONS:
TIMERS = how relay output will react to an OFF Timer. (The default is NO BLINK.)
PWR-UP = how relay output will react when the controller is powered up. The default is NO ACTION.
RELAY GROUP = a user-defined group of relay outputs that will react as a group to a switch or timer signal.

Table 3.1 - Relay Output TIMERS Parameter Options

TIMERS Choices	Definition
NO BLINK (default)	The relay will not blink prior to an OFF Timer.
BLINK	The relay output blinks and postpones the OFF Timer for a user defined-time (2-99 minutes). The default alert time is 5 minutes. If a switch controlling the relays is turned ON during this time, the OFF Timer is again postponed for a user-defined period (5-999 minutes) or until the switch is turned OFF. The default override is 120 minutes.
HID DELAY	Same as BLINK (the OFF Timer is postponed) except that there is NO blink warning.
ALARM ON PLS	During the ON pulse period (1-99 seconds programmable), the relay is cycled ON and OFF at 1-second intervals. The relay returns to OFF when complete. Used to alarm or buzzer signal applications.
ALARM OFF PLS	During the OFF pulse period (1-99 seconds programmable) the relay is cycled OFF and ON at 1-second intervals. The relay returns to ON when complete. Used in set-table blink alert applications.
ALARM ON	Relay will turn ON for a programmed duration (1-99 seconds) and then return to the OFF state. Used for mechanically latching contactor control.
ALARM OFF	Relay will turn OFF for a programmed duration (1-99 seconds) and then return to the ON state. Used with sentry switch or Watt Stopper 110.
<i>Note: How to change blink alert, override, and alarm pulse times defaults is done by selecting BLINK ALERT/ALARMS from the TIMER menu.</i>	

Table 3.2 - Relay Output PWR-UP Parameter Options

PWR-UP Choices	Definition
NO ACTION (default)	The relay output holds its pre-existing state when power is applied or reapplied to the controller.
TURN ON	The relay output switches ON when power is applied or reapplied to the controller.
TURN OFF	The relay output switches OFF when power is applied or reapplied to the controller.
ON/IN:1	The relay output switches ON when power is applied or reapplied to the controller if Input 1 is closed at the time of power-up.
OFF/IN:1	The relay output switches OFF when power is applied or reapplied to the controller if Input 1 is closed at the time of power-up.

SAMPLE OPERATION:

How to Turn a Relay ON From the Keypad

1. From the Home screen, press ► EDIT.
2. When the MAIN menu appears, press ► RELAY OUTPUTS.
3. When the RELAY OUTPUTS menu appears, press ► RELAY OUTPUT STATUS.
4. When the Single Relay/Group menu appears, press ► SINGLE RELAYS.
5. When the Relay Status menu appears, press ▲ until the relay you want to control appears.
6. Press ► ON to switch ON the relay or ► OFF to switch OFF the relay.
7. Press ► EXIT 4 times to return to the Home screen.

```
LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
```

Press ► EDIT

```
RELAY OUTPUTS
SWITCH INPUTS
SWITCH PILOTS
EXIT
```

Press ► RELAY OUTPUTS

```
RELAY OUTPUT STATUS
RELAY OUTPUT OPTIONS
RELAY GROUPING
EXIT
```

Press ► RELAY OUTPUT STATUS

```
SINGLE RELAYS
RELAY GROUPS
EXIT
```

Press ► SINGLE RELAYS

```
ON      RELAY 01
OFF     IS OFF
SWEEP
EXIT
```

Press ▲ for desired relay

```
ON      RELAY 03
OFF     IS OFF
SWEEP
EXIT
```

Press ► ON or ► OFF

```
ON      RELAY 03
OFF     IS ON
SWEEP
EXIT
```

Press ► EXIT 4 times to return HOME

```
LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
```

SAMPLE OPERATION:

How to Program a Relay to Perform a Blink Alert

1. From the Home screen, press ► EDIT.
2. When the Main menu appears, press ► RELAY OUTPUTS.
3. Press ► RELAY OUTPUT OPTIONS.
4. When the Relay Options screen appears, press ▲ or ▼ until the relay you want to perform the blink alert appears.
5. Press ► TIMERS; then press ▲ or ▼ until BLINK appears in the timer field.
6. Press ► EXIT 3 times to return to the Home screen.

```

LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
    
```

Press ► EDIT

```

RELAY OUTPUTS
SWITCH INPUTS
SWITCH PILOTS
EXIT
    
```

Press ► RELAY OUTPUTS

```

RELAY OUTPUT STATUS
RELAY OUTPUT OPTIONS
RELAY GROUPING
EXIT
    
```

Press ► RELAY OUTPUT OPTIONS

```

RELAY ◀ RELAY 01  ▲
TIMERS  NO BLINK  ▲
PWR-UP  NO ACTION ▼
EXIT
    
```

Press ▲ or ▼ for desired relay

```

RELAY ◀ RELAY 03  ▲
TIMERS  NO BLINK  ▲
PWR-UP  NO ACTION ▼
EXIT
    
```

Press ► TIMERS then ▲ or ▼ until BLINK appears

```

RELAY ◀ RELAY 03  ▲
TIMERS ◀ BLINK   ▲
PWR-UP  NO ACTION ▼
EXIT
    
```

Press ► EXIT 3 times to return HOME

```

LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
    
```

SAMPLE OPERATION:

How to Define a Relay Group

1. From the Home screen, press ► EDIT.
2. When the Main menu appears, press ► RELAY OUTPUTS.
3. Press ► RELAY GROUPING.
4. When the Relay Grouping screen appears, press ▲ or ▼ to select the relay group number.
5. Press ► RELAY; then press ▲ or ▼ until the first relay to be part of the group appears.
6. Press ► INCLUDE until YES appears in the Entry field.
7. Repeat steps 5 and 6 to include additional relays.
8. Press ► EXIT 3 times to return to the Home screen.

```

LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
    
```

Press ► EDIT

```

RELAY OUTPUTS
SWITCH INPUTS
SWITCH PILOTS
EXIT
    
```

Press ► RELAY OUTPUTS

```

RELAY OUTPUT STATUS
RELAY OUTPUT OPTIONS
RELAY GROUPING
EXIT
    
```

Press ► RELAY GROUPING

```

GROUP ◀  GROUP 01
RELAY    RELAY 01
INCLUDE  NO
EXIT
    
```

Press ▲ or ▼ for desired group

```

GROUP ◀  GROUP 02
RELAY    RELAY 01
INCLUDE  NO
EXIT
    
```

Press ► RELAY then ▲ or ▼ for first group relay

```

GROUP ◀  GROUP 02
RELAY ◀  RELAY 04
INCLUDE  NO
EXIT
    
```

Press ► INCLUDE until YES appears

```

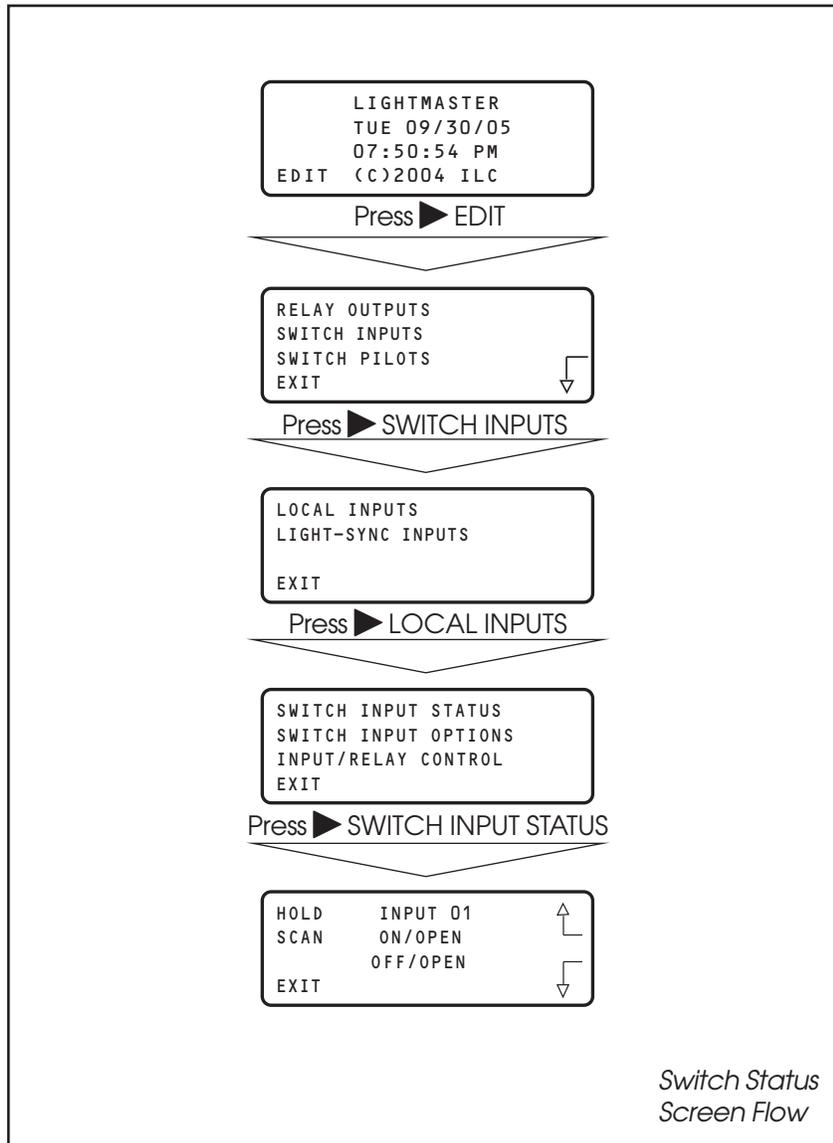
GROUP ◀  GROUP 02
RELAY ◀  RELAY 01
INCLUDE ◀ YES
EXIT
    
```

Press ► EXIT 3 times to return HOME

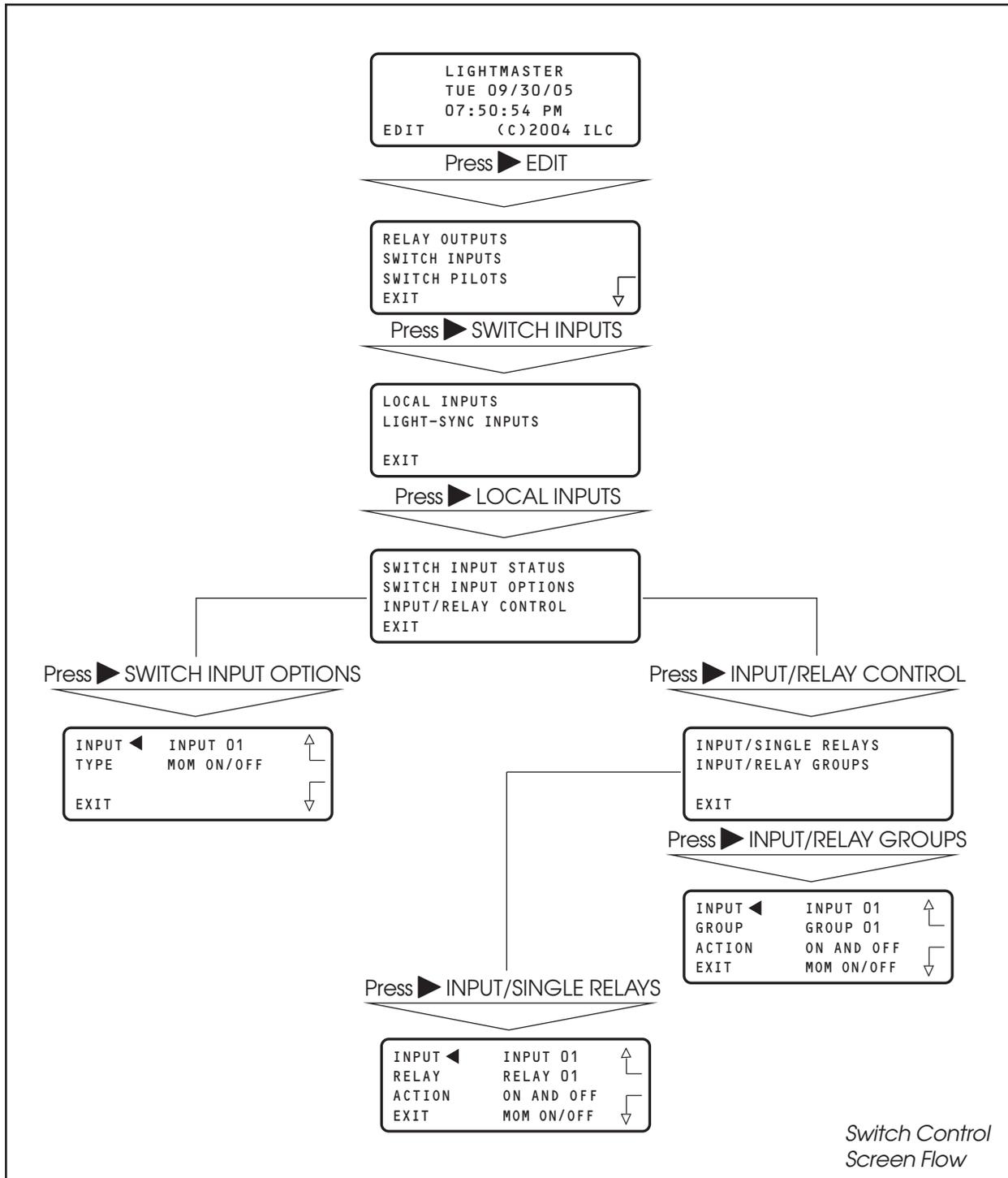
```

LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
    
```

3.4 Switch Operations: Status – Fast Track



Switch Operations: Controlling Relays With a Switch – Fast Track



Switch Status

CONCEPTS AND PARAMETERS

This function allows you to view the current status of each switch input attached to the LightMaster Controller.

NOTE: If your application features LightSync™ data line switching, see Section 4.

Parameter Key:

INPUT = 1 of 48 possible switch inputs.

HOLD ▼ or ▲ = access the input you want to view.

SCAN = scans all output for an ON or OFF closure and displays most recent input that has changed.

OPEN = maintained switch is OPEN; momentary switch is in neutral position.

CLOSED = maintained switch is closed; momentary switch is currently closing.

SAMPLE OPERATION:

Check the Current Status of a Switch Input

1. From the Home screen, press ► EDIT.
2. From the Main menu, press ► SWITCH INPUTS; then press ► LOCAL INPUTS.
3. From the Switch Input menu, press ► SWITCH INPUT STATUS.
4. When the Switch Input Status screen appears, press ▲ or ▼ until the switch you want to check appears.
5. Press ► EXIT 4 times to return to the Home screen.

```

LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
    
```

Press ► EDIT

```

RELAY OUTPUTS
SWITCH INPUTS
SWITCH PILOTS
EXIT
    
```

Press ► SWITCH INPUTS

```

LOCAL INPUTS
LIGHT-SYNC INPUTS
EXIT
    
```

Press ► LOCAL INPUTS

```

SWITCH INPUT STATUS
SWITCH INPUT OPTIONS
INPUT/RELAY CONTROL
EXIT
    
```

Press ► SWITCH INPUT STATUS

```

HOLD ◀ INPUT 01
SCAN   ON:OPEN
        OFF:OPEN
EXIT
    
```

Press ▲ or ▼ to scroll inputs

```

HOLD ◀ INPUT 06
SCAN   ON:OPEN
        OFF:OPEN
EXIT
    
```

How to Control a Relay or Relay Group of Relays With a Switch

CONCEPTS AND PARAMETERS

To control a relay with a switch, you must:

1. Define the selected switch input.
2. Select the relay output or relay group that the switch controls.
3. Define how the switch will control the relay.

NOTE: The LightMaster Controller input can accept dry contact inputs from 3-wire SPDT momentary contact switches or 2-wire momentary and maintained contact switches. (See Figure 3.4.)

Parameter Key:

SWITCH INPUT OPTIONS:

INPUT = 1 of 48 possible controller switch inputs

TYPE = switch type (Default is MOM. ON/OFF; see Table 3.3 for a list of possible switch types.)

RELAY = 1 of 48 possible controller relay outputs.

RELAY GROUP = a user-defined group of relay outputs that will react as a group to a switch or timer signal.

ACTION = how the switch actuation will affect the relay. (Default is NO ACTION.) Other possible responses are ON ONLY, OFF ONLY, ON AND OFF, BLINK ALERT.

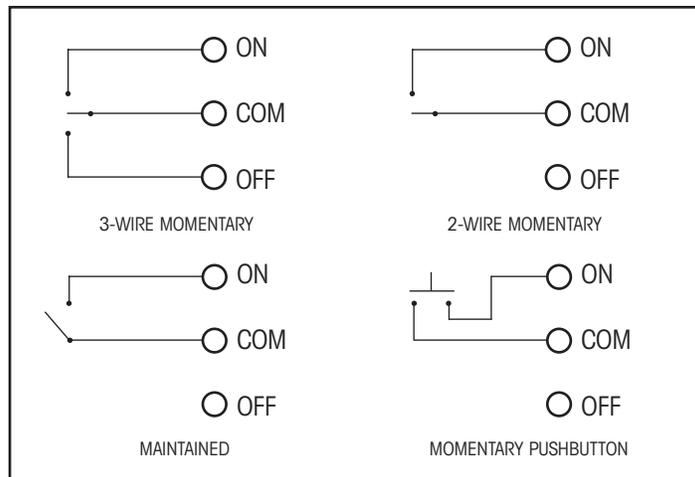


Figure 3.4 - Dry Contact Input Types

Type	Physical	Operation
Momentary ON/OFF (default type)	3-wire momentary	Momentary contact between ON and COMMON turns controlled relay outputs ON. Momentary contact between OFF and COMMON turns controlled relay outputs OFF.
Momentary Pushbutton	2-wire momentary	Momentary contact between ON and COMMON turns controlled relays ON and OFF alternately each time contact is made.
Maintained ON/OFF	2-wire maintained	When contact between ON and COMMON are made, controlled relays turn ON. When contact is broken, controlled relays turn OFF.
Maintained Multi-way	2-wire maintained	When contact is made or broken between ON and COMMON, the controlled relays will toggle from ON to OFF or OFF to ON; similar to conventional 3-way switching.
Set Preset	2-wire momentary	When momentary contact between ON and COMMON is made, the controlled relay outputs will go to their programmed states.
Timed ON	2- or 3-wire momentary	Contact between ON and COMMON will turn relay outputs on for a programmed time. At the end of this time the controlled relays will turn OFF. Contact between OFF and Common will turn relays OFF.
HID Bi-Level	3-wire momentary	The first contact between ON and COMMON turns the ON/OFF ballast relay ON and the HIGH/LOW ballast relay HIGH (NC default) or Low (NO default) and locks them in this position for a 15-minute warm-up period. Subsequent contact closures between ON and COMMON toggle between HIGH and LOW. Contact between OFF and COMMON locks both the ON/OFF and HIGH/LOW ballast relays OFF for 15 minutes.
2-Step Group	2-wire momentary	Upon switch activation, Group A relays turn ON and Group B turn OFF. The following activation causes Group A to turn OFF and Group B to turn ON. The pattern repeats with each switch activation.
4-Step Group	2-wire momentary	On the first activation, Group A relays turn ON and Group B turn OFF. On the second activation, Group A turns OFF and B turns ON. The third activation causes both A and B to go ON. On the fourth activation, both A and B go OFF. Then the pattern repeats.
Input Disable	2-wire maintained	As long as the switch is closed, other selected inputs are disabled.
Timer Disable	2-wire maintained	As long as the switch is closed, selected timers are disabled.
Output Override	2-wire maintained	When the switch is closed, selected relay(s) will go to the programmed ON, OFF, or NO CONTROL status; other signals are ignored until the switch is open.
Force Timer	2-wire maintained	The switch closure will trigger the selected timer.

Table 3.3 – LightMaster Switch Types

SAMPLE OPERATION:

Control a Single Relay Output With a Switch

Define the Switch Input:

1. From the Home screen, press ► EDIT.
2. When the Main menu appears, press ► SWITCH INPUTS; then press ► LOCAL INPUTS.
3. From the Switch Input menu, press ► SWITCH INPUT OPTIONS.
4. When the Switch Input Options screen appears, press ▲ or ▼ until the switch input you want to define appears.
5. Press ► TYPE; then press ▲ or ▼ until the desired switch type appears.
6. Press ► EXIT to return to the Switch Input menu.

```

LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
    
```

Press ► EDIT

```

RELAY OUTPUTS
SWITCH INPUTS
SWITCH PILOTS
EXIT
    
```

Press ► SWITCH INPUTS

```

LOCAL INPUTS
LIGHT-SYNC INPUTS
EXIT
    
```

Press ► LOCAL INPUTS

```

SWITCH INPUT STATUS
SWITCH INPUT OPTIONS
INPUT/RELAY CONTROL
EXIT
    
```

Press ► SWITCH INPUT OPTIONS

```

INPUT ◀ INPUT: 01 ▲
TYPE    MOM. ON/OFF ▼
EXIT
    
```

Press ▲ or ▼ to scroll inputs

```

INPUT ◀ INPUT: 06 ▲
TYPE    MOM. ON/OFF ▼
EXIT
    
```

Press ► TYPE, then ▲ or ▼ to scroll types

```

INPUT ◀ INPUT: 06 ▲
TYPE ◀ MNT. ON/OFF ▼
EXIT
    
```

Press ► EXIT to return to SWITCH INPUT

```

SWITCH INPUT STATUS
SWITCH INPUT OPTIONS
INPUT/RELAY CONTROL
EXIT
    
```

SAMPLE OPERATION:

Control a Single Relay Output With a Switch

Select the relay to be controlled:

1. From the Local Switch Input Menu, press ► INPUT/RELAY CONTROL.
2. When the Single Relay/Relay Groups Control menu appears, press ► INPUT/ SINGLE RELAYS.
3. When the Input/Relay Control Screen appears, press ▲ or ▼ until the input you are programming appears in the INPUT field.
4. Press ► RELAY; then press ▲ or ▼ until the relay to be controlled appears in the RELAY field.
5. Press ► ACTION; then press ▲ or ▼ until the desired switch action appears.
6. Press ► EXIT 5 times to return to the Home screen.

```

SWITCH INPUT STATUS
SWITCH INPUT OPTIONS
INPUT/RELAY CONTROL
EXIT
    
```

Press ► INPUT/RELAY CONTROL

```

INPUT/SINGLE RELAYS
INPUT/RELAY GROUPS
EXIT
    
```

Press ► INPUT/SINGLE RELAYS

```

INPUT ◀ INPUT 01 ▲
RELAY RELAY 01 ↗
ACTION ON AND OFF ↘
EXIT MOM ON/OFF ▼
    
```

Press ▲ or ▼ to scroll inputs

```

INPUT ◀ INPUT 03 ▲
RELAY RELAY 01 ↗
ACTION ON AND OFF ↘
EXIT MOM ON/OFF ▼
    
```

Press ► RELAY, then ▲ or ▼ to scroll

```

INPUT INPUT 03 ▲
RELAY ◀ RELAY 03 ↗
ACTION ON AND OFF ↘
EXIT MOM ON/OFF ▼
    
```

Press ► ACTION, then ▲ or ▼ to scroll

```

INPUT INPUT 03 ▲
RELAY RELAY 03 ↗
ACTION ◀ ON AND OFF ↘
EXIT MOM ON/OFF ▼
    
```

Press ► EXIT 5 times to return HOME

```

LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT (C)2004 ILC
    
```

SAMPLE OPERATION:

Control a Relay Group With a Switch

Define the Switch Input:

1. From the Home screen, press ► EDIT.
2. When the Main menu appears, press ► SWITCH INPUTS; then press ► LOCAL INPUTS.
3. From the Switch Input menu, press ► SWITCH INPUT OPTIONS.
4. When the Switch Input Options screen appears, press ▲ or ▼ until the switch input you want to define appears.
5. Press ► TYPE; then press ▲ or ▼ until the desired switch type appears.
6. Press ► EXIT to return to the Switch Input menu.

```

LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
    
```

Press ► EDIT

```

RELAY OUTPUTS
SWITCH INPUTS
SWITCH PILOTS
EXIT
    
```

Press ► SWITCH INPUTS

```

LOCAL INPUTS
LIGHT-SYNC INPUTS
EXIT
    
```

Press ► LOCAL INPUTS

```

SWITCH INPUT STATUS
SWITCH INPUT OPTIONS
INPUT/RELAY CONTROL
EXIT
    
```

Press ► SWITCH INPUT OPTIONS

```

INPUT ◀ INPUT: 01 ▲
TYPE    MOM. ON/OFF ▼
EXIT
    
```

Press ▲ or ▼ to scroll inputs

```

INPUT ◀ INPUT: 06 ▲
TYPE    MOM. ON/OFF ▼
EXIT
    
```

Press ► TYPE, then ▲ or ▼ to scroll types

```

INPUT ◀ INPUT: 06 ▲
TYPE ◀ MNT. ON/OFF ▼
EXIT
    
```

Press ► EXIT to return to SWITCH INPUT

```

SWITCH INPUT STATUS
SWITCH INPUT OPTIONS
INPUT/RELAY CONTROL
EXIT
    
```

SAMPLE OPERATION:

Control a Relay Group With a Switch

Select the relay group that you want the switch to control. **NOTE: Be sure the relay group you wish to control has been previously defined. (See Sample Operation – How to Define a Relay Group.)**

1. From the Switch Input menu, press ► INPUT/RELAY CONTROL.
2. When the Single Relay/Relay Groups Control menu appears, press ► INPUT/RELAY GROUPS.
3. When the Input/Relay Groups Control Screen appears, press ▲ or ▼ until the input you are programming appears in the Input field.
4. Press ► GROUP; then press ▲ or ▼ until the relay to be controlled appears in the Group field.
5. Press ► ACTION; then press ▲ or ▼ until the desired switch action appears.
6. Press ► EXIT 5 times to return to the Home screen.

```

SWITCH INPUT STATUS
SWITCH INPUT OPTIONS
INPUT/RELAY CONTROL
EXIT
    
```

Press ► INPUT/RELAY CONTROL

```

INPUT/SINGLE RELAYS
INPUT/RELAY GROUPS
EXIT
    
```

Press ► INPUT/RELAY GROUPS

```

INPUT ◀ INPUT 01 ▲
GROUP   GROUP 01 ▲
ACTION  ON AND OFF ▼
EXIT    MOM ON/OFF ▼
    
```

Press ▲ or ▼ to scroll inputs

```

INPUT ◀ INPUT 03 ▲
GROUP   GROUP 01 ▲
ACTION  ON AND OFF ▼
EXIT    MOM ON/OFF ▼
    
```

Press ► GROUP, then ▲ or ▼ to scroll

```

INPUT   INPUT 03 ▲
GROUP ◀ GROUP 02 ▲
ACTION  ON AND OFF ▼
EXIT    MOM ON/OFF ▼
    
```

Press ► ACTION, then ▲ or ▼ to scroll

```

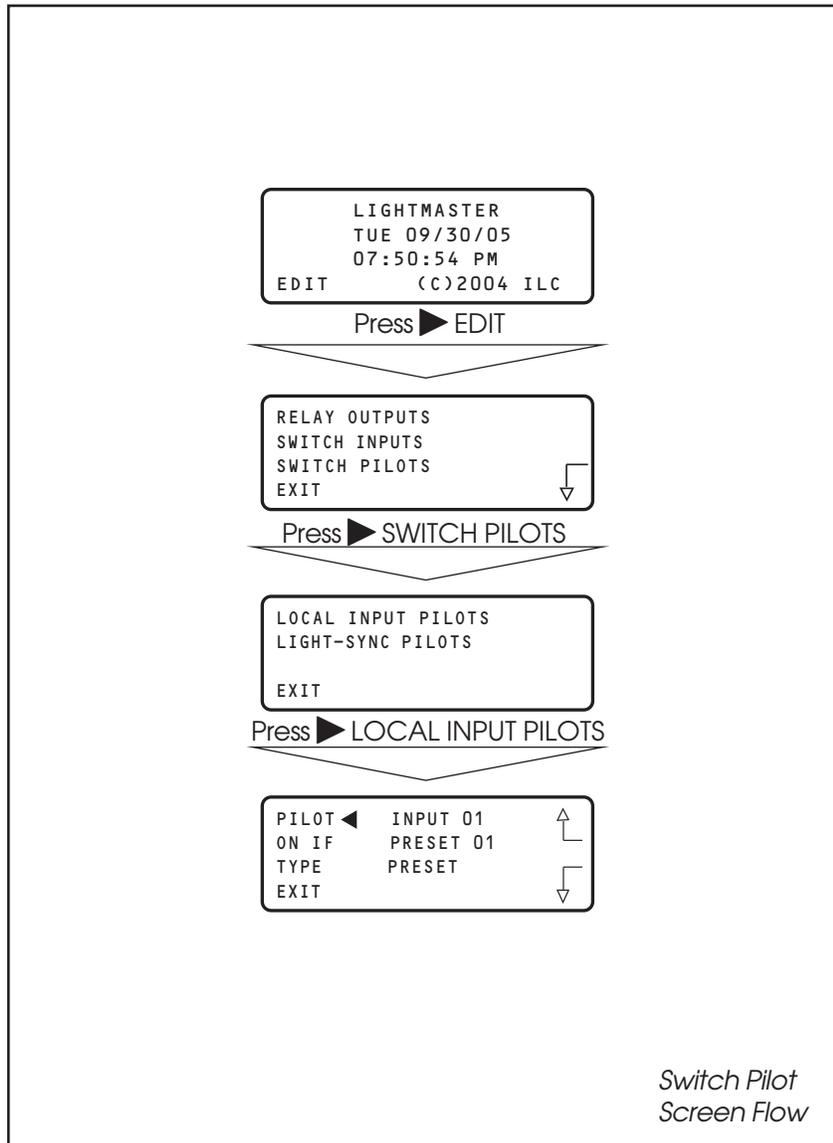
INPUT   INPUT 03 ▲
GROUP   GROUP 02 ▲
ACTION ◀ ON AND OFF ▼
EXIT    MOM ON/OFF ▼
    
```

Press ► EXIT 5 times to return HOME

```

LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT          (C)2004 ILC
    
```

3.5 Switch Pilot Operation – Fast Track



How to Define a Switch Pilot

CONCEPTS AND PARAMETERS

To define a switch pilot, you must:

1. Select the input whose Local Input Pilot status LED is to light.
2. Select the relay output, relay group or preset that is to light the selected status LED.

NOTE: Local switch pilots refer to switch pilot lights located on the controller's I/O board(s).

Parameter Key:

PILOT = the number of the switch input pilot (1-48).

ON IF = the number of the relay, relay group, or preset that will actuate the switch pilot (1-48).

TYPE = the type of actuator: relay output, group, or preset.

Note: The default is for the switch pilot to light with the corresponding relay status output LED lights.

SAMPLE OPERATION:

Program a Status LED to Light When a Preset Is ON

1. From the Home screen, press ► EDIT.
2. When the Main menu appears, press ► SWITCH PILOTS; then press ► LOCAL INPUT PILOTS.
3. From the Status Definition screen, press ▲ or ▼ to select the input.
4. Press ► TYPE until PRESET appears.
5. Press ► ON IF and then ▲ or ▼ until the desired preset appears.
6. Press ► EXIT 3 times to return to the Home screen.

```

RELAY OUTPUTS
SWITCH INPUTS
SWITCH PILOTS
EXIT
    
```

Press ► SWITCH PILOTS

```

LOCAL INPUT PILOTS
LIGHT-SYNC PILOTS
EXIT
    
```

Press ► LOCAL INPUT PILOTS

```

PILOT ◀ INPUT 01
ON IF   PRESET 01
TYPE   PRESET
EXIT
    
```

Press ▲ or ▼ to select input

```

PILOT ◀ INPUT 01
ON IF   PRESET 01
TYPE   PRESET
EXIT
    
```

Press ► TYPE until PRESET appears

```

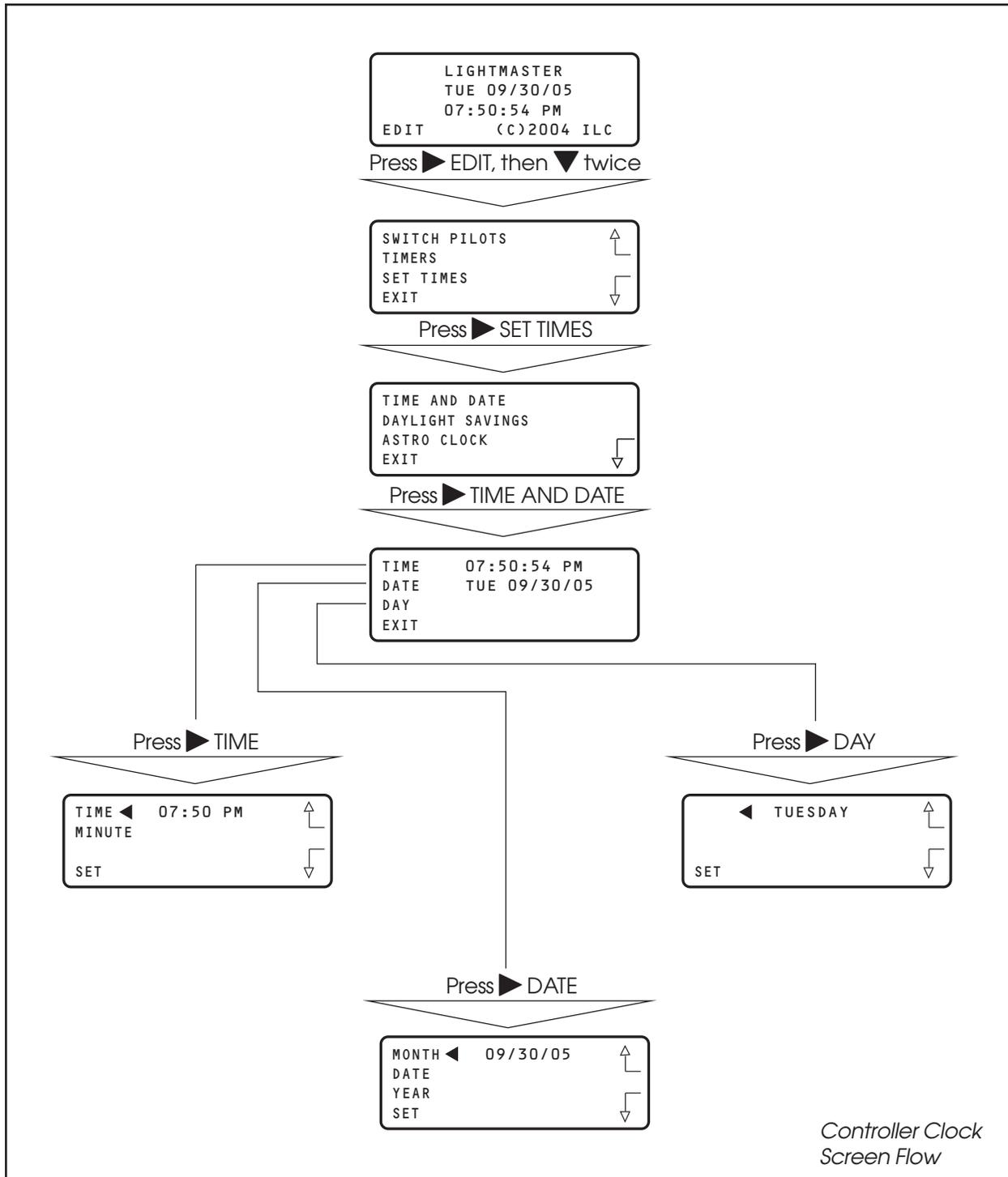
PILOT   INPUT 03
ON IF   PRESET 01
TYPE ◀  PRESET
EXIT
    
```

Press ► ON IF then ▲ or ▼

```

PILOT   INPUT 03
ON IF ◀ PRESET 03
TYPE   PRESET
EXIT
    
```

3.6 How to Set the Controller Clock – Fast Track



How to Set the Controller Clock

Setting the controller clock to the proper time and date is fundamental to the execution of all time-based operations.

1. From the Home screen, press ► EDIT; then press ▼ twice.
2. From the Main menu, press ► SET TIMES.
3. From the Set Times menu, press ► TIME AND DATE.
4. From the Time/Date menu, press ► TIME.
5. When the Time Setting screen appears, press ▲ or ▼ until the proper hour is displayed. Be sure that AM/PM setting is correct.
6. Press ► MINUTE; then press ▲ or ▼ until the correct minute is displayed.
7. Press ► SET to return to the Time/Date menu.
8. Press ► DATE.
9. MONTH is displayed; then press ▲ or ▼ until the correct month is displayed.
10. Press ► DATE; then press ▲ or ▼ until the correct day of the month is displayed.
11. Press ► YEAR; then press ▲ or ▼ until the correct year is displayed.
12. Press ► SET to return to the Time/Date menu.
13. Press ► DAY; then press ▲ or ▼ until the correct day of the week is displayed.
14. Press ► SET to return to the Time/Date menu.
15. Press ► EXIT 3 times to return to the Home screen.

```

LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
    
```

Press ► EDIT, then press ▼ twice

```

SWITCH PILOTS
TIMERS
SET TIMES
EXIT
    
```

Press ► SET TIMES

```

TIME AND DATE
DAYLIGHT SAVINGS
ASTRO CLOCK
EXIT
    
```

Press ► TIME AND DATE

```

TIME      07:50:54 PM
DATE     TUE 9/30/05
DAY
EXIT
    
```

Press ► TIME, then ▲ or ▼

```

HOUR ◀ 07:50 PM
MINUTE
SET
    
```

Press ► MINUTE, then ▲ or ▼

```

HOUR      07:50 PM
MINUTE ◀
SET
    
```

Press ► SET

```

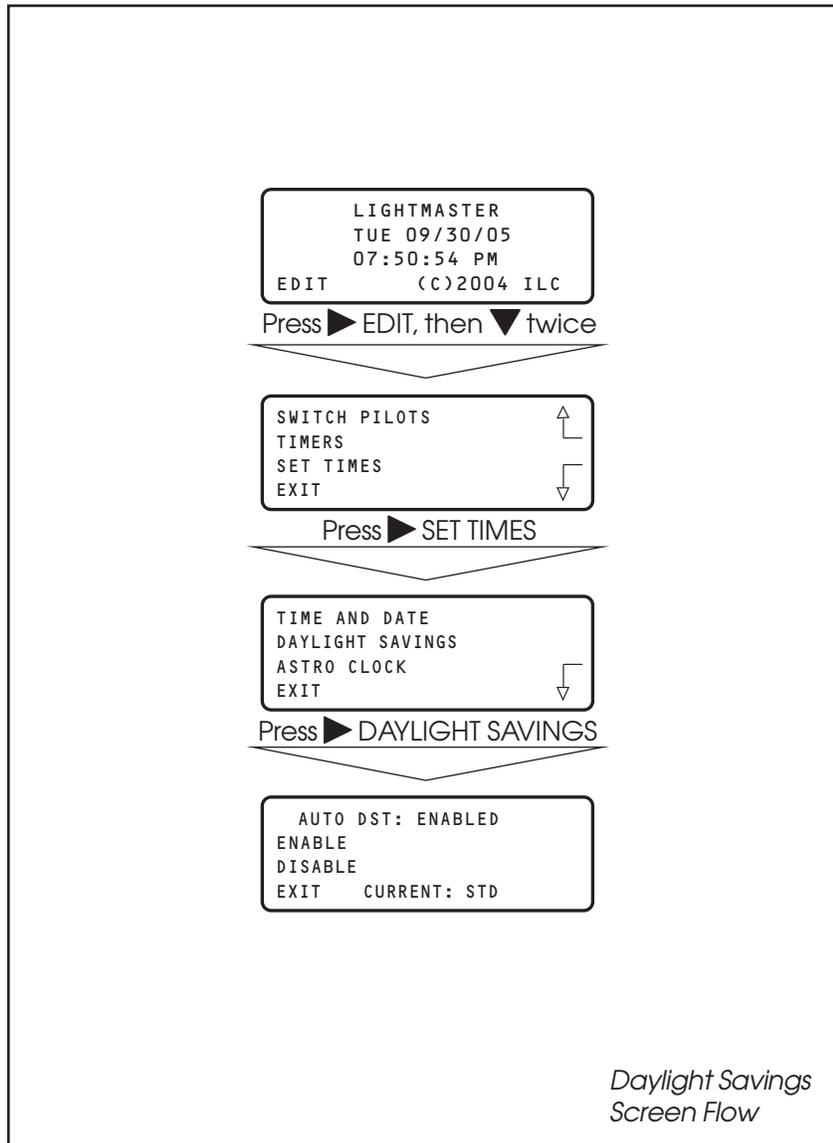
TIME      07:50:54 PM
DATE     TUE 9/30/05
DAY
EXIT
    
```

Press ► EXIT 3 times

```

LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
    
```

3.7 Disable Daylight Savings Time – Fast Track



How to Enable and Disable Daylight Savings

The LightMaster is defaulted for automatic changeover between standard and daylight savings time. If the controller is in an area that doesn't observe daylight savings, you can disable this feature.

1. From the Home screen, press ► EDIT; then press ▼ twice.
2. From the Main menu, press ► SET TIMES.
3. From the Set Times menu, press ► DAYLIGHT SAVINGS.
4. When the Daylight Savings screen appears, press ► DISABLE.
5. Press ► EXIT 3 times to return to the Home screen.

```
LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
```

Press ► EDIT, then press ▼ twice

```
SWITCH PILOTS
TIMERS
SET TIMES
EXIT
```

Press ► SET TIMES

```
TIME AND DATE
DAYLIGHT SAVINGS
ASTRO CLOCK
EXIT
```

Press ► DAYLIGHT SAVINGS

```
AUTO DST: ENABLED
ENABLE
DISABLE
EXIT  CURRENT: STD
```

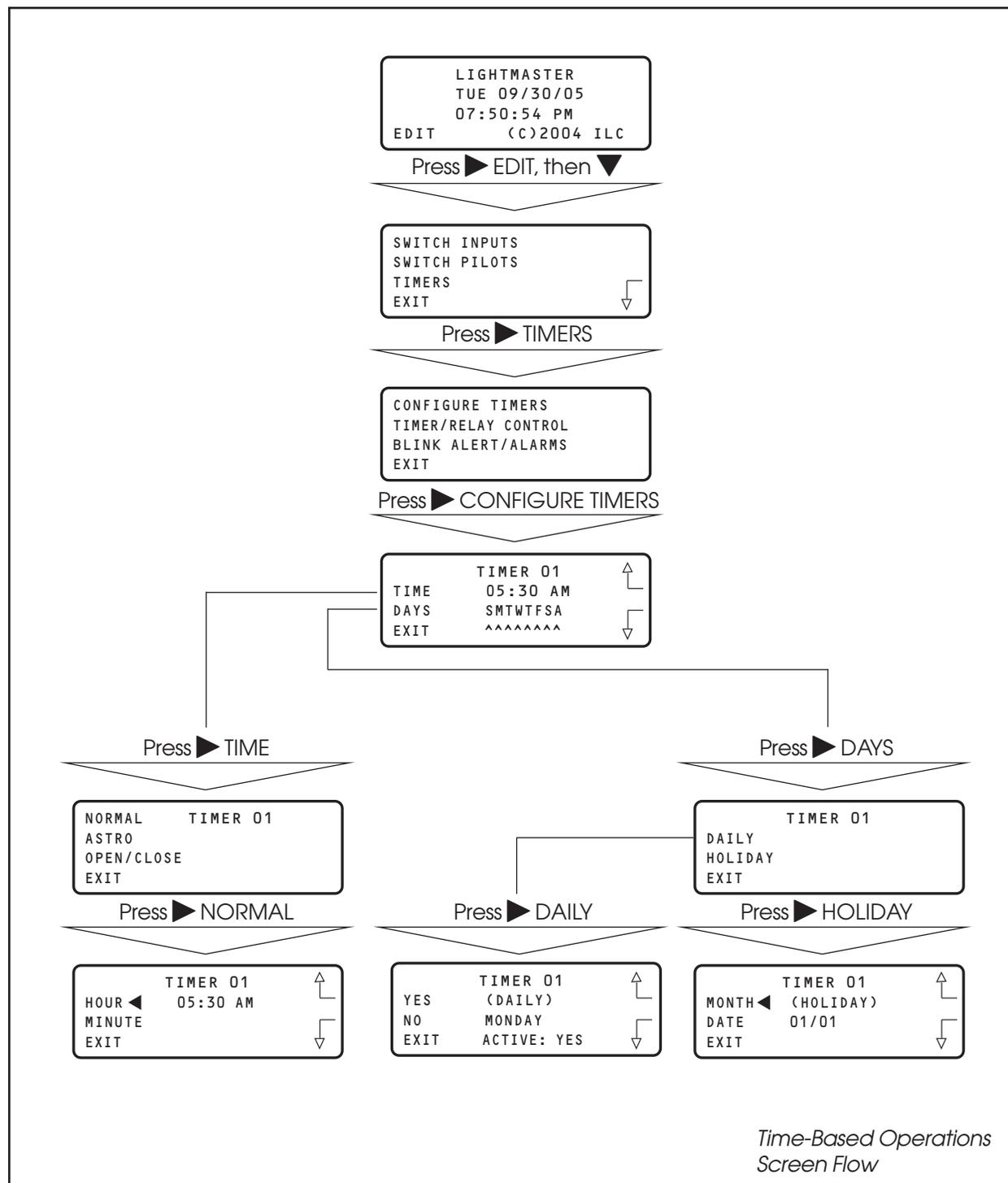
Press ► DISABLE

```
AUTO DST: DISABLED
ENABLE
DISABLE
EXIT  CURRENT: STD
```

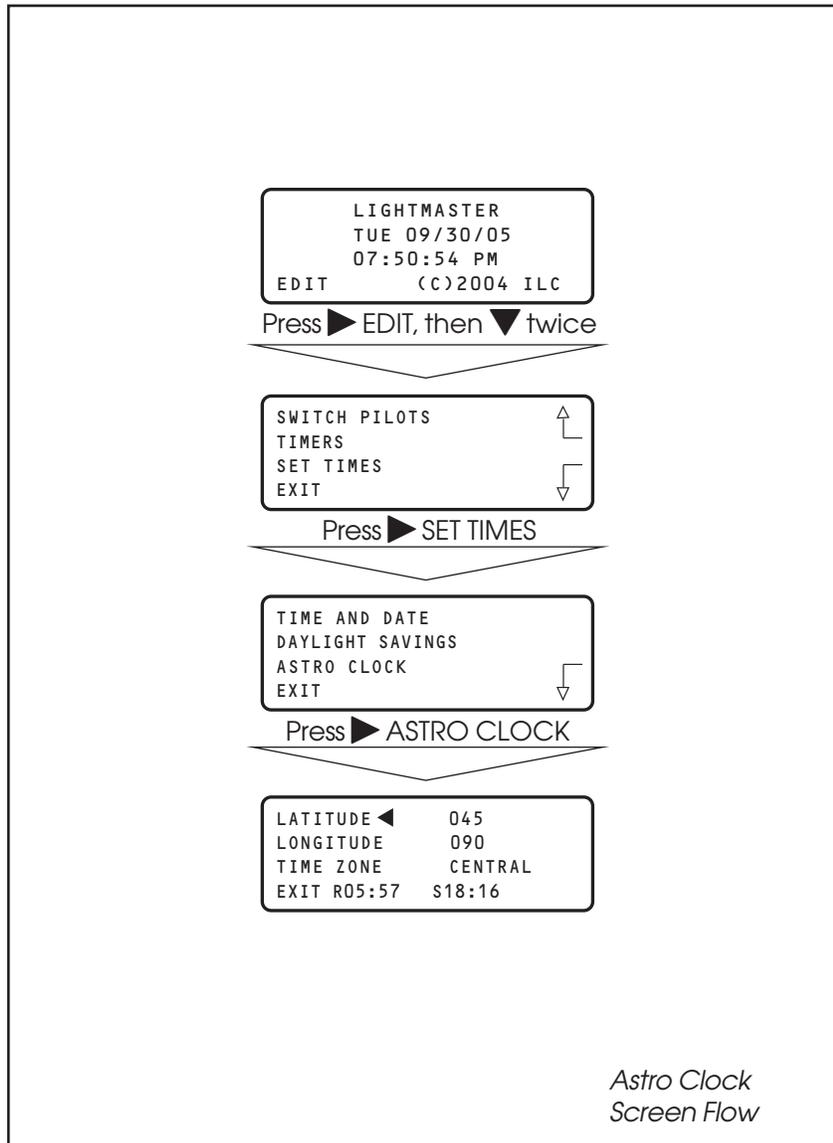
Press ► EXIT 3 times

```
LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
```

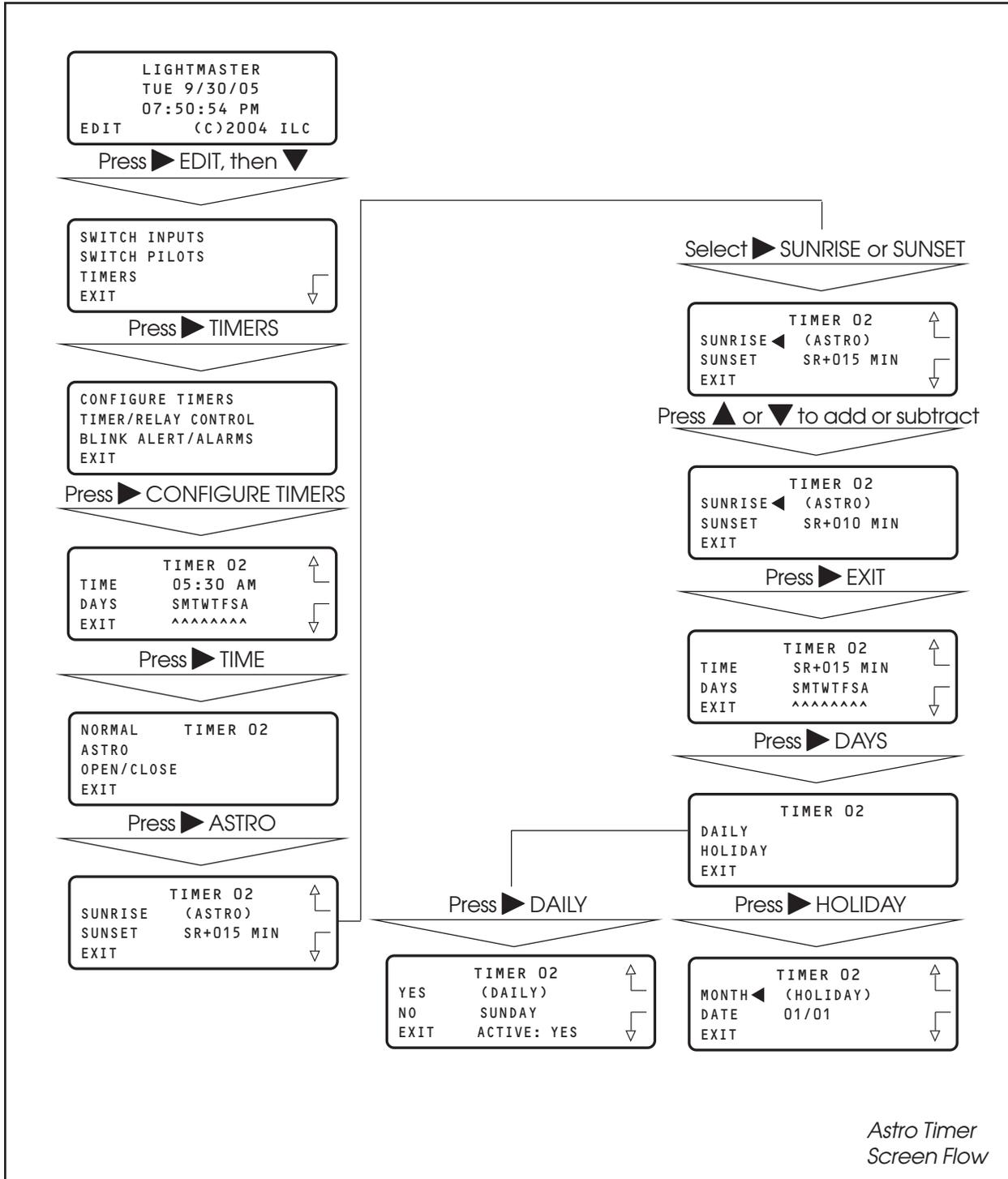
3.8 Time-Based Operations: How to Define a Normal Timer – Fast Track



Time-Based Operations: How to Set the Astro Clock Parameters – Fast Track

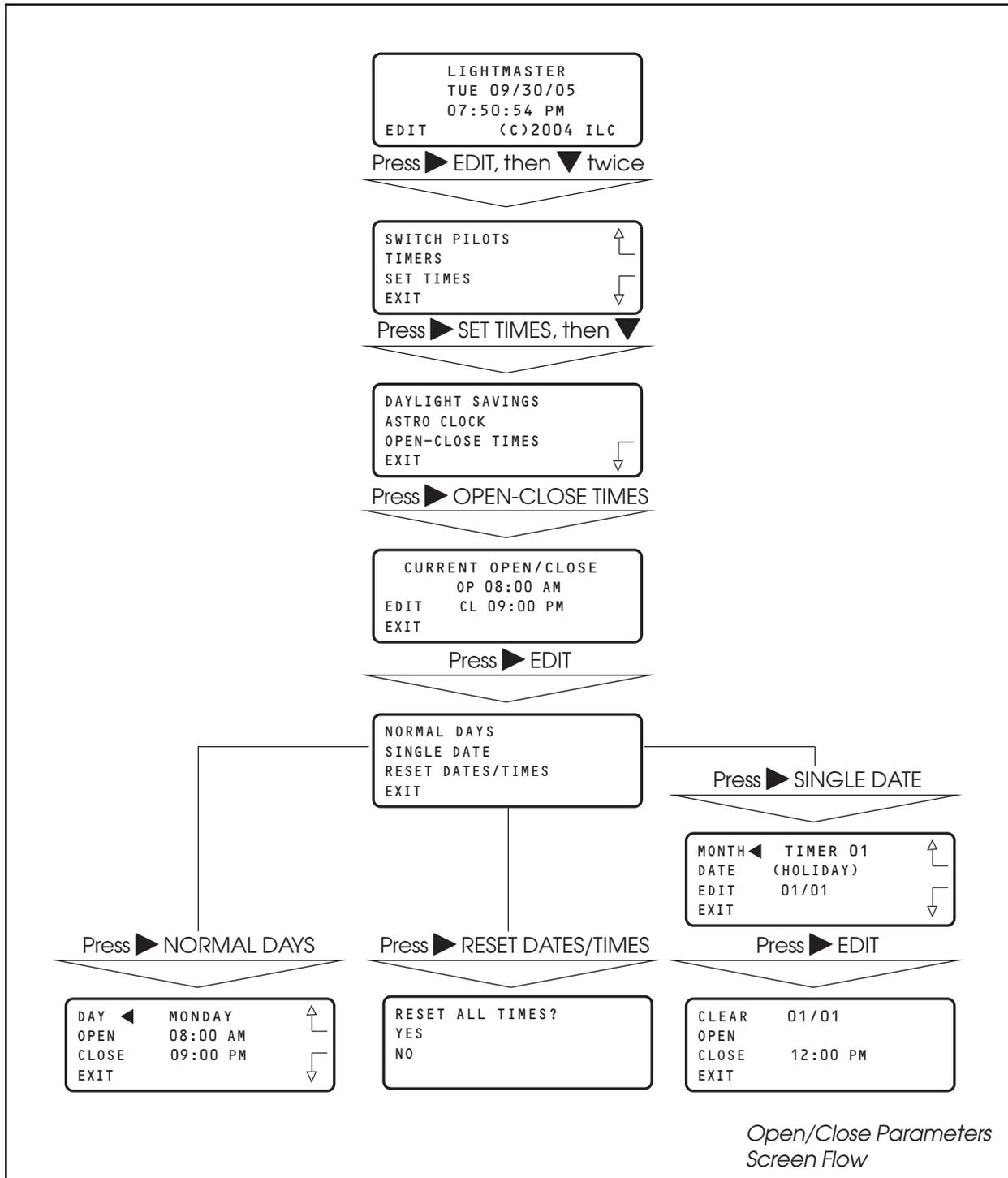


Time-Based Operations: How to Define an Astro Timer – Fast Track

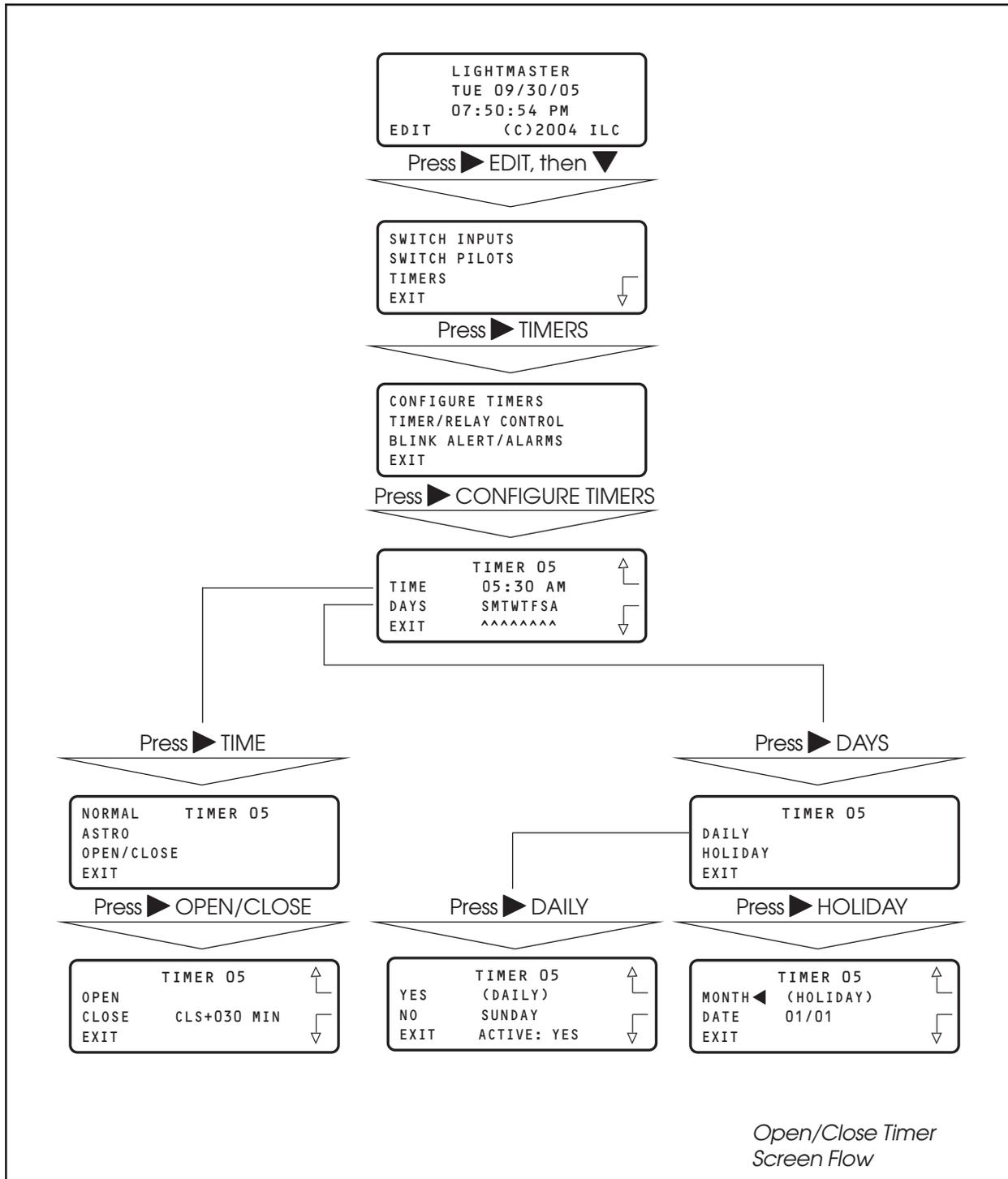


Programming

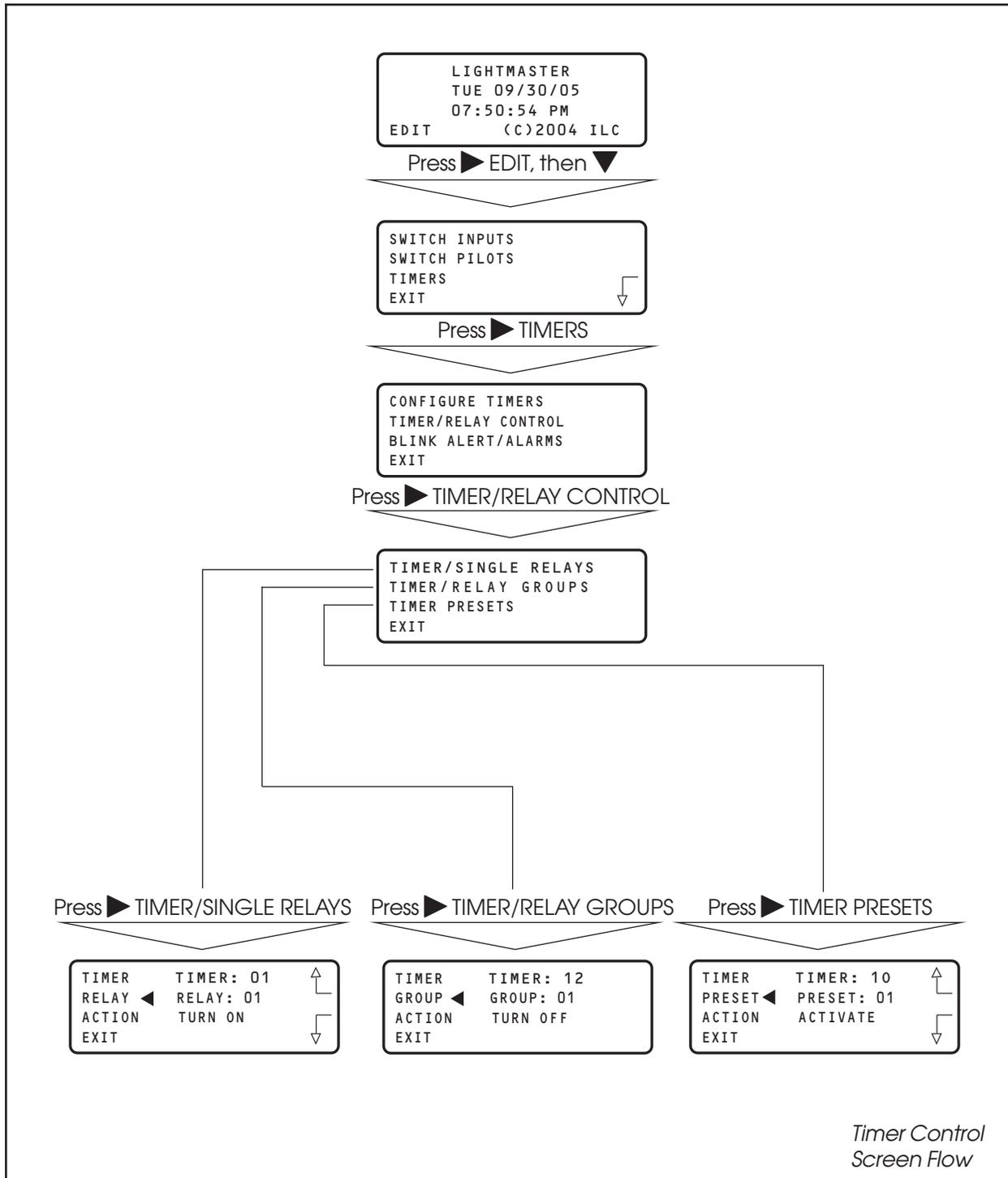
Time-Based Operations: How to Set Open/Closed Parameters – Fast Track



Time-Based Operations: How to Define an Open/Close Timer – Fast Track



Time-Based Operations: How to Control a Relay, Relay Group or a Preset With a Timer – Fast Track



Time-Based Operations

CONCEPTS AND PARAMETERS

You can program the LightMaster Controller to control a single relay output, a relay group, or a preset according to a time-based schedule. (A preset is a user-defined group of relays programmed to assume a predetermined ON/OFF pattern when invoked. Presets will be discussed later in more detail.)

Time-based control involves:

1. Defining the timer and any associated parameters.
2. Programming how the timer impacts the selected relay, relay group, or preset.

NOTE: You will need the latitude and longitude for your location in order to define an Astro Timer. A listing of latitudes and longitudes for many major US cities is provided in Appendix O.

NOTE: Refer to Table 3.1 for special Timer Output choices (Blink, HID Delay, and Alarm settings).

Parameter Key:

TIMER = 1 of up to 48 time-based events that impact relays, relay groups, or presets. A NORMAL timer executes its function according to standard AM/PM time. This is the default timer type. An ASTRO timer operates in relation to sunrise or sunset. An OPEN/CLOSE Timer is keyed to user-entered facility open and close times. (Both ASTRO and OPEN/CLOSE Timers can be programmed to occur at exactly sunrise/sunset open/close or offset either before or after these times.) OPEN/CLOSE Timers can be keyed to different OPEN/CLOSE times. For example, weekday hours as opposed to weekend hours. An OPEN/CLOSE Timer can also be programmed to execute on a specific date.

RELAY = 1 of 48 available relay outputs impacted by the timers.

RELAY GROUP = 1 of 48 available user-defined groups of relay outputs that respond as a group to a timer.

PRESET = 1 of 48 available user-defined ON/OFF relay output patterns activated by a timer.

ACTION = how the timer will impact the relay output, relay group, or preset. The default is NO ACTION. (The timer has no effect on the relay, relay group, or preset.) Other possible entries are:

- TURN ON** (used with relays and relay groups)
- TURN OFF** (used with relays and relay groups)
- ACTIVATE** (used with presets)

SAMPLE OPERATION: Program a Normal Timer

Define the Normal Timer:

1. From the Home screen, press ► EDIT; then press ▼.
2. From the Main menu, press ► TIMERS.
3. When the Timer menu appears, press ► CONFIGURE TIMERS.
4. When the Timer Definition screen appears, press ▲ or ▼ until the timer you want to program appears in the Timer field.
5. Press ► TIME; then when the Timer Type menu appears, press ► NORMAL.
6. When the Set Time screen appears, press ► HOUR, then press ▲ or ▼ until the hour for the timer to occur appears.
7. Press ► MINUTE; then press ▲ or ▼ until the correct time appears on the screen.
8. Press ► EXIT to return to the Timer Definition screen.
9. Press ► DAYS; when the Day menu appears, press ► DAILY.
10. When the Day Choice screen appears, press ▲ or ▼ and then press ► YES or ► NO to include or exclude each day from the timer operation.
11. Press ► EXIT 2 times to return to the Timer menu.

```

CONFIGURE TIMERS
TIMER/RELAY CONTROL
BLINK ALERT/ALARMS
EXIT
    
```

Press ► CONFIGURE TIMERS

```

TIMER 01
TIME    05:30 AM
DAYS    SMTWTFSA
EXIT    ^^^^^^^^
    
```

Press ► TIME

```

NORMAL   TIMER 01
ASTRO
OPEN/CLOSE
EXIT
    
```

Press ► NORMAL, then ► HOUR

```

TIMER 01
HOUR    05:30 AM
MINUTE
EXIT
    
```

Press ► MINUTE

```

TIMER 01
HOUR    05:30 AM
MINUTE
EXIT
    
```

Press ► EXIT to continue

```

TIMER 01
TIME    05:30 AM
DAYS    SMTWTFSA
EXIT    ^^^^^^^^
    
```

Press ► DAYS

```

TIMER 01
DAILY
HOLIDAY
EXIT
    
```

Press ► DAILY

```

TIMER 01
YES     (DAILY)
NO      MONDAY
EXIT    ACTIVE: YES
    
```

SAMPLE OPERATION:
Program a Normal Timer for a Holiday

Define the Normal Timer:

1. From the Home screen, press ► EDIT; then press ▼.
2. From the Main menu, press ► TIMERS.
3. When the Timer menu appears, press ► CONFIGURE TIMERS.
4. When the Timer Definition screen appears, press ▲ or ▼ until the timer you want to program appears in the Timer field.
5. Press ► TIME; then when the Timer Type menu appears, press ► NORMAL.
6. When the Set Time screen appears, press ► HOUR; then press ▲ or ▼ until the hour for the timer to occur appears.
7. Press ► MINUTE; then press ▲ or ▼ until the correct time appears on the screen.
8. Press ► EXIT to return to the Timer Definition screen.
9. Press ► DAYS; when the Day menu appears, press ► HOLIDAY.
10. Press ► MONTH; then press ▲ or ▼ until the desired month appears on the screen.
11. Press ► DATE; then press ▲ or ▼ until the desired date appears on the screen.
12. Press ► EXIT to return to the TIMER menu.

```

CONFIGURE TIMERS
TIMER/RELAY CONTROL
BLINK ALERT/ALARMS
EXIT
    
```

Press ► CONFIGURE TIMERS

```

TIMER 01
TIME 05:30 AM
DAYS SMTWTFSA
EXIT ^^^^^^^
    
```

Press ► TIME

```

NORMAL TIMER 01
ASTRO
OPEN/CLOSE
EXIT
    
```

Press ► NORMAL, then ► HOUR

```

TIMER 01
HOUR 05:30 AM
MINUTE
EXIT
    
```

Press ► MINUTE

```

TIMER 01
HOUR 05:30 AM
MINUTE
EXIT
    
```

Press ► EXIT to continue

```

TIMER 01
TIME 05:30 AM
DAYS SMTWTFSA
EXIT ^^^^^^^
    
```

Press ► DAYS

```

TIMER 01
DAILY
HOLIDAY
EXIT
    
```

Press ► HOLIDAY

```

TIMER 01
MONTH (HOLIDAY)
DATE 01/01
EXIT
    
```

SAMPLE OPERATION:
Program an Astro Timer (2 steps)

Step 1: Enter the Astro Clock Parameters:

1. From the Home screen, press ► EDIT; then press ▼ twice.
2. From the Main menu, press ► SET TIMES.
3. From the Set Times menu, press ► ASTRO CLOCK.
4. When the Astro Clock screen appears, press ▲ or ▼ until the proper latitude appears.
5. Press ► LONGITUDE; then press ▲ or ▼ until the proper longitude appears.
6. Press ► TIME ZONE; then press ▲ or ▼ until the proper time zone appears.
7. Press ► EXIT 3 times to return to the Home screen.

NOTE: The current sunrise and sunset times for the global coordinates selected appear at the bottom of the Astro Clock screen (R and S). (The default coordinates are for Minneapolis, Minnesota.)

```

LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
    
```

Press ► EDIT, then ▼ twice

```

SWITCH PILOTS
TIMERS
SET TIMES
EXIT
    
```

Press ► SET TIMES

```

TIME AND DATE
DAYLIGHT SAVINGS
ASTRO CLOCK
EXIT
    
```

Press ► ASTRO CLOCK

```

LATITUDE ◀ 045
LONGITUDE 090
TIME ZONE  CENTRAL
EXIT R05:57 S18:16
    
```

Press ► LONGITUDE

```

LATITUDE 045
LONGITUDE ◀ 090
TIME ZONE  CENTRAL
EXIT R05:57 S18:16
    
```

Press ► TIME ZONE

```

LATITUDE 045
LONGITUDE ◀ 090
TIME ZONE ◀ CENTRAL
EXIT R05:57 S18:16
    
```

Press ► EXIT 3 times

```

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EDIT      (C)2004 ILC
    
```

SAMPLE OPERATION:
Program an Astro Timer (2 steps)

Step 2: Define the Astro Timer:

1. From the Home screen, press ► EDIT; then press ▼.
2. From the Main menu, press ► TIMERS.
3. When the Timer menu appears, press ► CONFIGURE TIMERS.
4. When the Timer Definition screen appears, press ▲ or ▼ until the timer you want to program appears in the Timer field.
5. Press ► TIME; then when the Timer Type menu appears, press ► ASTRO.
6. When the Astro Time Set screen appears, press either ► SUNRISE (to set the time in relation to sunrise) or ► SUNSET (to key the timer to sunset). If you want to offset the time, press either ▲ or ▼ until the desired offset appears on the screen. Then press ► EXIT to return to the Timer Definition screen.
7. Press ► DAYS; when the Day menu appears press ► DAILY.
8. When the Day Choice screen appears, press ▲ or ▼ and then ► YES or ► NO to include or exclude each day from the Timer operation.
9. Press ► EXIT 2 times to return to the TIMER menu.

```
SWITCH INPUTS
SWITCH PILOTS
TIMERS
EXIT
```

Press ► TIMERS

```
CONFIGURE TIMERS
TIMER/RELAY CONTROL
BLINK ALERT/ALARMS
EXIT
```

Press ► CONFIGURE TIMERS

```
TIMER 12
TIME 05:30 AM
DAYS SMTWTFS
EXIT ^^^^^^^
```

Press ► TIME

```
NORMAL TIMER 12
ASTRO
OPEN/CLOSE
EXIT
```

Press ► ASTRO

```
TIMER 12
SUNRISE (ASTRO)
SUNSET SR+015 MIN
EXIT
```

Press ► EXIT

```
TIMER 12
TIME SR+030 MIN
DAYS SMTWTFS
EXIT ^^^^^^^
```

Press ► DAYS

```
TIMER 12
DAILY
HOLIDAY
EXIT
```

Press ► DAILY

```
TIMER 12
YES (DAILY)
NO SUNDAY
EXIT ACTIVE: YES
```

SAMPLE OPERATION: Program an Open/Close Timer (2 steps)

Step 1: Define the Open/Close Parameters:

1. From the Home screen, press ► EDIT; then press ▼ twice.
2. From the Main menu, press ► SET TIMES.
3. From the Set Times menu, press ▼; then press ► OPEN-CLOSE TIMES.
4. When the top level Open/Close screen appears, press ► EDIT.
5. When the Open/Close Day menu appears, press ► NORMAL DAYS
6. When the Open/Close Time Setting screen appears, press ► OPEN; then press ▲ or ▼ to set the open time of the facility for the day that appears in the Day field.
7. Press ► CLOSE; then press ▲ or ▼ to set the close time of the facility for the day that appears in the Day field.
8. Press ► DAY to access the next day; then repeat steps 5 and 6 for that day.
9. After finishing setting all the open and close times for the facility, press ► EXIT 5 times to return to the Home screen.

```

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EDIT      (C)2004 ILC
    
```

Press ► EDIT, then ▼ twice

```

SWITCH PILOTS
TIMERS
SET TIMES
EXIT
    
```

Press ► SET TIMES, then ▼

```

DAYLIGHT SAVINGS
ASTRO CLOCK
OPEN-CLOSE TIMES
EXIT
    
```

Press ► OPEN-CLOSE TIMES

```

CURRENT OPEN/CLOSE
OP 08:00 AM
EDIT CL 09:00 PM
EXIT
    
```

Press ► EDIT

```

NORMAL DAYS
SINGLE DATE
RESET DATES/TIMES
EXIT
    
```

Press ► NORMAL DAYS

```

DAY ◀ MONDAY
OPEN 08:00 AM
CLOSE 09:00 PM
EXIT
    
```

Press ► OPEN

```

DAY MONDAY
OPEN ◀ 08:00 AM
CLOSE 09:00 PM
EXIT
    
```

Press ► CLOSE

```

DAY MONDAY
OPEN 08:00 AM
CLOSE ◀ 09:00 PM
EXIT
    
```

SAMPLE OPERATION:

Program an Open/Close Timer (2 steps)

Step 2: Define the Open/Close Timer:

1. From the Home screen, press ► EDIT; then press ▼.
2. From the Main menu, press ► TIMERS.
3. When the Timer menu appears, press ► CONFIGURE TIMERS.
4. When the Timer Definition screen appears, press ▲ or ▼ until the timer you want to program appears in the Timer field.
5. Press ► TIME; then when the Timer Type menu appears, press ► OPEN/CLOSE.
6. When the Open/Close Set screen appears, press either ► OPEN or ► CLOSE to tie the timer to either the facility opening or closing time. If you desire to offset the time, press ▲ or ▼ until the correct offset appears on the screen. Then press ► EXIT to return to the Timer Definition screen.
7. Press ► DAYS; when the Day menu appears, press ► DAILY.
8. When the Day Choice screen appears, press ▲ or ▼ and then ► YES or ► NO to include or exclude each day from the Timer operation.
9. Press ► EXIT 2 times to return to the TIMER menu.

```

SWITCH INPUTS
SWITCH PILOTS
TIMERS
EXIT
    
```

Press ► TIMERS

```

CONFIGURE TIMERS
TIMER/RELAY CONTROL
BLINK ALERT/ALARMS
EXIT
    
```

Press ► CONFIGURE TIMERS

```

TIMER 05
TIME      05:30 AM
DAYS      SMTWTFSA
EXIT      ^^^^^^^^
    
```

Press ► TIME

```

NORMAL    TIMER 05
ASTRO
OPEN/CLOSE
EXIT
    
```

Press ► OPEN/CLOSE

```

TIMER 05
OPEN
CLOSE    CLS+030 MIN
EXIT
    
```

Press ► EXIT

```

TIMER 05
TIME
DAYS      CLS+30 MIN
EXIT      ^^^^^^^^
    
```

Press ► DAYS

```

TIMER 05
DAILY
HOLIDAY
EXIT
    
```

Press ► DAILY

```

TIMER 05
YES      (DAILY)
NO       MONDAY
EXIT     ACTIVE:YES
    
```

SAMPLE OPERATION:

Program a Timer to Control a Single Relay

Program the Timer to Control the Relay:

1. From the Timer menu, press ► TIMER/RELAY CONTROL.
2. From the Timer Control menu, press ► TIMER/SINGLE RELAYS.
3. When the Timer/Relay Control screen appears, press ▲ or ▼ until the timer that you want to control the relay appears in the Timer field.
4. Press ► RELAY; then press ▲ or ▼ until the relay you want to be controlled by the timer appears in the Relay field.
5. Press ► ACTION; then press ▲ or ▼ until the way you want the timer to control the relay appears.
6. Press ► EXIT 4 times to return to the Home screen.

```

CONFIGURE TIMERS
TIMER/RELAY CONTROL
BLINK ALERT/ALARMS
EXIT
    
```

Press ► TIMER/RELAY CONTROL

```

TIMER/SINGLE RELAYS
TIMER/RELAY GROUPS
TIMER PRESETS
EXIT
    
```

Press ► TIMER/SINGLE RELAYS

```

TIMER ◀  TIMER: 01  ▲
RELAY    RELAY: 01  │
ACTION   TURN ON   ▼
EXIT
    
```

Press ► RELAY

```

TIMER    TIMER: 03  ▲
RELAY ◀  RELAY: 01  │
ACTION   TURN ON   ▼
EXIT
    
```

Press ► ACTION

```

TIMER    TIMER: 03  ▲
RELAY    RELAY: 02  │
ACTION ◀  TURN ON   ▼
EXIT
    
```

SAMPLE OPERATION:

Program a Timer to Control a Relay Group

Program the Timer to Control the Relay Group:

1. From the Timer menu, press ► TIMER/RELAY CONTROL.
2. From the Timer Control menu, press ► TIMER/RELAY GROUPS.
3. When the Timer/Relay Group Control screen appears, press ▲ or ▼ until the timer that you want to control the relay group appears in the Timer field.
4. Press ► GROUP; then press ▲ or ▼ until the relay group you want to be controlled by the timer appears in the Relay field.
5. Press ► ACTION; then press ▲ or ▼ until the way you want the timer to control the relay group appears.
6. Press ► EXIT 4 times to return to the Home screen.

```

CONFIGURE TIMERS
TIMER/RELAY CONTROL
BLINK ALERT/ALARMS
EXIT
    
```

Press ► TIMER/RELAY CONTROL

```

TIMER/SINGLE RELAYS
TIMER/RELAY GROUPS
TIMER PRESETS
EXIT
    
```

Press ► TIMER/RELAY GROUPS

```

TIMER ◀  TIMER: 12
GROUP    GROUP: 01
ACTION   TURN OFF
EXIT
    
```

Press ► GROUP

```

TIMER    TIMER: 12
GROUP ◀  GROUP: 01
ACTION   TURN OFF
EXIT
    
```

Press ► ACTION

```

TIMER    TIMER: 12
GROUP    GROUP: 01
ACTION ◀ TURN OFF
EXIT
    
```

Press ► EXIT 4 times

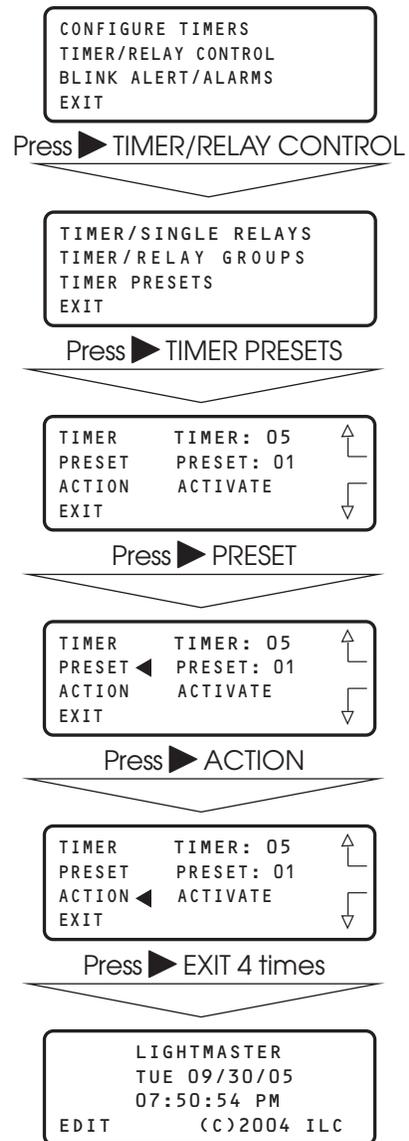
```

LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
    
```

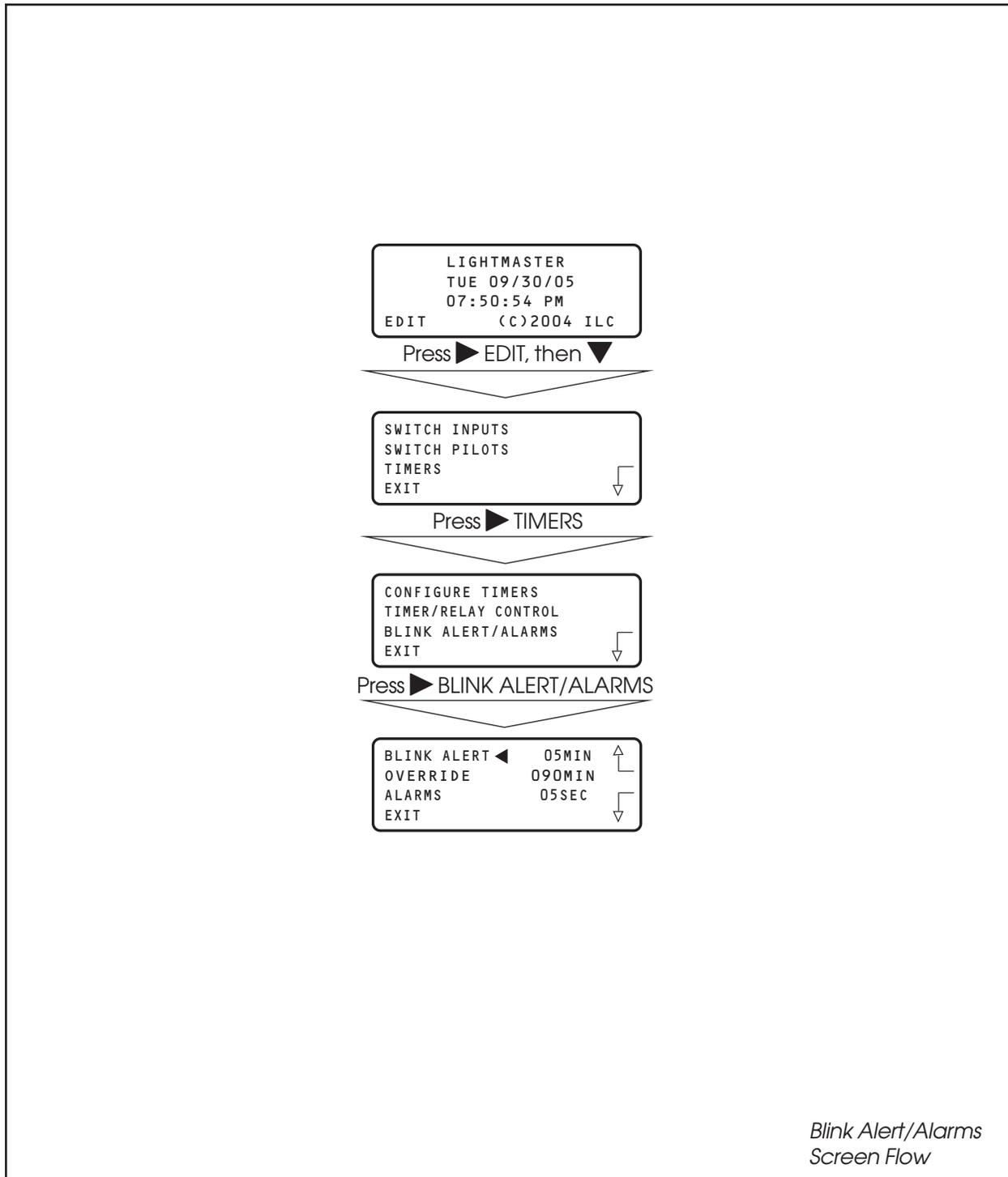
SAMPLE OPERATION:
Program a Timer to Control a Preset

Program a Timer to Control a Preset:

1. From the Timer menu, press ► TIMER/RELAY CONTROL.
2. From the Timer Control menu, press ► TIMER/PRESETS.
3. When the Timer/Preset Control screen appears, press ▲ or ▼ until the timer that you want to control the preset appears in the Timer field.
4. Press ► PRESET; then press ▲ or ▼ until the preset you want to be controlled by the timer appears in the Relay field.
5. Press ► ACTION; then press ▲ or ▼ until the way you want the timer to control the preset appears.
6. Press ► EXIT 4 times to return to the Home screen.



3.9 Blink Alert/Alarms – Fast Track



Blink Alert/Alarms
Screen Flow

Blink Alert/Alarms

CONCEPTS AND PARAMETERS

If the default timing parameters for the *optional* blink alert, HID delay, and alarm relay output timer options are not appropriate for your application, you can change them. If the defaults are appropriate, you need not conduct operations in this area.

Parameter Key:

BLINK ALERT = the length of time between a blink alert, HID delay, or alarm and the execution of an OFF timer or blink alert switch signal, that has not been overridden by a switch closure. The default is 5 minutes. Other choices are from 2-99 minutes.

OVERRIDE = the amount of time a switch closure can be programmed to postpone the execution of an OFF Timer or blink alert switch signal. The default is 120 minutes. Other choices are from 5 minutes to 999 minutes.

ALARMS = the length of the pulse for momentary alarm signals. The default is 5 seconds. Other choices are from 1-99 seconds.

CONFIGURE TIMED-ON = whether the timed-on period is invoked by a switch opening or closing.

FORCE TIMERS = execute the selected timer.

SAMPLE OPERATION:

Change the Blink Alert From the Default

1. From the Home screen, press ► EDIT; then press ▼.
2. When the Main menu appears, press ► TIMERS.
3. When the Timer menu appears, press ► BLINK ALERT/ALARMS.
4. When the Blink Alert/Alarms screen appears, press ▲ or ▼ until the desired Blink Alert time appears in the Blink Alert field.
5. Press ► EXIT 3 times to return to the Home screen.

```
LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
```

Press ► EDIT, then ▼

```
SWITCH INPUTS
SWITCH PILOTS
TIMERS
EXIT
```

Press ► TIMERS

```
CONFIGURE TIMERS
TIMER/RELAY CONTROL
BLINK ALERT/ALARMS
EXIT
```

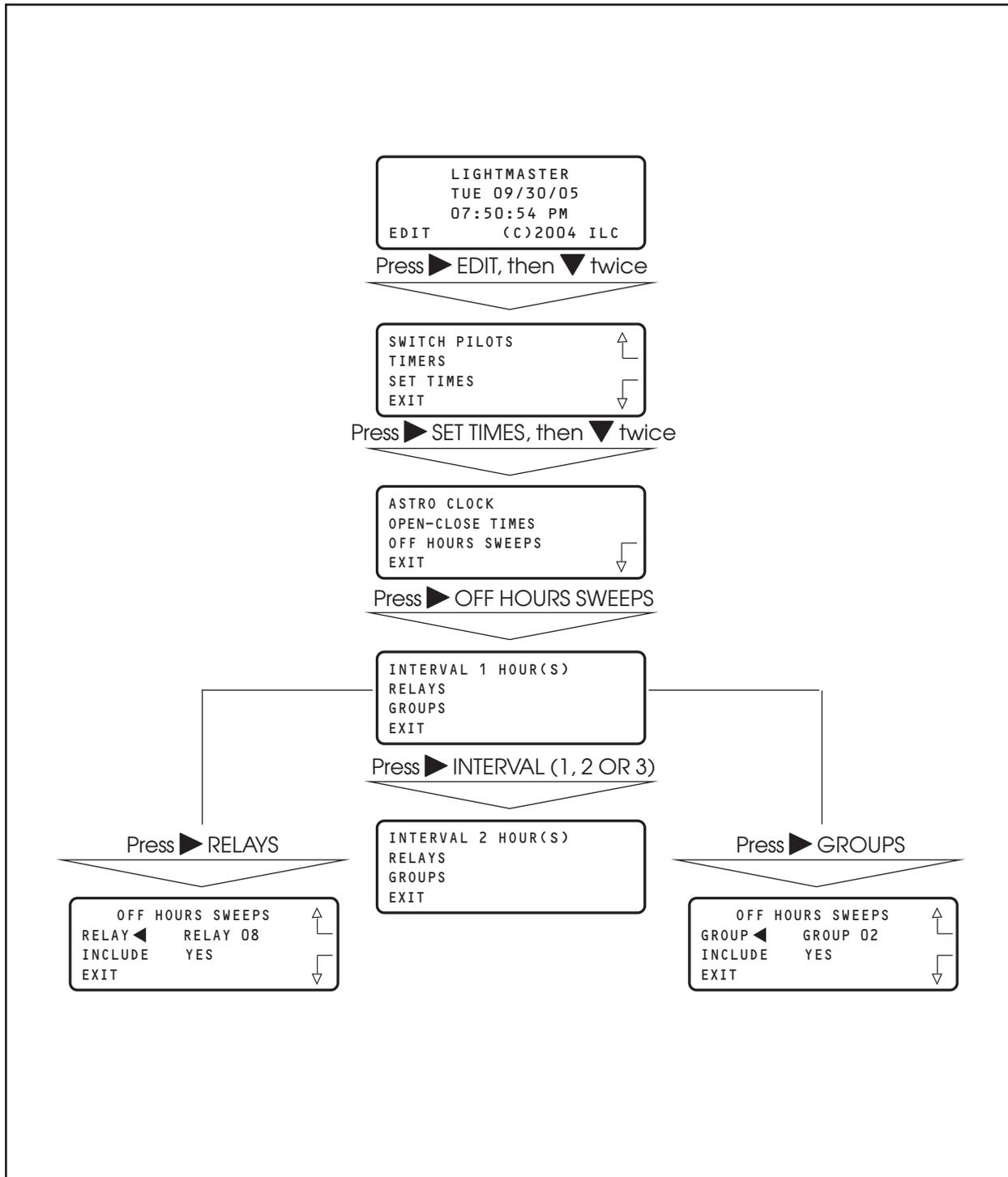
Press ► BLINK ALERT/ALARMS

```
BLINK ALERT ◀ 10MIN
OVERRIDE      090MIN
ALARMS        05SEC
EXIT
```

Press ► EXIT 3 times

```
LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
```

3.10 Off Hours Sweeps – Fast Track



Off Hours Sweeps

CONCEPTS AND PARAMETERS

You can program the controller to execute OFF sweeps to ensure that single relay outputs and relay groups will be turned OFF at regular intervals outside of normal business hours. (**NOTE:** This is used in conjunction with Open/Close Times; see pages 3-35, 3-36 and 3-42.)

Parameter Key:

INTERVAL = time between OFF sweeps (1, 2, 3 hours).

Relays = individual relays subject to the OFF sweeps.

Groups = relay groups subject to the OFF sweeps.

SAMPLE OPERATION:

Program a Relay Group for Off Sweeps

1. From the Home screen, press ► EDIT; then press ▼ twice.
2. When the Main menu appears, press ► SET TIMES; then press ▼ twice.
3. When the SET TIMES menu appears, press ► OFF HOURS SWEEPS.
4. When the Off Hours Sweep menu appears, press ► GROUPS.
5. When the Off Sweep Group screen appears, press ▲ or ▼ to select the relay group subject to the Off sweep.
6. Press ► INCLUDE until YES appears.
7. Press ► EXIT 4 times to return to the Home screen.

LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT (C)2004 ILC

Press ► EDIT, then ▼ twice

SWITCH PILOTS
TIMERS
SET TIMES
EXIT

Press ► SET TIMES, then ▼ twice

ASTRO CLOCK
OPEN-CLOSE TIMES
OFF HOURS SWEEPS
EXIT

Press ► OFF HOURS SWEEPS

INTERVAL 1 HOUR(S)
RELAYS
GROUPS
EXIT

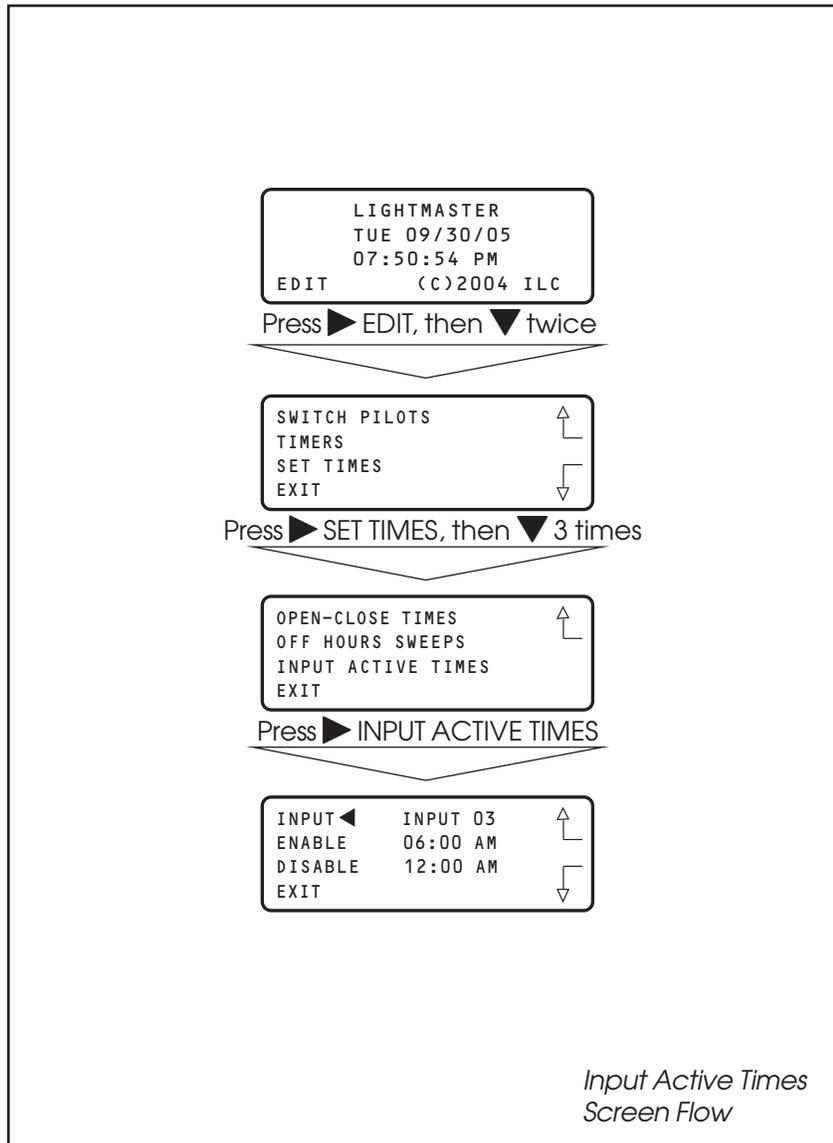
Press ► GROUPS

OFF HOURS SWEEPS
GROUP ◀ GROUP 03
INCLUDE NO
EXIT

Press ► INCLUDE

OFF HOURS SWEEPS
GROUP GROUP 03
INCLUDE ◀ YES
EXIT

3.11 Input Active Times – Fast Track



Input Active Times

CONCEPTS AND PARAMETERS

You can program the controller to enable/disable selected input(s) during certain hours. During the enable time, the input will function normally. During the disable hours, the input will not function.

Parameter Key:

Input = 1 of up to 48 possible controller switch inputs.

Enable = the input will function from the entered enable time to the entered disable time.

Disable = the input will NOT function from the entered disable time to the entered enable time.

SAMPLE OPERATION:

Program a Switch Input for Input Active Times

1. From the Home screen, press ► EDIT; then press ▼ twice.
2. When the Main menu appears, press ► SET TIMES; then press ▼ 3 times.
3. When the SET TIMES menu appears, press ► INPUT ACTIVE TIMES.
4. When the Input Active Times screen appears, press ▲ or ▼ until the input you want to program appears in the Input field.
5. Press ► ENABLE; then press ▲ or ▼ until the desired enable time appears.
6. Press ► DISABLE; then press ▲ or ▼ until the desired disable time appears.
7. Press ► EXIT 3 times to return to the Home screen.

```

LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
    
```

Press ► EDIT, then ▼ twice

```

SWITCH PILOTS
TIMERS
SET TIMES
EXIT
    
```

Press ► SET TIMES, then ▼ 3 times

```

OPEN-CLOSE TIMES
OFF HOURS SWEEPS
INPUT ACTIVE TIMES
EXIT
    
```

Press ► INPUT ACTIVE TIMES

```

INPUT  INPUT 04
ENABLE 06:00 AM
DISABLE 12:00 AM
EXIT
    
```

Press ► ENABLE

```

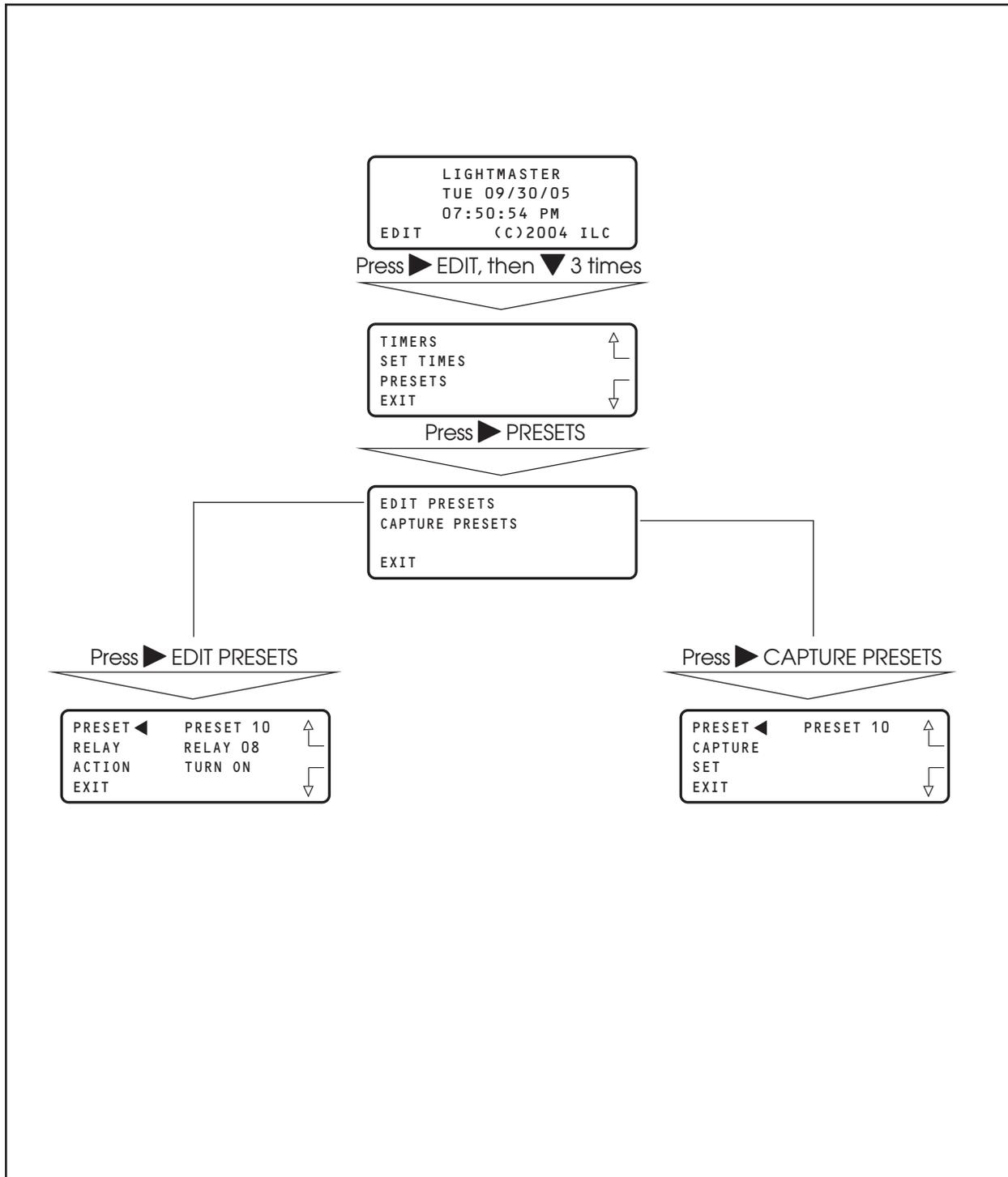
INPUT  INPUT 04
ENABLE 09:00 AM
DISABLE 12:00 AM
EXIT
    
```

Press ► DISABLE

```

INPUT  INPUT 04
ENABLE 09:00 AM
DISABLE 10:00 PM
EXIT
    
```

3.12 Preset Operations – Fast Track



Preset Operations

CONCEPTS AND PARAMETERS

The LightMaster supports the ability to save the current relay output ON/OFF states in a preset scene. You can program the controller to execute this scene by keyboard command, a signal from a Set Preset switch type, or timer signal. You also have the ability to edit the preset if you need to change the ON/OFF pattern.

Parameter Key:

CAPTURE PRESETS:

PRESET = 1 of a possible 48 ON/OFF relay output patterns.

CAPTURE = save the current relay ON/OFF states to a preset scene.

SET = a keyboard command to invoke a captured preset.

EDIT PRESETS:

RELAY = 1 of 48 possible relay outputs making up the preset.

ACTION = the state you want the relay output to assume when the preset is invoked.

SAMPLE OPERATION:

Capture, Edit, and Invoke a Preset

1. From the Home screen, press ► EDIT; then press ▼ 3 times.
2. When the Main menu appears, press ► PRESETS.
3. When the Presets menu appears, press ► CAPTURE PRESETS.
4. When the Preset Capture screen appears, press ▲ or ▼ until the preset you want to capture appears in the Preset field.
5. Press ► CAPTURE to save the current ON/OFF relay pattern as the preset.
6. Press ► EXIT to return to the Preset menu.
7. Press ► EDIT PRESETS.
8. When the Edit Presets screen appears, press ▲ or ▼ until the preset you previously captured appears in the Preset field.
9. Press ► RELAY; then press ▲ or ▼ until the relay whose preset ON/OFF state you want to change appears.
10. Press ► ACTION; then press ▲ or ▼ until the desired relay state appears in the Action field.
11. Repeat steps 9 and 10 for any additional relays you want to change.
12. Press ► EXIT to return to the Presets menu; then press ► CAPTURE PRESETS.
13. Press ► to select the preset you have just edited.
14. Press ► SET to invoke the preset.
15. Press ► EXIT 3 times to return to the Home screen.

```

LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
    
```

Press ► EDIT, then ▼ 3 times

```

TIMERS
SET TIMES
PRESETS
EXIT
    
```

Press ► PRESETS

```

EDIT PRESETS
CAPTURE PRESETS
EXIT
    
```

Press ► CAPTURE PRESETS

```

PRESET      PRESET 10
CAPTURE ◀
SET
EXIT
    
```

Press ► EDIT PRESETS

```

PRESET ◀      PRESET 10
RELAY          RELAY 08
ACTION        TURN ON
EXIT
    
```

Press ► RELAY

```

PRESET      PRESET 10
RELAY ◀      RELAY 08
ACTION      TURN ON
EXIT
    
```

Press ► ACTION

```

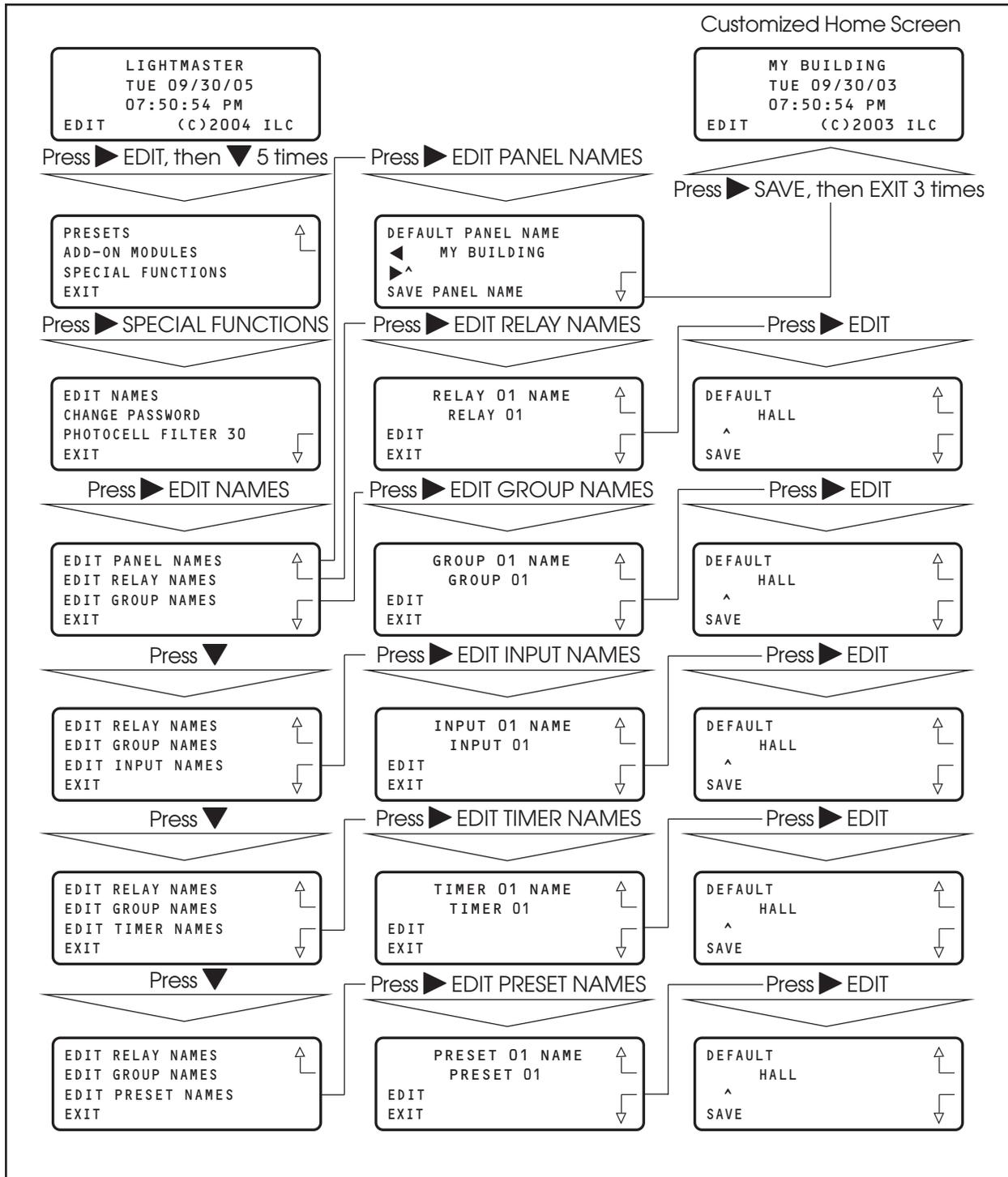
PRESET      PRESET 10
RELAY ◀      RELAY 08
ACTION ◀      TURN ON
EXIT
    
```

Press ► SET

```

PRESET      PRESET 10
CAPTURE
SET ◀
EXIT
    
```

3.13 Edit Names – Fast Track



How to Customize the Name(s) of the LightMaster, Relays, Groups, Inputs, Timers, and Presets

You have the option of assigning customized names to the controller and the other major components/features of the lighting control system. The customized names will appear on the screens featuring that component/feature.

SAMPLE OPERATION:

Customize the Name of a Relay Output

1. From the Home screen, press ► EDIT; then press ▼ 5 times.
2. When the Main menu appears, press ► SPECIAL FUNCTIONS.
3. When the Special Functions menu appears, press ► EDIT NAMES.
4. When the Edit Names menu appears, press ► EDIT RELAY NAMES.
5. When the Relay Naming screen appears, press ▲ or ▼ until the relay that you want to name appears.
6. Press ► EDIT.
7. When the Relay Name Editing screen appears, press ► until the cursor is positioned under the first character of the default name. Then press ▲ or ▼ until the first character of the customized name appears.
8. Repeat step 7 until the customized name has completely overridden the default name.
9. Press ► SAVE.
10. Press ► EXIT 4 times to return to the Home screen.

```

LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
    
```

Press ► EDIT, then ▼ 5 times

```

PRESETS
ADD-ON MODULES
SPECIAL FUNCTIONS
EXIT
    
```

Press ► SPECIAL FUNCTIONS

```

EDIT NAMES
CHANGE PASSWORD
PHOTOCELL FILTER 30
EXIT
    
```

Press ► EDIT NAMES

```

EDIT PANEL NAMES
EDIT RELAY NAMES
EDIT GROUP NAMES
EXIT
    
```

Press ► EDIT RELAY NAMES

```

RELAY 01 NAME
RELAY 01
EDIT
EXIT
    
```

Press ► EDIT

```

DEFAULT
< HALL R:01
^
>
SAVE
    
```

Press ► SAVE

```

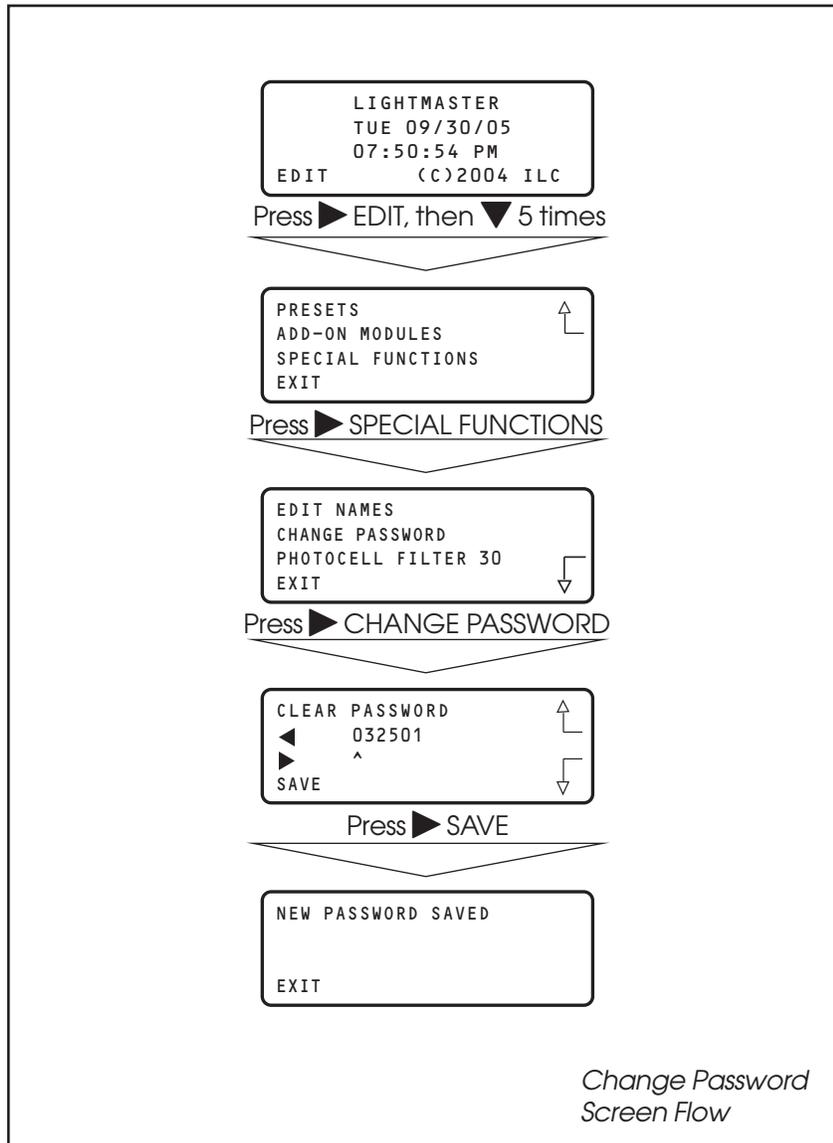
DEFAULT
< OFFICE R:01
^
>
SAVE
    
```

Press ► EXIT 4 times

```

RELAY 01 NAME
OFFICE
EDIT
EXIT
    
```

3.14 How to Enter or Change a Password – Fast Track



Entering/Changing a Password

CONCEPTS AND PARAMETERS

If you want, you can enter a 6-digit password to restrict unauthorized access to the controller.

Caution: Memorize and write down the password. Store it in a secure place. Once you have saved the password, you will need to enter it or be denied access to the controller.

SAMPLE OPERATION:

Enter a Password for the Controller

1. From the Home screen, press ► EDIT; then press ▼ 5 times.
2. When the Main menu appears, press ► SPECIAL FUNCTIONS.
3. When the Special Functions menu appears, press ► CHANGE PASSWORD.
4. When the Password Editing screen appears, press ► until the cursor is positioned under the first digit in the Password field. Then press ▲ or ▼ until the first digit of the password appears.
5. Repeat step 4 for the remaining digits.
6. Press ► SAVE. A message will appear saying NEW PASSWORD SAVED.
7. Press ► EXIT to return to the Home screen.

```
LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
```

Press ► EDIT, then ▼ 5 times

```
PRESETS
ADD-ON MODULES
SPECIAL FUNCTIONS
EXIT
```

Press ► SPECIAL FUNCTIONS

```
EDIT NAMES
CHANGE PASSWORD
PHOTOCELL FILTER 30
EXIT
```

Press ► CHANGE PASSWORD

```
CLEAR PASSWORD
032501
SAVE
```

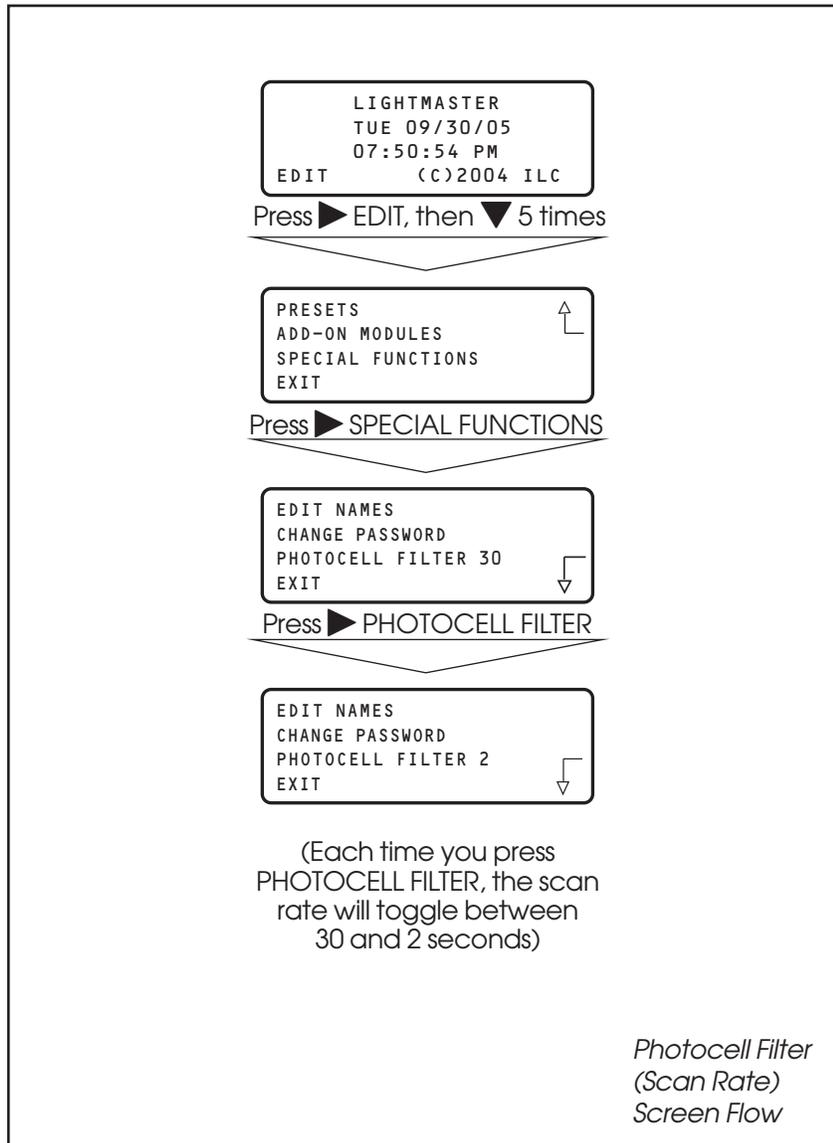
Press ► SAVE

```
NEW PASSWORD SAVED
EXIT
```

Press ► EXIT

```
LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
```

3.15 How to Enter the Photocell Filter (Scan Rate) – Fast Track



How to Change the Photocell Filter

CONCEPTS AND PARAMETERS

The controller reacts to a change of state seen by the photo sensor. To ensure switching accuracy, the controller will react only when the change of state is observed for a pre-established default duration time of 30 seconds. You may change the default duration time (30 seconds) to 2 seconds.

SAMPLE OPERATION:

Change the Photocell Filter to 2 Seconds

1. From the Home screen, press ► EDIT; then press ▼ 5 times.
2. When the Main menu appears, press ► SPECIAL FUNCTIONS.
3. When the Special Functions menu appears, press ► PHOTOCELL FILTER to change the scan rate from 30 to 2 seconds.
4. Press ► EXIT twice to return to the Home screen.

```

LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
    
```

Press ► EDIT, then ▼ 5 times

```

PRESETS
ADD-ON MODULES
SPECIAL FUNCTIONS
EXIT
    
```

Press ► SPECIAL FUNCTIONS

```

EDIT NAMES
CHANGE PASSWORD
PHOTOCELL FILTER 30
EXIT
    
```

Press ► PHOTOCELL FILTER

```

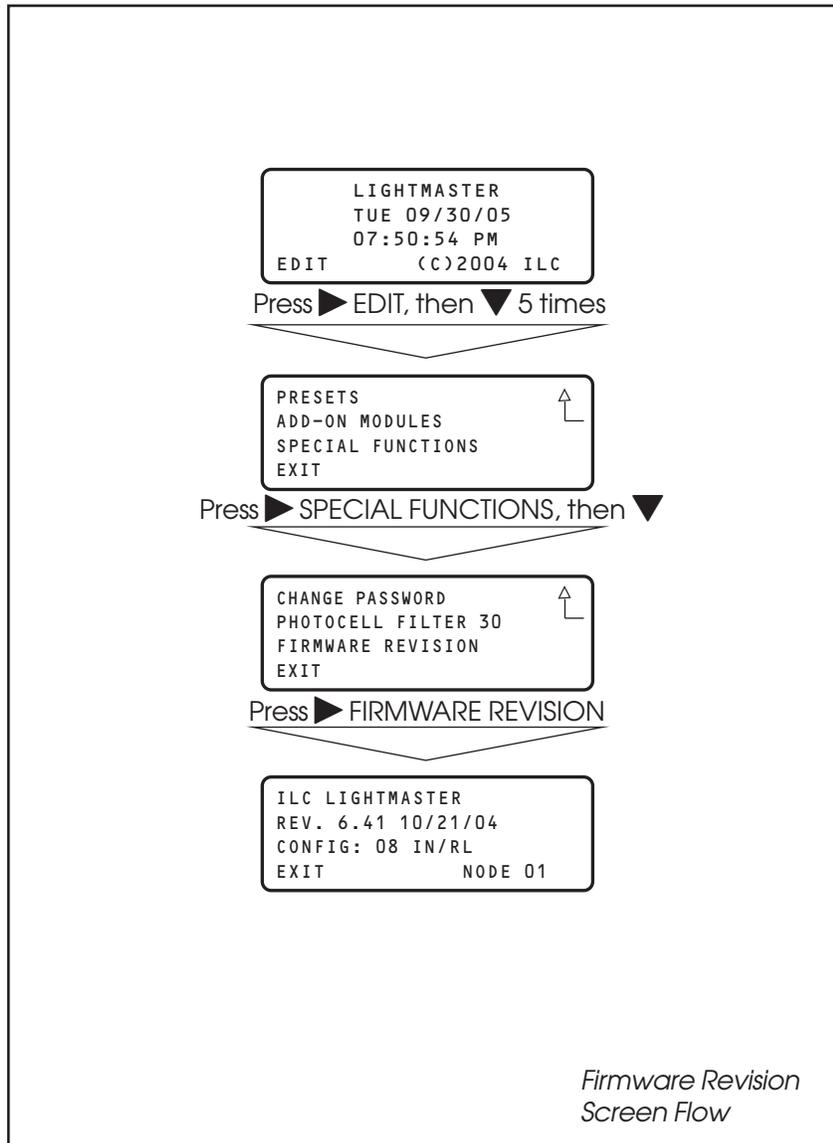
EDIT NAMES
CHANGE PASSWORD
PHOTOCELL FILTER 2
EXIT
    
```

Press ► EXIT twice

```

LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
    
```

3.16 How to View the Firmware Revision – Fast Track



How to View the Controller Firmware Revision

The Firmware Revision screen lists the firmware currently in the controller and the number of controller I/O points. This information may be useful when requesting advice or repair components. This screen also serves as a gateway to a "Hidden" screen used to perform certain operations. **(NOTE: See Hidden Menu Choices in Section 3.1.)**

SAMPLE OPERATION: View The Controller Firmware Revision

1. From the Home screen, press ► EDIT; then press ▼ 5 times.
2. When the Main menu appears, press ► SPECIAL FUNCTIONS; then press ▼.
3. When the Special Functions menu appears, press ► FIRMWARE REVISION to view the Firmware Revision screen.
4. Press ► EXIT 3 times to return to the Home screen.

```
LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
```

Press ► EDIT, then ▼ 5 times

```
PRESETS
ADD-ON MODULES
SPECIAL FUNCTIONS
EXIT
```

Press ► SPECIAL FUNCTIONS, then ▼

```
CHANGE PASSWORD
PHOTOCELL FILTER 30
FIRMWARE REVISION
EXIT
```

Press ► FIRMWARE REVISION

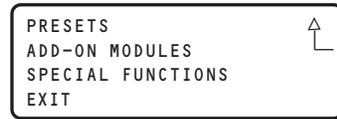
```
ILC LIGHTMASTER
REV. 6.41 10/21/04
CONFIG: 08 IN/RL
EXIT      NODE 01
```

Press ► EXIT 3 times

```
LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
```

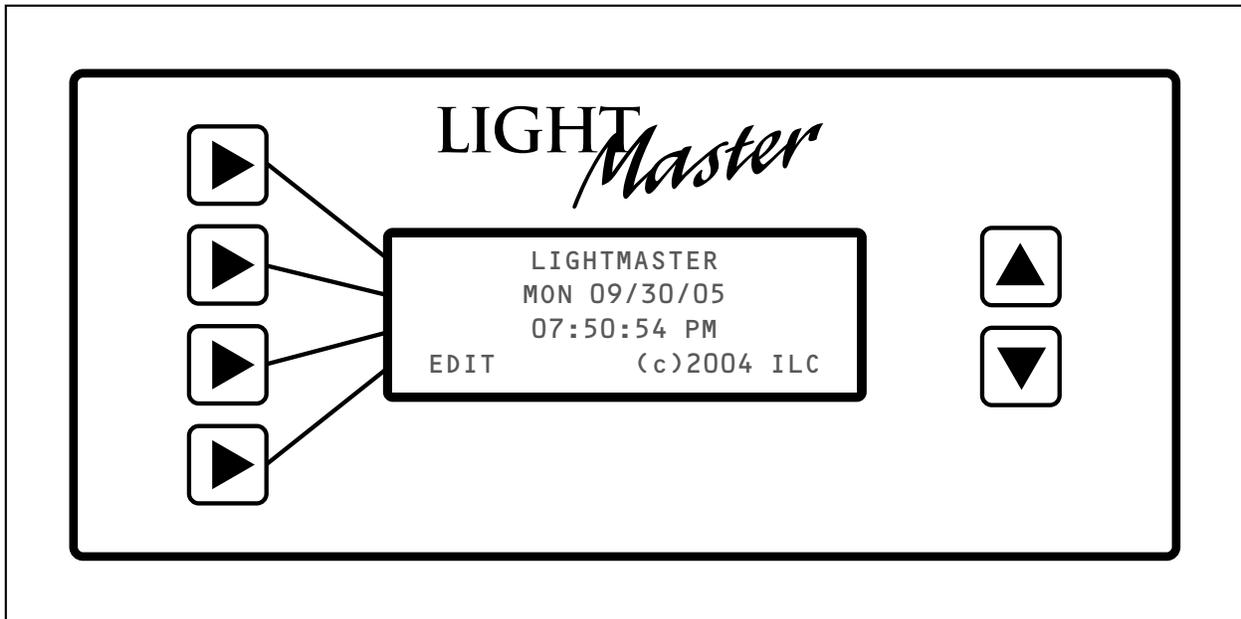
Add-On Modules

ADD-ON MODULES is a choice on the Main menu. It is of interest only if the controller is equipped with optional serial communications and/or telephone interface cards. Details of these options are discussed in the relevant appendix.



Section 4

LightSync™ Switching



Section 4 LightSync Device Switching

4.0 Section Overview	4-1
4.1 Installation	4-1
4.2 How to Control Relays With a LightSync Switch	4-15
4.3 LightSync Switch Status.....	4-19
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4.0 Section Overview

This section covers installation and programming procedures required to implement LightSync™ switching via a Standard Network LightMaster controller. You should be equipped with the following tools (available from ILC):
CAT-5 Terminal Crimping Tool –
ILC Part No. (1 ea): 93000801
LanRover CAT-5 Tester –
ILC Part No. (1 ea): 93000802

System Overview/Guidelines

You can control relay outputs and monitor switch and switch pilot status over the controller's communications bus. Most switch functions available via hardwired connection to the switch inputs are also available for LightSync™ switching (see Figure 4.10). The LightMaster Standard Network supports up to 127 LightSync™ switch nodes. **Note:** *These addresses are separate set of addresses from the 32 LightMaster Controller node addresses.*

The communications media is an 8-wire 24-gauge CAT-5 cable terminated at the controller CPU Board RJ-45 female connectors. (See Figures 4.1a and 4.1b.) Run the CAT-5 cable between the controller and specially designed LightSync™ devices installed throughout the facility. (See Figure 4.4a and 4.4b.) There are limitations to the distance that data can travel over CAT-5 cable without loss, and distance limitations due to voltage drop associated with cable length and number of devices on the LightSync™ data line. (See Figure 4.2b for detail.) The devices are equipped with two RJ-45 connectors. Each switch must have a unique node address (01-7F). (See Figure 4-5.) **NOTE:** LightSync™ switch node addresses are preset at the factory.

LightSync™ switches are available in momentary pushbutton, maintained, or key switch configurations. Switches are available with up to 6 pushbuttons mounted on a single gang plate. Key switch nodes are limited to one per gang. In addition to the switches, a LightSync™ photocell node (Figure 4.6), a 4-input switch station (SIB-4) (Figure 4.7), and a 6-Input/Output module (D-6) (Figure 4.8) are

also available. The LightMaster controller may power up to 8 LightSync™ switch nodes. No LightMaster controller panel can power more than eight (8) LightSync™ devices on the data line without a Power Supply (PS), Power Supply Repeater (PSR) or LightSync Hub (each can power up to 20 additional LightSync devices). (See Figures 4.2a, b and c). PSRs are also required if the installation layout requires "T" connections (one incoming and two outgoing lines). (See Figure 4.9.) **NOTE:** The LM-4 is slightly different than other LightMaster panels as it has a port designated for four (4) local LightSync™ devices. Each device must be programmed only as LightSync™ node address 01, 02, 03, and 04.

4.1 Installation

1. Check the electrical prints and other job documentation to determine the most efficient way to route the CAT-5 cable as well as the number and location of any required repeaters.
2. Run the cable between the LightMaster and all the LightSync™ node locations. Observe all guidelines detailed in Figure 4-2a.
3. Install the male RJ-45 connectors on the cable ends and verify the integrity of cable runs with a CAT-5 cable tester.

Note: *The controller and device node address are separate sets. Therefore it is possible, for example, to have a controller node 03 and a device node 03. However, to avoid confusion it is best to avoid this practice. For example, if there are 5 controller nodes, address them 01-05. If there are also 5 device nodes, address them 06-0A.*

4. Set each node address and plug the cables into the appropriate controller and device nodes.
5. Power-up the LightMaster controller nodes. (If necessary, see Section 2 for required guidance.)
6. Program the switches and define the relay outputs/relay groups that each switch controls. (See programming information later in this section.)
7. Actuate each switch to verify correct operation.

Data Cable Requirements

Definitions:

Category 5 Cable (UTP-Unshielded Twisted Pair) – A 4 pair high-performance cable that consists of twisted pair conductors, used mainly for data transmission. Basic CAT-5 cable was designed for characteristics of up to 100 MHz. **NOTE:** The twisting of the pairs gives the cable a certain amount of immunity from the infiltration of unwanted interference.

Category 5E Cable (Enhanced) – Same as Category 5, except that it is made to somewhat more stringent standards (see comparison chart below). The Category 5E standard is now officially part of the 568A standard. Category 5 E is recommended for all new installations, and was designed for transmission speeds of up to 1 gigabit per second.

Below you will find a list of the required properties your selected cable must meet. You will also find a list of cables, which meet these criteria, from several different manufacturers. At your option you may utilize one of the below-suggested cables or have your cable supplier provide you with a suitable alternative, that meets the listed criteria.

Category 6 Cable – Same as Category 5E, except that it is made to a higher standard (see comparison chart below). Category 6 is now part of the 568A standard.

Standard 24-gauge Data Cable Performance Specification Chart:

Parameter	Category 5	Category 5E	Category 6
Specified frequency range	1-100 MHz	1-100 MHz	1-250 MHz
Attenuation	24 dB	24 dB	36 dB
NEXT	27.1 dB	30.1 dB	33.1 dB
Power-sum NEXT	N/A	27.1 dB	30.2 dB
ACR	3.1 dB	6.1 dB	-2.9 dB
Power-sum ACR	N/A	3.1 dB	-5.8 dB
ELFEXT	17 dB	17.4 dB	15.3 dB
Power-sum ELFEXT	14.4 dB	14.4 dB	12.3 dB
Return loss	8 dB	10 dB	8 dB
Propagation delay	548 nsec	548 nsec	546 nsec
Delay skew	50 nsec	50 nsec	50 nsec

Suggested Manufacturers and Data Cables:

Manufacturer	Part Number	Cable Type	Phone
Belden	7854A	CAT-5 non-plenum	800 235 3361
	1583A	CAT-5E non-plenum	
	7811A	CAT-5 plenum	
	1585A	CAT-5E plenum	
General	2137113	CAT-5 non-plenum	Contact Cassidey Technologies (800 464 9473), manufacturer, or local distributor
	5133299E	CAT-5E non-plenum	
	5131413	CAT-5 plenum	
	6131278	CAT-5E plenum	
Hitachi	38696-8	CAT-5 non-plenum	
	38993-8	CAT-5E non-plenum	
	39419-8	CAT-5 plenum	
	38891-8	CAT-5E plenum	

If you have any questions or would like our engineers to approve your cable selection, please feel free to contact our applications department at 1-800-922-8004.

Figure 4.1a – Data Cable Requirements

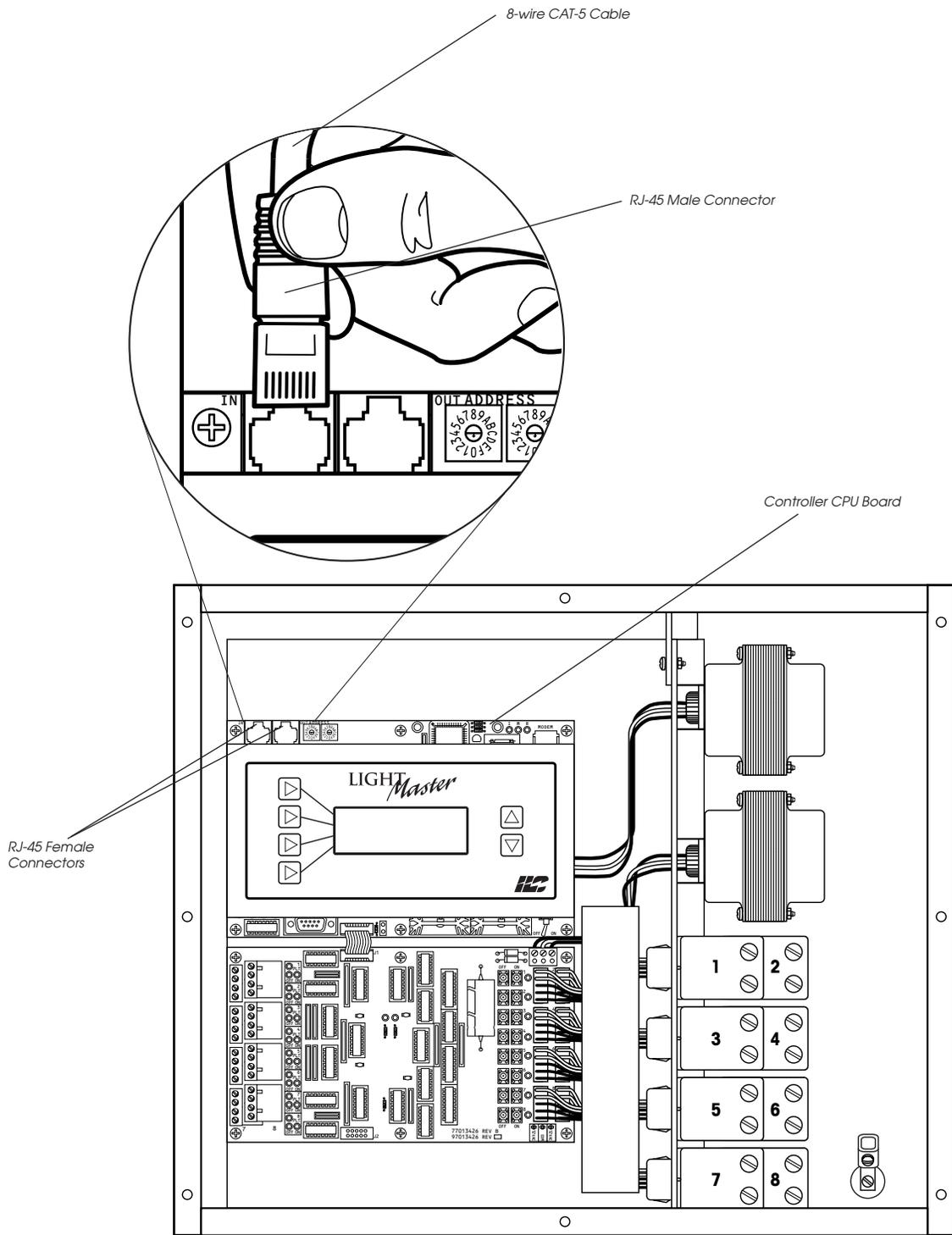


Figure 4.1b – CPU Board LightSync™ Connection Detail

ILC Power and Data Repeating Devices Overview

A **Power Supply Repeater** (PSR) is both a power supply and data repeater and its primary purpose is to repeat data and provide a bridge to another data line capable of 3000 feet end to end. This device also has one incoming and two outgoing RJ-45 ports to split the line into two different directions. The PSR also adds power to LightSync™ devices for an additional 3000 cumulative feet.

A **Power Supply** (PS) provides additional power as needed to the LightSync™ data line. This is the most efficient option to compensate for voltage drop from multiple LightSync™ devices on the data line. Note that a PS provides power only and does not repeat data.

A **LightSync™ Hub** (HUB) is a device that allows a home run configuration by providing RJ-45 ports for up to 20 LightSync™ devices, supplying power and data up to 1500 feet.

CAT-5 Data Cable and Class 2 Switch Wiring Installation Guidelines

- Observe all ILC Data Cable Requirements and LightSync™ Cable Run Distance requirements as they pertain to your project in laying out the cable runs.
- Maintain the twists of the pairs all the way to the point of termination, or no more than 1" untwisted.
- Make gradual bends of the cable, where necessary. No sharper than a 1" radius.
- Dress the cables neatly with cable ties. Use low to moderate pressure.
- Use low to moderate force when pulling cable.
- Use cable pulling lubricant for cable runs that may otherwise require great force to install.
- Keep cables away from potential sources of EMI (electrical cables, transformers, light fixtures, etc.).
- Install proper cable supports, spaced no more than 5 feet apart.
- Always label every termination point. Use a unique number for each cable segment. This will make moves, adds, changes and troubleshooting as simple as possible. Document these onto a riser.
- Always test every installed segment with a CAT-5 cable tester.
- Always leave extra slack in the cable run, neatly coiled up in the ceiling or nearest concealed place.
- Always use grommets to protect the cable when passing through metal studs or anything that can possibly cause damage to them.
- Always follow all local and national building and fire codes. Be sure to "firestop" all cables that penetrate a firewall. Use plenum rated cable where it is mandated.
- Do not pull ANY data cable or switch wires with high voltage wires.
- Keep all low voltage totally separate from ALL high voltage. Failure to do so will void the ILC warranty.
- Always contact ILC on installations between buildings or cable pulled underground. Special considerations may be needed.

Figure 4.2a – Device Overview and Wiring Guidelines

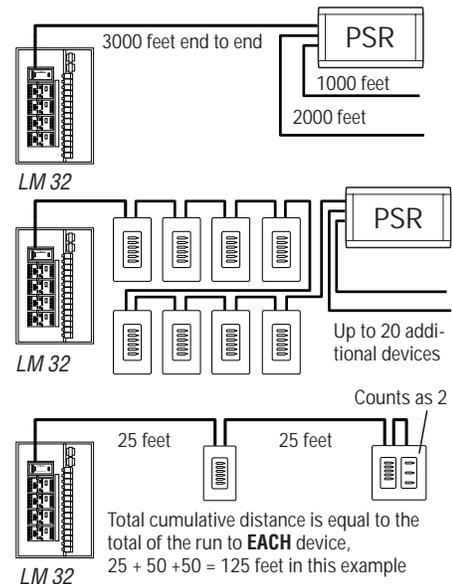
Section 4 – LightSync™ Device Switching

LightSync™ Network Cable Run Distance Detail

Devices that operate on ILC’s LightSync™ CAT-5 data line include LightSync™ switches, photocells, and interfaces like the LightSync™ D-6 and SIB-4. A standard CAT-5 cable is used for the data line and provides both data and power to these devices. There are limitations to the distance data can travel over CAT-5 cable without loss, and distance limitations due to voltage drop associated with cable length and number of devices on the LightSync™ data line. These limitations are addressed by the addition of a Power Supply Repeater, Power Supply or LightSync™ Hub (see chart), depending on the application. The specific use of these devices depends on the project layout.

There are four main areas of limitation to be addressed:

- 1. Total Data Line Overall Distance:** The total data line end to end distance may not exceed 3000 feet without the addition of a PSR to the data line. Only a PSR will extend the data line.
- 2. Total number devices (LightMaster panels and LightSync™ devices):** Total number of devices without a PSR is 32. A PSR will add 31 more devices (PSRs are counted as a device).
- 3. Total number of LightSync™ devices powered:** No Lightmaster controller panel can power more than eight (8) LightSync™ devices on the data line without a PS, PSR or LightSync™ Hub (each can power up to 20 additional LightSync™ devices).
- 4. Total Power Cumulative Distance:** The cumulative distance from each device to its power supply may not exceed 2000 feet if powered by a LightMaster panel, or 3000 feet if powered by a PS, PSR or LightSync™ Hub.



ILC Power and Data Repeating Device	Total Data (end to end) Distance	No. of LightSync™ Devices Powered	Cumulative Power Distance
LightMaster Panel	3000 feet	8	2000 feet
Power Supply (PS)	N/A	20	3000 feet
Power Supply Repeater (PSR)	3000 feet (combined)	20	3000 feet
LightSync™ Hub (HUB)	1500 feet per port	20 total	1500 feet per port

ILC Power and Data Repeating Devices

A **Power Supply Repeater (PSR)** is both a power supply and data repeater and its primary purpose is to repeat data and provide a bridge to another data line capable of 3000 feet end to end. This device also has one incoming and two outgoing RJ-45 ports to split the line into two different directions. The PSR also adds power to LightSync™ devices for an additional 3000 cumulative feet.

A **Power Supply (PS)** provides additional power as needed to the LightSync™ data line. This is the most efficient option to compensate for voltage drop from multiple LightSync™ devices on the data line. Note that a PS provides power only and does not repeat data.

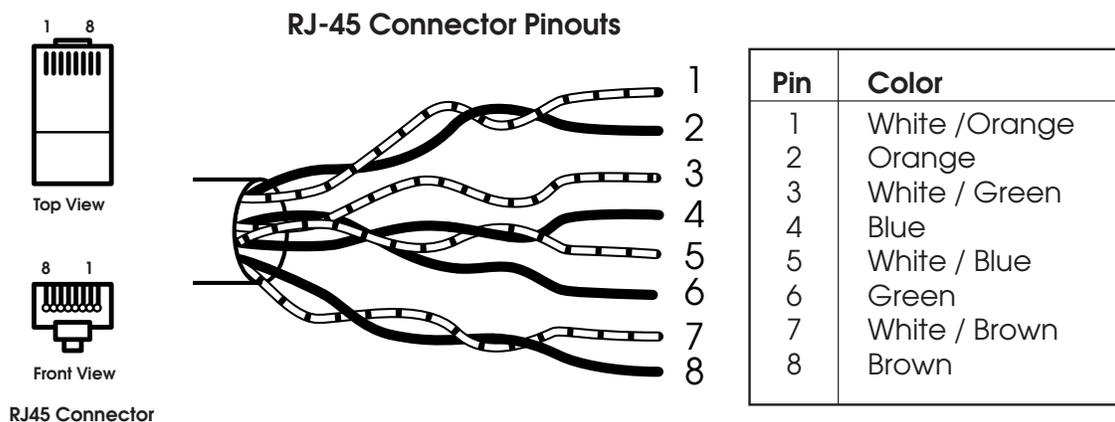
A **LightSync™ Hub (HUB)** is a device that allows a home run configuration by providing RJ-45 ports for up to 20 LightSync™ devices, supplying power and data up to 1500 feet per each port.

Figure 4.2b – LightSync™ Network Cable Run Distance Detail

Field RJ-45 Connector Termination Detail

Termination instructions for RJ-45 connector to CAT-5 (or CAT-6) cable.

1. Strip cable jacket back about 2" from the end of the cable.
2. Sort the pairs so they fit into the connector in the following order.



3. Insert the pairs through the connector.
4. Crimp the pins with a crimp tool.
5. Repeat for other end and test cable for wiring faults with a cable tester.

NOTE: DO NOT UNTWIST ANY PAIR MORE THAN ½ INCH.

To purchase industry standard CAT-5 RJ-45 Connectors, Crimp Tools and Testers, contact your local Electrical Distributor or ILC at 800 922-8004.

RJ-45 Crimping Tool: ILC Part No. (1 ea): 93000801
 Cat-5 Connectors: ILC Part No. (10/pk): 56801415

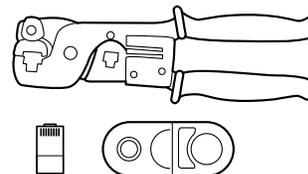
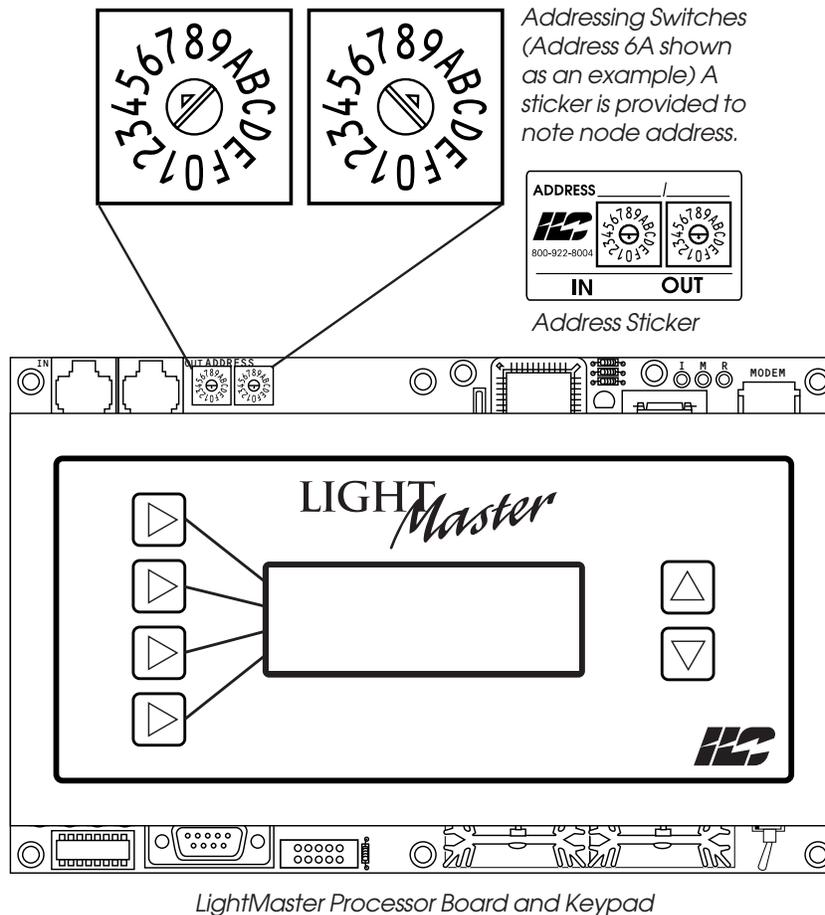


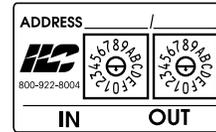
Figure 4.2c – Field RJ-45 Connector Termination Detail

LightMaster LAN Node Addressing

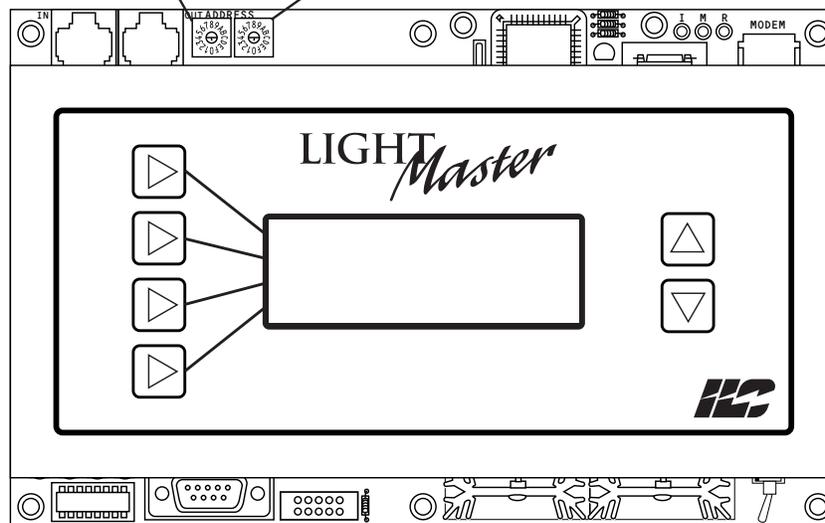
(This User Guide outlines the capabilities of the controller in stand-alone applications. The LightMaster may also be easily integrated into a network of controllers. Contact Intelligent Lighting Controls (ILC) about networking your stand-alone LightMaster controller.)



Addressing Switches
(Address 6A shown
as an example) A
sticker is provided to
note node address.



Address Sticker



LightMaster Processor Board and Keypad

- In networked applications, each networked LightMaster relay control panel must be given a unique 2-digit node address using the addressing switches noted above. Settings from 01 to 7F can be used to address up to 128 panels in a network.
- This 2-digit address code system is also used with LightSync™ data line devices.
- Note all node addresses on the supplied sticker for future reference (they will be needed for programming).

Figure 4.3 – LightMaster Node Addressing

Section 4 – LightSync™ Device Switching

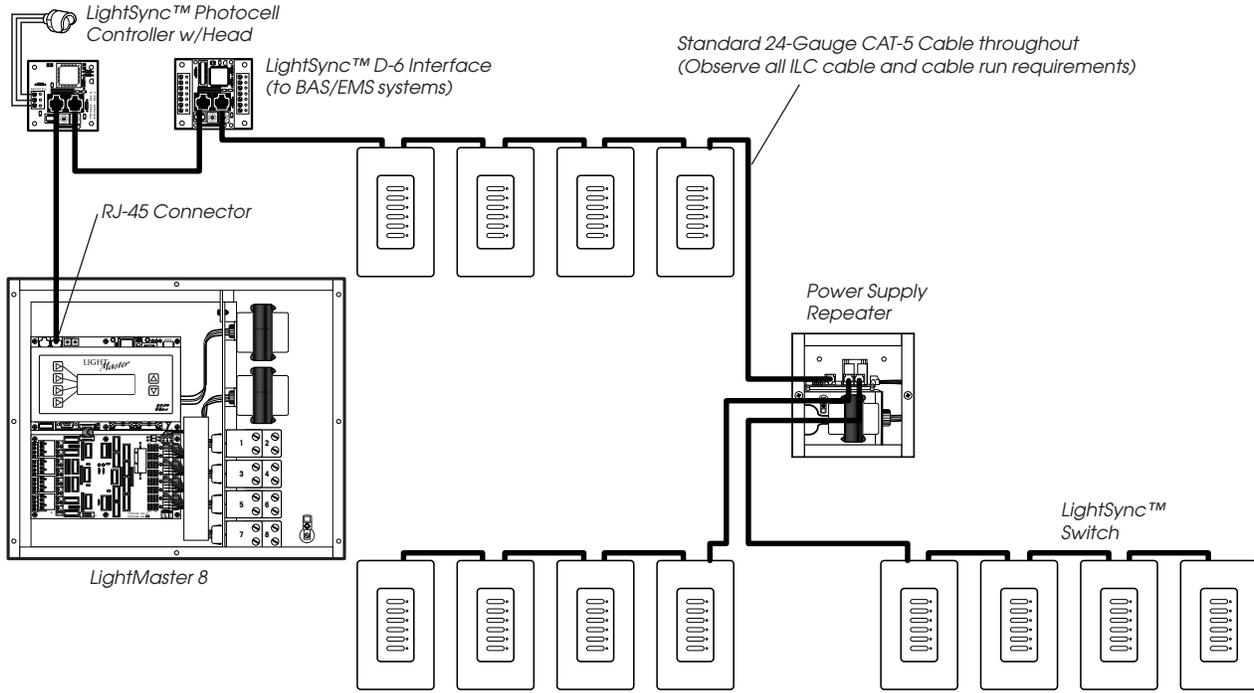


Figure 4.4a – Single Controller LightSync™ Cable Network Example

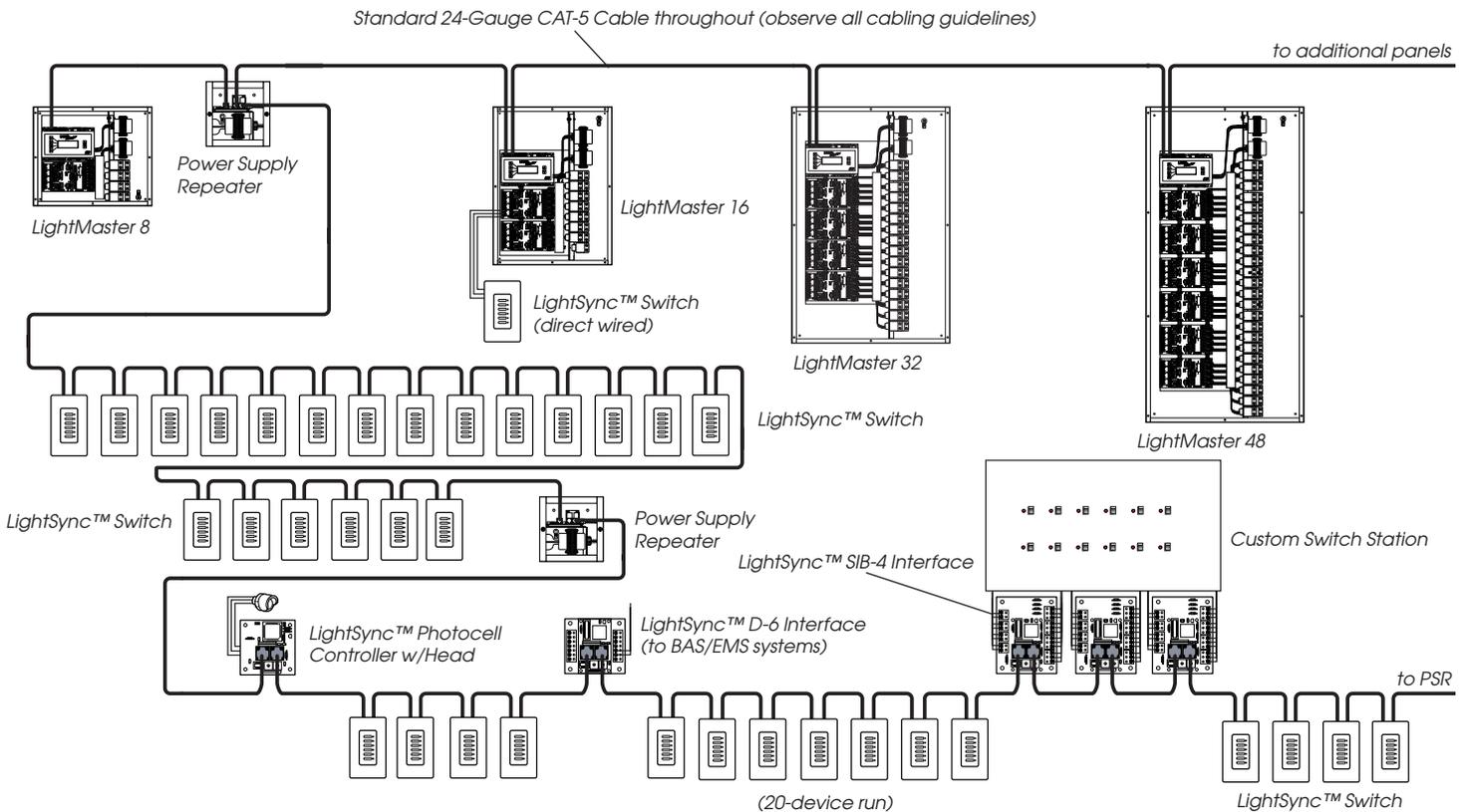
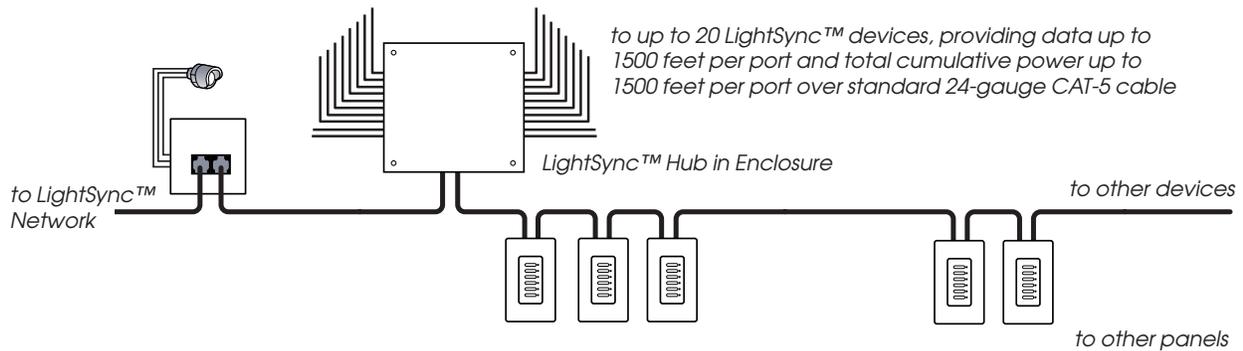
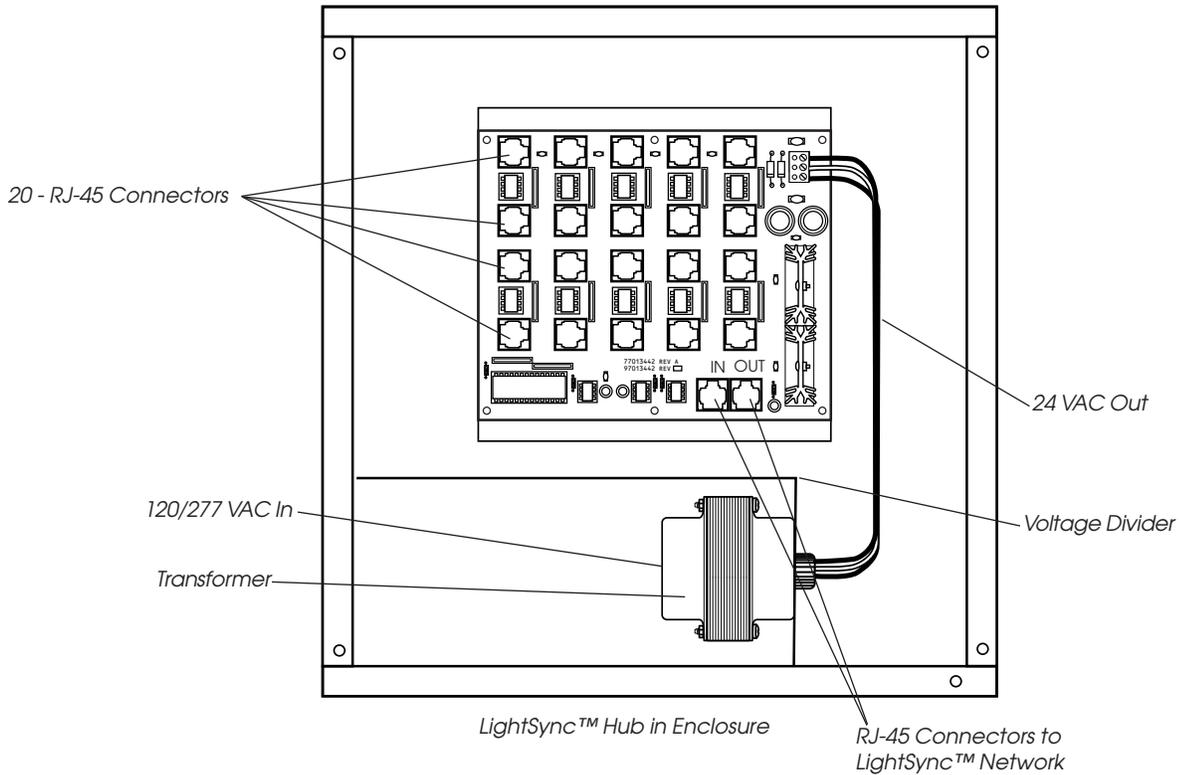


Figure 4.4b – Multiple Controller LightSync™ Cable Network Example



LightSync™ Network Example with LightSync Hub

Figure 4.4c – LightSync™ Hub Option

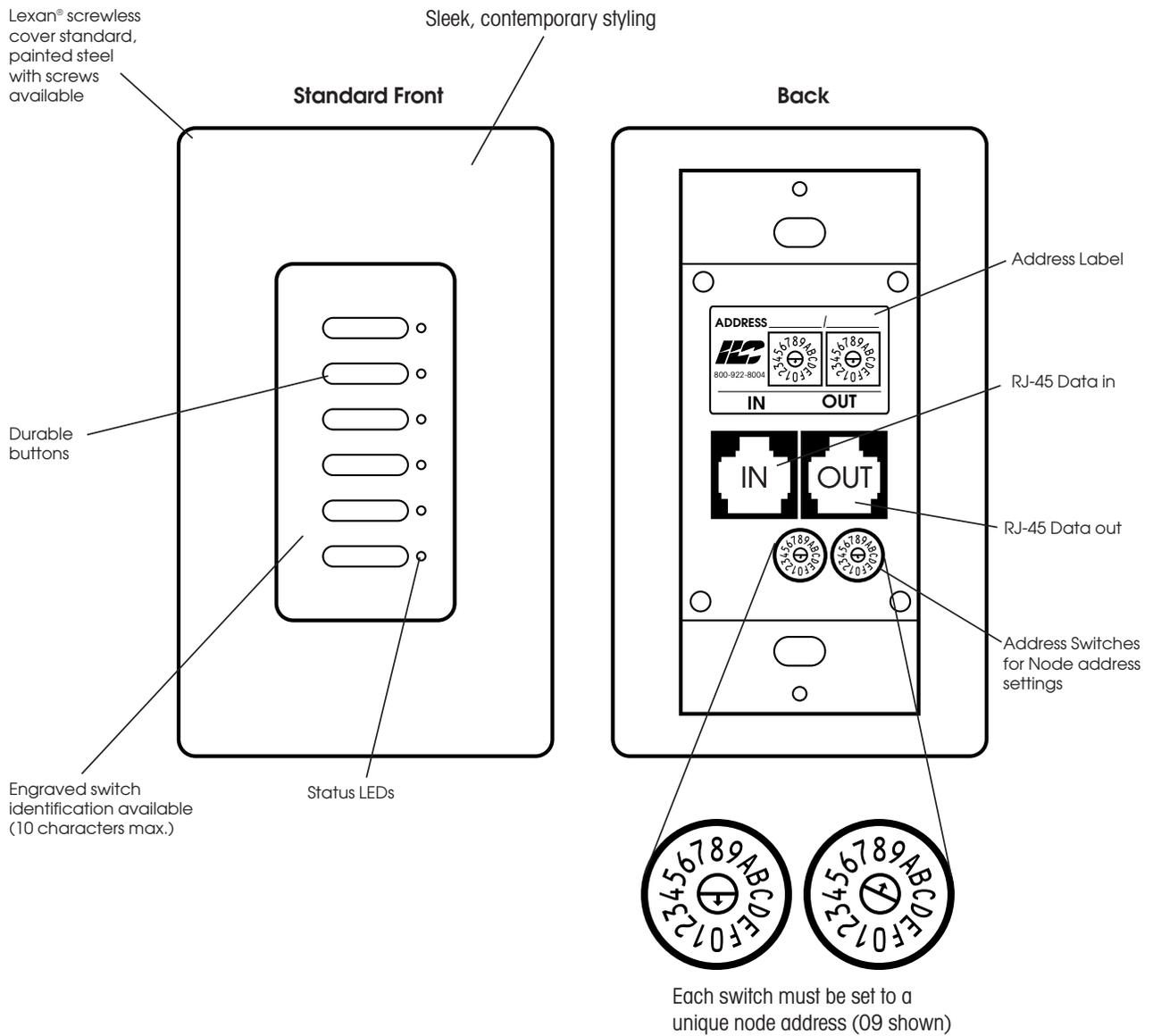


Figure 4.5 – LightSync™ Switch Detail

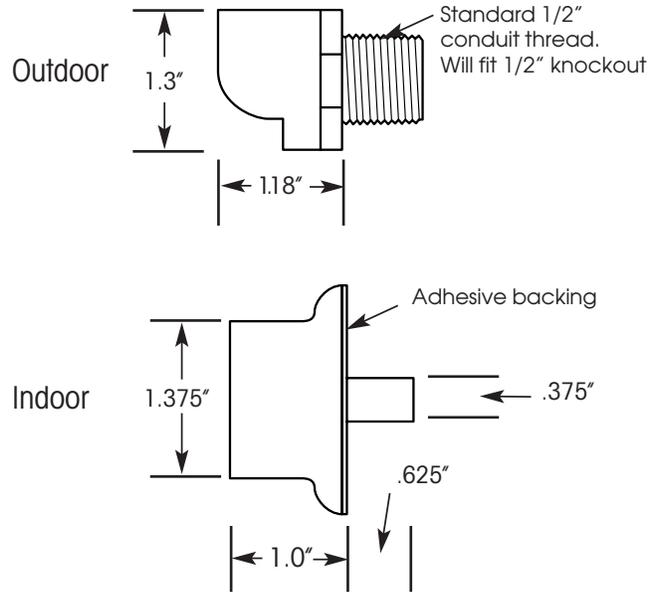
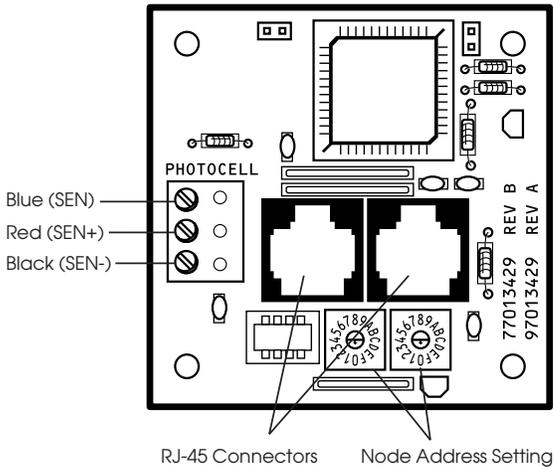
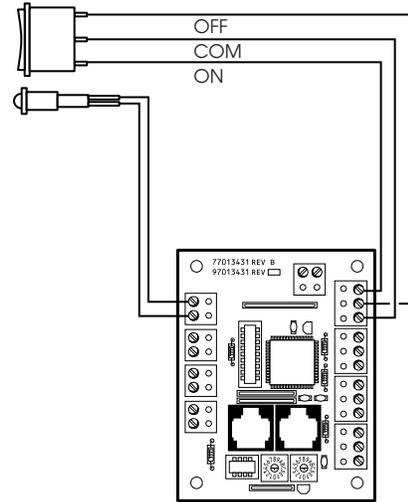
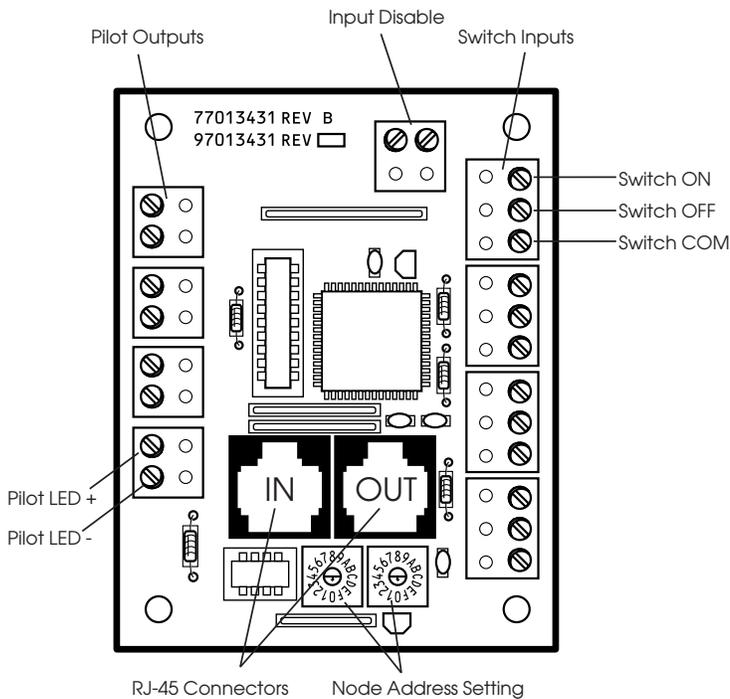


Figure 4.6 – LightSync™ Photocell Controller and Heads Detail



Wiring a typical momentary rocker switch with pilot light to SIB-4

Figure 4.7 – LightSync™ SIB-4 Switch Interface

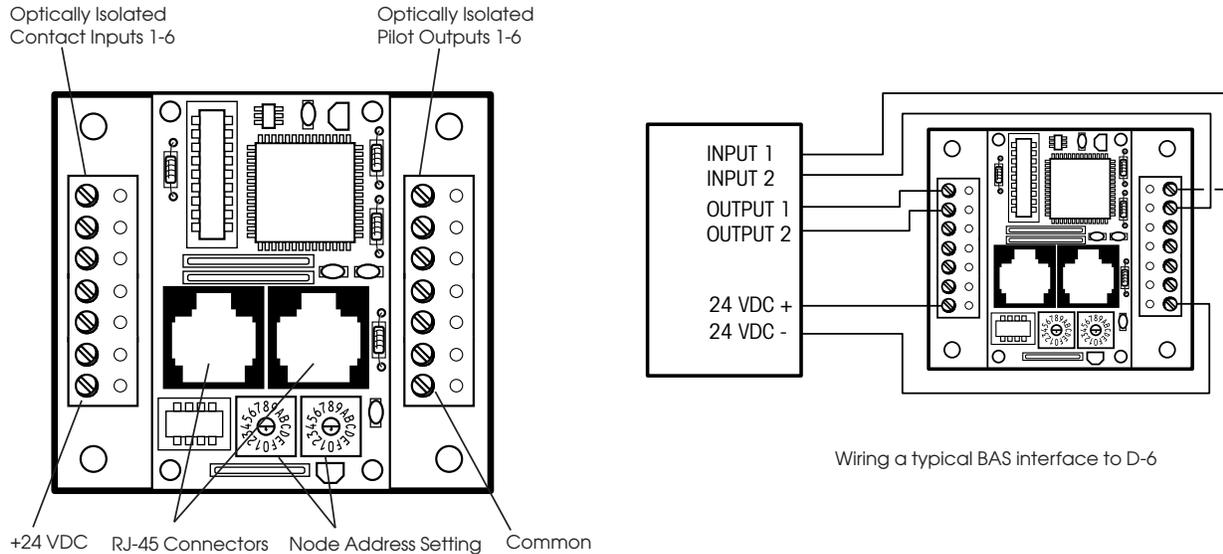


Figure 4.8 – LightSync™ D-6 Network Contact Interface

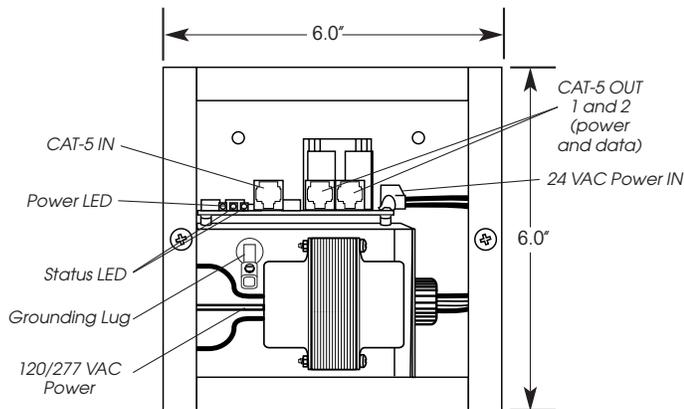


Figure 4.4 – LightSync™ Power Supply Repeater (PSR) Detail

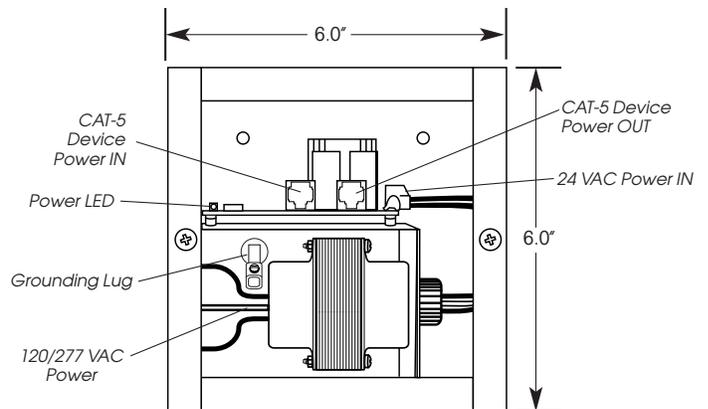


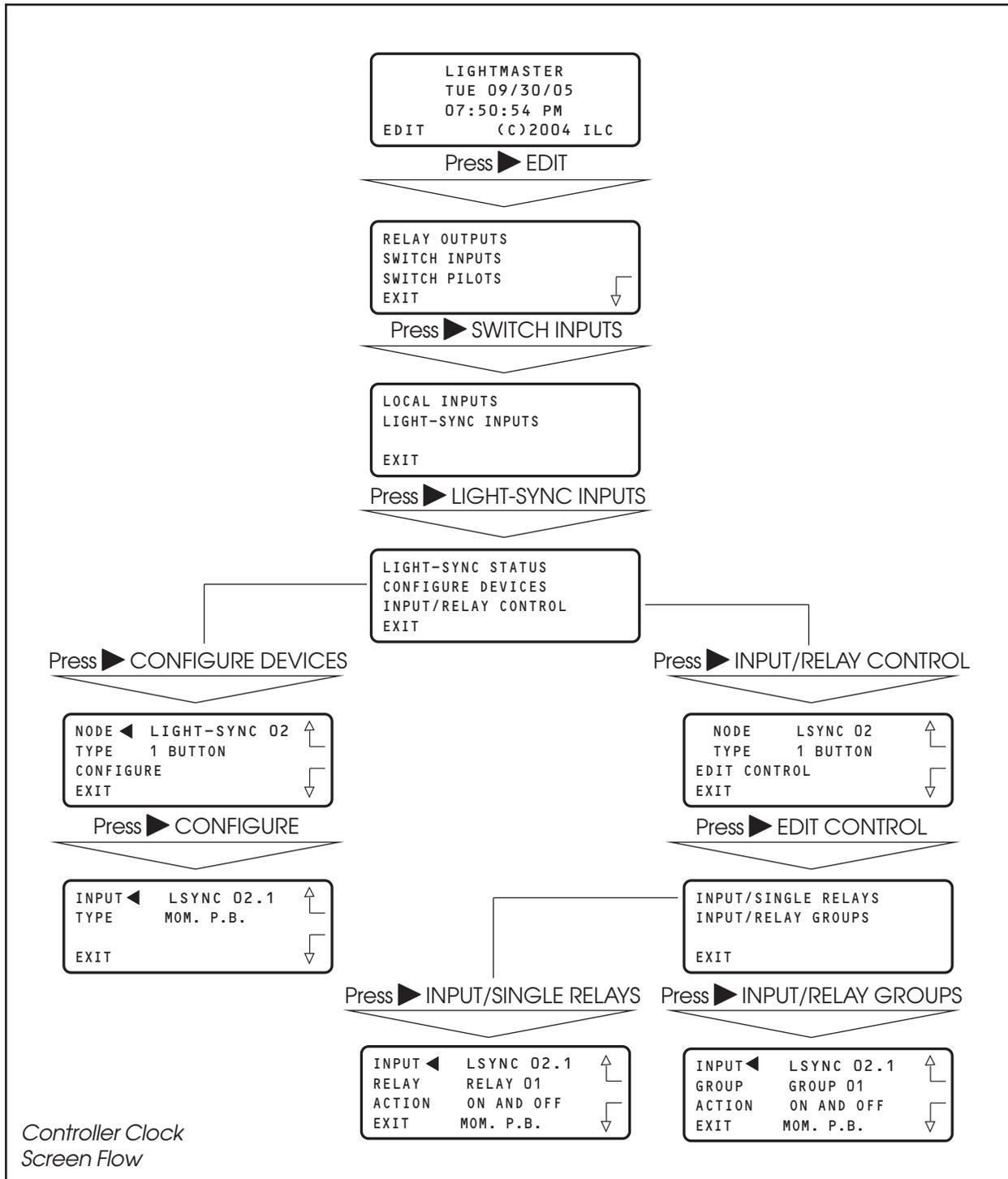
Figure 4.4a – LightSync™ Power Supply (PS) Detail

Figure 4.9 – LightSync™ Power Supply Repeater

Type	Physical	Operation
Momentary ON/OFF	LightSync SIB-4	Momentary contact between ON and COMMON turns controlled relay outputs ON. Momentary contact between OFF and COMMON turns controlled relay outputs OFF.
Momentary Pushbutton	LightSyncSwitch, LightSync SIB-4	Momentary contact between ON and COMMON turns controlled relays ON and OFF alternately each time contact is made.
Maintained ON/OFF	LightSync SIB-4, LightSync D-6	When contact between ON and COMMON is made, controlled relays turn ON. When contact is broken, controlled relays turn OFF.
Photocell	LightSync Photocell Controller	Relays go ON and OFF at user-entered approximations of foot candle levels.
Set Preset	LightSync Switch, LightSync SIB-4, LightSync D-6	When momentary contact between ON and COMMON is made, the controlled relay outputs will go to their programmed states.
HID BI-LEVEL	LightSync SIB-4	The first contact between ON and COMMON turns the ON/OFF ballast relay ON and the HIGH/LOW ballast relay HIGH (NC default) or Low (NO default) and locks them in this position for a 15-minute warm-up period. Subsequent contact closures between ON and COMMON toggle between HIGH and LOW. Contact between OFF and COMMON locks both the ON/OFF and HIGH/LOW ballast relays OFF for 15 minutes.
Two-Step Group	LightSync Switch, LightSync SIB-4, LightSync D-6	Upon switch activation, Group A relays turn ON and Group B turn OFF. The following activation causes Group A to turn OFF and Group B to turn ON. The pattern repeats with each switch activation.
Four-Step Group	LightSync Switch, LightSync SIB-4, LightSync D-6	On the first activation, Group A relays turn ON and Group B turn OFF. On the second activation, Group A relays turn OFF and B turns ON. The third activation causes both A and B to go ON. On the fourth , activation both A and B go OFF. Then the pattern repeats.
Timer Disable	LightSync SIB-4	As long as the switch is closed, selected timers are disabled.
Timed ON	LightSync Switch, LightSync SIB-4, LightSync D-6	When momentary contact is made between COMMON and ON, relay outputs are turned ON. When contact is broken, a timed ON duration is started from 5-999 minutes. Contact between OFF and COMMON will turn relays OFF.
Output Override	LightSync SIB-4	As long as the switch is closed, selected relay output(s) will ignore all input, timer, or network commands.

Figure 4.10 – LightSync™ Device Types

4.2 How to Control Relays With a LightSync™ Switch – Fast Track



How To Control a Relay or Relay Group From a LightSync™ Switch Node

CONCEPTS AND PARAMETERS

To control a relay or relays from a LightSync™ line switch node, you must:

1. Define the selected switch node.
2. Select the relay output or relay group that the switch node controls.
3. Define how the switch node will control the relay.

LIGHTSYNC NODE CONTROL: PARAMETERS/OPTIONS:

NODE = 1 of 127 possible controller switch node addresses. (01-7F Hex.) Note that nodes containing more than one device have address hard encoded suffixes to differentiate the devices. For example, the third pushbutton of a 6 pushbutton station you address as node 06 would be 6.3.

TYPE (node) = the physical configuration of the node – 1-6 pushbutton station, 4 input switch station (SIB-4), 6 unit I/O unit (D-6), data line photocell.

CONFIGURE = the process of defining the parameters of each device making up the switching node.

INPUT = the node address of the device, which is to control the Relay or Relay group.

TYPE (functional) = the operational characteristics of the input. (See Table 4-10 for possible choices.)

RELAY = 1 of 48 possible controller relay outputs.

RELAY GROUP = a user-defined group of relay outputs that will react as a group to a switch or timer signal.

ACTION = how the switch actuation will affect the relay. (Default is NO ACTION.) Other possible responses are ON ONLY, OFF ONLY, ON AND OFF, BLINK ALERT.

SAMPLE OPERATION:
Control a Single Relay Output From a Switch Node

Define the LightSync™ Switch Node:

1. From the Home screen, press ► EDIT.
2. When the Main menu appears, press ► SWITCH INPUTS; then press ► LIGHT-SYNC INPUTS.
3. From the Switch Input menu, press ► CONFIGURE DEVICES.
4. When the top level configuration screen appears, press ▲ or ▼ until the switch node address you want to define appears.
5. Press ► TYPE; then press ▲ or ▼ until the physical switch node type appears.
6. Press ► CONFIGURE to access the second configuration screen.
7. If necessary, press ▲ or ▼ until the sub-address of the device you want to define appears. **NOTE:** On multi-device nodes, each device will have a distinct sub-address, which can be assigned its own function switch type. For example: in a 3-button pushbutton addressed as 06, the buttons would be 06.1, 06.2, and 06.3, respectively.
8. Press ► TYPE; then press ▲ or ▼ until the desired functional switch type appears. Note: Functional switch types are limited by the physical node type. (See Table 4-10.)
9. Press ► EXIT twice to return to the LightSync™ Input menu.

```
LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
```

Press ► EDIT

```
RELAY OUTPUTS
SWITCH INPUTS
SWITCH PILOTS
EXIT
```

Press ► SWITCH INPUTS

```
LOCAL INPUTS
LIGHT-SYNC INPUTS
EXIT
```

Press ► LIGHT-SYNC INPUTS

```
LIGHT-SYNC STATUS
CONFIGURE DEVICES
INPUT/RELAY CONTROL
EXIT
```

Press ► CONFIGURE DEVICES

```
NODE ◀ LIGHT-SYNC 02
TYPE   1 BUTTON
CONFIGURE
EXIT
```

Press ► CONFIGURE

```
INPUT ◀ LSYNC 02.1
TYPE   MOM. P.B.
EXIT
```

Press ► TYPE

```
INPUT   LSYNC 02.1
TYPE ◀  MOM. P.B.
EXIT
```

Press ► EXIT twice

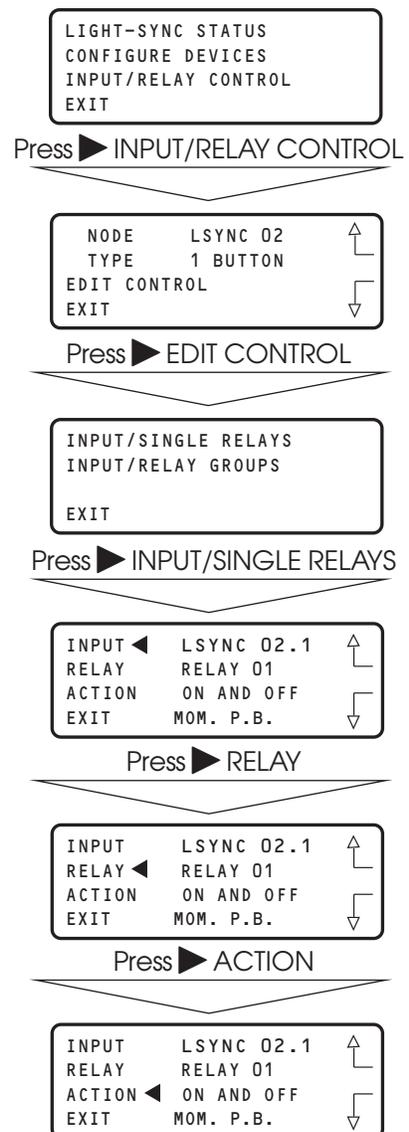
```
LIGHT-SYNC STATUS
CONFIGURE DEVICES
INPUT/RELAY CONTROL
EXIT
```

SAMPLE OPERATION:

Control a Single Relay Output From a Switch Node

Select the Relay That the Switch Node Controls:

1. From the LightSync Input menu, press ► INPUT/RELAY CONTROL; press ▲ or ▼ to select device; then press ► EDIT CONTROL. On the next screen, press ► INPUT/SINGLE RELAYS.
2. Press ▲ until the input that controls relay(s) appears.
3. Press ► RELAY; then press ▲ or ▼ until the relay to be controlled appears.
4. Press ► ACTION; then press ▲ or ▼ until the desired relay action appears.
5. Repeat steps 3 and 4 for any additional relays controlled by the input.
6. Press ► EXIT 6 times to return to the Home screen.

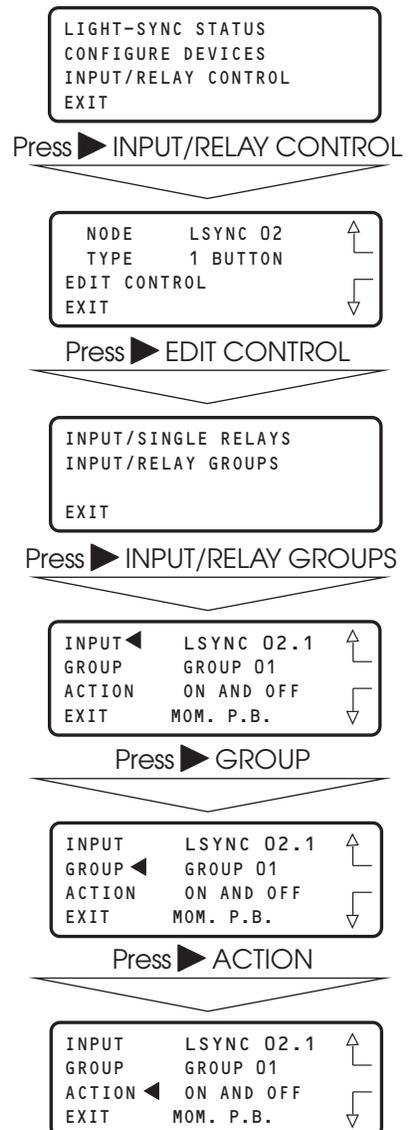


SAMPLE OPERATION:

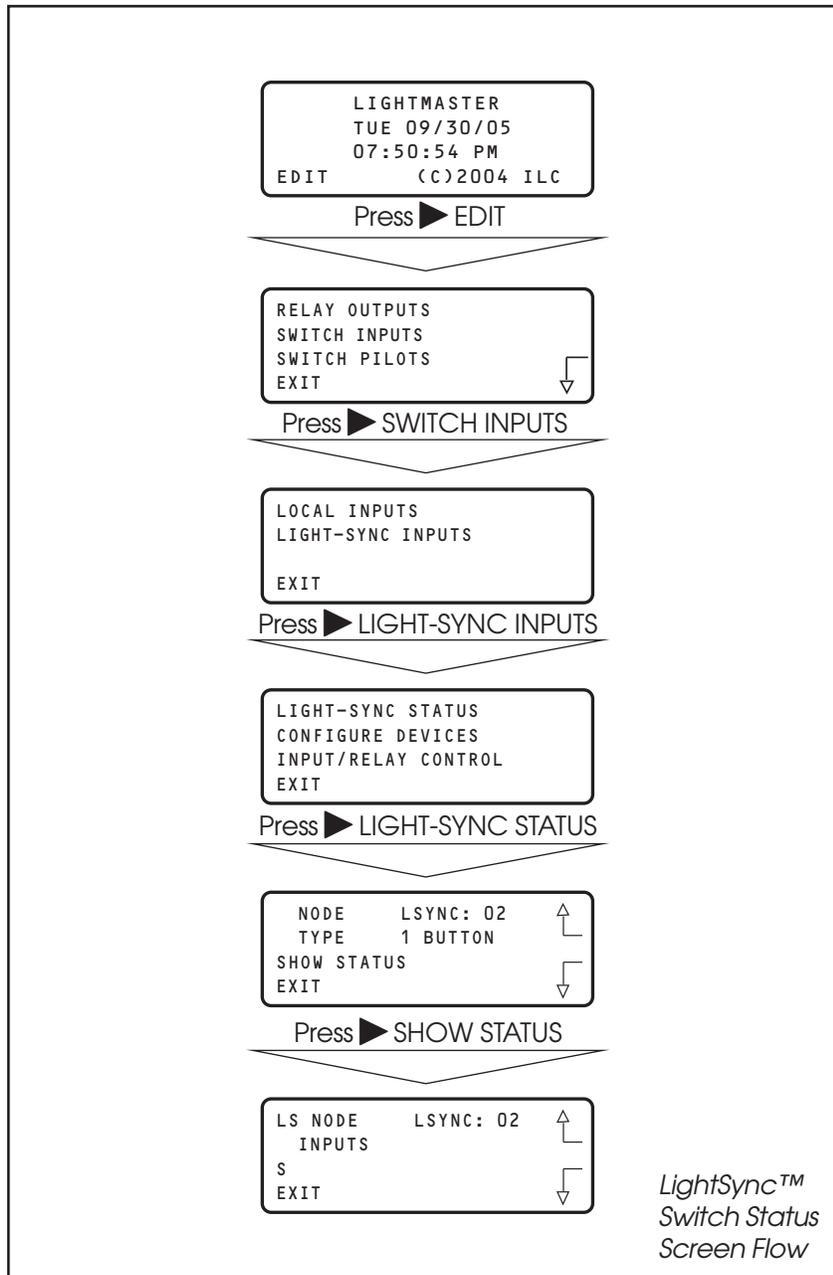
Control a Relay Group From a LightSync™ Switch Node

Define the LightSync switch node as already described; then select the relay group that the switch node controls. NOTE: Be sure the relay group you wish to control has been previously defined. (See Sample Operation – How to Define a Relay Group in Section 3)

1. From the LightSync Input menu, press ► INPUT/RELAY CONTROL; press ▲ or ▼ to select device, then press ► EDIT CONTROL.
2. When the Single Relay/Relay Group Control menu appears, press ► INPUT/ RELAY GROUPS.
3. Press ▲ or ▼ until the input that controls relay(s) appears.
4. Press ► GROUP; then press ▲ or ▼ until the relay group to be controlled appears.
5. Press ► ACTION; then press ▲ or ▼ until the desired relay group action appears.
6. Repeat steps 3 and 4 for any additional relay groups controlled by the input.



4.3 LightSync™ Switch Status – Fast Track



LightSync™ Switch Status

CONCEPTS AND PARAMETERS

You can view the current status of each switch input.

Parameter Key:

NODE = 1 of 127 possible switching nodes.

SHOW STATUS = display the status of the selected switch node.

CONNECTED = the switch is on the RJ-45 data line and capable of activation.

SAMPLE OPERATION:

Check the Current Status of a Switch Input

1. From the Home screen, press ► EDIT.
2. From the Main menu, press ► SWITCH INPUTS; then press ► LIGHT-SYNC INPUTS.
3. From the Switch Input menu, press ► LIGHT-SYNC STATUS.
4. When the Switch Input Status screen appears, press ▲ or ▼ until the LightSync™ node you want to check appears.
5. Press ► SHOW STATUS to check the status of the node.
6. Press ► EXIT 5 times to return to the Home screen.

NOTE: For a momentary pushbutton switch, the screen momentarily displays the switch number when the button is pushed.

```
LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
```

Press ► EDIT

```
RELAY OUTPUTS
SWITCH INPUTS
SWITCH PILOTS
EXIT
```

Press ► SWITCH INPUTS

```
LOCAL INPUTS
LIGHT-SYNC INPUTS
EXIT
```

Press ► LIGHT-SYNC INPUTS

```
LIGHT-SYNC STATUS
CONFIGURE DEVICES
INPUT/RELAY CONTROL
EXIT
```

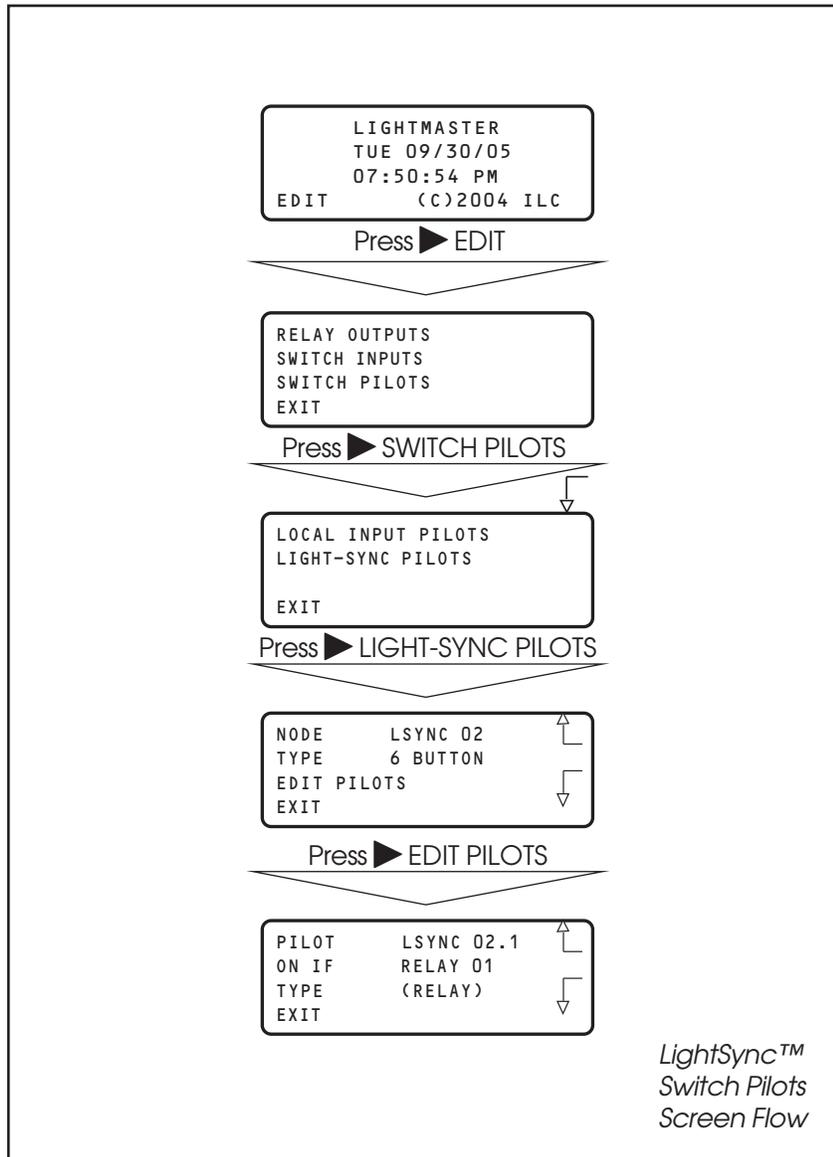
Press ► LIGHT-SYNC STATUS

```
NODE      LSYNC: 02
TYPE      1 BUTTON
SHOW STATUS
EXIT
```

Press ► SHOW STATUS

```
LS NODE   LSYNC: 02
TYPE      1 BUTTON
EXIT      CONNECTED
```

4.4 LightSync™ Switch Pilots – Fast Track



How to Define a LightSync™ Switch Pilot

CONCEPTS AND PARAMETERS

You can program how the pilot lights located on the LightSync™ switches react or operate. Some users prefer the switch pilots to be ON all the time (example: location light). Some users prefer that the pilot LED be ON only when the load or group switched has been switched ON.

To define a switch pilot, you must:

1. Select the LightSync™ switch pilot.
2. Select the relay output, relay group or preset that is to light the selected switch pilot.

Parameter Key:

PILOT = the number of the switch input pilot (1-6) located on a LightSync™ switch.

ON IF = the number of the relay, relay group, or preset that will actuate the switch pilot (1-48).

TYPE = the type of actuator: relay output, group, preset or static. (*Static is the default.*)

STATIC = the user has the option of locking the switch pilots into either Always ON or Always OFF. (*Always OFF is the default condition.*)

SAMPLE OPERATION:

Program a Status LED to Light When a Preset Is ON

1. From the Home screen, press ► EDIT.
2. When the Main menu appears, press ► SWITCH PILOTS; then press ► LIGHT-SYNC PILOTS; then press ▲ or ▼ to select device.
3. When the top level Pilot definition screen appears, press ► EDIT PILOTS
4. From the Pilot Edit Screen, press ▲ or ▼ to select the Input.
5. Press ► TYPE until PRESET appears.
6. Press ▲ or ▼ until the desired preset appears.

```

LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT          (C)2004 ILC
    
```

Press ► EDIT

```

RELAY OUTPUTS
SWITCH INPUTS
SWITCH PILOTS
EXIT
    
```

Press ► SWITCH PILOTS

```

LOCAL INPUT PILOTS
LIGHT-SYNC PILOTS
EXIT
    
```

Press ► LIGHT-SYNC PILOTS

```

NODE   LSYNC: 02
TYPE   1 BUTTON
EDIT PILOTS
EXIT
    
```

Press ► EDIT PILOTS

```

PILOT ◀ LSYNC: 02
ON IF   PRESET: 01
TYPE    PRESET
EXIT
    
```

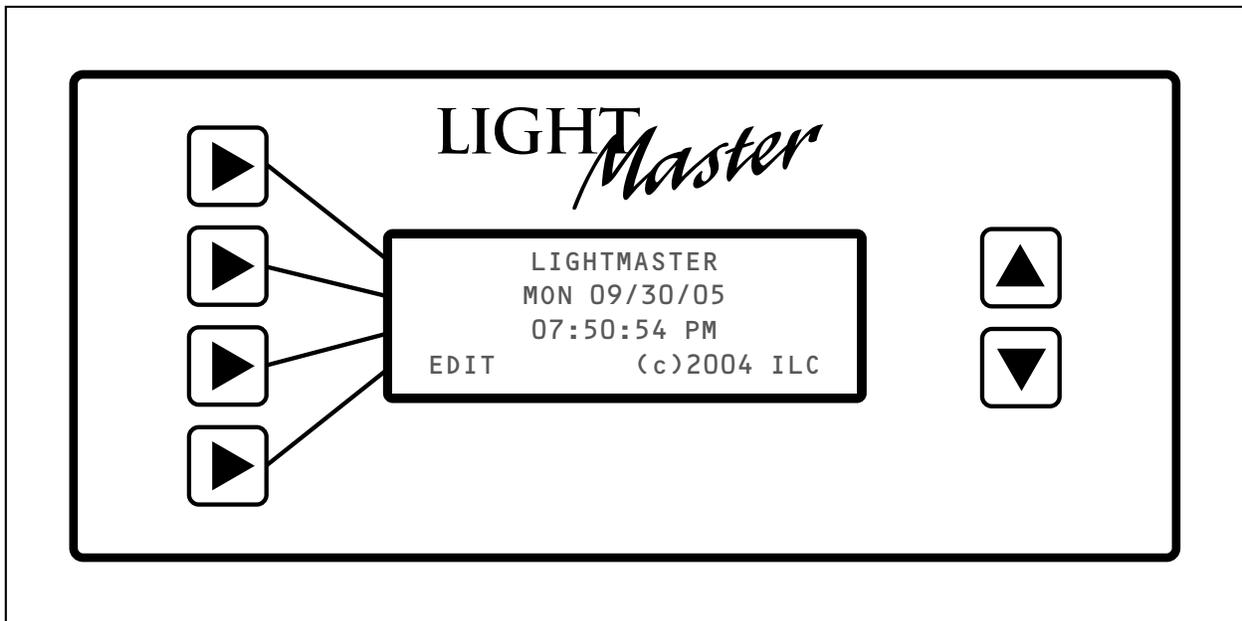
Press ► TYPE

```

PILOT   LSYNC: 02
ON IF   PRESET: 01
TYPE ◀  PRESET
EXIT
    
```

Section 5

Appendix



Section 5 Appendix

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The FCC requires that the following statement be included in this manual.

FCC Registration #6TP USA-35522-DM-N

Ringer Equivalence 0.4B

Connecting to the telephone company

This equipment complies with Part 68 of the FCC rules. On the back plate near the RJ-11 jack of this equipment is a label that contains, among other information, the FCC registration number and ringer equivalence (REN) for this equipment. If requested, provide this information to your telephone company.

The REN is useful to determine the quantity of devices that may be connected to the telephone line. Excessive RENs on the telephone line may result in devices not ringing in response to an incoming call. In most, but not all areas, the sum of RENs of all devices should not exceed five (5). To be certain of the number of devices that may be connected to a line, as determined by the total RENs, contact the local telephone company.

If your telephone equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice isn't practical, you will be notified as soon as possible. You will be advised of your right to file a complaint with the FCC if you believe it is necessary.

Your telephone company may make changes in your facilities, equipment, operations, or procedures that could affect the operation of your equipment. If they do, you will be given advance notice so as to give you an opportunity to maintain uninterrupted service.

If you experience trouble with this telephone equipment, please contact: Intelligent Lighting Controls, Inc./Reliant Relay Co., Technical Support Department at 1-800-922-8004 for repair and warranty information. If your equipment is causing harm to the telephone network, the telephone company may request that you disconnect the equipment until the problem is resolved.

This equipment may not be used on public coin service provided by the telephone company. Connection to party lines is subject to state tariffs. (Contact your local state public utility commission or corporation commission for information.)

NOTICE: The Industry Canada label identifies certain equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. The Industry Canada does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line of individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designed by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

CAUTION: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

The Ringer Equivalence Number (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Numbers of all the devices does not exceed 5.

A.1 Overview

The telephone Add-On Module is an optional board that is easily added to the LightMaster Controller. This module supports dual-tone multi-frequency (DTMF) touchtone telephone control and monitoring. The module plugs into the expansion port provided on the LightMaster Controller CPU board. (See Figure A-2.)

A.2 Voice/DTMF Control Features

This Add-On Module supports the following touchtone telephone control features:

- Get the current status of the controller’s relay outputs
- Turn ON or OFF single relays or groups of relays
- Get the current status of the controller’s switch inputs
- Activate preset scenes

DTMF commands and control functions are supported by voice prompts that guide you through operational commands and give you instructions on how to use the system.

A.3 Voice/DTMF Control Setup

1. The LightMaster must be equipped with a Voice/DTMF Add-On Module. Locate the card on the controller’s processor board. (See Figure A.1.)
2. Connect a phone cord to the module’s RJ-11 jack and connect the other end to the telephone outlet. **The telephone line must be an analog line and have its own phone number. The line must be direct and not switched through a PBX or any type of extension system.**
3. Dial the telephone number of the controller.
4. When the controller answers, follow the voice prompts that will guide you through the operations you can perform.

LightMaster Controller

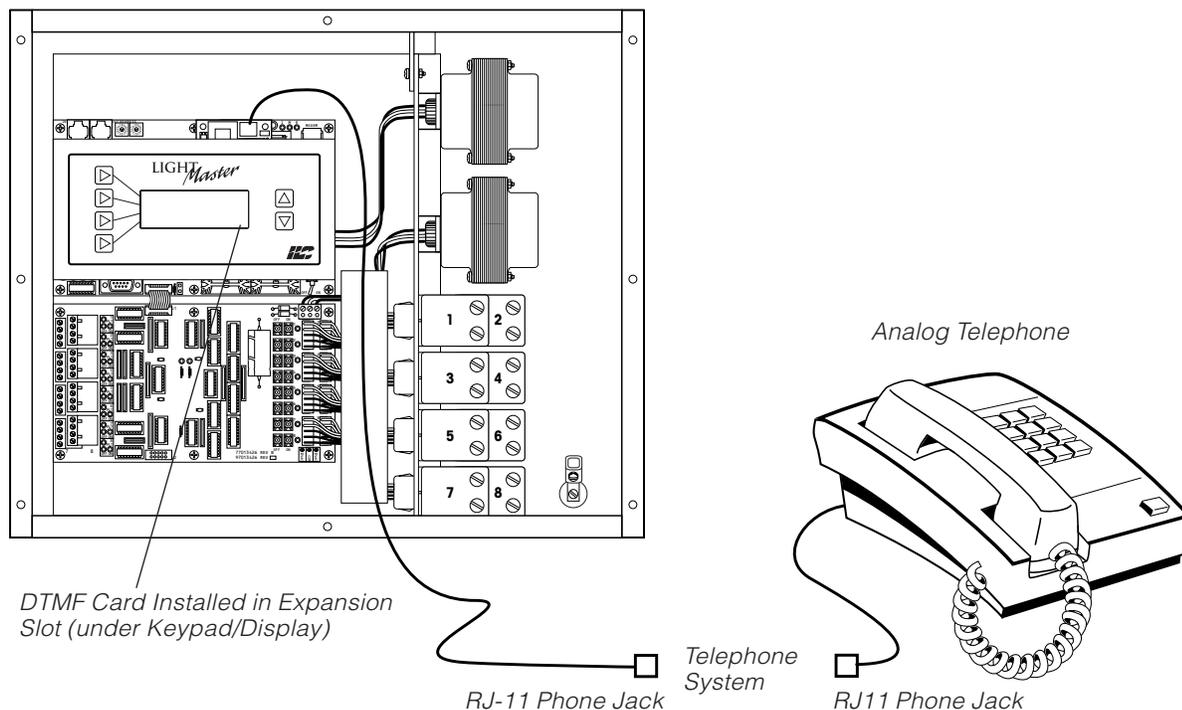


Figure A.1 – DTMF Phone Control

A.4 Voice Prompts for Stand-Alone DTMF Control

When you dial in to the controller you will hear the following voice prompts (prompts in bold):

ILC Elite, press 1 (Press 1)

(Main Menu)

For relay status and control press 1

(Enter the relay number followed by the # key or press * to return to the Main Menu)

For presets, press 3

(Enter the preset number followed by the # key or press * to return to the Main Menu)

For group control, press 4

(Enter the group number followed by the # key or press * to return to the Main Menu)

To end this call, press #

To repeat this menu, press *

(Sub Menus)

(If "1" is pressed on the Main Menu):

Enter the relay number followed by the # key or press * to return to the Main Menu

(Press 01-48 for relays 1-48. The current status of the chosen relay will then be stated.)

Relay __ is ON; to turn OFF Relay __, Press 2.

To return to the Main Menu, press 9

Relay __ is OFF; to turn ON Relay __, Press 1.

To return to the Main Menu, press 9

(If "3" is pressed on the Main Menu):

Enter the preset number followed by the # key

(Press 01-48 for the desired preset)

Preset __ has been activated

(It will then automatically go back to the Main Menu)

(If "4" is pressed on the Main Menu):

Enter the group number followed by the # key

(Press 01-48 for the desired group)

To turn ON Group, press 1; to turn OFF Group, press 2; to return to the Main Menu, press 9

A.4.1 Control Codes

Use the telephone keypad to enter the following control codes:

- Relay codes (2 digits)
Code designates which relay in the panel you want to control (01-48)
Sample: Enter code 12 to control relay 12
- Preset codes (2 digits)
(See page 3-57 for information on how to define a preset)
01-48
Sample: Enter code 31 to set Preset 31
- Group codes (2 digits)
(See page 3-20 for information on how to define a relay group)
01-48
Sample: Enter code 22: you will be prompted to push 1 to turn ON Group 22 or push 2 to turn OFF Group 22

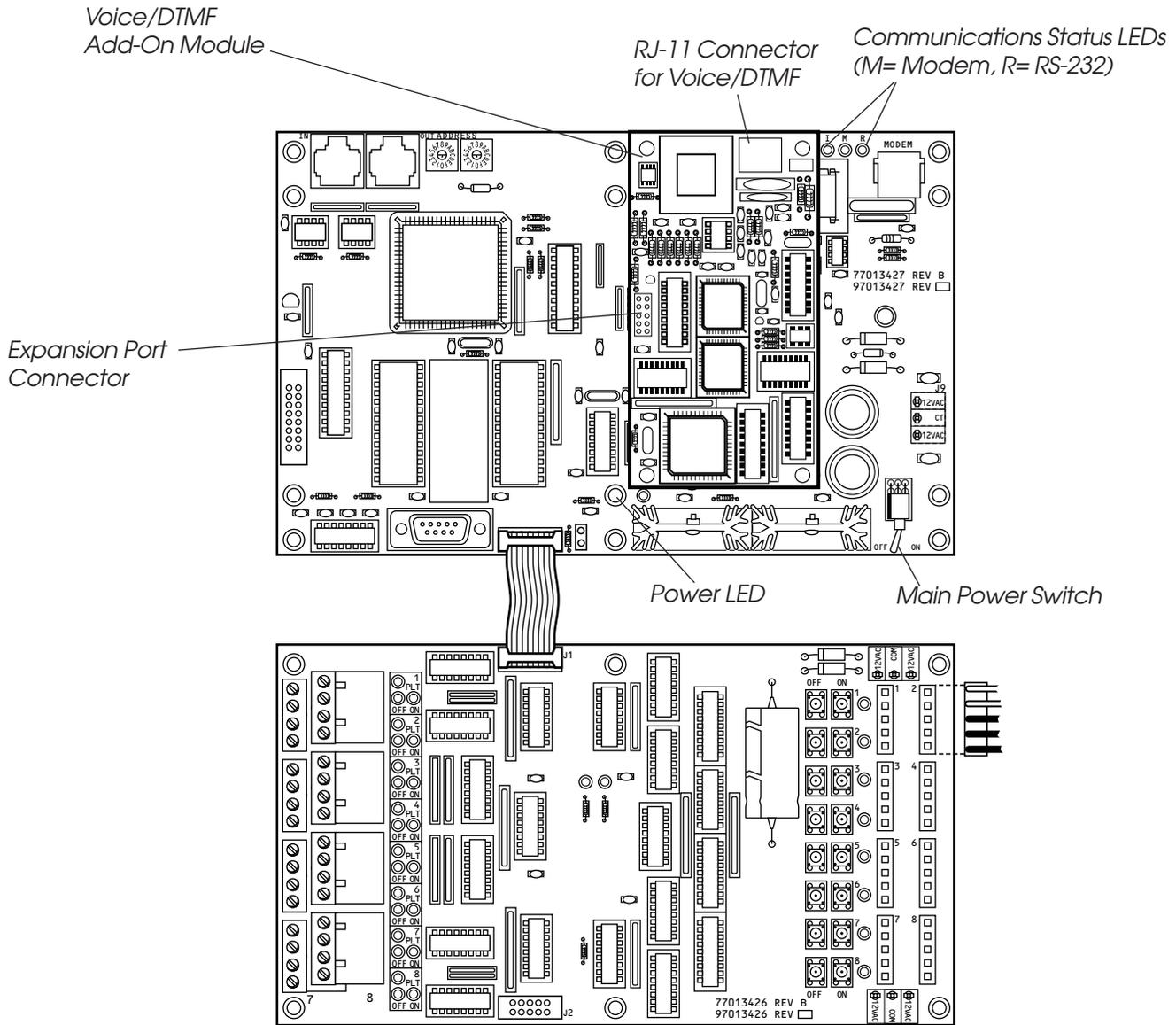


Figure A.2 – Voice/DTMF Module Installation
(Keypad/Display Module removed to show detail)

Overview

B.1 On-Board Modem Programming Control and Monitoring

Using an analog phone line, you can link a personal computer (PC) equipped with a modem and LightMaster Pro software to the LightMaster Controller's on-board modem and perform all the control and programming operations supported by LightMaster Pro, including:

- Check the status of the controller's relay outputs and switch inputs
- Turn ON/OFF individual relay outputs
- Sweep ON/OFF all the relay outputs
- Define switch inputs and map them to relay outputs
- Define timers and map them to relay outputs
- Define and invoke preset scenes

- Upload and download data between the controller and your PC.

B.2 On-Board Modem Control Setup

1. Connect a phone cord to the controller's on-board RJ-11 jack and connect the other end to the telephone outlet. **The telephone line must be an analog line and have its own phone number. The line must be direct and not switched through a PBX or any type of extension system.**
2. Using LightMaster Pro, dial the controller phone number.
3. When your PC and the controller link, perform the desired LightMaster Pro operations.

NOTE: An FCC-compliant telephone cord should be used to connect to the telephone network.

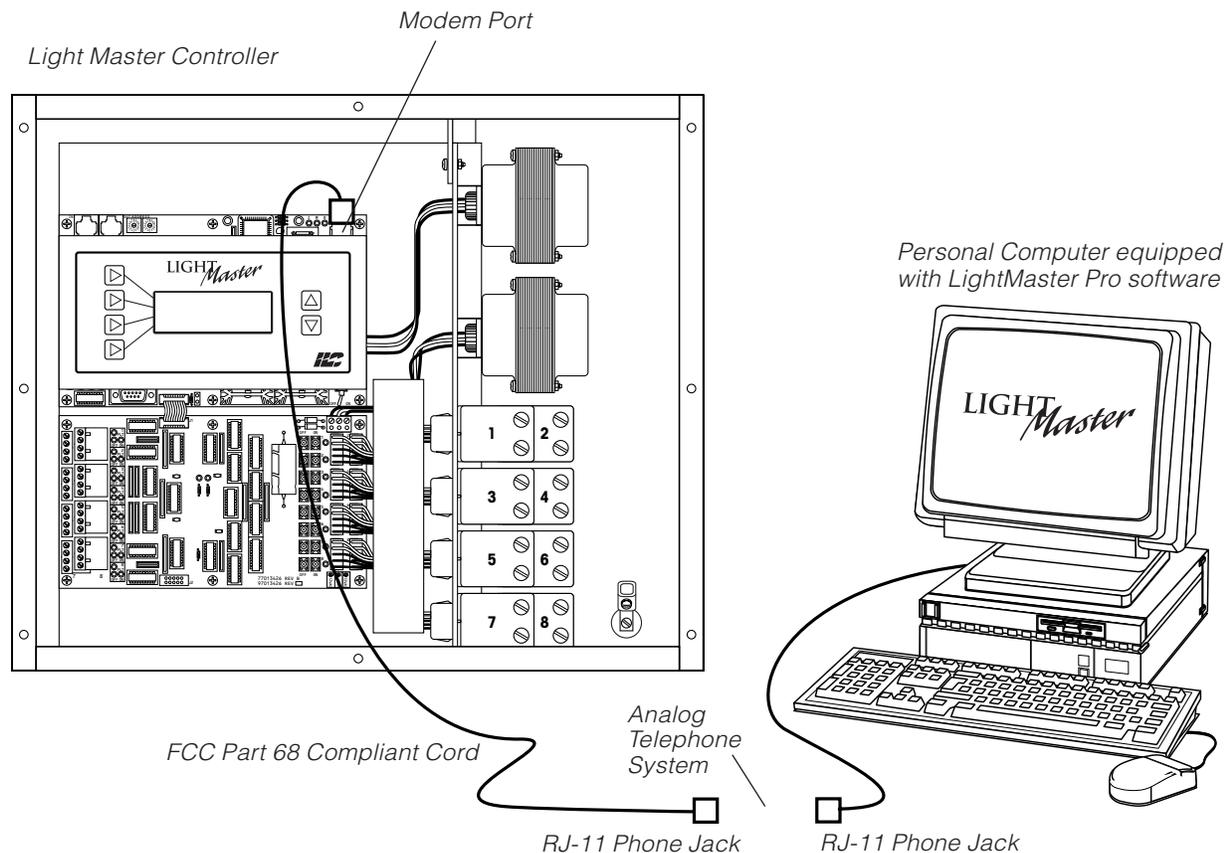


Figure B.1 – Programming the Controller From a PC

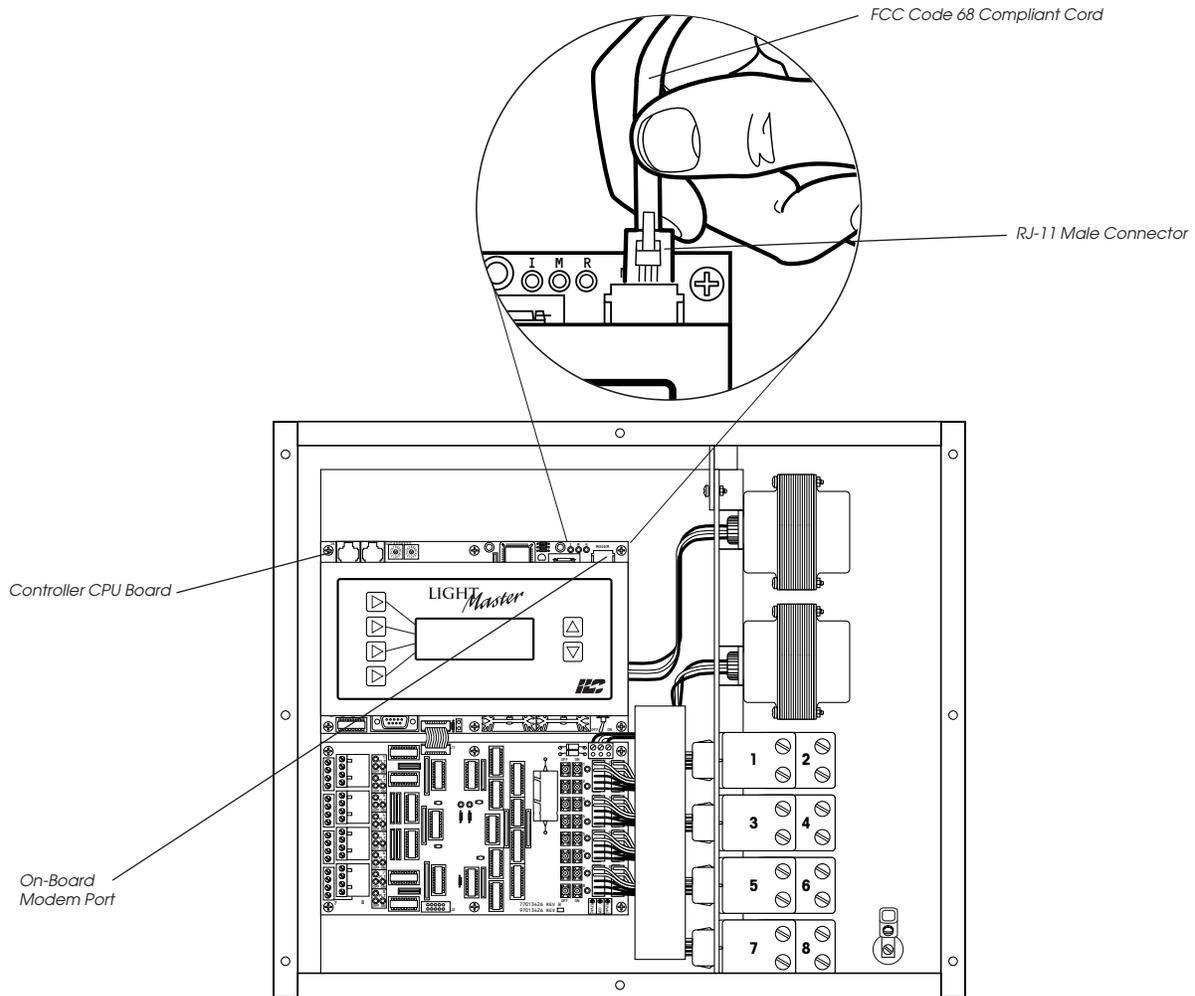


Figure B.2 – On-Board Modem Cable Termination

The FCC requires that the following statement be included in this manual.

This equipment complies with Part 68 of the FCC rules and requirements adopted by the ACTA. On the back plate near the RJ-11C jack of this equipment is a label that contains, among other information, a product identifier in the format US:AAAEQ##TXXXX. If requested, provide this information to your telephone company.

This equipment uses the following USOC jacks: RJ-11C

A plug and jack used to connect this equipment to the premises wiring and telephone network must comply with the applicable FCC Part 68 rules and requirements adopted by ACTA. See installation instructions for details.

The REN is useful to determine the quantity of devices that may be connected to the telephone line. Excessive RENs on the telephone line may result in devices not ringing in response to an incoming call. In most, but not all areas, the sum of RENs of all devices should not exceed five (5.0). To be certain of the number of devices that may be connected to a line, as determined by the total RENs, contact the local telephone company. The ## in the product identifier represents the REN number without a decimal point (e.g., 03 is a REN of 0.3).

If your telephone equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice isn't practical, you will be notified as soon as possible. You will be advised of your right to file a complaint with the FCC if you believe it is necessary.

Your telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of your equipment. If they do, you will be given advance notice so as to give you an opportunity to maintain uninterrupted service.

If you experience trouble with this telephone equipment, please contact: Intelligent Lighting Controls Inc., Technical Support Department at 1-800-922-8004 for repair and warranty information. No user repairs can be performed. If your equipment is causing harm to the telephone network, the telephone company may request that you disconnect the equipment until the problem is resolved.

Connection to party line service is subject to state tariffs. Contact the state public utility commission, public service commission or corporation commission.

Advisory: Telephone companies report that electrical surges, typically lightning transients, are very destructive to customer terminal equipment connected to AC power sources. The use of a surge arrester is suggested.

Overview

C.1 RS-232 Programming Control and Monitoring

You can link a personal computer (PC) equipped with an RS-232 port and LightMaster Pro software to the LightMaster Controller's RS-232 port and perform all the control and programming operations supported by LightMaster Pro, including:

- Check the status of the controller's relay outputs and switch inputs
- Turn ON/OFF individual relay outputs
- Sweep ON/OFF all the relay outputs
- Define switch inputs and map them to relay outputs
- Define timers and map them to relay outputs

- Define and invoke preset scenes
- Upload and download data between the controller and your PC.

C.1 RS-232 Setup

1. Connect the factory-supplied RS 232 cable (a straight-through DB9F to DB9F serial cable) to the LightMaster's RS-232 port and connect the other end to the COM port you have selected for communication on your computer.
2. Using LightMaster Pro, connect with the controller.
3. When your PC and the controller link, perform the desired LightMaster Pro operations.

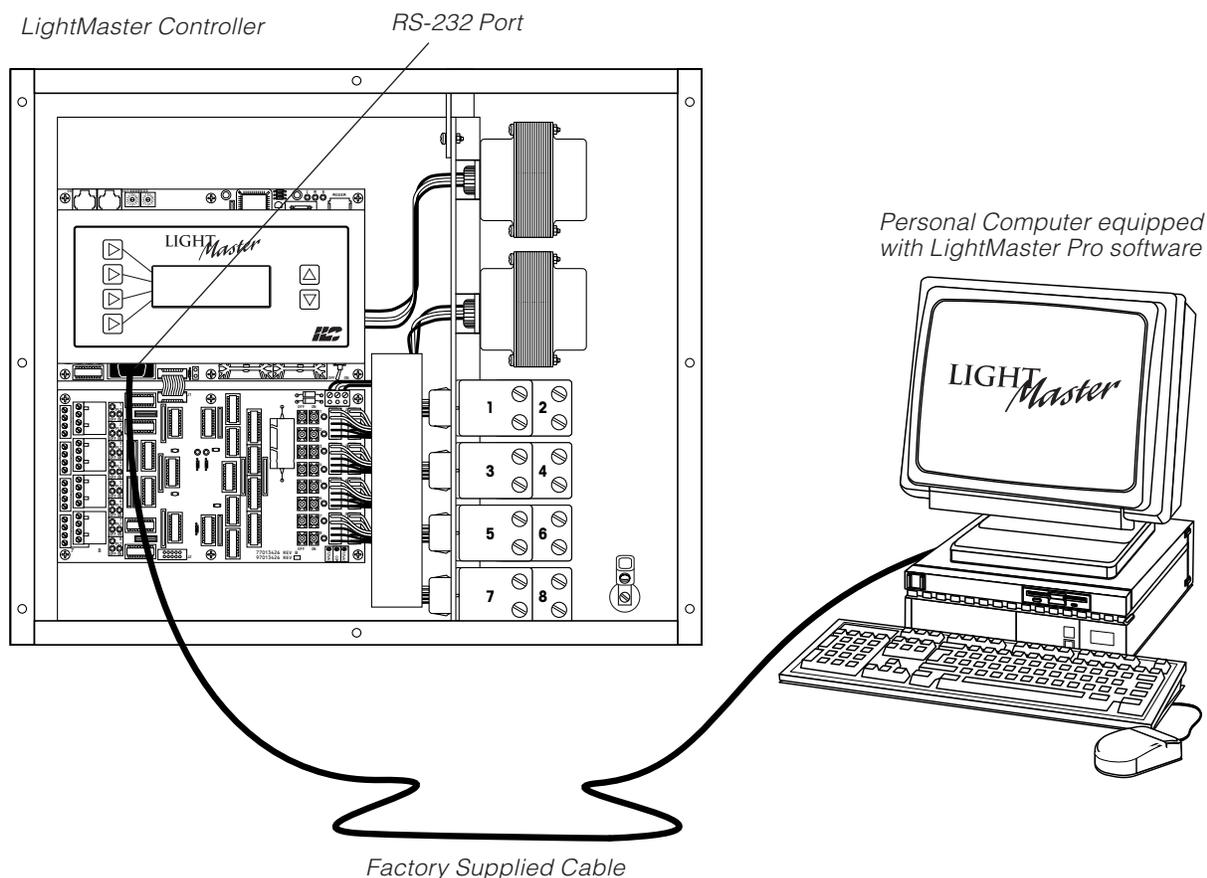


Figure C.1 – Programming the Controller From a PC

E.1 Overview

- With the addition of a DMX 512 interface card, the LightMaster Controller supports the control of non-dimmed loads via standard USITT DMX 512 communications protocol.
- The physical link is a standard USITT DMX 512 control cable (18-gauge, shielded twisted pair) that runs from the DMX output of the theatrical lighting controller to the LightMaster DMX communications port. The DMX 512 interface mounts on the LightMaster CPU board. (See Figure D-1.)
- You can program the LightMaster with desired ON and OFF DMX signal levels and then select how the LightMaster relay outputs will respond.
- You set common ON and OFF DMX signal levels for all DMX 512 channels (1 to 512 channels). However, you can program relay action on an individual channel basis.

ON and DMX OFF Levels:

Any time a DMX channel is at or above the ON level, the relay(s) mapped to that channel will be forced ON regardless of any switch input or timer control. Any time a DMX channel is at or below the OFF level, the relay(s) mapped to that channel will be forced OFF regardless of any switch input or timer control. While a DMX channel is below the ON level and above the OFF level, the relay(s) mapped to that channel are able to be controlled by switch inputs and timers.

EXAMPLE 1: To lock out all control other than DMX, set the DMX ON level to 90% and the OFF level to 10%. By setting the DMX signal level to 100% or 0%, the relay(s) will turn ON or OFF and also revert to the desired position after any change due to a switch input or timer.

EXAMPLE 2: To control relays via DMX and also allow switch inputs or timers to change the position, set the DMX ON level to 90% and the OFF level to 10%. By momentarily setting the DMX signal level to 100% and then setting it to 50%, the relay(s) will be turned ON and local control will return. By momentarily setting the DMX signal level to 0% and then setting it to 50%, the relay(s) will be turned OFF and local control will return.

DMX Filter:

The Filter setting determines the number of times the ILC Apprentice must receive a constant value on a DMX channel prior to performing the control mapped to that channel. The Filter may be set from 1 to 16. Lower Filter settings make the ILC Apprentice respond faster to DMX commands. Higher Filter settings prevent undesired relay control due to momentary zero levels on DMX channels. The Filter setting does not directly correspond to DMX frame counts.

E.2 Objectives

After reading Appendix E, you will be able to program the LightMaster to implement DMX control.

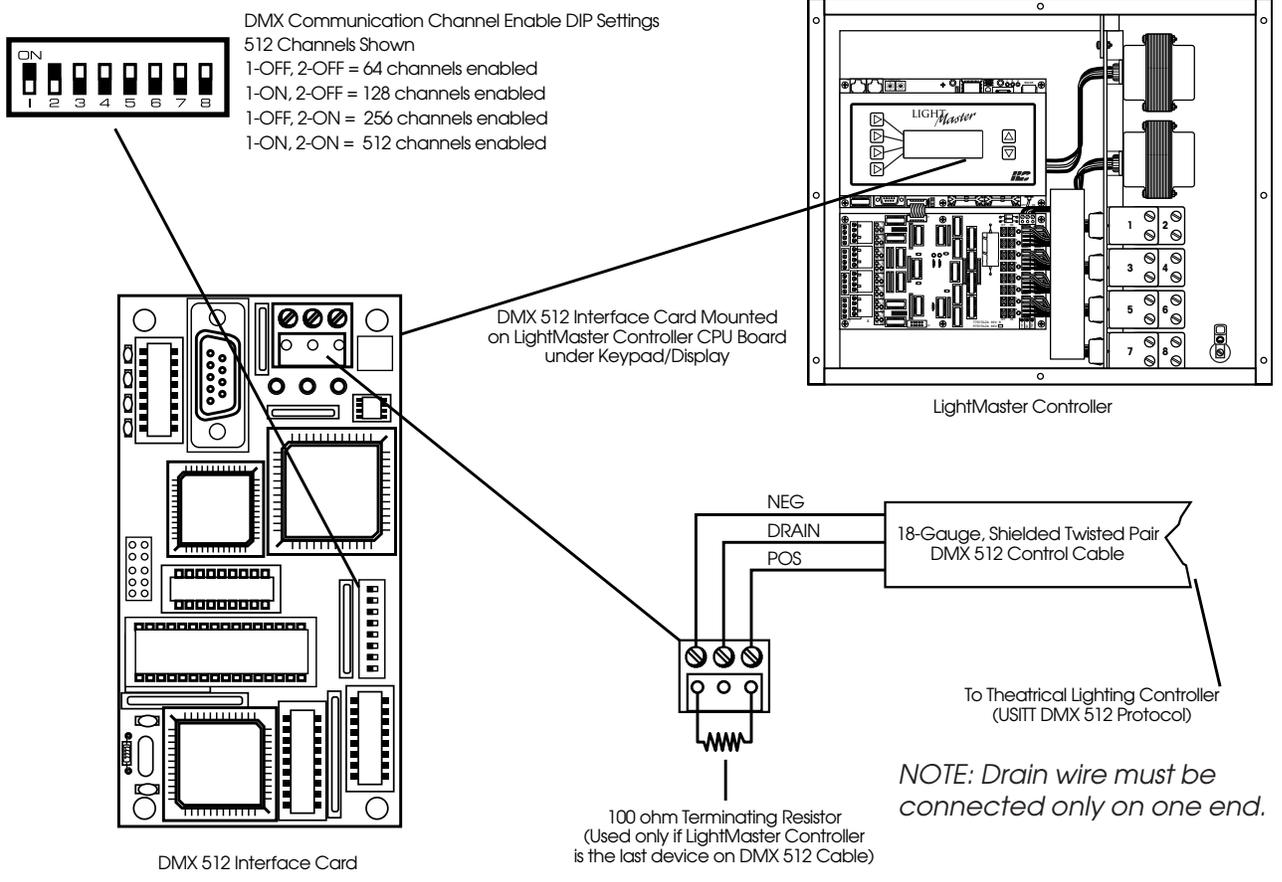
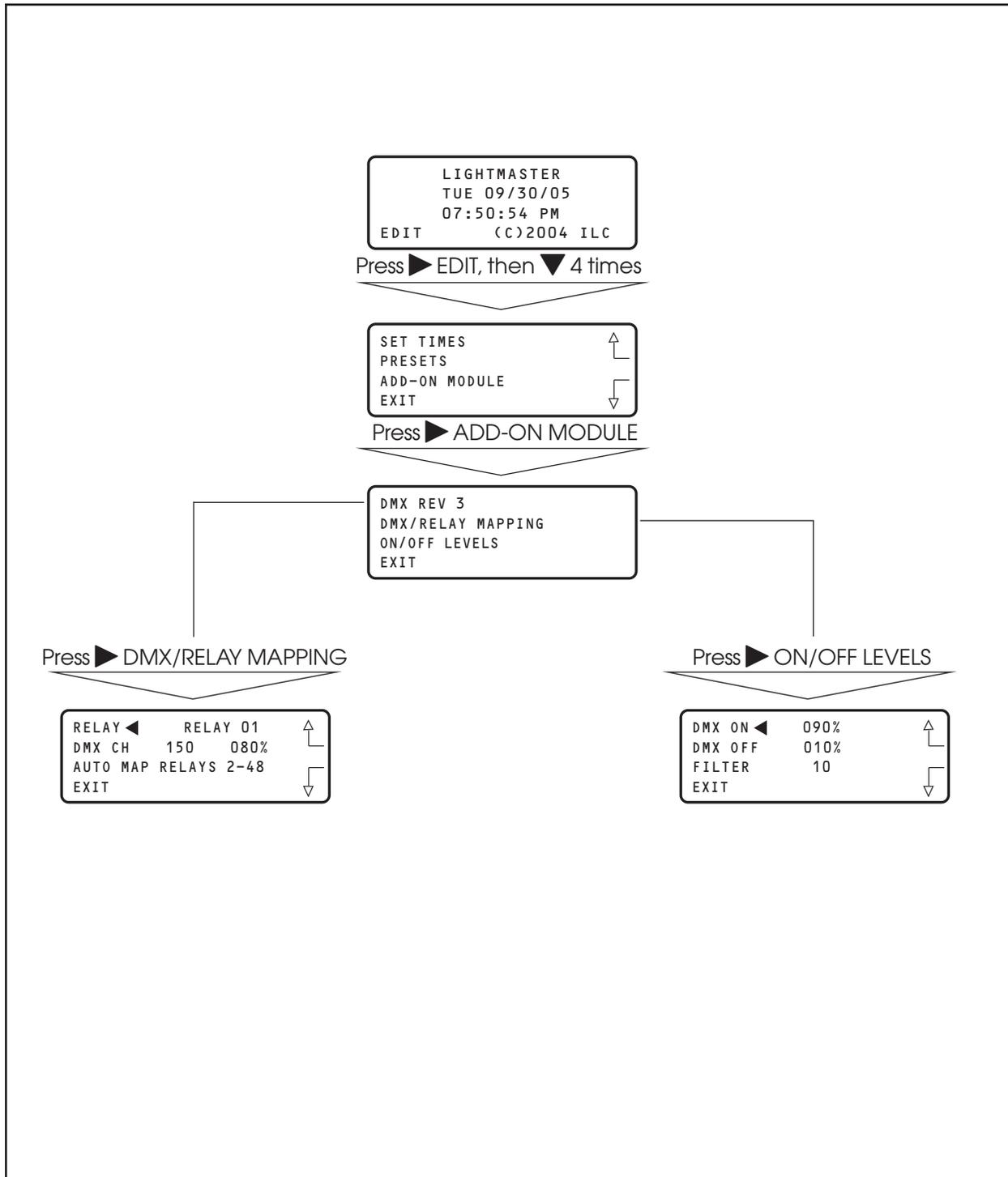


Figure E.1 – DMX Interface Hardware Features

DMX Control – Fast Track



E.3 Programming Example

Set the DMX signal ON level at 92% and the OFF level at 15%. Program relay output 1 to respond by switching ON at 92% and OFF at 15% on channel 200. (The default values are 90% and 10%, respectively.)

NOTE: If programming relays 1-48 you can enter the relay channel for relay 01 – then press Auto Map Relays 2-48, and the controller will automatically assign relays 2-48 to the channels in ascending order.

Example: If you program Relay 01 to channel 200, relay 2 will be assigned to channel 201, relay 3 to channel 202, and so on in ascending order.

Note also that the DMX/Relay Control screen displays the current level.

1. From the Home screen, press ► EDIT; then press ▼ 4 times.
2. Press ► ADD-ON MODULE.
3. Press ► ON/OFF LEVELS.
4. When the Level screen appears, press ▲ or ▼ until 92% appears in the ON field.
5. Press ► DMX OFF; then press ▲ or ▼ until 15% appears in the OFF field.
6. Press ► FILTER; then press ▲ or ▼ to select a filter value.
7. Press ► EXIT to return to the DMX menu.
8. Press ► DMX/RELAY MAPPING.
9. Press ► DMX CH; then press ▲ or ▼ until channel 200 appears.
10. If you want to Auto program the rest of the channels, press ► AUTO MAP RELAYS 2-48.
11. Press ► EXIT 3 times to return to the Home screen.

```

LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT          (C)2004 ILC
    
```

Press ► EDIT, then ▼ 4 times

```

SET TIMES
PRESETS
ADD-ON MODULE
EXIT
    
```

Press ► ADD-ON MODULE

```

DMX REV 3
DMX/RELAY MAPPING
ON/OFF LEVELS
EXIT
    
```

Press ► ON/OFF LEVELS

```

DMX ON  092%
DMX OFF 015%
FILTER   10
EXIT
    
```

Press ► EXIT

```

DMX REV 3
DMX/RELAY MAPPING
ON/OFF LEVELS
EXIT
    
```

Press ► DMX/RELAY MAPPING

```

RELAY  RELAY 01
DMX CH 150  080%
AUTO MAP RELAYS 2-48
EXIT
    
```

Press ► DMX CH, then ▲

```

RELAY  RELAY 01
DMX CH 200  080%
AUTO MAP RELAYS 2-48
EXIT
    
```

Press ► AUTO MAP RELAYS

```

RELAY  RELAY 01
DMX CH 150  080%
AUTO MAP RELAYS 2-48
EXIT
    
```

M.1 Overview

MODBUS protocol is an industrial communications and distributive control system developed by Gould-Modicon to integrate programmable logic controllers (PLCs), computers, terminals and other monitoring, sensing, and control devices. With the addition of an ILC MODBUS Add-On Module, and setting a unique address via the module's address DIP switches, a LightMaster lighting controller can become a Slave NODE on the MODBUS Network. (See Figure M-1.)

M.2 Structure

MODBUS is a Master/Slave communications protocol. One device (the Master) controls all serial activity by selectively polling one or more of the slave devices. The maximum number of slave devices is 247 per network. Each device (node) is assigned a unique address to distinguish it from all the other nodes.

Only the Master initiates a transaction. Transactions are either a query/response (only a single slave is addressed) or a broadcast/no response (all slaves are addressed). A transaction comprises a single query and single response frame or a single broadcast frame.

Certain characteristics of the MODBUS protocol are fixed: frame format, frame sequences, communications error handling, exception conditions, and the functions performed.

Other characteristics are selectable: transmission media, baud rate, character parity, number of stop bits, communications error handling, exception conditions, and functions performed.

M.3 Transmission Modes

The transmission mode is the structure of the individual units of information within a message, and the numbering system used to transmit the data. Two transmission modes are available. Both provide the same communication capabilities. The mode selected depends on the equipment used as the MODBUS master. Only one transmission mode may be selected per network. Mixing modes on a single network is not allowed. The two available transmission modes are ASCII (American Standard Code For Information Interchange) and RTU (Remote Terminal Unit).

M.3.1 ASCII

Coding System – ASCII (7 Bit); hexadecimal uses ASCII printable characters (0-9, A-F)

Start Bits – 1

Data Bits (least significant first) – 7

Parity (optional) – 1 (1 Bit set for even or odd, no Bits for no parity)

Stop Bits – 1 or 2

Error Checking – LRC (Longitudinal Redundancy Check)

M.3.2 RTU

Coding System – 8 Bit Binary

Start Bits – 1

Data Bits (least significant first) – 8

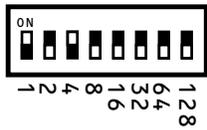
Parity (optional) – 1 (1 Bit set for even or odd, no Bits for no parity)

Stop Bits – 1 or 2

Error Checking – CRC (Cyclical Redundancy Check)

LightMaster MODBUS Communications Example – See Termination Detail Below

DIP Switch Addressing



Add the value of each ON switch to determine the address (address 05 shown).

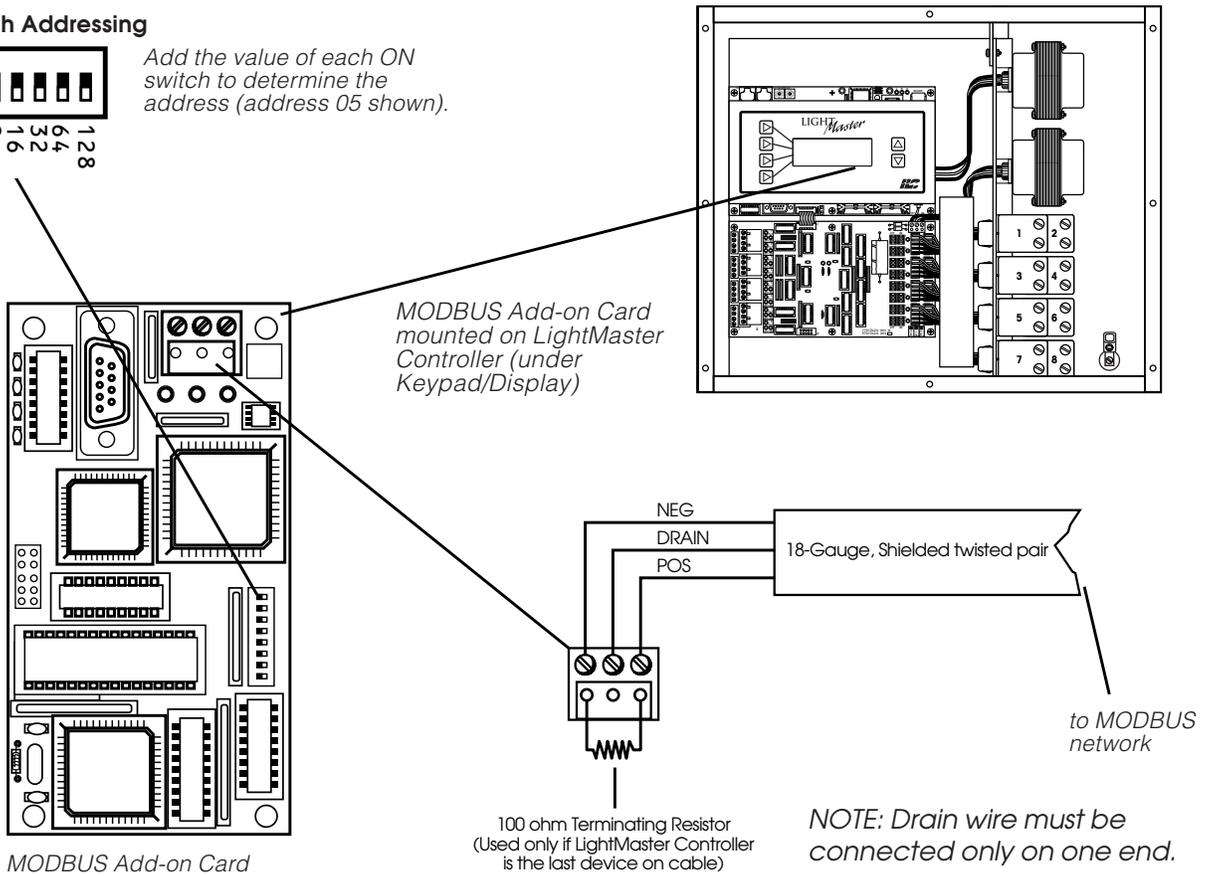


Figure M.1 MODBUS Setup

M.4 Transmission Mode Characteristics

ASCII printable characters are easy to view when troubleshooting and this mode is suited to PLC masters and computer masters programmed in a high level language, such as VISCOM BASIC.

In RTU mode, data is sent in 8-bit binary characters. In ASCII mode, data is divided into two 4-bit parts and then represented by the hexadecimal equivalent. ASCII mode uses twice as many characters as RTU mode but decoding is easier.

In RTU mode data must be transmitted in a continuous stream. In ASCII mode breaks of up to one second can occur between characters to allow for a relatively slow master.

M.5 Hardware Setup

The **LightMaster** must be equipped with a MODBUS add-on card and addressed with a unique node address (See Figure M.1). The network cable is a 2-wire shielded twisted pair. Consult the Automation system provider for the exact specifications. Terminate the cable as shown in Figure M.1.

M.6 Required Parameter Entries

After setting the MODBUS card address DIP switches, you must power up the LightMaster Controller and define certain operational parameters for MODBUS communication. (See Fast Track diagram on next page.)

M.7 Framing

Both ASCII and RTU transmission modes feature mechanisms to indicate the beginning and end of a frame, the node address, a function code (the type of information sought/command signal), a data field indicating the particular point or register accessed. See Table M.1 for data field I/O point designators for a LightMaster node.

M.8 Supported Commands

01 Read coil status
02 Read input status
05 Force single coil
15 Force multiple coils
For more information, refer to Modicon Modbus Protocol Reference Guide (PI-MBUS-300).

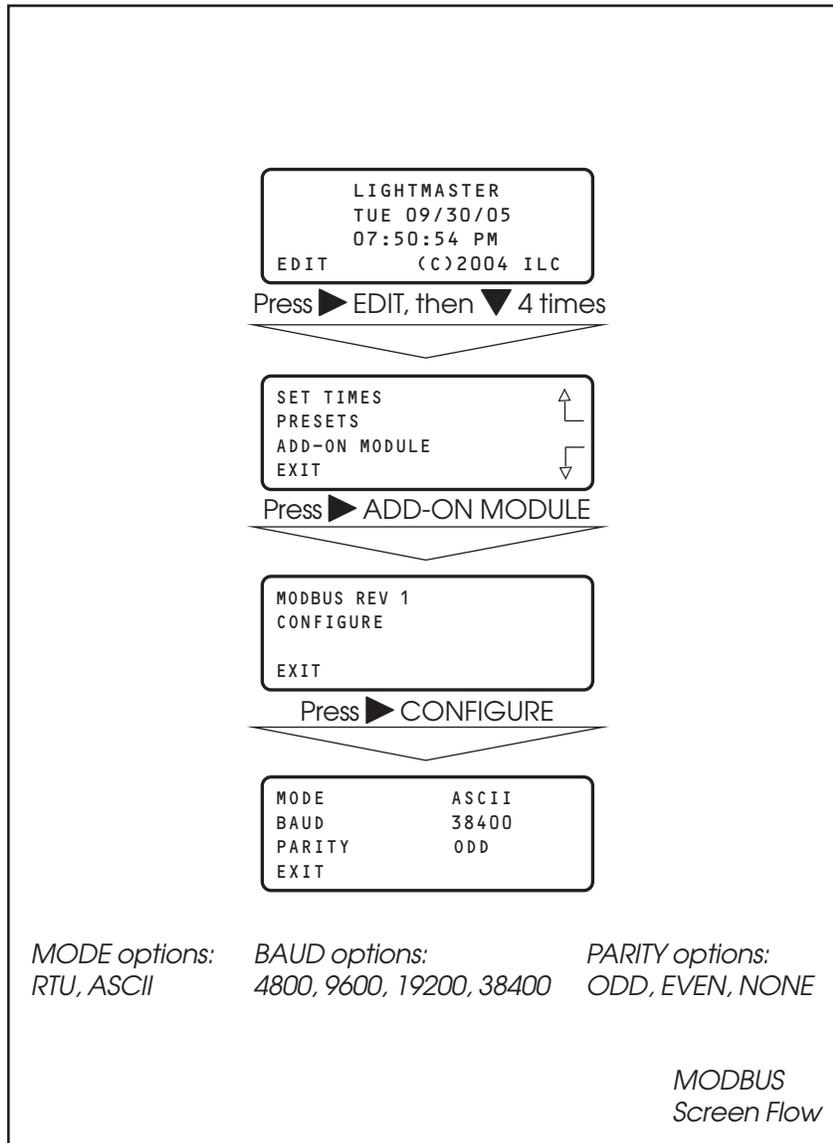
M.9 Additional Functions

- ON/OFF with Time options (Blink/Alarm) See Table M.1.2.
- Input Enable/Disable. See Table M.1.3.

M.10 Additional Information

Contact Modicon Inc. if you would like more detailed information on MODBUS protocol.

MODBUS – Fast Track



LightMaster Input	ON	OFF	Closed	Open
1	1	49	1=Input Closed	0=Input Open
2	2	50	1=Input Closed	0=Input Open
3	3	51	1=Input Closed	0=Input Open
4	4	52	1=Input Closed	0=Input Open
5	5	53	1=Input Closed	0=Input Open
6	6	54	1=Input Closed	0=Input Open
7	7	55	1=Input Closed	0=Input Open
8	8	56	1=Input Closed	0=Input Open
9	9	57	1=Input Closed	0=Input Open
10	10	58	1=Input Closed	0=Input Open
11	11	59	1=Input Closed	0=Input Open
12	12	60	1=Input Closed	0=Input Open
13	13	61	1=Input Closed	0=Input Open
14	14	62	1=Input Closed	0=Input Open
15	15	63	1=Input Closed	0=Input Open
16	16	64	1=Input Closed	0=Input Open
17	17	65	1=Input Closed	0=Input Open
18	18	66	1=Input Closed	0=Input Open
19	19	67	1=Input Closed	0=Input Open
20	20	68	1=Input Closed	0=Input Open
21	21	69	1=Input Closed	0=Input Open
22	22	70	1=Input Closed	0=Input Open
23	23	71	1=Input Closed	0=Input Open
24	24	72	1=Input Closed	0=Input Open
25	25	73	1=Input Closed	0=Input Open
26	26	74	1=Input Closed	0=Input Open
27	27	75	1=Input Closed	0=Input Open
28	28	76	1=Input Closed	0=Input Open
29	29	77	1=Input Closed	0=Input Open
30	30	78	1=Input Closed	0=Input Open
31	31	79	1= Input Closed	0=Input Open
32	32	80	1=Input Closed	0=Input Open
33	33	81	1=Input Closed	0=Input Open
34	34	82	1=Input Closed	0=Input Open
35	35	83	1=Input Closed	0=Input Open
36	36	84	1=Input Closed	0=Input Open
37	37	85	1=Input Closed	0=Input Open
38	38	86	1=Input Closed	0=Input Open
39	39	87	1=Input Closed	0=Input Open
40	40	88	1=Input Closed	0=Input Open
41	41	89	1=Input Closed	0=Input Open
42	42	90	1=Input Closed	0=Input Open
43	43	91	1=Input Closed	0=Input Open
44	44	92	1=Input Closed	0=Input Open
45	45	93	1=Input Closed	0=Input Open
46	46	94	1=Input Closed	0=Input Open
47	47	95	1=Input Closed	0=Input Open
48	48	96	1=Input Closed	0=Input Open

Table M.1 – LightMaster Data Field Input Point Designators

LightMaster Output	Closed	Open
1	1=Output Closed	0=Output Open
2	1=Output Closed	0=Output Open
3	1=Output Closed	0=Output Open
4	1=Output Closed	0=Output Open
5	1=Output Closed	0=Output Open
6	1=Output Closed	0=Output Open
7	1=Output Closed	0=Output Open
8	1=Output Closed	0=Output Open
9	1=Output Closed	0=Output Open
10	1=Output Closed	0=Output Open
11	1=Output Closed	0=Output Open
12	1=Output Closed	0=Output Open
13	1=Output Closed	0=Output Open
14	1=Output Closed	0=Output Open
15	1=Output Closed	0=Output Open
16	1=Output Closed	0=Output Open
17	1=Output Closed	0=Output Open
18	1=Output Closed	0=Output Open
19	1=Output Closed	0=Output Open
20	1=Output Closed	0=Output Open
21	1=Output Closed	0=Output Open
22	1=Output Closed	0=Output Open
23	1=Output Closed	0=Output Open
24	1=Output Closed	0=Output Open
25	1=Output Closed	0=Output Open
26	1=Output Closed	0=Output Open
27	1=Output Closed	0=Output Open
28	1=Output Closed	0=Output Open
29	1=Output Closed	0=Output Open
30	1=Output Closed	0=Output Open
31	1=Output Closed	0=Output Open
32	1=Output Closed	0=Output Open
33	1=Output Closed	0=Output Open
34	1=Output Closed	0=Output Open
35	1=Output Closed	0=Output Open
36	1=Output Closed	0=Output Open
37	1=Output Closed	0=Output Open
38	1=Output Closed	0=Output Open
39	1=Output Closed	0=Output Open
40	1=Output Closed	0=Output Open
41	1=Output Closed	0=Output Open
42	1=Output Closed	0=Output Open
43	1=Output Closed	0=Output Open
44	1=Output Closed	0=Output Open
45	1=Output Closed	0=Output Open
46	1=Output Closed	0=Output Open
47	1=Output Closed	0=Output Open
48	1=Output Closed	0=Output Open

Table M.1.1 – LightMaster Data Field Output Point Designators

LightMaster Output	Coil Point	Closed	Open
1	101	1=Output Closed/Timer Option	0=Output Open/Timer Option
2	102	1=Output Closed/Timer Option	0=Output Open/Timer Option
3	103	1=Output Closed/Timer Option	0=Output Open/Timer Option
4	104	1=Output Closed/Timer Option	0=Output Open/Timer Option
5	105	1=Output Closed/Timer Option	0=Output Open/Timer Option
6	106	1=Output Closed/Timer Option	0=Output Open/Timer Option
7	107	1=Output Closed/Timer Option	0=Output Open/Timer Option
8	108	1=Output Closed/Timer Option	0=Output Open/Timer Option
9	109	1=Output Closed/Timer Option	0=Output Open/Timer Option
10	110	1=Output Closed/Timer Option	0=Output Open/Timer Option
11	111	1=Output Closed/Timer Option	0=Output Open/Timer Option
12	112	1=Output Closed/Timer Option	0=Output Open/Timer Option
13	113	1=Output Closed/Timer Option	0=Output Open/Timer Option
14	114	1=Output Closed/Timer Option	0=Output Open/Timer Option
15	115	1=Output Closed/Timer Option	0=Output Open/Timer Option
16	116	1=Output Closed/Timer Option	0=Output Open/Timer Option
17	117	1=Output Closed/Timer Option	0=Output Open/Timer Option
18	118	1=Output Closed/Timer Option	0=Output Open/Timer Option
19	119	1=Output Closed/Timer Option	0=Output Open/Timer Option
20	120	1=Output Closed/Timer Option	0=Output Open/Timer Option
21	121	1=Output Closed/Timer Option	0=Output Open/Timer Option
22	122	1=Output Closed/Timer Option	0=Output Open/Timer Option
23	123	1=Output Closed/Timer Option	0=Output Open/Timer Option
24	124	1=Output Closed/Timer Option	0=Output Open/Timer Option
25	125	1=Output Closed/Timer Option	0=Output Open/Timer Option
26	126	1=Output Closed/Timer Option	0=Output Open/Timer Option
27	127	1=Output Closed/Timer Option	0=Output Open/Timer Option
28	128	1=Output Closed/Timer Option	0=Output Open/Timer Option
29	129	1=Output Closed/Timer Option	0=Output Open/Timer Option
30	130	1=Output Closed/Timer Option	0=Output Open/Timer Option
31	131	1=Output Closed/Timer Option	0=Output Open/Timer Option
32	132	1=Output Closed/Timer Option	0=Output Open/Timer Option
33	133	1=Output Closed/Timer Option	0=Output Open/Timer Option
34	134	1=Output Closed/Timer Option	0=Output Open/Timer Option
35	135	1=Output Closed/Timer Option	0=Output Open/Timer Option
36	136	1=Output Closed/Timer Option	0=Output Open/Timer Option
37	137	1=Output Closed/Timer Option	0=Output Open/Timer Option
38	138	1=Output Closed/Timer Option	0=Output Open/Timer Option
39	139	1=Output Closed/Timer Option	0=Output Open/Timer Option
40	140	1=Output Closed/Timer Option	0=Output Open/Timer Option
41	141	1=Output Closed/Timer Option	0=Output Open/Timer Option
42	142	1=Output Closed/Timer Option	0=Output Open/Timer Option
43	143	1=Output Closed/Timer Option	0=Output Open/Timer Option
44	144	1=Output Closed/Timer Option	0=Output Open/Timer Option
45	145	1=Output Closed/Timer Option	0=Output Open/Timer Option
46	146	1=Output Closed/Timer Option	0=Output Open/Timer Option
47	147	1=Output Closed/Timer Option	0=Output Open/Timer Option
48	148	1=Output Closed/Timer Option	0=Output Open/Timer Option

Table M.1.2 – LightMaster with a Timer Option (Blink/Alarm) Output Point Designators

LightMaster Input	Coil Point	Closed	Open
1	201	1=Input Disable	0=Input Enable
2	202	1=Input Disable	0=Input Enable
3	203	1=Input Disable	0=Input Enable
4	204	1=Input Disable	0=Input Enable
5	205	1=Input Disable	0=Input Enable
6	206	1=Input Disable	0=Input Enable
7	207	1=Input Disable	0=Input Enable
8	208	1=Input Disable	0=Input Enable
9	209	1=Input Disable	0=Input Enable
10	210	1=Input Disable	0=Input Enable
11	211	1=Input Disable	0=Input Enable
12	212	1=Input Disable	0=Input Enable
13	213	1=Input Disable	0=Input Enable
14	214	1=Input Disable	0=Input Enable
15	215	1=Input Disable	0=Input Enable
16	216	1=Input Disable	0=Input Enable
17	217	1=Input Disable	0=Input Enable
18	218	1=Input Disable	0=Input Enable
19	219	1=Input Disable	0=Input Enable
20	220	1=Input Disable	0=Input Enable
21	221	1=Input Disable	0=Input Enable
22	222	1=Input Disable	0=Input Enable
23	223	1=Input Disable	0=Input Enable
24	224	1=Input Disable	0=Input Enable
25	225	1=Input Disable	0=Input Enable
26	226	1=Input Disable	0=Input Enable
27	227	1=Input Disable	0=Input Enable
28	228	1=Input Disable	0=Input Enable
29	229	1=Input Disable	0=Input Enable
30	230	1=Input Disable	0=Input Enable
31	231	1=Input Disable	0=Input Enable
32	232	1=Input Disable	0=Input Enable
33	233	1=Input Disable	0=Input Enable
34	234	1=Input Disable	0=Input Enable
35	235	1=Input Disable	0=Input Enable
36	236	1=Input Disable	0=Input Enable
37	237	1=Input Disable	0=Input Enable
38	238	1=Input Disable	0=Input Enable
39	239	1=Input Disable	0=Input Enable
40	240	1=Input Disable	0=Input Enable
41	241	1=Input Disable	0=Input Enable
42	242	1=Input Disable	0=Input Enable
43	243	1=Input Disable	0=Input Enable
44	244	1=Input Disable	0=Input Enable
45	245	1=Input Disable	0=Input Enable
46	246	1=Input Disable	0=Input Enable
47	247	1=Input Disable	0=Input Enable
48	248	1=Input Disable	0=Input Enable

Table M.1.3 – LightMaster Input Enable/Disable Point Designators

N.1 Overview

The LightMaster Controller(s) can be integrated into a Building Automation System (BAS) that uses the N2 communications protocol. The host system can then poll the status of the LightMaster Controller inputs and outputs and issue ON/OFF commands to the LightMaster's relay outputs.

N.2 Hardware Setup

The LightMaster must be equipped with an N2 add-on module that is addressed with a

unique node address. (See Figure N-1.) The network cable is a 2-wire shielded twisted pair. Consult the BAS system documentation for the exact specifications. Terminate the cable as shown in Figure N-1.

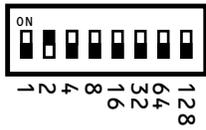
N.3 Point Map

Fill out the point map for the LightMaster Controller. Note that only BI and BO point types are used. The completed point map will serve as the control schedule used to determine how LightMaster relay outputs will be controlled.

ILC LightMaster N2 Rev 1 Unsupported Attributes		
All attributes in the following regions		
Analog Input Analog Output Internal Float Internal Integer Internal Byte		
Binary Input Unsupported Attributes		
Attribute 1		
Bit 0	COS_enabled	Always 1 (COS is always enabled)
Bit 1	Normal state	Always 0
Bit 3	Alarm_enabled	Always 0 (disabled)
Attribute 2		
Bit 0	Always reliable (0)	Always 0 (not active)
Bit 1	Override active	
Bit 4	Normal (0)	
Bit 5	JCI use only	
Attribute 3	JCI use only	
Attribute 4	JCI use only	
Binary Output Unsupported Attributes		
Attribute 1		
Bit 0	COS_enabled	Always 0 (COS is always enabled)
Bit 1	Normal state	
Attribute 2		
Bit 0	Always reliable (0)	Always 0 (not active)
Bit 1	Override active	
Bit 4	JCI use only	
Bit 5	JCI use only	
Attribute 3	Minimum ON time	Always 0
Attribute 4	Minimum OFF time	Always 0
Attribute 5	Maximum Cycles/Hour	Always 0
Attribute 6	JCI use only	
Attribute 7	JCI use only	

LightMaster N2 Network Example – See Termination Detail Below

DIP Switch Addressing



Add the value of each ON switch to determine the address (address 02 shown).

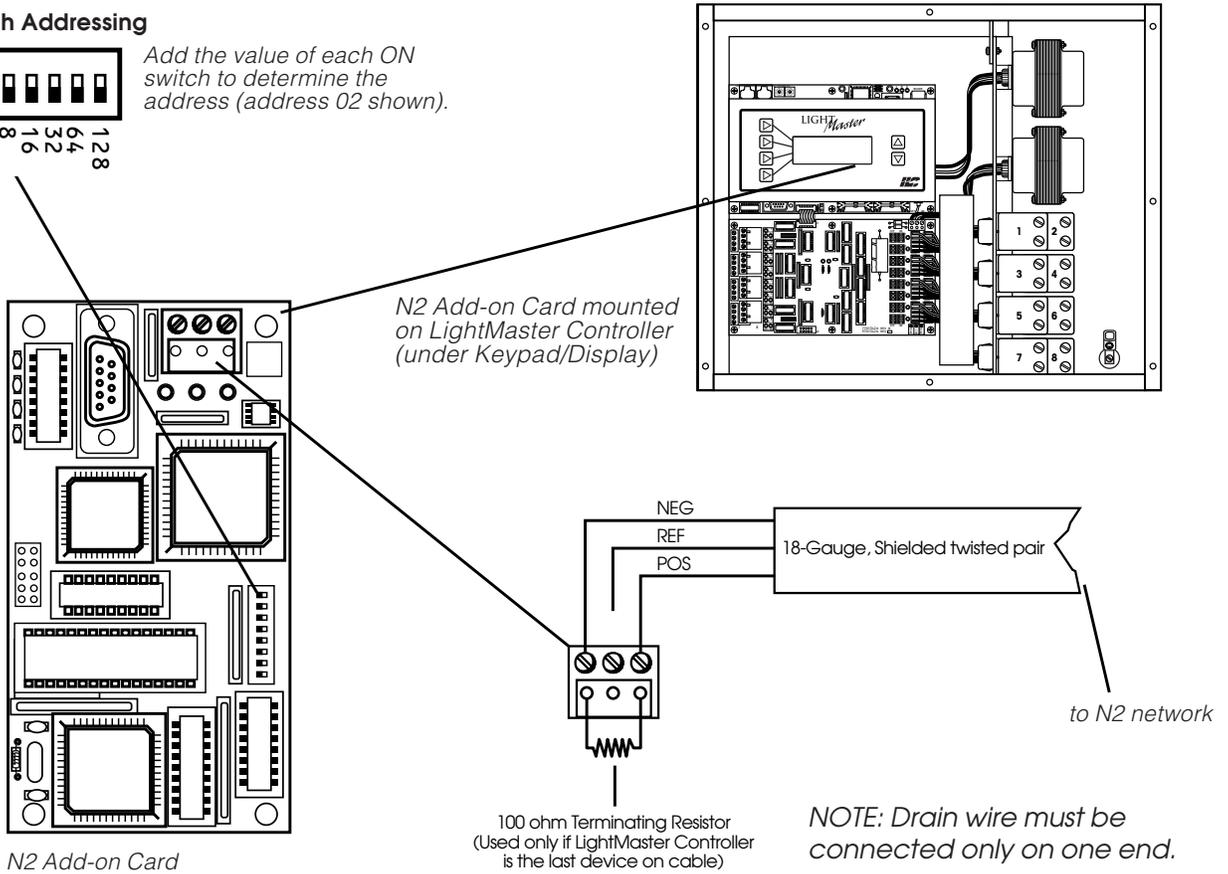
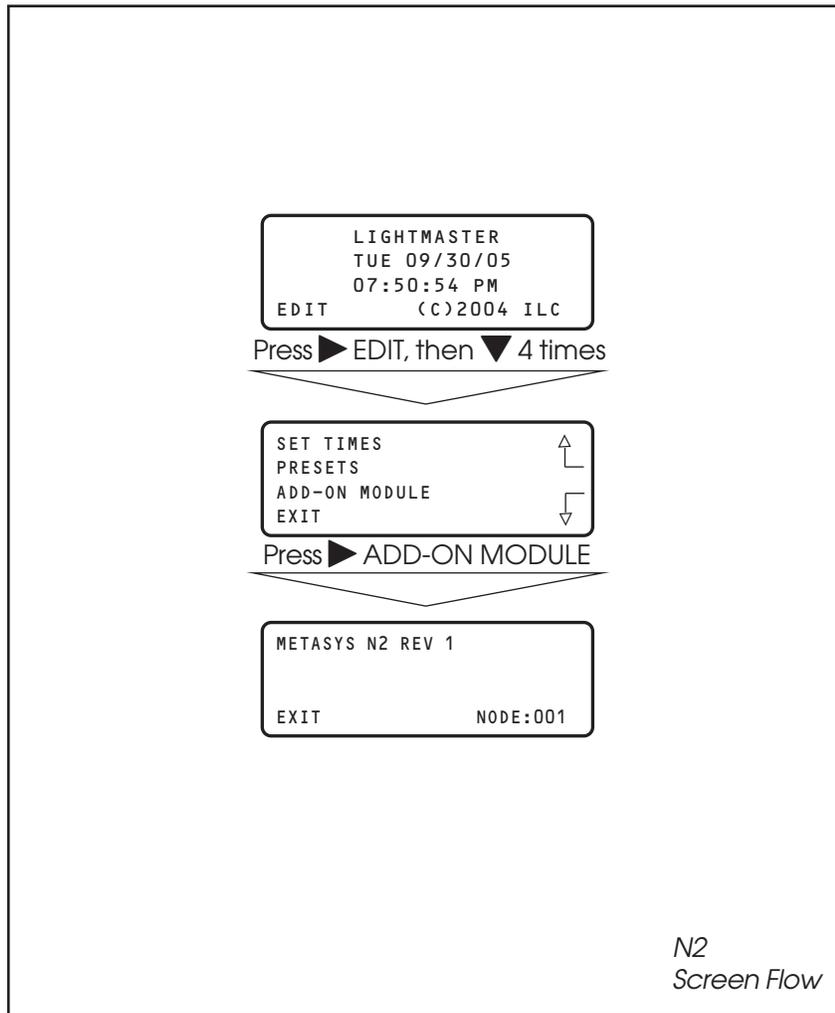


Figure N.1 N2 Setup

N2 – Fast Track



Appendix N: N2 Communications



NETWORK POINT TYPE	NETWORK POINT ADDRESS	UNITS	POINT DESCRIPTION	RANGE/VALUE	NOTES
BI	1		SWITCH INPUT #1 OFF	0-OPEN 1-CLOSED	
BI	2		SWITCH INPUT #1 ON	0-OPEN 1-CLOSED	
BI	3		SWITCH INPUT #2 OFF	0-OPEN 1-CLOSED	
BI	4		SWITCH INPUT #2 ON	0-OPEN 1-CLOSED	
BI	5		SWITCH INPUT #3 OFF	0-OPEN 1-CLOSED	
BI	6		SWITCH INPUT #3 ON	0-OPEN 1-CLOSED	
BI	7		SWITCH INPUT #4 OFF	0-OPEN 1-CLOSED	
BI	8		SWITCH INPUT #4 ON	0-OPEN 1-CLOSED	
BI	9		SWITCH INPUT #5 OFF	0-OPEN 1-CLOSED	
BI	10		SWITCH INPUT #5 ON	0-OPEN 1-CLOSED	
BI	11		SWITCH INPUT #6 OFF	0-OPEN 1-CLOSED	
BI	12		SWITCH INPUT #6 ON	0-OPEN 1-CLOSED	
BI	13		SWITCH INPUT #7 OFF	0-OPEN 1-CLOSED	
BI	14		SWITCH INPUT #7 ON	0-OPEN 1-CLOSED	
BI	15		SWITCH INPUT #8 OFF	0-OPEN 1-CLOSED	
BI	16		SWITCH INPUT #8 ON	0-OPEN 1-CLOSED	
BI	17		SWITCH INPUT #9 OFF	0-OPEN 1-CLOSED	
BI	18		SWITCH INPUT #9 ON	0-OPEN 1-CLOSED	
BI	19		SWITCH INPUT #10 OFF	0-OPEN 1-CLOSED	
BI	20		SWITCH INPUT #10 ON	0-OPEN 1-CLOSED	
BI	21		SWITCH INPUT #11 OFF	0-OPEN 1-CLOSED	
BI	22		SWITCH INPUT #11 ON	0-OPEN 1-CLOSED	
BI	23		SWITCH INPUT #12 OFF	0-OPEN 1-CLOSED	
BI	24		SWITCH INPUT #12 ON	0-OPEN 1-CLOSED	

Table N.1 – LightMaster N2 Point Map

Appendix N: N2 Communications



NETWORK POINT TYPE	NETWORK POINT ADDRESS	UNITS	POINT DESCRIPTION	RANGE/VALUE	NOTES
BI	25		SWITCH INPUT #13 OFF	0-OPEN 1-CLOSED	
BI	26		SWITCH INPUT #13 ON	0-OPEN 1-CLOSED	
BI	27		SWITCH INPUT #14 OFF	0-OPEN 1-CLOSED	
BI	28		SWITCH INPUT #14 ON	0-OPEN 1-CLOSED	
BI	29		SWITCH INPUT #15 OFF	0-OPEN 1-CLOSED	
BI	30		SWITCH INPUT #15 ON	0-OPEN 1-CLOSED	
BI	31		SWITCH INPUT #16 OFF	0-OPEN 1-CLOSED	
BI	32		SWITCH INPUT #16 ON	0-OPEN 1-CLOSED	
BI	33		SWITCH INPUT #17 OFF	0-OPEN 1-CLOSED	
BI	34		SWITCH INPUT #17 ON	0-OPEN 1-CLOSED	
BI	35		SWITCH INPUT #18 OFF	0-OPEN 1-CLOSED	
BI	36		SWITCH INPUT #18 ON	0-OPEN 1-CLOSED	
BI	37		SWITCH INPUT #19 OFF	0-OPEN 1-CLOSED	
BI	38		SWITCH INPUT #19 ON	0-OPEN 1-CLOSED	
BI	39		SWITCH INPUT #20 OFF	0-OPEN 1-CLOSED	
BI	40		SWITCH INPUT #20 ON	0-OPEN 1-CLOSED	
BI	41		SWITCH INPUT #21 OFF	0-OPEN 1-CLOSED	
BI	42		SWITCH INPUT #21 ON	0-OPEN 1-CLOSED	
BI	43		SWITCH INPUT #22 OFF	0-OPEN 1-CLOSED	
BI	44		SWITCH INPUT #22 ON	0-OPEN 1-CLOSED	
BI	45		SWITCH INPUT #23 OFF	0-OPEN 1-CLOSED	
BI	46		SWITCH INPUT #23 ON	0-OPEN 1-CLOSED	
BI	47		SWITCH INPUT #24 OFF	0-OPEN 1-CLOSED	
BI	48		SWITCH INPUT #24 ON	0-OPEN 1-CLOSED	
BI	49		SWITCH INPUT #25 OFF	0-OPEN 1-CLOSED	

Table N.1 – LightMaster N2 Point Map

Appendix N: N2 Communications



NETWORK POINT TYPE	NETWORK POINT ADDRESS	UNITS	POINT DESCRIPTION	RANGE/VALUE	NOTES
BI	50		SWITCH INPUT #25 ON	0-OPEN 1-CLOSED	
BI	51		SWITCH INPUT #26 OFF	0-OPEN 1-CLOSED	
BI	52		SWITCH INPUT #26 ON	0-OPEN 1-CLOSED	
BI	53		SWITCH INPUT #27 OFF	0-OPEN 1-CLOSED	
BI	54		SWITCH INPUT #27 ON	0-OPEN 1-CLOSED	
BI	55		SWITCH INPUT #28 OFF	0-OPEN 1-CLOSED	
BI	56		SWITCH INPUT #28 ON	0-OPEN 1-CLOSED	
BI	57		SWITCH INPUT #29 OFF	0-OPEN 1-CLOSED	
BI	58		SWITCH INPUT #29 ON	0-OPEN 1-CLOSED	
BI	59		SWITCH INPUT #30 OFF	0-OPEN 1-CLOSED	
BI	60		SWITCH INPUT #30 ON	0-OPEN 1-CLOSED	
BI	61		SWITCH INPUT #31 OFF	0-OPEN 1-CLOSED	
BI	62		SWITCH INPUT #31 ON	0-OPEN 1-CLOSED	
BI	63		SWITCH INPUT #32 OFF	0-OPEN 1-CLOSED	
BI	64		SWITCH INPUT #32 ON	0-OPEN 1-CLOSED	
BI	65		SWITCH INPUT #33 OFF	0-OPEN 1-CLOSED	
BI	66		SWITCH INPUT #33 ON	0-OPEN 1-CLOSED	
BI	67		SWITCH INPUT #34 OFF	0-OPEN 1-CLOSED	
BI	68		SWITCH INPUT #34 ON	0-OPEN 1-CLOSED	
BI	69		SWITCH INPUT #35 OFF	0-OPEN 1-CLOSED	
BI	70		SWITCH INPUT #35 ON	0-OPEN 1-CLOSED	
BI	71		SWITCH INPUT #36 OFF	0-OPEN 1-CLOSED	
BI	72		SWITCH INPUT #36 ON	0-OPEN 1-CLOSED	
BI	73		SWITCH INPUT #37 OFF	0-OPEN 1-CLOSED	

Table N.1 – LightMaster N2 Point Map

Appendix N: N2 Communications



NETWORK POINT TYPE	NETWORK POINT ADDRESS	UNITS	POINT DESCRIPTION	RANGE/VALUE	NOTES
BI	74		SWITCH INPUT #37 ON	0-OPEN 1-CLOSED	
BI	75		SWITCH INPUT #38 OFF	0-OPEN 1-CLOSED	
BI	76		SWITCH INPUT #38 ON	0-OPEN 1-CLOSED	
BI	77		SWITCH INPUT #39 OFF	0-OPEN 1-CLOSED	
BI	78		SWITCH INPUT #39 ON	0-OPEN 1-CLOSED	
BI	79		SWITCH INPUT #40 OFF	0-OPEN 1-CLOSED	
BI	80		SWITCH INPUT #40 ON	0-OPEN 1-CLOSED	
BI	81		SWITCH INPUT #41 OFF	0-OPEN 1-CLOSED	
BI	82		SWITCH INPUT #41 ON	0-OPEN 1-CLOSED	
BI	83		SWITCH INPUT #42 OFF	0-OPEN 1-CLOSED	
BI	84		SWITCH INPUT #42 ON	0-OPEN 1-CLOSED	
BI	85		SWITCH INPUT #43 OFF	0-OPEN 1-CLOSED	
BI	86		SWITCH INPUT #43 ON	0-OPEN 1-CLOSED	
BI	87		SWITCH INPUT #44 OFF	0-OPEN 1-CLOSED	
BI	88		SWITCH INPUT #44 ON	0-OPEN 1-CLOSED	
BI	89		SWITCH INPUT #45 OFF	0-OPEN 1-CLOSED	
BI	90		SWITCH INPUT #45 ON	0-OPEN 1-CLOSED	
BI	91		SWITCH INPUT #46 OFF	0-OPEN 1-CLOSED	
BI	92		SWITCH INPUT #46 ON	0-OPEN 1-CLOSED	
BI	93		SWITCH INPUT #47 OFF	0-OPEN 1-CLOSED	
BI	94		SWITCH INPUT #47 ON	0-OPEN 1-CLOSED	
BI	95		SWITCH INPUT #48 OFF	0-OPEN 1-CLOSED	
BI	96		SWITCH INPUT #48 ON	0-OPEN 1-CLOSED	

Table N.1 – LightMaster N2 Point Map

Appendix N: N2 Communications



NETWORK POINT TYPE	NETWORK POINT ADDRESS	UNITS	POINT DESCRIPTION	RANGE/VALUE
BO	1		RELAY OUTPUT #1	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	2		RELAY OUTPUT #2	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	3		RELAY OUTPUT #3	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	4		RELAY OUTPUT #4	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	5		RELAY OUTPUT #5	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	6		RELAY OUTPUT #6	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	7		RELAY OUTPUT #7	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	8		RELAY OUTPUT #8	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	9		RELAY OUTPUT #9	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	10		RELAY OUTPUT #10	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	11		RELAY OUTPUT #11	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	12		RELAY OUTPUT #12	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	13		RELAY OUTPUT #13	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	14		RELAY OUTPUT #14	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	15		RELAY OUTPUT #15	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	16		RELAY OUTPUT #16	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	17		RELAY OUTPUT #17	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	18		RELAY OUTPUT #18	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	19		RELAY OUTPUT #19	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	20		RELAY OUTPUT #20	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	21		RELAY OUTPUT #21	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	22		RELAY OUTPUT #22	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	23		RELAY OUTPUT #23	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	24		RELAY OUTPUT #24	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option

Table N.1 – LightMaster N2 Point Map

Appendix N: N2 Communications



NETWORK POINT TYPE	NETWORK POINT ADDRESS	UNITS	POINT DESCRIPTION	RANGE/VALUE
BO	25		RELAY OUTPUT #25	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	26		RELAY OUTPUT #26	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	27		RELAY OUTPUT #27	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	28		RELAY OUTPUT #28	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	29		RELAY OUTPUT #29	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	30		RELAY OUTPUT #30	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	31		RELAY OUTPUT #31	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	32		RELAY OUTPUT #32	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	33		RELAY OUTPUT #33	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	34		RELAY OUTPUT #34	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	35		RELAY OUTPUT #35	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	36		RELAY OUTPUT #36	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	37		RELAY OUTPUT #37	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	38		RELAY OUTPUT #38	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	39		RELAY OUTPUT #39	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	40		RELAY OUTPUT #40	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	41		RELAY OUTPUT #41	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	42		RELAY OUTPUT #42	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	43		RELAY OUTPUT #43	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	44		RELAY OUTPUT #44	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	45		RELAY OUTPUT #45	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	46		RELAY OUTPUT #46	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	47		RELAY OUTPUT #47	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option
BO	48		RELAY OUTPUT #48	0-OFF (Open) 1-ON (Closed) 2-OFF w/Timer Option

Table N.1 – LightMaster N2 Point Map

Appendix N: N2 Communications



NETWORK POINT TYPE	NETWORK POINT ADDRESS	INPUTS	RANGE/VALUE	NOTES
BO	201	01	0- Input Enable 1- Input Disable	
BO	202	02	0- Input Enable 1- Input Disable	
BO	203	03	0- Input Enable 1- Input Disable	
BO	204	04	0- Input Enable 1- Input Disable	
BO	205	05	0- Input Enable 1- Input Disable	
BO	206	06	0- Input Enable 1- Input Disable	
BO	207	07	0- Input Enable 1- Input Disable	
BO	208	08	0- Input Enable 1- Input Disable	
BO	209	09	0- Input Enable 1- Input Disable	
BO	210	10	0- Input Enable 1- Input Disable	
BO	211	11	0- Input Enable 1- Input Disable	
BO	212	12	0- Input Enable 1- Input Disable	
BO	213	13	0- Input Enable 1- Input Disable	
BO	214	14	0- Input Enable 1- Input Disable	
BO	215	15	0- Input Enable 1- Input Disable	
BO	216	16	0- Input Enable 1- Input Disable	
BO	217	17	0- Input Enable 1- Input Disable	
BO	218	18	0- Input Enable 1- Input Disable	
BO	219	19	0- Input Enable 1- Input Disable	
BO	220	20	0- Input Enable 1- Input Disable	
BO	221	21	0- Input Enable 1- Input Disable	
BO	222	22	0- Input Enable 1- Input Disable	
BO	223	23	0- Input Enable 1- Input Disable	
BO	224	24	0- Input Enable 1- Input Disable	

Table N.1 – LightMaster Input Disable/Enable N2 Point Map

Appendix N: N2 Communications



NETWORK POINT TYPE	NETWORK POINT ADDRESS	INPUTS	RANGE/VALUE	NOTES
BO	225	25	0- Input Enable 1- Input Disable	
BO	226	26	0- Input Enable 1- Input Disable	
BO	227	27	0- Input Enable 1- Input Disable	
BO	228	28	0- Input Enable 1- Input Disable	
BO	229	29	0- Input Enable 1- Input Disable	
BO	230	30	0- Input Enable 1- Input Disable	
BO	231	31	0- Input Enable 1- Input Disable	
BO	232	32	0- Input Enable 1- Input Disable	
BO	233	33	0- Input Enable 1- Input Disable	
BO	234	34	0- Input Enable 1- Input Disable	
BO	235	35	0- Input Enable 1- Input Disable	
BO	236	36	0- Input Enable 1- Input Disable	
BO	237	37	0- Input Enable 1- Input Disable	
BO	238	38	0- Input Enable 1- Input Disable	
BO	239	39	0- Input Enable 1- Input Disable	
BO	240	40	0- Input Enable 1- Input Disable	
BO	241	41	0- Input Enable 1- Input Disable	
BO	242	42	0- Input Enable 1- Input Disable	
BO	243	43	0- Input Enable 1- Input Disable	
BO	244	44	0- Input Enable 1- Input Disable	
BO	245	45	0- Input Enable 1- Input Disable	
BO	246	46	0- Input Enable 1- Input Disable	
BO	247	47	0- Input Enable 1- Input Disable	
BO	248	48	0- Input Enable 1- Input Disable	

Table N.1 – LightMaster Input Disable/Enable N2 Point Map

Appendix O: Latitude and Longitude

Alabama, Birmingham: 33,87	Illinois, Rockford: 42,89	Missouri, St. Joseph: 40,95	Pennsylvania, Harrisburg: 40,77
Alabama, Gadsden: 34,86	Illinois, Springfield: 40,89	Missouri, St. Louis: 38,90	Pennsylvania, Johnstown: 40,79
Alabama, Huntsville: 34,86	Illinois, Urbana: 40,86	Montana, Billings: 46,108	Pennsylvania, Lancaster: 40,76
Alabama, Mobile: 30,88	Indiana, Evansville: 38,87	Montana, Butte: 46,112	Pennsylvania, Philadelphia: 40,75
Alabama, Montgomery: 32,86	Indiana, Ft. Wayne: 41,85	Montana, Great Falls: 47,111	Pennsylvania, Pittsburgh: 40,80
Alaska, Anchorage: 61,150	Indiana, Gary: 41,87	Montana, Helena: 46,112	Pennsylvania, Reading: 40,76
Alaska, Fairbanks: 65,148	Indiana, Indianapolis: 40,86	Nebraska, Lincoln: 41,96	Pennsylvania, Wilkes-Barre: 41,76
Alaska, Juneau: 58,135	Indiana, Lafayette: 40,87	Nebraska, Omaha: 41,96	Rhode Island, Providence: 42,71
Arizona, Flagstaff: 35,111	Indiana, Muncie: 40,85	Nevada, Carson City: 39,120	South Carolina, Charleston: 33,80
Arizona, Phoenix: 33,112	Indiana, South Bend: 41,86	Nevada, Las Vegas: 36,115	South Carolina, Columbia: 34,81
Arizona, Tucson: 32,111	Indiana, Terre Haute: 39,87	Nevada, Reno: 39,120	South Carolina, Greenville: 35,82
Arizona, Yuma: 32,114	Iowa, Cedar Rapids: 42,91	New Hampshire, Concord: 43,71	South Carolina, Spartanburg: 35,82
Arkansas, Fort Smith: 35,94	Iowa, Des Moines: 41,93	New Hampshire, Manchester: 43,71	South Dakota, Pierre: 44,100
Arkansas, Little Rock: 34,92	Iowa, Dubuque: 42,90	New Hampshire, Portsmouth: 43,71	South Dakota, Rapid City: 44,103
California, Bakersfield: 35,119	Iowa, Iowa City: 41,91	New Jersey, Atlantic City: 39,74	South Dakota, Sioux Falls: 43,96
California, Berkeley: 38,122	Iowa, Sioux City: 43,96	New Jersey, Elizabeth: 40,74	Tennessee, Chattanooga: 35,85
California, Eureka: 41,124	Iowa, Waterloo: 42,92	New Jersey, Jersey City: 40,74	Tennessee, Knoxville: 36,84
California, Fresno: 36,120	Kansas, Dodge City: 38,100	New Jersey, Newark: 40,74	Tennessee, Memphis: 35,90
California, Los Angeles: 34,118	Kansas, Kansas City: 39,94	New Jersey, Patterson: 41,74	Tennessee, Nashville: 36,87
California, Oakland: 37,122	Kansas, Salina: 39,97	New Jersey, Trenton: 40,75	Texas, Abilene: 32,99
California, Pasadena: 34,118	Kansas, Topeka: 39,95	New Mexico, Albuquerque: 35,106	Texas, Amarillo: 35,102
California, Sacramento: 38,121	Kansas, Wichita: 37,97	New Mexico, Gallup: 35,108	Texas, Austin: 30,97
California, San Bernardino: 34,117	Kentucky, Ashland: 38,82	New Mexico, Santa Fe: 35,106	Texas, Beaumont: 30,94
California, San Diego: 32,117	Kentucky, Bowling Green: 37,86	New York, Albany: 42,74	Texas, Corpus Christi: 28,97
California, San Francisco: 38,122	Kentucky, Lexington: 38,84	New York, Binghamton: 42,76	Texas, Dallas: 33,97
California, San Jose: 37,122	Kentucky, Louisville: 38,86	New York, Buffalo: 43,79	Texas, El Paso: 32,106
California, Santa Barbara: 34,119	Kentucky, Paducah: 37,88	New York, Central Islip: 41,73	Texas, Fort Worth: 32,97
California, Santa Cruz: 37,122	Louisiana, Baton Rouge: 30,91	New York, New York: 41,74	Texas, Galveston: 29,95
California, Stockton: 38,121	Louisiana, New Orleans: 30,90	New York, Rochester: 43,77	Texas, Houston: 30,95
Colorado, Colorado Springs: 39,105	Louisiana, Shreveport: 32,93	New York, Schenectady: 43,74	Texas, Laredo: 27,99
Colorado, Denver: 39,105	Maine, Augusta: 44,70	New York, Syracuse: 43,76	Texas, Lubbock: 33,102
Colorado, Grand Junction: 39,108	Maine, Bangor: 45,69	New York, Troy: 42,73	Texas, Marshall: 32,94
Colorado, Pueblo: 38,104	Maine, Lowell: 42,71	New York, Utica: 43,75	Texas, Port Arthur: 30,94
Connecticut, Bridgeport: 41,73	Maine, Portland: 43,70	New York, White Plains: 41,74	Texas, San Antonio: 29,95
Connecticut, Hartford: 42,72	Maryland, Baltimore: 39,76	North Carolina, Asheville: 35,82	Texas, Texarkana: 33,94
Connecticut, Meriden: 41,73	Massachusetts, Boston: 42,71	North Carolina, Charlotte: 35,81	Texas, Waco: 31,97
Connecticut, New Britain: 41,73	Massachusetts, Brockton: 42,71	North Carolina, Durham: 36,79	Utah, Ogden: 41,112
Connecticut, New Haven: 41,73	Massachusetts, Cambridge: 42,71	North Carolina, Greensboro: 35,80	Utah, Provo: 40,111
Connecticut, Stamford: 41,73	Massachusetts, Fall River: 41,71	North Carolina, Raleigh: 36,78	Utah, Salt Lake City: 41,112
Delaware, Wilmington: 39,75	Massachusetts, Lawrence: 42,71	North Carolina, Wilmington: 34,78	Vermont, Brattleboro: 43,72
District of Columbia, Washington: 39,77	Massachusetts, Plainfield: 42,73	North Carolina, Winston-Salem: 36,80	Vermont, Burlington: 44,73
Florida, Daytona Beach: 29,81	Massachusetts, Springfield: 42,72	North Dakota, Bismarck: 47,101	Vermont, Montpelier: 44,72
Florida, Gainesville: 29,82	Massachusetts, Worcester: 42,72	North Dakota, Fargo: 37,97	Virginia, Norfolk: 37,76
Florida, Jacksonville: 30,81	Michigan, Ann Arbor: 42,83	North Dakota, Minot: 48,101	Virginia, Portsmouth: 37,76
Florida, Key West: 24,82	Michigan, Battle Creek: 42,85	Ohio, Akron: 41,81	Virginia, Richmond: 37,77
Florida, Miami: 26,80	Michigan, Bay City: 43,84	Ohio, Canton: 41,81	Virginia, Roanoke: 37,80
Florida, Orlando: 28,81	Michigan, Detroit: 42,83	Ohio, Cincinnati: 39,84	Washington, Bellingham: 49,122
Florida, Pensacola: 30,87	Michigan, Flint: 43,83	Ohio, Cleveland: 41,81	Washington, Seattle: 47,122
Florida, Sarasota: 27,82	Michigan, Grand Rapids: 43,85	Ohio, Columbus: 40,83	Washington, Spokane: 47,117
Florida, St. Petersburg: 28,82	Michigan, Jackson: 42,84	Ohio, Dayton: 40,84	Washington, Tacoma: 47,122
Florida, Tallahassee: 30,84	Michigan, Kalamazoo: 42,85	Ohio, Hamilton: 39,84	Washington, Walla Walla: 46,118
Florida, Tampa: 28,82	Michigan, Lansing: 42,84	Ohio, Lima: 40,84	Washington, Yakima: 46,120
Florida, West Palm Beach: 26,80	Michigan, Saginaw: 43,84	Ohio, Springfield: 40,84	West Virginia, Charleston: 38,81
Georgia, Atlanta: 34,84	Minnesota, Duluth: 47,92	Ohio, Steubenville: 40,80	West Virginia, Wheeling: 40,80
Georgia, Augusta: 33,82	Minnesota, Minneapolis: 45,93	Ohio, Toledo: 41,83	Wisconsin, Eau Claire: 45,91
Georgia, Columbus: 32,85	Minnesota, Rochester: 44,92	Ohio, Youngstown: 41,80	Wisconsin, Green Bay: 44,88
Georgia, Macon: 33,83	Minnesota, St. Cloud: 45,94	Ohio, Zanesville: 40,82	Wisconsin, Kenosha: 42,88
Georgia, Savannah: 32,81	Minnesota, St. Paul: 45,93	Oklahoma, Enid: 36,98	Wisconsin, Madison: 43,89
Idaho, Boise: 43,116	Mississippi, Biloxi: 30,89	Oklahoma, Oklahoma City: 35,97	Wisconsin, Milwaukee: 43,88
Idaho, Pocatello: 43,112	Mississippi, Gulfport: 30,89	Oklahoma, Tulsa: 38,96	Wisconsin, Racine: 42,88
Illinois, Bloomington: 40,89	Mississippi, Jackson: 32,90	Oregon, Salem: 45,123	Wisconsin, Sheboygan: 44,87
Illinois, Champaign: 40,88	Mississippi, Natchez: 31,91	Oregon, Eugene: 44,123	Wisconsin, Superior: 46,92
Illinois, Chicago: 42,87	Missouri, Columbia: 38,92	Oregon, Portland: 45,122	Wyoming, Cheyenne: 41,105
Illinois, Decatur: 40,89	Missouri, Joplin: 37,94	Pennsylvania, Allentown: 40,75	Wyoming, Sheridan: 45,107
Illinois, Peoria: 40,89	Missouri, Kansas City: 39,94	Pennsylvania, Erie: 42,80	
	Missouri, Springfield: 37,93		

P.1 Overview

ILC Corporation manufactures photo control systems specially designed to work with the LightMaster Controller. One model is hardwired to the LightMaster Controller. The other model is installed as a LightSync™ device node and communicates with the LightMaster via a CAT-5 data cable.

P.2 Hardwired Model

The hardwired photo-controller system features two main components: the controller board and the photo sensor. Both indoor and outdoor sensors are available. The photo control features an indoor range of 1-100 foot candles (fc) and an outdoor range of 1-1000 foot candles. The photo controller supports individually selectable ON/OFF set points. There is also a time delay feature to prevent nuisance switching. The photo control board is powered by either a 12 VAC or a 12 VDC power supply. See Figures P.1 and P.2 for detailed setup and installation instructions.

P.3 Programming

1. Program the LightMaster switch input that the photo-controller is wired to as a MAINTAINED ON/OFF switch TYPE.
2. Program the Input/Relay control of the relay or relay group that the switch controls.

Consult Section 3 of this manual (The LightMaster User Guide) for detailed programming information.

P.4 LightSync™ Model

If you are not familiar with Lightsync™ data line concepts and installation procedures consult Section 4 of this manual (LightMaster User Guide).

The LightSync™ photo controller is installed as a LightSync™ device node and communicates with the LightMaster Controller over the CAT-5 data cable. The LightSync™ photo controller features 8 sets of independently adjustable ON/OFF set points each with 256 possible set point steps. Each step equates on average to the foot candle levels shown

in Table P.1 (Component and environmental variables may require adjustments from these settings to attain a desired foot candle level.) Either an indoor or an outdoor photo eye is available. The photo eye may be installed up to 5000 ft. from the photo controller using 18-gauge wire. The settings are programmed at the LightMaster Controller. See Figures P.3 and P.4 for installation detail.

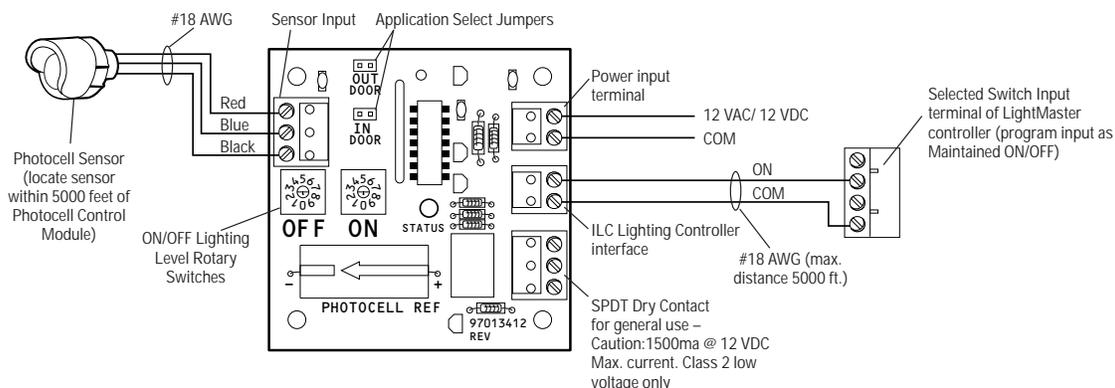
Table P.1– LightSync™ Photocell Set Points

Foot Candle	Avg. Settings
1	18
2	27
3	37
4	47
5	56
6	61
7	65
8	71
9	74
10	80
11	84
12	87
13	90
14	93
15	96
20	108
30	112
40	115
50	126
60	131
70	135
80	139
90	146
100	167
150	179
200	192
300	202
400	207
500	213
600	216
700	220
800	223
900	226
1000	229
1200	231
1400	233
1600	235
1800	236

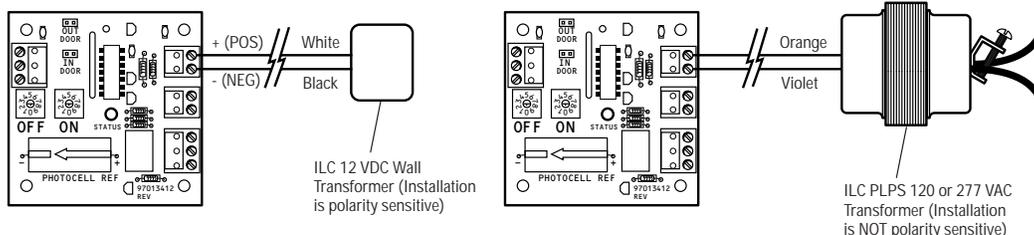
Note: Typical ON/OFF set points for an outdoor application are 25 fc (110) ON and 75 fc (137) OFF.

Photocell Controller Board Installation Guide

Wiring Overview



Power Supply Termination



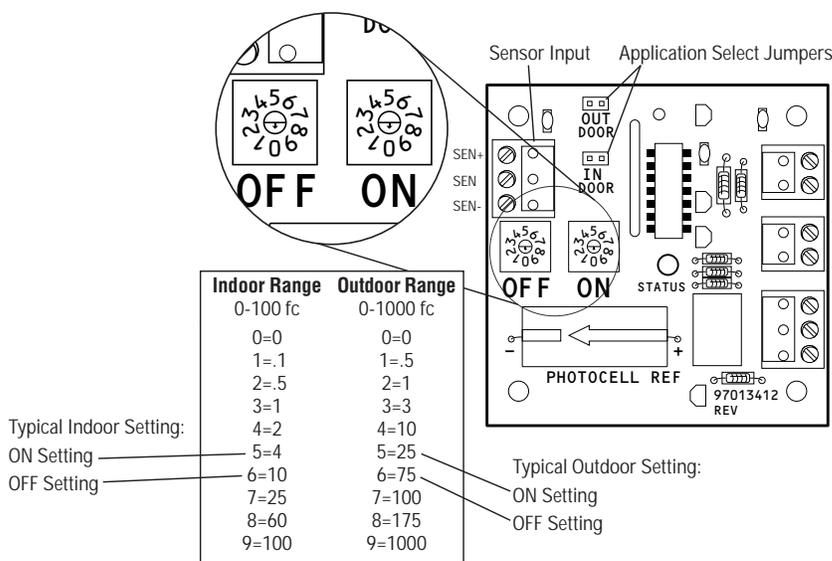
Installation

1. Mount the control module either in, or remote from, the lighting control device. When interfacing with a LightMaster Controller, it is usually easiest to mount the photocell control module in the low voltage section of the controller. If choosing to mount the control module remotely, do not exceed a distance of 5000 feet from the control module to the ILC lighting controller. Use 18-gauge conductors. If the photocell controller is used to interface with non-ILC manufactured equipment, consult the manufacturer's literature for guidance.
2. Install the sensor and terminate it to the sensor inputs on the photocell control module. Use 18-gauge wire and keep the distance under 5000 feet. If the sensor is for an outdoor application, mount it on a roof or equal, facing north with its hood on top and facing away from any nighttime light sources. Indoor sensors should be installed 6-8 feet from windows, with the sensing eye pointed down and away from any direct lighting.
3. Depending on the application, wire the photocell control module output to the input of the lighting control device. Use 18-gauge conductors. Use a dedicated output when interfacing with an ILC controller. (Program the selected lighting controller switch input as Maintained ON/OFF.) Use the SPDT dry contact output when interfacing with other devices. **Caution: Do not exceed 1500ma @ 30 VDC.**
4. Wire the 12 VAC or VDC power source to the photocell control module power input terminals.

Figure P.1– Hardwired Photocell Installation

Photocell Controller Board Setup Guide

ON and OFF Set Point Selectors



Description

The ILC Photocell is an electronic device that supports the ON/OFF control of lighting circuits. The lighting circuits are controlled indirectly by means of the photocell controller module maintained contact closure signals sensed by the switch inputs of ILC Quanta Elite or LightMaster lighting controllers or by dry contact inputs to other devices that control line voltage loads via low voltage (Class 2) signals. The photocell control module can be mounted either on the manufacturer provided plastic channel for installation in the control section of the Quanta Elite or LightMaster lighting controller, or in an enclosure suitable for remote mounting. The photocell control module requires either a 12 VAC or a 12 VDC power source to operate. It is recommended that the power source feature a disconnecting means to facilitate service.

The photocell control module outputs respond when the photocell sensor detects the user selected ON and OFF foot candle level. Both outdoor and indoor sensors are available depending on the required application.

Setup (See above example)

1. Jumper the photocell control module for either outdoor or indoor depending on your application.
2. Set the desired ON and OFF foot candle levels by turning the rotary switches to the desired settings.
Typical settings:
outdoor – ON at 25fc, OFF at 75fc;
indoor – ON at 4fc, OFF at 10fc.
3. Energize the 12 VAC or 12 VDC power.
4. Simulate dark and light conditions at the sensor and make any required adjustments on the rotary switches. Note: On power-up there is a 15-25 minute setup period during which the controller will react instantly. After the setup time has expired, there is an 8-12 second time delay to prevent nuisance switching during normal operation.

Figure P.2– Hardwired Photocell Setup

P.5 Installation

1. Route the CAT-5 cable to the photo controller from the nearest device node or from the LightMaster.
2. Crimp male ends on the cable and check the cable integrity with a CAT-5 cable tester.
3. Install the photo sensor and terminate the conductors to the controller board.
4. Set the node address.
5. Plug the incoming CAT-5 cable into the "IN" photo-controller RJ-45 connector. Plug the other end of the CAT-5 into the "OUT" connector on the upstream LightSync™ node. (This node could be the LightMaster controller or a LightSync™ device like a LightSync™ pushbutton switch.

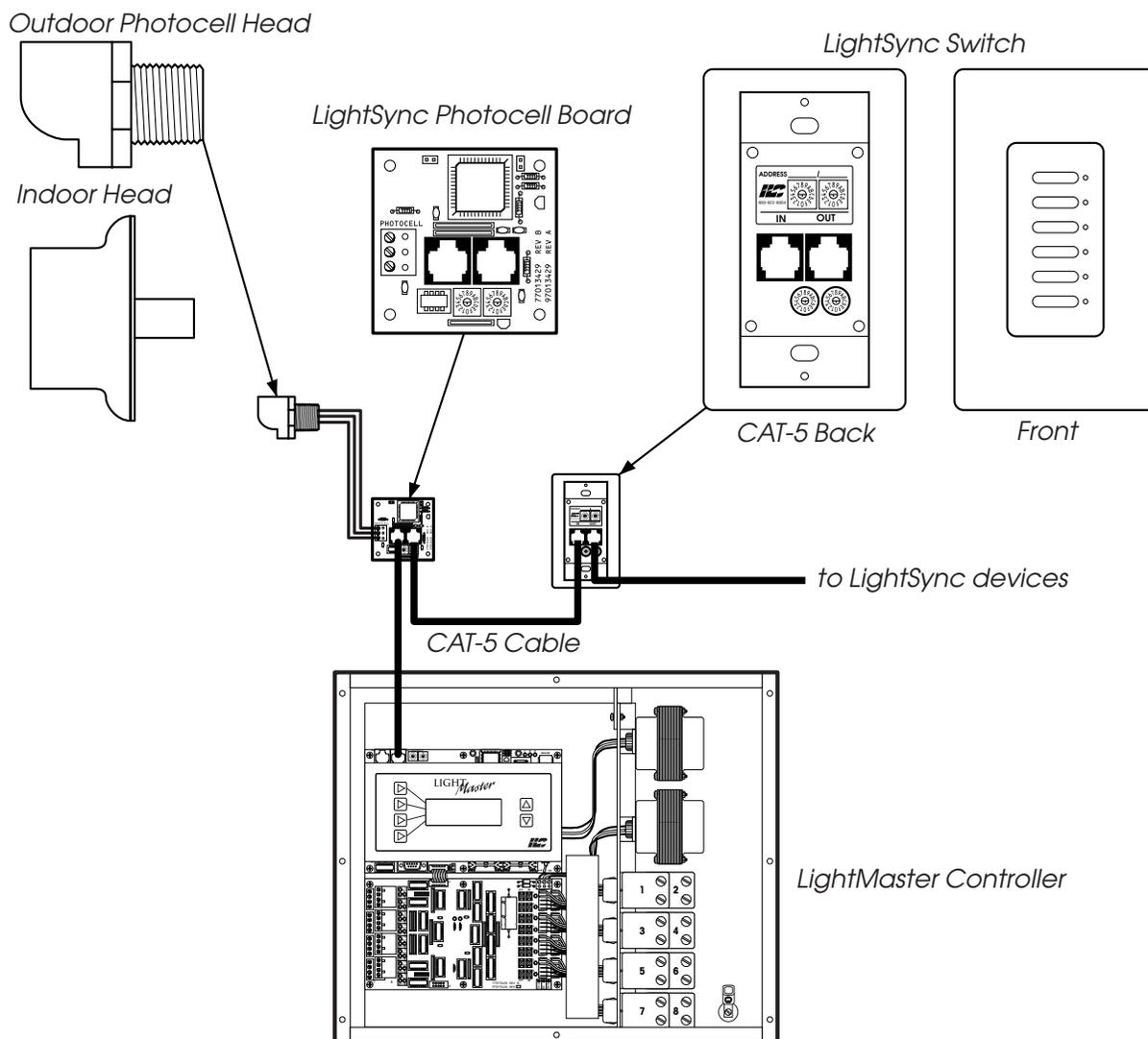
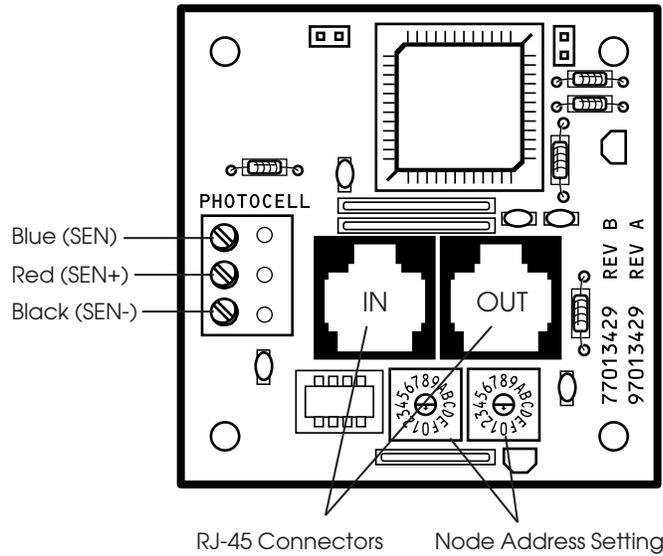


Figure P.3 – LightSync Photocell Installation Overview

LightSync Photocell Controller Board



LightSync Photocell Controller Board Mounting Options

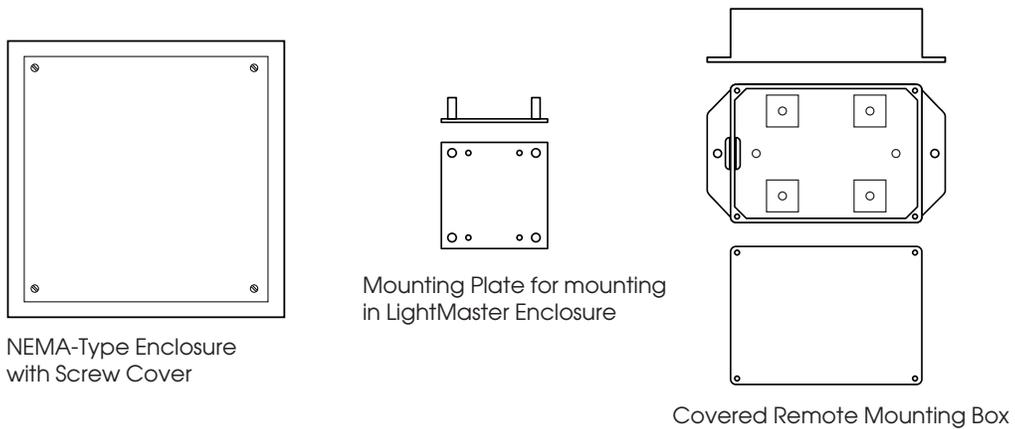


Figure P.4 – LightSync Photocell Controller Board Detail and Mounting Options

P.6 Programming Example

How to Program a LightSync™ Photocell to Control Relay Outputs

You have to perform two essential and possibly one optional tasks to control relays from a LightSync™ photocell.

- Define the photocell operational parameters.
- Select the relays to be controlled and define how they will react.
- If desired, change the photocell filter rate from its default of 30 seconds to 2 seconds. The filter is a delay period applied to the photocell controller to prevent nuisance switching (30 is generally used).

Define the Photocell Node:

1. From the Home screen, press ► EDIT.
2. When the Main menu appears, press ► SWITCH INPUTS; then press ► LIGHT-SYNC INPUTS.
3. From the Switch Input menu, press ► CONFIGURE DEVICES.
4. When the top level Configuration screen appears, press ▲ or ▼ until the node address of the photocell appears.
5. Press ► TYPE; then press ▲ or ▼ until PHOTOCELL appears.
6. Press ► CONFIGURE to access the second Configuration screen.
7. If necessary, press ▲ or ▼ until the sub-address of the device appears (there will be eight possible sub-addresses: 01.1, 01.2, etc.). Each sub-address can be assigned its own set point values.
8. Press ► ON; then press ▲ or ▼ until the desired ON set point appears.
9. Press ► OFF; then press ▲ or ▼ until the desired OFF set point appears.
10. To define additional sub-addresses, press ► INPUT; then press ▲ or ▼ to select another sub-address and repeat steps 8 and 9.
11. Press ► EXIT twice to return to the Switch Input menu.

```
LIGHTMASTER
TUE 09/30/05
07:50:54 PM
EDIT      (C)2004 ILC
```

Press ► EDIT

```
RELAY OUTPUTS
SWITCH INPUTS
SWITCH PILOTS
EXIT
```

Press ► SWITCH INPUTS

```
LIGHT-SYNC STATUS
CONFIGURE DEVICES
INPUT/RELAY CONTROL
EXIT
```

Press ► CONFIGURE DEVICES

```
NODE ◀ LIGHT-SYNC 04
TYPE   PHOTOCELL
CONFIGURE
EXIT
```

Press ► CONFIGURE

```
INPUT ◀ LSYNC 04.1
ON     LEVEL 110/255
OFF    LEVEL 137/255
EXIT
```

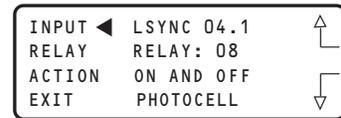
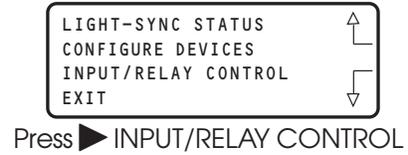
Press ► EXIT twice

```
LIGHT-SYNC STATUS
CONFIGURE DEVICES
INPUT/RELAY CONTROL
EXIT
```

P.6 Programming Example, continued

Select the Relay That the Switch Node Controls:

1. From the Light-Sync Input menu, press ► INPUT/RELAY CONTROL; then when the next screen appears, press ► EDIT CONTROL. Then on the next screen, press ► INPUT/ SINGLE RELAYS.
2. Press ▲ until the input that controls relay(s) appears.
3. Press ► RELAY; then press ▲ until the relay to be controlled appears.
4. Press ► ACTION; then press ▲ until the desired relay action appears.
5. Repeat steps 3 and 4 for any additional relays controlled by the input.
6. Press ► EXIT 3 times to return to the Switch Input menu.



If desired, change the photocell filter.

1. From the Home screen, press ► EDIT; then press ▼ 5 times.
2. When the Main menu appears, press ► SPECIAL FUNCTIONS.
3. When the Special Functions menu appears, press ► PHOTOCELL FILTER to change the filter from 30 to 2 seconds.
4. Press ► EXIT twice to return to the Home screen.

